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CICLO XXII

***ON CONTEXT EFFECTS IN MEDICAL DECISION MAKING: WHEN THE WAY  
INFORMATION IS PRESENTED AFFECTS PATIENTS' DECISIONS***

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## ABSTRACT

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Decision making is pervasive in our daily life. Sometimes we face decisions that are very important, such as the decision about what medical treatment to undergo. But how can we be sure that we are making the right decision? Or even more subtly, how can we be sure that our decision would be the same, no matter what the circumstances? The answer from the research that has been conducted in the field of medical judgment and decision making is “you can’t be sure.” Indeed, the context has a great impact on what patients decide. In this dissertation, I show some examples of the effects of contextual information on decision making. Specifically, three studies address the effect of different variables that influence judgments and decisions without the decision maker being aware of them. In the first study, I examine the role played by three factors on the decision between a risky and a safe alternative: the decision domain (the medical vs. financial domain); the decision maker’s purpose (utilitarian vs. hedonic); and the type of information provided (generic vs. detailed). The results suggest that when the information is generic and the purpose is hedonic (i.e., not essential), the risk attitude is opposite in the two domains, thus suggesting that when people’s life or health is at stake, they are more cautious, whereas they are more willing to play with their money for hedonic purposes. The second study investigates several potential explanations for an unusual finding. Indeed, while people generally prefer harms of omission to harms of commission (i.e., omission bias), for cancer they prefer active treatments over undergoing regular check-ups without treatment. On one hand, the results highlight that this finding depends on how the inactive option is conceived and described. On the other hand, they also point out that the instance of a malignant tumor which has already been diagnosed is a peculiar case relative to other kinds of illnesses. Finally, the third study is a demonstration that physicians are also affected by context factors



that should not affect their choices. Specifically, they are influenced both by how many options are available and by information about patients that is irrelevant to the decision.

Thus, when we as patients or physicians are making decisions which impact either our own health or someone else's health, we are subject to biases and we are affected by contextual information. But what if we were health communicators? How would we use this knowledge? Knowing that patients may make differing choices depending on the way information is presented is certainly important, but how health communicators and policy decision makers apply this knowledge is just as central to medical decision making. Possible approaches that can be taken can be visualized along a continuum. At one extreme, the paternalist approach sees the doctor as an apprehensive father, and, thus, it is the doctor who makes the decision with little or no input from the patient. At the other extreme, with the informed decision making approach, it is the patient who, after being fully informed about all the options available and their consequences, makes the decision with little or no input from the doctor.

Depending on the approach that is chosen, health messages also can take different forms. When they are aimed at persuading people to engage in a given behavior, such as dieting or undergoing a screening test. When informing a patient about the options available (in the informed or shared approach), the message should not be designed to influence the patient's decision other than providing information, i.e., it should be neutral relative to the decision. The other three studies presented in the dissertation investigate cancer screening decision making within these two approaches. The first two of these studies investigate the effect of the way in which information is presented on participants' prostate cancer screening decisions. The first study takes an informed approach, while the second one considers the same topic from the paternalistic approach, by using prospect theory as reference. The last study, also using a paternalistic approach, but applied to the decision whether or not to undergo colon cancer screening, assesses the real screening behavior of patients. Our findings allow us to discuss in a critical manner the results of a recent meta-analysis that disconfirmed the effect of framing, as proposed and interpreted in prospect theory. Indeed, we have tested and confirmed

one possible reason for this result, not considered in the meta-analysis and which could have, therefore, biased its conclusion. Specifically, the lexical valence of the terms used to describe the consequences seems to be a relevant factor in the effectiveness of the message. To our knowledge, this factor was considered neither in previous studies nor in the more recent meta-analysis. To summarize, I first investigated some of the contextual factors that affect medical judgments and decisions from an experimental perspective. Then, I studied more specifically context effects in messages promoting cancer screening behaviors, highlighting some practical implications and theoretical consequences.



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## RIASSUNTO

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Le decisioni sono molto comuni nella nostra vita quotidiana. Spesso si tratta di decisioni banali, altre volte ci confrontiamo con scelte molto importanti, come ad esempio quelle che coinvolgono la nostra salute. Potremmo, ad esempio, essere chiamati a decidere se sottoporci o meno ad un certo trattamento medico, oppure potremmo trovarci a dover scegliere tra due o più alternative di trattamento. Ma come potremmo essere sicuri che la nostra scelta sia davvero la scelta giusta, o comunque la migliore per noi? E, ancora, come potremmo essere sicuri che quella sarebbe in qualsiasi caso la nostra decisione? La risposta della ricerca condotta nell'ambito delle decisioni mediche è "non possiamo esserne sicuri". Numerosi effetti di contesto influenzano, infatti, le decisioni dei pazienti. In questa tesi illustro alcuni esempi che mostrano come le informazioni contestuali possano avere un effetto sulla presa di decisione. Nello specifico, tre studi indagano l'effetto di diverse variabili che influenzano i giudizi e le decisioni senza che i decisori stessi ne siano consapevoli. Nel primo studio mostro come la scelta tra un'alternativa rischiosa e un'alternativa sicura possa essere influenzata da tre fattori: l'ambito della decisione (medico vs. finanziario); l'obiettivo del decisore (necessario vs. futile); e l'informazione fornita (generica vs. dettagliata). I risultati suggeriscono che quando l'informazione è generica e l'obiettivo è futile, l'atteggiamento nei confronti del rischio è l'opposto nei due ambiti, suggerendo quindi che quando è la vita delle persone ad essere in gioco, esse si mostrano più caute, mentre risultano maggiormente disposte ad azzardare con il denaro, quando l'obiettivo è futile. Il secondo studio indaga numerose potenziali spiegazioni per un risultato riportato recentemente in letteratura che sembra andare in direzione opposta a quelli riportati negli studi che lo hanno preceduto. Infatti, sebbene generalmente le persone preferiscano opzioni i cui danni derivanti dalla mancata azione sono maggiori rispetto ai danni provocati dalla

commissione di un'azione ("omission bias"), nel caso di una diagnosi di cancro sembra preferiscano trattamenti attivi rispetto alla possibilità di effettuare controlli regolari, senza trattamenti. Da una parte, i risultati del mio studio evidenziano che questo risultato dipende da come è concepita e descritta l'opzione di omissione dell'azione. Dall'altra, evidenziano anche che una diagnosi di tumore maligno è un caso particolare, rispetto ad altri tipi di diagnosi. Il terzo studio, infine, è una dimostrazione del fatto che anche gli studenti di medicina sono influenzati da fattori di contesto che, auspicabilmente, non dovrebbero invece influire sulle loro scelte. In particolare, sono influenzati sia dal numero di alternative a disposizione, sia da informazioni che, pur essendo relative alla storia clinica del paziente, dovrebbero essere irrilevanti per la decisione.

Quindi, l'essere pazienti o medici che decidono per la propria o l'altrui salute non ci esime dall'essere soggetti a distorsioni e, tutti, siamo vittime di trappole cognitive e siamo influenzati da informazioni contestuali. Ma cosa succederebbe se fossimo esperti in comunicazione sulla salute? Come useremmo questa conoscenza? Sapere che i pazienti possono prendere decisioni diverse a seconda del modo in cui le informazioni sono presentate loro è certamente importante, ma anche l'uso che gli esperti in comunicazione sulla salute e coloro che attuano le decisioni a livello comunitario fanno di questa conoscenza è centrale nella presa di decisione in ambito medico. I diversi approcci possono essere collocati lungo un continuum. Ad un estremo, l'approccio paternalistico vede il medico come un padre apprensivo: in questo caso, è il medico a prendere la decisione, con poche o nessuna indicazione da parte del paziente. All'altro estremo, secondo l'approccio informato alle decisioni mediche, è il paziente che, dopo essere completamente informato su tutte le opzioni disponibili e sulle loro conseguenze, prende la decisione, con poche o nessuna indicazione da parte del medico.

A seconda dell'approccio adottato, gli stessi messaggi per la salute possono avere forme diverse. Quando si promuove un comportamento salutista usando un approccio paternalistico, il messaggio dovrebbe cercare di convincere le persone ad attuare il comportamento desiderato, come ad esempio mettersi a dieta o effettuare un test di screening. Quando invece si informa il paziente sulle opzioni disponibili (approccio informato o condiviso), il messaggio non dovrebbe essere formulato in

modo da influenzare la decisione del paziente, dovrebbe cioè essere neutro rispetto alla decisione. Gli altri tre studi presentati nella tesi indagano la decisione di sottoporsi a screening oncologici nell'ottica di questi due approcci. I primi due di questi studi indagano l'effetto del modo in cui sono presentate le informazioni relativamente allo screening per il cancro alla prostata. Il primo studio assume un approccio informato, mentre il secondo considera lo stesso argomento con un approccio paternalistico, prendendo la teoria del prospetto come riferimento. L'ultimo studio, anch'esso in una prospettiva paternalista, ma applicata allo screening per il cancro del colon, confronta diversi tipi di messaggio e valuta, anziché le intenzioni dei pazienti, il comportamento effettivo di adesione dei pazienti all'esame proposto.

I dati ottenuti ci consentono di discutere in modo critico i risultati di una recente meta-analisi che ha confutato l'effetto framing, così come proposto dalla teoria del prospetto. Abbiamo preso in considerazione e testato un possibile aspetto, non valutato nella meta-analisi, che potrebbe aver contribuito a distorcere i risultati e la conclusione. In particolare, la nostra ipotesi è che la valenza lessicale dei termini usati per descrivere le conseguenze del comportamento sia un fattore rilevante nel determinare l'efficacia del messaggio. Per quanto ne sappiamo, questo fattore non è stato considerato né negli studi precedenti, né nella più recente meta-analisi.

Per riassumere, i primi studi presentati in questa tesi hanno indagato alcuni dei fattori di contesto che influenzano i giudizi e le decisioni da una prospettiva sperimentale. Nelle ricerche successive, ho studiato più specificamente gli effetti del contesto nei messaggi che promuovono comportamenti di screening per tumori, mettendo in luce possibili approfondimenti teorici e alcune implicazioni pratiche.



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# CHAPTER 1

## INTRODUCTION

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### 1.1 A Brief History of Judgment and Decision Making

Decision making is pervasive in our daily life. Sometimes we face decisions without even noticing we are making a choice, for instance, choosing which kind of cereal to buy, what way back from the office to take, or where to have dinner. When we think about the decisions we face in our life, we are more likely to think about the more important ones, such as whether or not to accept a new job or what kind of medical treatment to undergo for a disease, or also important collective decisions, such as when electing a new president. Interest in how human beings make decisions, and how they think and reason, can be traced back to the ancient Greek philosophers. For instance, the formal logic developed initially by Aristotle can be considered one of the first normative theories about decision making, that is, a theory that describes how people should behave and reason according to formal logic rules. But the origins of the research on judgment and decision making processes with a scientific and experimental approach are more recent, and can be dated to research conducted in the 1950s, 1960s, and subsequently, although even earlier researchers still influence the field. Before this period, the mainstream theory about decision making was the theory of Expected Utility, which was first formulated by Bernoulli in the XVIII century (1738), then expanded by von Neuman and Morgenstern (1944). According to this theory, people choose depending on the expected utility of their options, and they choose the alternative that maximizes the expected utility.

One of the first steps toward a psychologically valid theory was made by Simon, with his conception of “bounded rationality”, according to which the rationality of individuals is limited by the information they have, the cognitive limitations of their minds, and the finite amount of time they have to make decisions (Simon, 1957).



This is in contrast with the assumption underlying most economic theories, which considers individuals to be rational and able to act according to their preferences. Certainly, a cornerstone of judgment and decision making research was the work by Kahneman, Tversky, and their colleagues, started in the early 1970s, which lead Kahneman to receive the Nobel Prize in Economics in 2002 for the Prospect Theory (Kahneman & Tversky, 1979). Since then, the field spread from its origins in psychology and economics to other disciplines with different approaches, among which is medical decision making. Judgment and decision making are two slightly different concepts, which are strongly interconnected between them. Indeed, judgment is a combination of evaluative and inferential processes that are often used in the process of decision making, in order to evaluate the options available and their attributes. Decision making can be seen as the choice resulting from the evaluations and judgments about the options among which to decide, or simply as the judgment about what to do or what to choose.

The work conducted by Kahneman, Tversky, and colleagues has focused mainly on the way people really behave, as opposed to how they are supposed to behave according to the expected utility theory. In other words, their approach was “descriptive” of what people choose, as opposed to the “normative” approach of what people should or ought to choose according to utility theory. One of the main accomplishments of Kahneman and Tversky has been Prospect Theory (1979), which enabled them to explain most of their findings about how people actually decide and choose. Indeed, the study of judgment and decision making has long focused on the comparison between normative models and descriptive models, and how to improve judgments according to normative standards, i.e., through prescriptive models. This viewpoint assumes that the way in which people judge and decide can be biased and not follow normative models, implying that decisions made according to normative standards are better, and that prescriptive models help us in making better decisions. From this perspective, the knowledge and understanding of normative models is essential, in that it is required to look for and recognize biases, and then develop prescriptive models (Baron, 2008). On the other hand, in order to create good prescriptive models, we need to have good descriptive models, because the knowledge of the nature of the problem is essential for trying to correct it. While

normative models are a prerogative task of philosophy, resulting from reflection and analysis, descriptive models are clearly the task of psychology.

Beginning with Kahneman and Tversky, the first studies on judgment and decision making developed mainly in the field of economics, dealing primarily with gambles concerning the probability of winning or losing money. This was due not only to the interest in decisions concerning money, but also to the relative simplicity of these kind of decisions. Obviously, however, decisions are involved in almost all disciplines (see Figure 2.9 for an example), and one of the most interesting applications of decision making is in the medical field, and is of practice importance as well.

## **1.2 Medical Decision Making and Judgment and Decision Making**

Medical decision making can be seen as the application of the judgment and decision making research findings to the medical field. It can be considered as a subset or as overlapping with the field of judgment and decision making *per se*. Indeed, the topic of interest is common: Investigating how people make judgments and make decisions, and what factors affect those decisions. Judgment and decision making *in se* is a theoretical approach, that can be applied to every field, but has been developed mainly in the economic domain.

Medical decision making concerns the study of a particular subset of decisions, but the interest is not only theoretical, but often practical and applied to real-world situations. In fact, while theoretical implications are also important and interesting, more often the research in medical decision making is aimed at helping patients, practitioners, and policy makers in making real decisions. Furthermore, a characteristic that is very common in real world medical decision making is the complexity of the decisions. This complexity can be due to several factors, and often more than one factor is relevant at the same time. For instance, almost always, options available in a medical context involve uncertainty, for example about the possible outcomes of the available treatments. This uncertainty can sometimes be expressed by means of probability values, but sometimes the medical literature is not informative enough or the treatment is new, and in these cases the uncertainty is

more vague and ill-defined. Another aspect that results in complex medical decisions is the number of alternatives or the number of the attributes of the alternative and their respective uncertainty. In other words, sometimes there are a number of treatments available, or even if there are only a few, they have a great number of aspects that have to be considered and incorporated into the decision. Moreover, there are situations in which what is essential in determining the decision is the weight that the patient himself/herself gives to the possible outcomes of the decision. These situations are referred to as “preference-sensitive” decisions or clinical equipoise (e.g., Elwyn, Edwards, Kinnersley, & Grol, 2000). Moreover, often the patients are uneducated, and must be first educated either through public campaigns or by physicians in order for them to make informed decisions.

Although medical decision making differs in many aspects from judgment and decision making, there are also innumerable similarities. I would argue that the first studies on medical decision making used this field as one of the fields in which judgment and decision making applies, and not with the goal of improving medical decisions *per se*. Scenarios concerning health were used along with other topics, such as the environment or law, in order to generalize results beyond the economic domain, which has almost certainly been the most frequently used. Later, the interest for medical decision making grew, and the field become more and more independent (and is still developing), as testified by the existence of numerous societies, the largest of which is the Society for Medical and Decision Making (SMDM). SMDM also has published a peer reviewed journal since 1981 (Medical Decision Making) and organizes an annual conference; another regular event is the biannual conference of Informed Shared Decision Making (ISDM).

### **1.3 The Continuum Between The Paternalistic, Shared Decision Making and Informed Decision Making Approaches**

In medical decision making, at least one patient and one doctor are involved. The situation can be more complex, for instance involving the family members of the patients and/or involving more than one doctor. In any of those cases, the roles that the respective parties have in making the decision can vary extremely. The range of

possibilities can be considered a continuum, where at one extreme there is the “paternalistic” approach and at the other extreme there is the “informed” decision making approach. When the approach is paternalistic, the doctor makes the decision with little or no input from the patient. Usually, this happens when one of the options available is commonly considered the best option by the clinical community and there are scientific studies that support it. In this case, the doctor acts as a father would do with his child; having more knowledge and being more responsible than the patient, he would guide the patient to the better decision. Although some patients do not want to make the decision on their own, and ask for the advice or recommendation of their physicians anyway, the paternalistic approach has been criticized for several reasons, and the term itself has acquired a negative meaning. One problem with the paternalistic approach is that it makes the assumption that the doctor knows better than the patient which the best decision is for the patient. While this could be true to a certain extent, the doctor being an expert, and the patient usually a lay person, nevertheless the patient can have different preferences and perspectives that the doctor does not take into account. For example, he could have religious beliefs that prevent him from receiving blood from someone else, thus excluding the surgical treatment option, or she could prefer a shorter life relative to any risk of death. On the other hand, the paternalistic approach is often used in policy making, for example when the Department or Minister of Health, after having performed cost-benefit analyses, recommends colorectal cancer screening, or requires all newborns to undergo screening. Moreover, when there is a clearly better option, it might be a waste of time and effort for both the patient and the doctor if a different approach to be used.

In contrast with the paternalistic approach, at the other end of the continuum, the informed medical decision making approach prescribes that the patient, after being informed, makes the decision, with little or no input from the doctor. In order for the patient to be able to choose the best option, the patient needs to be fully informed about all the possible options (including the option to do nothing), their consequences, and their probability of occurring. For example, the Institute of Medicine in the United States “considers patient-centered care to be a foundation of high-quality health care, along with effectiveness, safety, efficiency, timeliness, and

equity. Patient-centered care is empirically based and promotes respect and patient autonomy; it is considered an end in itself, not merely a means to achieve other health outcomes” (Epstein & Peters, 2009). The informed approach too has been sometimes criticized, especially for the assumption that once the patient is informed, he/she is able to make the best choice. Especially when decisions are complex, this might not be true, and, even for simple decisions, there are many factors that can affect the decision even when the patient is completely informed (see Chapter 2). Moreover, some patients see informed decision making as a way to make them responsible for their choice and thus liable from the legal point of view, and also some practitioners are afraid that they could be sued if they do not advice for the commonly considered best option, and instead inform the patients and eventually share the decision with them.

There are several other possibilities between the two extremes, but in general the middle of the continuum is referred to as “shared” medical decision making, i.e. when the decision is shared between the patient and the physician (e.g., Elwyn et al., 2000; Rimer, Briss, Zeller, Chan, & Woolf, 2004). Shared decision making too requires the patient to be fully informed, but then the patient also discusses with the doctors which treatments are better for him/her, considering his/her preferences and goals. The informed and shared approaches to decision making are usually used when there is not an option that is clearly the best, and the options available offer an uncertain mix of costs and benefits, or when their importance to the patient might depend on the patient’s values. In these cases, what is important is the quality and satisfaction of the decision made by the patient, more than the decision itself. In general, the role of the patient in the decision process is nowadays more commonly acknowledged, and this implies the need for information that enables the patient to take part in the decision.

#### **1.4 Communicating Health Messages: An Overview**

When providing information to the patients, the information itself can be customized depending on the approach towards decision making. Specifically, when taking a paternalistic approach, the information provided is aimed at influencing the

patient's choice in one direction, similar to what would a paternalistic doctor do. In other words, persuasive communication is used when the information is aimed at convincing the patient to make a certain decision. For instance, if the Department or Minister of Health has recognized that colon cancer screening is effective in reducing the mortality and the morbidity of the disease, a campaign promoting colon cancer screening could be done to convince people to get screened. On the other hand, with both informed and shared decision making, the information provided to the patient should not favor any of the options over another, and the way in which the information itself is presented should not affect the patient's decision. The content and the format of the presentation of information concerning the same decision can thus be different depending on the goal of the communicator and on the approach chosen (for instance, see Chapters 6 and 7).

### **1.5 Persuasive Health Messages**

Persuasive communication has a long history outside the medical field, mainly in the political domain and in the business and market domains. Within the medical domain, the use of persuasive health messages has usually targeted two different kind of behaviors: good health habits (e.g., exercising regularly, eating fruits and vegetables, using sunscreen, etc.) and "regulation" behaviors (e.g., quitting smoking, dieting, or quitting gambling). In particular for regulation behaviors, the informed approach is ineffective. For instance, in spite of knowing that smoking can kill or lead to other undesired consequences, people continue to smoke, and the efficacy of the labels on the cigarette boxes have been put in doubt (e.g., Ruiter & Kok, 2005). Persuasive communication is usually used to make people change their attitudes and beliefs, thus promoting a change in their behaviors. Changing a health behavior is not easy, and the information approach alone seems to be unsuccessful. While the messages and interventions regarding "regulation" behaviors aim at the reduction or cessation of a behavior, messages concerning good health habits usually aim at inducing a behavior. They can promote a daily habit, such as flossing your teeth or drinking more water, or they can promote habits that have to be repeated less

frequently over time, such as undergoing screening for breast cancer or using sunscreen when sunbathing.

The fact that these messages are “persuasive” does not mean that the information provided is not true. The persuasiveness can be attained in a number of ways, for instance by constructing a personalized message that addresses the issues that are more relevant to the specific individual (tailored message), or by inducing counterfactual thinking to elicit feelings of regret (e.g., “If you do not perform a screening test, you might later find out you could have prevented or detect the illness in an early stage”). The way in which a message achieves persuasiveness and the content of the message are driven by the theory that is used as a framework.

For instance, in a program helping people to quit smoking, the Transtheoretical Model (which comprises five ordered categories along a continuum of motivational readiness to change a problem behavior, Prochaska & Velicer, 1997) could be used, and the messages delivered would be matched according to the stage of change in which the recipient is. Another theory that can be used to form a persuasive message is Prospect Theory (Kahneman & Tversky, 1979), according to which people’s attitude for risk depends on the manner they perceive a given situation, i.e. when the situation is perceived as a gain relative to the present status, they tend to be more risk averse, while they tend to be more risk-seeking when the situation is perceived as a loss relative to the present status. Again, this fact can be employed by presenting the same information from the perspective that is more effective in promoting the desired behavior.

## **1.6 Beyond Persuasiveness: Informed Medical Decision Making**

A typical case calling for informed patient decision making is when the decision is preference-sensitive (i.e., when it is affected by patients’ preferences and values). A preference-sensitive decision is a decision for which there is no best option for each person facing the decision, but it is instead the case that which option is better for each person depends on that person’s individual preferences and the weight that he or she gives to certain features of the option. In other words, when the tradeoff between the benefits and the harms is not certain, or the strength of the scientific

evidence is low, and the patients' values can therefore tip the scales in favor of one of the options (O'Connor, Légaré, & Stacey, 2003). Examples of preference sensitive decisions are: antenatal screening, management of symptoms of menopause, menorrhagia, benign prostate enlargement, back pain, or treatment for early stage breast or prostate cancers. For all these cases, there is usually not a right or wrong decision. Another term that is used to describe this concept is "equipoise", a term that was first used in the context of medical trials, referring to the fact that there should be a "genuine uncertainty within the expert medical community - not necessarily on the part of the individual investigator - about the preferred treatment" as a necessary condition for clinical trials (Freedman, 1987). Subsequently, the meaning of the term "equipoise" has been extended and is now used more in general to refer to situations in which the doctors have no clear preference for a given treatment option, and when this absence of preference does not result from the lack of knowledge or evidence (Elwyn et al., 2000). In these cases, what is most important is the quality of the decision and the patient's satisfaction with the choice, more than the choice in itself.

One tool that is often used in informed decision making is referred to as a "patient decision aid." The International Patient Decision Aid Standards (IPDAS) collaboration has defined a series of criteria that the information provided to patients should meet in order to be considered balanced information and to be considered a patient decision aid (O'Connor, Llewelyn-Thomas, & Stacey, 2005). The topics covered are: a) using a systematic development process; b) providing information about options; c) presenting probabilities; d) clarifying and expressing values; e) using personal stories; f) guiding/coaching in deliberation and communication; g) disclosing conflicts of interest; h) delivering decision aids through the Internet; i) balancing the presentation of options; j) using plain language; k) basing information on up-to-date scientific evidence; and l) establishing the effectiveness of the options. For each of these topics, the relevant literature was reviewed and, where possible, a recommendation was done. More generally, some of these criteria can be applied to information that is needed by the patient according to informed and shared decision making approaches, for instance, the fact that the information should be based on



up-to-date scientific evidence, or that probabilities should be incorporated whenever possible, and the language used should be plain and understandable by laypeople.

A very important consideration is that the way in which the information itself is presented should not bias the patient's decision, because that would negate the effort to make the information balanced and objective. A huge body of literature has investigated context effects, i.e. the effects of the way in which information is provided on decision making (not only in the medical field), and the general conclusion is that people can be influenced by contextual information which should actually not affect their decisions (more details are presented in the following chapter). The "informed" perspective makes this an issue. Indeed, on one hand, using a paternalistic approach it is possible to target the wanted behavior and thus select the features of the message or the information that increase that specific behavior. On the other hand, the informed decision making approach is usually applied to preference-sensitive decisions, in which by definition there is no best option, therefore it is not ethically possible to choose the features of the message that maximize one option, or the purpose of informed decision making process would fail. One aspect that can be targeted as an important outcome to increase is the patient's knowledge. Additionally, considering that in these cases what is most important is the quality of and the satisfaction with the decision, these could also be targeted rather than knowledge, but the outcome of the decision in itself can not be used as a target or reference for improved decision making.

As argued more generally by Schwartz (2000), in modern occidental societies freedom and autonomy are highly valued, and self-determination is seen as a very positive and valuable sign of well-being for both individuals and society. However, this pervasive self-determination can become "tyrannical" (as Schwartz suggests with his title "Self-Determination: The Tyranny of Freedom") when freedom and autonomy are excessive and brought to extremes, resulting in dysfunctions such as clinical depression and general dissatisfaction. Schwartz, using the example of ordering a meal at a Chinese restaurant as a metaphor for choice with complete information, as prescribed by the theory of rational choice, highlights that in real life complete information is rarely available ("perfect information is a myth"), and that even when complete information is available and the decision might seem easy,

many factors other than rational deliberation seem to govern choices, for example habit and tradition. One consideration is that “if people fall back on habit and tradition even in a situation where rational deliberation with full information is possible, imagine how much more inclined they are to do so in the situations of everyday life that are full of open-ended uncertainty.” The second point made in this article concerns the drawbacks of self-determination. Indeed, as Schwartz states, “all this emphasis on individuals as the makers of their own worlds, their own destinies [...] leaves people indecisive about what to do and why. Freedom of choice is a two-edged sword, for just on the other side of liberation sits chaos and paralysis” (Schwartz, 2000). These arguments can be obviously relevant also to the informed decision making approach. When people are responsible for their choice or decision, they could become indecisive and paralyzed by choice, which is clearly the opposite of the desired effect.

### **1.7 Various Factors Affecting the Way in Which People Judge and Choose**

As previously mentioned, there is a huge body of literature on factors affecting the way in which people judge and decide among options, referred in general to as context effects. This research obviously also reaches beyond the medical domain, and it extends to all fields of judgment and decision making. In general, these effects can be distinguished in three broad (sometimes overlapping) categories: 1) when the options available affect people’s preferences, i.e. the choice between the same two options is “biased” by which options are available to the decision maker (for example the “dominated” option is preferred); 2) when judgments and decisions are affected by external cues that should not affect them, for example the evaluability of options or who the decision is made for; and 3) when the options available are actually the same but they are perceived to be different (e.g., framing effect) because of the way in which they are presented.

All these situations can be a problem in medical decision making, because they lead the patients (or the decision makers in general) to make a non-optimal or unsatisfactory decision, or also to shifting their judgments or preferences. The strongest evidence of a potential issue that could arise in medical decision making is

probably a case in which the dominated option (i.e., with worst characteristics) is preferred to the dominant one (i.e., with best characteristics). In this situation, there is a clearly better option, but the contextual information shifts people's preferences toward the other option. Considering the paternalistic and informed approaches, while the paternalistic physician would decide on or strongly recommend the dominant option, the fully informed patient would be victim of these kind of effects, and could end up choosing the dominated option.

The term "biased decision" is vague enough as commonly used to include the previous case and also the shift in preferences when there is not a clearly better option. For example, when diagnosed with an early stage prostate cancer, patients might be offered the choice between watchful waiting (or "active surveillance") and active treatments (such as surgery or radiotherapy) though there is not clear evidence that one is superior to the others in terms of duration and quality of life. When there is not a better option, then other outcomes measures can be used as indicators of whether one choice is better than another, for example the satisfaction with the decision or the adherence to recommended practice. Also in the case in which one option is better than another, external contextual information can affect judgments and decisions. For example, if the choice of a treatment would be different if the patient was making it for himself/herself or when his family members are making it in his/her place, this means that preferences depend on something other than the available alternatives themselves. Another example is when the same options are judged differently depending on which reference is used. For instance, when one of the options is judged in isolation, it can be more appealing relative to when it is judged together with another option that is then used as a reference for the judgment of the first one.

Finally, a third category of contexts effects concerns the case of the presentation of the very same information, but people's judgments and decisions are affected by the way in which it is presented. For example, when statistics elicit different subjective feelings when they are presented as percentages relative to frequencies; or when expressing the outcomes of two treatments in terms of survival or mortality make people chose differently. This can also induce a bias in decision

making, which is very subtle because the options are exactly the same, and only the presentation format is different.

These three classes of effects can be a challenge to informed decision making, because they all highlight how judgments and decisions are subject to the influence of many factors that should not be relevant. On the other hand, the study of these factors can inform health communicators and health practitioners of the known effects and thus what they should or should not include in information provided to patients. As previously noted, the choice of approach (paternalistic, informed or somewhere in between) ideally would depend on whether there is a clearly superior option or not, because when it is not available, the approach can not be other than informed or shared decision making, whereas when there is a clearly superior option, the best approach could be in between the shared and the paternalistic one. It is worth noticing that the effects discussed above are not limited to patients' decision making, but affects also physicians and policy makers. Therefore, in any case, medical decision makers should be enabled to optimize their decision-making abilities by avoiding contextual effects.

In the next chapter, I will give an overview of examples of the three classes of context effects, with special reference to medical decisions, when possible, and with a closer examination to framing effects in medical decision making. In subsequent chapters, I will present a series of experiments and studies that I have conducted with my collaborators, and the resulting discussion, in light of the possible approaches to medical decision making.



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## CHAPTER 2

### OVERVIEW AND EXAMPLES OF CONTEXT EFFECTS

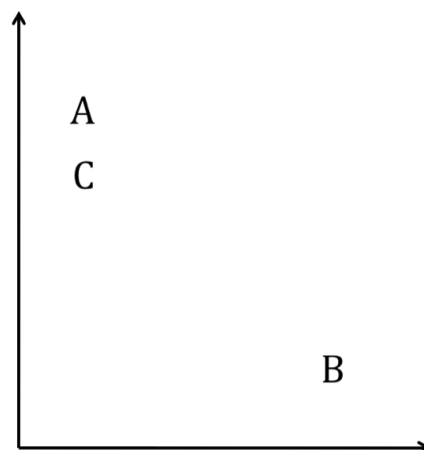
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#### 2.1 Examples of Cases in Which the Options Available Affect Preferences and the Dominated Option is Preferred

##### *2.1.1 Asymmetric dominance or the attraction effect*

When people are deciding among options, they should be consistent. One assumption that most of the choice models include is the so called “regularity”, according to which the probability of the choice of one alternative does not increase when more alternatives are added (Köhler, 2007; Tversky & Simonson, 1993). Nevertheless, in some cases the options available affect the choice. For example, the preference for option A over option B should not be affected by the presence of a third option C (see Figure 2.1).

**Figure 2.1** Asymmetric dominance or attraction effect, where A is the target, B is the competitor and C is the decoy.



This happens when neither A or B dominates each other, and the third option C (the decoy) is similar to one of the other options (A) but is asymmetrically dominated by it, i.e., it is slightly inferior on one of the two attributes describing the options. In this case the preference for the option A increases when C is among the alternatives relative to when the choice is only between A (the target) and B (the competitor). This phenomenon, which is a violation of the regularity principle, is referred to as “asymmetric dominance” or “attraction effect”.

One of the first demonstration of this phenomenon (Huber, Payne, & Puto, 1982) and many subsequent replications (e.g., Dhar & Simonson, 2003; Doyle, O'Connor, Reynolds, & Bottomley, 1999; Kardes, Herr, & Marilino, 1989; Lehman & Pan, 1994; Ranteshwar, Shocker, & Stewart, 1987; Simonson & Tversky, 1992) are in the field of consumer choice or finance, but it has been shown in several other domains, for example in the choice among political candidates (Pan, O'Curry, & Pitts, 1995), job candidates (Highhouse, 1996), policy issues (Herne, 1997), lotteries (Herne, 1999), and even in the choice of feeding places made by two species of birds (Shafir, Waite, & Smith, 2002; Hurly, 2003).

The more common explanation that has been proposed concerns the accountability of the decision (e.g., Baron, 2008). Those who would be undecided between A and B, when presented also with C, have an additional reason to choose A (i.e., it is superior to C). Option C would be considered as a term of comparison for option A, without affecting B. This explanation has found support in a study by Simonson (1989), who divided the participants in two groups, one of which knew that they would have to explain and justify their choice to the others, while the other group did not. Those who justified their choice showed a higher preference for the dominant option A and they were likely to cite its superiority to C as a reason for their choice. These results confirm that the introduction of option C leads to a greater justifiability of the choice of option A. This explanation received support also from a study on physicians' decision making (Schwartz, Chapman, Brewer, & Bergus, 2004), which showed that when physicians were held accountable for their decision (i.e., when they were asked to provide a written defense of their decision that they would discuss later), the attraction effect was stronger compared to the case in

which they only chose without defending the choice made. The accountability explanation is not limited to the attraction effect, indeed it has been shown more generally that some decision making biases become stronger when the decision makers are held accountable for their choice (Lerner & Tetlock, 1999).

Another explanation that has been proposed concerns the evaluability of the options (Köhler, 2007). Specifically, the introduction of the third option would affect the perception and the weight that the attributes describing the two options have for the individual. The attribute on which options A and C are better than B would be more salient and would be given more weight than the other attribute, making option A more attractive relative to option B (e.g., Huber et al., 1982).

In the medical domain, the asymmetric dominance has been shown for example by Schwartz and Chapman (1999), who investigated the hypothetical choices among medications made by internal medicine residents. The three scenarios used presented patients with depression, sinusitis, and vaginitis and participants were asked to choose either between two medications or among three. In line with the literature on asymmetric dominance, the introduction of the third option (the decoy) increased the choice of the dominant option (the target).

Thus, also physicians are subject to the fallacy due to the number of options available. Since the recommendation of medication is a very common practice among physicians and the options available can vary, they should be aware of this bias. A way in which they could handle this kind of decision is by comparing the options in couples, i.e., considering only two options at a time, which has been suggested as a general way to debias the effects of the number of alternatives on decisions. Another approach suggested concerns the identification of the dominance relationships and the exclusion of the dominated options from the set of alternatives (Schwartz & Chapman, 1999).

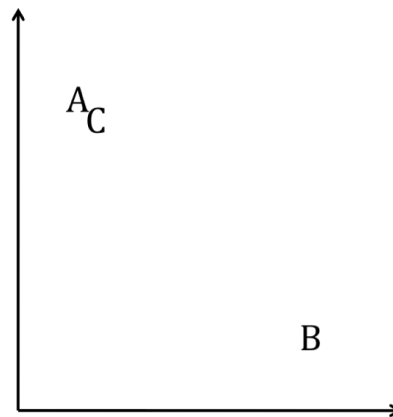
### **2.1.2 The disturb effect**

When option C is not dominated by option A, but is instead very similar to it (see Figure 2.2), then, the effect of the introduction of the third option is different, although still a violation of the regularity principle. In this case, it is the preference for



option B that increases (disturb effect), instead of the preference for option A (as in the asymmetrical dominance).

**Figure 2.2** Disturb effect, where A and C are very similar and do not dominate each other.



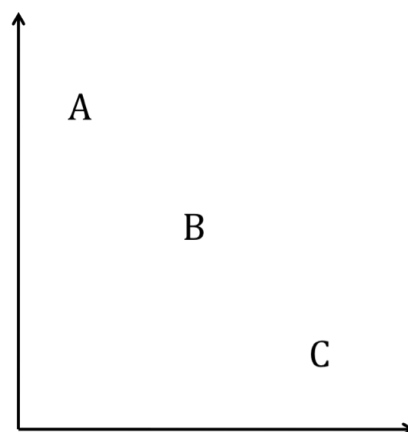
For example, in a study by Redelemier and Shafir (1995) participants were presented with a scenario with either two or three options among which to choose. Participants were family physicians, neurologists, neurosurgeons, and legislators, and each group received a scenario concerning their field of expertise. One of the scenario used described a patient with osteoarthritis and the decision concerned whether to start him on a new medication or not. Half of the family physicians chose between referring him to an orthopedic consultant for consideration for hip replacement surgery and starting the patient on ibuprofen (option A) or simply referring him to the orthopedic consultant without starting him on ibuprofen (option B). The other half of family physicians were given also a third option (option C), another medication that the patient has not tried yet, piroxicam (which is a nonsteroidal anti-inflammatory, as ibuprofen is). The choice of referring the patient without starting him on any new drug was chosen significantly more often when the options were three (73%) relative to when the options were only two (53%). In contrast to the attraction effect where option A clearly dominates option C (see Figure 1.1), in this case A and C are equivalent, and have the same value on the two attributes, as shown in Figure 1.2. When only A and B were presented, about half of the physicians chose B, but when the third option C was also present, about two

third of them chose option B. Option A and option C were very similar and, according to the authors, “the uncertainty in deciding between two similar medications led some physicians to avoid this decision altogether and recommended not starting any new medication”. Similar results were obtained with neurologists, neurosurgeons, and legislators: The introduction of a third option shifted the preference between the other two options, increasing the choice of one of the options already present. The explanation of this bias seems to be that the third option makes the choice more difficult, because there are not strong reasons to prefer one of the two similar options (e.g., ibuprofen or piroxicam), and in order to avoid the indecision between them, the other option is then chosen, even if it was not chosen as frequently when it was competing with only another option.

### **2.1.3 The compromise effect**

Another intriguing shift in preferences that depends on the options available is called “compromise” effect. Again, imagine three options A, B, and C described by two attributes, as depicted in Figure 2.3.

**Figure 2.3** Compromise effect: The option B is chosen more frequently when also C is available relative to when it is not.



The option A has a high value on the first attribute, and a low one on the second attribute, C is the opposite, and B has middle values on both attributes. The

middle option B is more likely to be chosen when it is a “compromise” between the other options than when it is not. In other words, B is preferred more frequently when choosing between the three options (A, B, and C), relative to when choosing between two (either A and B or B and C; Simonson, & Tversky, 1992).

#### **2.1.4 The unpacking principle**

Another way in which the number of alternatives can affect people’s judgments is referred to as the “unpacking” principle (Tversky & Koehler, 1994). According to this principle, unspecified probabilities are discounted. In other words, the estimate of the likelihood of an event that is described explicitly (listing specific possibilities, unpacking the event in sub-events) is higher than the one of the same event when it is described implicitly (without mentioning specific possibilities). For example, in one study, physicians were asked to estimate the probability of possible diagnoses of a hypothetical patient; half of them were provided with two diagnoses and the option “none of the above/other”, whereas the other half were provided with four additional diagnoses (Redelmeier, Koehler, Liberman, & Tversky, 1995). The further diagnoses were explicit descriptions (or unpacked versions) of the previously implicitly described option “other”. The estimated probability that the diagnosis was “something else” was 50% when implicitly described, but increased to 69% when explicitly described. The same bias due to the number of specific possibilities considered has been found to affect also the decisions about testing in medical students (Redelmeier et al., 1995).

In general, these results suggest that physicians should be aware and know that the probability of the possibilities considered can be overestimated, while the probability of unspecified alternatives can be underestimated or discounted.

#### **2.1.5 The omission bias**

An example of preference for a dominated option that developed in medical decision making is the “omission bias”: People prefer to risk negative consequences caused by omissions to equal or lower risk of harm caused by commissions. For example, Ritov and Baron (1990) showed that participants preferred not to vaccinate their child for a flu that could be fatal (omission or inaction), even if this choice would

lead to a higher risk of death than the vaccination itself (commission or action). For instance, many participants preferred not to vaccinate their hypothetical child when the mortality of the disease was 10 out of 10,000 and the risk of death from vaccination was 5 out of 10,000. This is again a case in which the dominated option is favored over the dominant option. A possible explanation for this effect is the over-generalization of the rule “do not hurt anybody”, which is generally a good rule, but, in this case, is over-applied, producing the contradiction that the option chosen is actually the one with higher risk of mortality for the child. Numerous studies have replicated the omission bias, finding it both in real decisions (Aberegg, Haponik, & Terry, 2005; Asch, Baron, Hershey, Kunreuther, Meszaros, Ritov, et al., 1994; DiBonaventura & Chapman, 2008; Meszaros, Asch, Baron, Hershey, Kunreuther, & Schwartz-Buzaglo, 1996), and in other medical situations (Aberegg et al., 2005; Cohen & Pauker, 1994).

### **2.1.6 Avoiding side effects**

A further example coming from the medical domain in which participants prefer the dominated option has to deal with side effects and their avoidance. An example is a study (Kulpa, Zikmund-Fisher, Fagerlin, & Ubel, 2006) in which participants imagined to have colon cancer and had to choose between two treatments: Surgery A, with 80% probability of complete remission and 20% probability of death; and surgery B, with 80% probability of complete remission, 4% probability of surviving with a complication (1% of each: colostomy, chronic diarrhea, intermittent bowel obstruction, wound infection), and 16% probability of death. Although the surgery B has a higher chance of surviving than surgery A, participants preferred more often surgery A (65.6%). The authors tested two methods to reduce this bias: Showing the frequency of each possible outcome with a pictograph (a graphical representation of the outcomes of 100 patients undergoing each surgery), which reduced the bias, but still 55.3% preferred surgery A; and asking to rate how good each of the outcome would be, which did not change participants' choice. In follow-up surveys, preference for the uncomplicated surgery (surgery A) remained relatively consistent and resistant to possible debiasing techniques, including the presentation of the risks in frequencies (rather than percentages), the grouping of the complications into a single

category, the addition of a small chance of complications to the uncomplicated surgery, and also when, before choosing, participants were asked to state directly their preferences between life with each complication *versus* death, they still preferred more frequently the uncomplicated surgery (Amsterlaw, Zikmund-Fisher, Fagerlin, & Ubel, 2006). Taken together, these findings have highlighted the robustness of the preference for a dominated option (which is indeed very robust to intervention aimed at reducing the bias).

Another demonstration of the aversion to side effects investigated the willingness to undergo preventive treatments that could either have or not small side effects (Waters, Weinstein, Colditz, & Emmons, 2007). The results confirmed that the presence of information about a side effect dramatically decreased the willingness to undergo the treatment, and also the accuracy in evaluating its effects. Again, these findings, other than highlighting the difficulty in combining the probability of benefit and harms in the evaluation of a treatment as a whole, suggest a robust aversion to side effects.

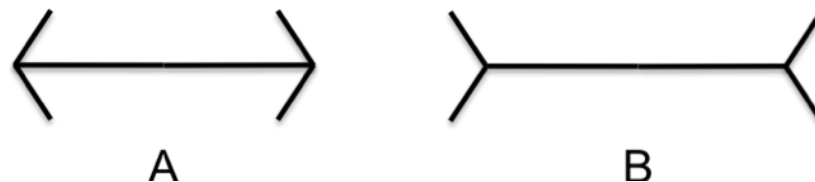
### **2.1.7 Summary**

It is worth noticing that, in all the cases illustrated, the decision makers are acquainted with the information on which they actually base their decisions or judgments. This evidence support the idea that the mere information may not be enough for the patients to make a good and satisfactory decision. Similarly to what happens with optical illusions, knowing that they are illusions do not change their perceptions; with decision making, knowing that we might be affected by context effects do not prevent us (as well as patients, physicians, health practitioners, health policy decision makers, etc.) from being influenced by context effects, among which the ones presented in this paragraph. For instance, knowing that the two lines in the Müller-Lyer's optical illusion are the same length, do not prevent people to see the line B as longer than line A (Figure 2.4).

In the perspective of informed decision making, the paragon with the optic illusions suggests that the knowledge and information only are not enough to have a correct perception of the alternatives. For instance, in the examples discussed above, which illustrate this point, the case in which the dominated option is preferred

to the dominant one because of the presence of other available options is a situation in which there is a clearly better option, nevertheless, context information (the presence of a third option) shifts people's preferences toward an option which is not the best one. In this situation, even a fully informed patient (or any decision maker) would be subject to the biasing effect of the available information, and could therefore choose an option that is indeed worse than the other one(s). The same logic applies to the other effects discussed: being informed could not always be enough.

**Figure 2.4.** Müller-Lyer's optical illusion.



## **2.2 Examples of Cases in Which External Clues Bias Judgments and Decisions**

### **2.2.1 Evaluability of options and joint vs. separate evaluations**

A bias in judgments has been shown when presenting two options either jointly or separately (e.g., Hsee, 1996a; Hsee, Lowenstein, Blount, & Bazerman, 1999; Hsee, 1998; Kogut & Ritov, 2005). When the two options are presented together, their evaluation is easier because they serve as a reference for each other in evaluating the values that their attributes have. The joint presentation facilitates the comparison between the values of the two. When presented separately, however, the evaluation of the “goodness” or “badness” of a value that describes an attribute is more difficult, and can be affected by cues other than the value of the attribute itself.

For example, Hsee and colleagues have proposed the “evaluability hypothesis” according to which “separate evaluations of objects are often influenced by attributes which are easy to evaluate rather than by those which are important” (e.g., Hsee, 1998; Hsee, 1996b). For instance, they found that, when judged separately, a person giving a \$45 scarf as a gift was perceived to be more generous than one giving a \$55 coat, while the opposite was true when judged together. When presented together, the comparison between the money value is salient and the judgment

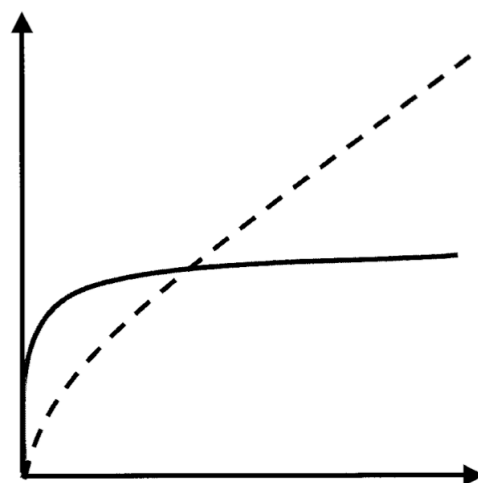
about generosity is affected by the comparison between the two money values. However, when presented separately, the price is evaluated without a reference value, and other cues are used to judge the generosity. Probably, in this case, people use a range for the price of objects: Considering the usual price of scarves, one that is worth \$45 is likely to be of high quality and, thus, considered a generous donation, while when considering the price range for coats, a coat worth \$55 is probably less valuable and cheaper than usual, and it results in a lower generosity rating.

Another example in a different domain concerns the willingness to help and donate to identified victims (Kogut & Ritov, 2005). The “identified victim effect” (the fact that people are more willing to help identified victims relative to non-identified ones) was found to be limited to situations with a single victim, whereas the identification of the individual group members had essentially no effect on willingness to help. In other words, the provision of identifying information increased willingness to help and donate only in the case of a single victim, but not when there was a group of victims.

A similar finding, but in the medical domain, was found when evaluating the options separately: 10,000 lives saved out of 15,000 were valued more than 20,000 out of 160,000 (Fetherstonhaugh, Slovic, Johnson, & Friedrich, 1997). Also, the judgments of goodness of an healthcare provider have been found to depend on whether it was presented in isolation or in comparison with another healthcare provider (Zikmund-Fisher, Fagerlin, & Ubel, 2004). In particular, preference reversal was found when the providers were evaluated separately compared to when they were evaluated concurrently, confirming the idea that everything is be relative, and that the evaluability is affected by what is evaluated, especially by the other options being evaluated. The authors also commented on which format is better for practical purposes in clinical practice. They suggested that it depends on the goal, and that clinicians should consider both the type of information they are going to provide and the patient to whom they are talking (and his/her ability to evaluate each type of information) and, then, choose the presentation format that facilitates the objectives of the communication.

The evaluability hypothesis does not apply only to the joint *versus* separate presentation, but it concerns, more generally, the ease of evaluation of options, depending on the way in which they are evaluated and the ease with which the value of an attribute can be evaluated independently (Hsee & Rottenstreich, 2004; Hsee, Rottenstreich, & Xiao, 2005). The authors have distinguished between two processes that can be used when evaluating: Valuation by feeling or by calculation, that can be encouraged by means of a priming task, involving either questions about emotions and feelings or questions requiring conscious and deliberate calculations. They investigated the effect of these two processes on the sensitivity to the “scope” of a stimulus, i.e., its quantitative aspect, or the value it has on an attribute (Hsee & Rottenstreich, 2004). When participants were primed to value by feelings, their sensitivity was triggered only by the presence or absence of the stimulus, but it did not change further with the increase of the quantitative aspect. On the other hand, when they were primed to value by calculations, they were more sensitive to the increase in the quantitative values of the attributes, and they showed an almost linear function between the objective and subjective values. Moreover, when investigating these two processes together with the evaluation mode (joint vs. separate) and also the ease with which the value of an attribute can be evaluated independently, they found that reliance on feeling, lack of independent evaluability, and separate evaluation lead to insensitivity to magnitude (Hsee et al., 2005).

**Figure 2.5.** Value function for valuation by calculation (dotted line) and valuation by feeling (solid line), from Hsee and Rottenstreich (2004).

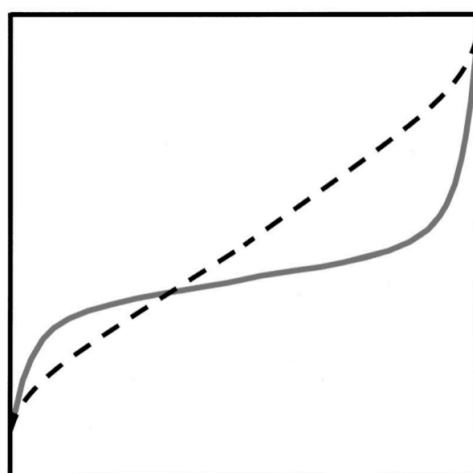




Based on these and other findings (e.g., Rottenstreich & Hsee, 2001) and in line with similar lines of research (Finucane, Alhakami, Slovic, & Johnson, 2000; Frederick, 2002; Kahneman, Ritov, & Schkade, 2000; Slovic, Finucane, Peters, & MacGregor, 2002), Hsee and colleagues proposed that the function that links the subjective and objective values (i.e., the value function, see Paragraph 2.4.1) is differently shaped depending on the way in which a stimulus is processed. As shown in Figure 2.5, with the valuation by calculation, the subjective value is close to the objective one, resulting in a relatively steep line, whereas with the valuation by feeling, the subjective value is highly sensitive to the change from absence to presence of the stimulus, but almost insensitive further increases in the objective value, resulting in a slope that is very steep near the axes intercept, and almost flat as it moves away from them.

Moreover, also the importance and weight that is subjectively attributed to objective probabilities has been suggested to be affected by the process that is used to evaluate the stimulus or event. As depicted in Figure 2.6, again, the valuation by calculation leads to an almost linear function, while the valuation by feeling is very sensitive to small and high probabilities and relatively insensitive to changes in between (Hsee & Rottenstreich, 2004; Rottenstreich & Hsee, 2001).

**Figure 2.6** Probability weighting for valuation by calculation (dotted line) and valuation by feeling (solid line), from Hsee and Rottenstreich (2004).



### **2.2.2 Evaluability of statistics expressed as probabilities or as frequencies**

Similarly to the idea that certain probabilities can be weighted differently depending on the way in which they are considered and evaluated (Hsee & Rottenstreich, 2004; Rottenstreich & Hsee, 2001), another conspicuous line of research has shown that people are sensitive to bias when dealing with statistics expressed as frequencies, sometimes referred to as “base rate neglect” or as “denominator neglect”, i.e., different superficial representation of the same statistic, can lead to different judgments (e.g., Denes-Raj, & Epstein, 1994; Fetherstonhaugh et al., 1997; Yamagishi, 1997; Zikmund-Fisher et al., 2004). Probably, the most known example is the finding that a considerable number of participants would prefer to draw a bean from a bowl containing a greater absolute number of winning beans (e.g., 8 in 100) relative to a bowl containing a smaller absolute number of winning beans, but with a higher probability of winning (e.g., 1 in 10; Denes-Raj & Epstein, 1994). Notice that, in this case, the two bowls were presented together, being the task a choice task and not a judgment task (as in separate evaluations), however, participants still preferred the bowl with the greater absolute number of winning beans.

As demonstrated by Yamagishi (1997), the same distortion happens when lives are at odds. As highlighted by the title “When a 12.86% mortality is more dangerous than 24.14%: Implications for risk communication”, the study investigated the perception of risk related to several causes of death, for which the estimated number of victims was expressed in different superficial representations, i.e., as frequencies relative to different denominators. For example, the number of estimated deaths for cancer was expressed as “2,414 out of 10,000”, “1,286 out of 10,000”, “24.14 out of 100”, and “12.86 out of 100”. In line with the hypothesis, participants’ judgment of riskiness was mainly affected by the value of the denominator, while the denominator was neglected. For instance, the risk of cancer was rated higher when the estimated number of deaths was “1,286 out of 10,000” compared to when it was “24.14 out of 100”. These findings suggest caution when presenting risk information to patients (and people in general), indeed the choice of different denominators may bias people’s perception of the level of of an activity or of a disease because even if the probability represented is the same, its superficial representation elicits different risk

perception. A solution proposed by the authors for an effective communication about risks (but whose application is limited to the presentation of several causes of death) is presenting the list of the risk ordered by descending probability, so that the comparison between risks is easier (for example, for policy makers allocating funding to different prevention programs).

The difficulty in the evaluation of quantities has been found to be more general and not limited to the frequency of events but also to values of attributes describing choice options (Burson, Larrick, & Lynch, 2009). For example, when describing the quality of two options, the fact that their difference is expressed by 20 points on a 100-point scale or is expressed by 1 point on a 5-point scale should not make any difference, but it actually does. Although the objective difference is the same, again, the superficial values are different. Notice that, in this case, the denominator can also be something other than numbers, for example the price per year *versus* the price per month. In line with the “discriminability” hypothesis, when an attribute is expressed by means of an expanded scale (e.g., price per year or 100-point scale) the perceived difference between the two options is inflated, making it potentially easier to discriminate between them, whereas when the attribute is expressed on a contracted scale (e.g., price per month or 5-point scale) the perceived difference is reduced. The authors conclude that “Any judgmental process that requires the interpretation of a numerical dimension is potentially susceptible to discriminability effects”, including not only frequencies and units of measure but also arbitrary scales.

### **2.2.3 The functions of affect in judgment and decision making**

While for decades the field of research on judgment and decision making considered exclusively the cognitive part of decision making, focusing on deliberative and reason-based decision making (Shafir, Simonson, & Tversky, 1993), more recently (during the last decade), the role of emotions in decision making has redeemed its place and, nowadays, the research on the influence of affective feelings on judgments and decisions has grown to the point that it is referred to as “affective rationality” (Slovic et al., 2002). A huge body of literature has theorized the distinction of two fundamental ways in which human beings process information and

comprehend risk, which can interact between them: One is referred to as “analytic”, “deliberative”, “rule-based”, “systematic”, “explicit” system, or System 1, the other is called “intuitive”, “experiential”, “automatic”, “implicit”, “narrative” system, or System 2 (e.g., Hammond, 1996; Hogarth, 2001; Sloman, 1996). The two systems are characterized by different computational principles and by different features: The analytic or rational system, which uses algorithms and normative rules, is relatively slow, effortful, and requires conscious control, whereas the experiential or intuitive system, which relies on images and associations, is intuitive, fast, mostly automatic, and not very accessible to conscious awareness. These two systems have been shown to function simultaneously, each one using information from the other one, and each one having its own limitations and biases (Slovic, Finucane, Peters, & MacGregor, 2004).

The perception of risk is also subject to the processing in an analytical or in an experiential way. Indeed, “risk as analysis” refers to the intervention of logic, reason, and scientific deliberation, while “risk as feeling” refers to the fast, instinctive, and intuitive reactions that individuals have when facing danger (Slovic & Peters, 2006; Slovic, Peters, Finucane, & MacGregor, 2005). On this topic, a conspicuous line of research has been conducted by Slovic, Peters, and colleagues, who have proposed the “affect heuristic”, which is the reliance on risk as feelings (e.g., Peters, Västfjäll, Gärling, & Slovic, 2006; Slovic et al., 2004; Slovic, Finucane, Peters, & MacGregor, 2007; Slovic & Peters, 2006; Slovic et al., 2005).

The term “affect”, in this context, refers to a feeling of “goodness” or “badness” of a stimulus; it is short in duration and it is evoked (with or without consciousness) rapidly and automatically in response to a stimulus. For example, when reading the word “hate” or “cancer” the affect is negative, when reading “love” or “holiday” the affect is positive, while other things like “table” or “bottle” do not evoke affect. The affect heuristic is the reliance on these feelings or affective responses in making judgments and decisions. For instance, when judging the risks and benefits of an activity or a situation, often it has been found that individuals erroneously perceive an inverse relationship between them (e.g., Alhakami & Slovic, 1994). An explanation of this phenomenon is the reliance on feelings or affective responses. Supporting this explanation, the strength of the inverse relationship was increased

under time pressure, and the judgments about benefits and harms have been found to be affected in the expected direction by providing affective information about the hazard evaluated (Finucane et al., 2000). In particular, a good feeling towards a situation (i.e., positive affect) lead to a lower risk perception and a higher benefit perception, and the opposite was found for a bad feeling.

Another example of a study showing the affect heuristic at work concerns the effect of emotional first impressions on judgment and decision making. The judgment about the degree to which a Chinese ideograph was liked was affected by the kind of subliminal priming stimulus: More positive when the prime was a smiling face, and more negative when it was a frowning face relative to when the prime was a neutral geometric shape (Winkielman, Zajonc, & Schwarz, 1997). Moreover, when repeating the task with the same ideograph but preceded by a different prime, participants carried over the first impression they had, for example they would still like more the ideographs that were first preceded by a smiley face even when preceded by a frowning face in the repetition of the task (Winkielman et al., 1997).

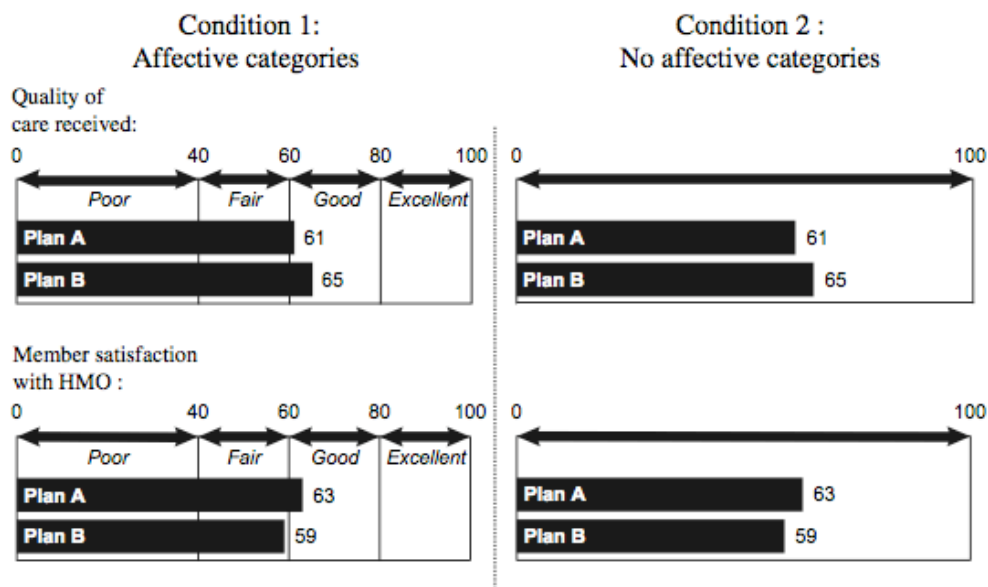
Nowadays, the study of the role of affect in judgment and decision making cover a vast range of topics, going from the impact of mood-inducing events such as weather on behavior in real economic markets, to the neural underpinnings of affect-based decision making (Loewenstein, Weber, Hsee, & Welch, 2001; Schwarz & Clore, 2003; Trepel, Fox, & Poldrack, 2005).

#### **2.2.4 Some examples of the role of emotions in medical decision making**

Peters and colleagues have identified four functions that affect can have in judgment and decision making processes in general and specifically for health communications and in the construction of health preferences: affect as information, as a spotlight, as a motivator, and as common currency (Peters, Lipkus, & Diefenbach, 2006; Peters et al., 2006b; Peters, 2006). The more important and more widely studied of these function is affect as *information*: when judging or when choosing, people can take into account their feelings about a choice and use them in guiding the judgment or decision processes (Schwarz & Clore, 2003; Slovic et al., 2002). For example, when people are unfamiliar with the options they have to judge or choose from, the use of “affective cues” may help them to judge the information.

In a series of studies by Peters, Slovic, and Hibbard (2004), the unfamiliar and cold information provided concerned health plan quality, and it was expressed in different ways. The information was about the actual scores of quality of care and member satisfaction, and it was depicted in bar charts (see Figure 2.7). The participants who received the other version of the information, were presented with the same picture, with the addition of the affective category, i.e., specifying with labels whether the health plans were poor, fair, good, or excellent. This classification was found to help participants in their evaluation, especially those with a low deliberative efficiency (low speed of processing). The authors suggest that “*affective categories appear to provide more information and influence its meaning—suggesting that affective labels may be especially useful among those who are taxed by too much information, time pressure, or the stress of illness. Allowing individuals such as a recently diagnosed cancer patient access to the meaning of important information like the quality of care offered at different hospitals should help them to process it more deeply and make better decisions.*” (Peters, Lipkus, & Diefenbach, 2006).

**Figure 2.7** Examples of information about health plans with and without affective categories, from Peters, Lipkus, and Diefenbach (2006).



However, I would point out that this conclusion requires a consideration, especially in the health care context: The use of affective labels or other affective cues can be seen as in contrast with the informed decision making approach, whose interest is in providing patients with complete, accurate, neutral, and objective information. The use of affective cues would shift the focus and point out the importance also of the usability, comprehensibility and meaningfulness of the information. However, this would require health communicators to be responsible for deciding not only the content of the information, but also which format would best support decision making in an ethical manner. Moreover, even if health professionals might be reluctant in giving subjective interpretations and prefer to provide only objective or scientifically proved information, the best interest of the patient requires that the information is comprehended and then used, and affective cues are a way that has been proven to help. These results and the previous consideration highlight a general limitation of the informed decision making approach. Indeed, since its goal is to help patients make their own medical decisions, providing information that can not be fully understood and that can bias patients' decisions would be a failure to reach that goal.

While the function of affect as information has been widely studied (for more details, see Peters et al., 2006a), the other functions have received less attention. The function of *affect as a spotlight* has been proposed to be a two-steps process in which the affective feeling first focuses the attention of the decision maker on new information, and then this new information guide the judgment or decision process. In other words, individuals may focus their attention on different information depending on their feelings; for example when deciding which kind of screening test to undergo for colorectal cancer, the negative feeling of embarrassment and invasiveness of colonoscopy may lead to focus more on its risks than on its benefits. Following this reasoning, it could be useful to test tailored methods of communication that take into account individuals' personal emotions and feelings, trying to attenuate or alter the influence that the affective feelings might have in spotlighting some information to the detriment of other information.

The third function that affect can play in judgment decision making processes is as a *motivator of information processing and behavior*. Even if affect is not as strong

as an emotion, it has been shown that we usually classify stimuli in two broad classes of good and bad, and that this classification elicits different behavioral tendencies: An approach tendency for those which are classified as good (Chen & Bargh, 1999) or an avoidance tendency for those classified as bad (for example fear and worry seems to motivate cancer screening, for example Diefenbach, Miller, & Daly, 1999).

The last function that affect can have is *as common currency*, i.e., as an internal metric that can be used to compare different things. Since affective evaluations are a simplification relative to more complex thoughts, it is easier to compare and integrate good and bad affective feelings rather than comparing directly several conflicting reasons concerning different aspects. In this light, this function of affect can be considered a subcategory of the affect as information, by simplifying the information and reducing the complexity of comparison and integration of information. For example, in the study previously cited about health plan choice (Peters et al., 2004), the affective labels helped participants integrating the quality information in their judgments. Peters and colleagues suggested that providing information about cancer screening and treatment “*in a more affective format might help patients integrate more information and thus make more informed choices.*” (Peters et al., 2006a).

These four functions of affect are not separate and independent, but are clearly interrelated and interconnected. In general, this line of research has demonstrated that affect influences information processes, judgments, and decisions. In medical decision making and in health communication, the role played by affect is likely to be nuanced and complex, and therefore, it requires careful consideration and deeper studying.

### **2.2.5 The effect of emotions and affect on medical decision making**

One common way to help patients make medical decisions is to provide them with decision aids that present unbiased and evidence-based information on options available, while also helping patients evaluate their values and preferences (for example, Bekker, Thornton, Airey, Connelly, Hewison, Robinson, et al., 1999; O'Connor, Stacey, Entwistle, Llewellyn-Thomas, Rovner, Holmes-Rovner, et al.,



2003). Patient decision aids often include personal stories or anecdotes, even if such anecdotal evidence is not considered to be indispensable by experts (Elwyn, O'Connor, Stacey, Vol, Edwards, Coulter, et al., 2006). The terms used to refer to anecdotal information vary, for example, from narratives (Green & Brock, 2000; Mazor, Baril, Dugan, Spencer, Burgwinkle, & Gurwitz, 2007; Winterbottom, Bekker, Conner, & Mooney, 2008), to exemplars (Brosius, 1999), to personal stories (Butow, Fowler, & Ziebland, 2005; Khangura, Bennett, Stacey, & O'Connor, 2008), to testimonial evidence (Ubel, Jepson, & Baron, 2001), to anecdotal information itself (Fagerlin, Wang, & Ubel, 2005; Slater & Rouner, 1996). The relevance to medical decision making of anecdotal information is wide and goes beyond the provision of information in decision aids. For example, with the always more frequent use of internet as a source of information, patients are very likely to get in touch with other patients' experiences. Moreover, personal experiences of other patients are likely to be affective rich and easy to imagine, and thus can be considered a potential way to convey information that is more comprehensible and graspable by patients.

However, the effect of including anecdotal information in decision aids is not clear, both because of the great variability in the content of the personal stories, and because the presence of narratives is often not distinguishable from the presence of other factors, and it is not clear which factor(s) or combination of factors makes decision aids effective (Bekker, Hewison, & Thornton, 2003; Bekker et al., 1999; Butow et al., 2005; Charles, Gafni, Whelan, & O'Brien, 2005; Elwyn et al., 2006; Feldman-Stewart, Brennestuhl, McIssac, Austoker, Charvet, Hewitson, et al., 2007).

Not only single studies, but also the reviews on the effect of narrative information showed mixed results. For example, while Reinard (1988) and Taylor and Thompson (1982) supported the persuasive effect of narrative information, the meta-analysis conducted by Allen and Preiss (1997) showed that statistical evidence was more persuasive than narrative evidence. More recently, two papers have addressed this issue. Khangura et al. (2008) have characterized the current use of personal stories in publicly available patient decision aids, sampling a subset from the 2007 Cochrane A to Z Inventory. The authors have confirmed the wide variability in breadth, depth, format, and content of the information provided by personal stories. Moreover, while the number of stories favoring and against the most

intensive option presented was balanced in most of the sampled decision aids, the number of stories portraying satisfaction was disproportionately represented relative to those portraying dissatisfaction. The conclusion of this study was that *“While it is known that personal stories impact patient decision making, it is yet poorly understood how this happens”* and that *“Research is needed to better understand the impact of stories on patient decision making and to inform the guidelines for their inclusion in patient decision aids.”* (Kahngura et al., 2008)

Also Winterbottom and colleagues (2008) systematically reviewed empirical research on the effect of narrative information on decision making in the context of health and medicine. The review was limited only to studies comparing the use of narrative information with the use of another format of information (for example, statistical information). This inclusion criterion reduced the initial sample size to 17 studies, which were not suitable for a meta-analysis because of their heterogeneity. Five out of the 17 studies found that narrative information influenced decision making and was more persuasive relative to the provision of statistical information or no other information, while four studies found the anecdotal information to be only equally persuasive as the statistical one. Another purpose of the review was to identify factors explaining the effect of narratives, especially the vividness and the credibility of the information provided. Findings showed mixed support for the effect of these possible mediators or moderators. The mixed results on both the effect of narrative and the role of mediators and moderators were also found to be similar in non-medical settings. The authors concluded that *“It seems likely that narrative information does affect the individual’s decision making process and outcomes, in both health and other contexts. [...] At present, it is unclear why narratives affect the decision making process, whether they facilitate or bias the decision making and if they affect the quality, and/or outcome of the decision being made.”* (Winterbottom et al., 2008).

Thus, both Kahngura et al. (2008) and Winterbottom et al. (2008) have highlighted the inconsistency of previous results on the effect of personal stories on decision making and have called for more extensive empirical research on the direction of the effect and on factors influencing the effect.

It is important to note that these studies were conducted following the approach of informed decision making, i.e., investigating the effect of testimonials or anecdotal information in situations in which patients are provided with information and have to make their decision based on that. Again, the conclusions could be different if considering a paternalistic approach, when one of the options is superior to the others. In this case, indeed, the effect of testimonials could be used to help patients overcome their hesitations or clarify their doubts.

### **2.2.6 The decision making role: Choosing for others vs. choosing for oneself**

The assumption that when choosing people are maximizing the expected utility, when applied to medical treatment choice, implies that, in general, when the alternatives are the same, the choice should be the same regardless of who is deciding and for whom. Several studies have highlighted differences in preferences depending on the decision making role. For example, Zikmund-Fisher, Sarr, Fagerlin, and Ubel (2006) have investigated the choice of four possible decision making roles on two scenarios: The vaccination scenario that has been shown to induce omission bias (Ritov & Baron, 1990) and a scenario concerning a slow-growing cancer. Specifically, participants were asked to choose as if they were: a patient, a physician treating a single patient, a medical director creating treatment guidelines, or a parent deciding for a child.

When individuals have a high degree of responsibility, the distinction between harmful acts and harmful omissions is overshadowed and what is relevant in people's evaluations is mainly the outcome of the decision (Haidt & Baron, 1996). Indeed, the results suggest that when people are responsible (even if they only imagine to be responsible), they are more likely to choose the option that maximizes the survival (i.e., the action, flu vaccination and chemotherapy) relative to when they are choosing for themselves as patients. This happens both when they imagine themselves as parents or as physicians (both deciding for a single patient or for guidelines). A possible explanation proposed for this difference is that when people are responsible, they choose the option that is more justifiable to others, similarly to what happens when the attraction effect is amplified by telling the respondents that they will have to provide a justification for their answers (e.g., Baron, 2008). On the

other hand, this explanation and these findings seem to be in contrast with the omission bias, found when participants were deciding for a hypothetical child (Ritov & Baron, 1990).

Therefore, patients' decisions seem to be different from physicians' decisions. Considering that in the informed decision making perspective doctors should not express their recommendations, but only provide information and leave the decision to the patient (McNutt, 2004; Schneider, 1998), but also that the decision might differ depending on the perspective taken, it might be reasonable to suggest that when patients take a decision, they should consider it also from a different decision making role, to help preventing biases related to the role and the responsibility of the decision maker. Specifically, they could be suggested to think about the same decision but for someone else, like a family member or a close friend. With a different perspective, they could be better able to clarify and weight the benefits and harms of the options.

### **2.2.7 Summary**

In the light of the paternalistic-informed approaches continuum, all these results are insightful, and suggest that people (patients, but physicians too) are inclined to be influenced by external cues that should not affect their judgments and decisions. They are influenced by how options are presented (not only separated vs. joint evaluations, but also which other options are available: attraction effect, disturb effect, and compromise effect), by how the characteristics of the options are described, by affect and feelings, and by the decision maker role they are taking. It is worth noticing that not only patients can be affected by these effects, but also physicians and policy makers, thus, again, making the conclusions valid not only for the informed decision making approach but also for the paternalistic approach.

### **2.3 Example of cases where the options are the same but perceived to be different**

One of the cardinal principle of normative decision theories is the *principle of invariance*, that posits that regardless of how a certain outcome is described, it

should have the same utility for the individual (e.g., Kahneman & Tversky, 1984; Tversky & Kahneman, 1981). In other words, the choice or decision should depend on the situation *per se* and should not be affected by the way in which it is described. According to this principle, different but logically equivalent representations of a set of options should give rise to the same decision. Judgment and decision making literature has repeatedly shown that often it is not the case (e.g., Tversky & Kahneman, 1981) and the violations of the invariance principle has been generally referred to as *framing effects*, meaning that different “frames”, or different perspectives, can change the decision maker’s choice even if he/she is evaluating the same options. The term “framing effect” can be used in general, or more specifically to refer to the frames of gains and losses (see Paragraph 2.3.2). When considering it more generally, under the category of evidence showing the influence of the perspective on the judgment or choice performed on the same options, several phenomena can be included.

### **2.3.1 The status quo bias or endowment effect**

One example of a situation in which exactly the same object is valued differently, depending on the perspective of the individual, is the status quo bias or endowment effect. The value that an individual attributes to an object should be unaffected by the fact that it is owned or not, especially if it has been owned just for a few minutes, such as in an experimental setting, without affective value added. The classical example of the endowment effect is indeed related to the ownership of a simple mug (Kahneman, Knetsch, & Thaler, 1990). The general effect is that the separation from what people own, the loss of a possessed object, looms larger than the gain of something that we otherwise prefer to it, or, put otherwise, people usually demand much more to give up an object than they would be willing to pay to acquire it (e.g., Thaler, 1980; Kahneman et al., 1990). In the mug example, those who were randomly assigned to own a mug from their university bookstore were asking significantly more money to sell it (around \$7) than those who were randomly assigned not to own it and were willing to buy it (around \$3; Kahneman et al., 1990).

The phenomenon of endowment effect is also known as the “status quo bias” because it is a general phenomenon of aversion to the change of current status or

status quo (e.g., Samuelson & Zeckhauser, 1988). Another example of aversion to change concerns the choice of health plans by employees: Those who originally had to choose among four plans tended to still choose among the original four even when other plans were proposed, while those who chose when the options were more numerous were more likely to choose the new plans, (Samuelson & Zeckhauser, 1988). A similar finding is obtained with default options, the classical example being the two American states in each of which one of the same two insurance plans was the default plan. The choices were very different depending on which plan was the default, thus even if the two options were the same, the one that was set as the default was chosen more frequently (Hershey & Johnson, 1990).

### **2.3.2 The framing effect**

The classical and probably most known example of framing effect is the so called “Asian disease” problem (Tversky & Kahneman, 1981). This is an example of what is called specifically framing effect, i.e., concerning gain and loss perspectives. The scenario introduced the problem as follows: *“Imagine that the United States is preparing for the outbreak of an unusual Asian disease which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:”*

Half of the participants were presented with the following two options (gain version):

- *If program A is adopted, 200 people will be saved;*
- *If program B is adopted, there is a one third probability that 600 people will be saved and two third probability that nobody will be saved.*

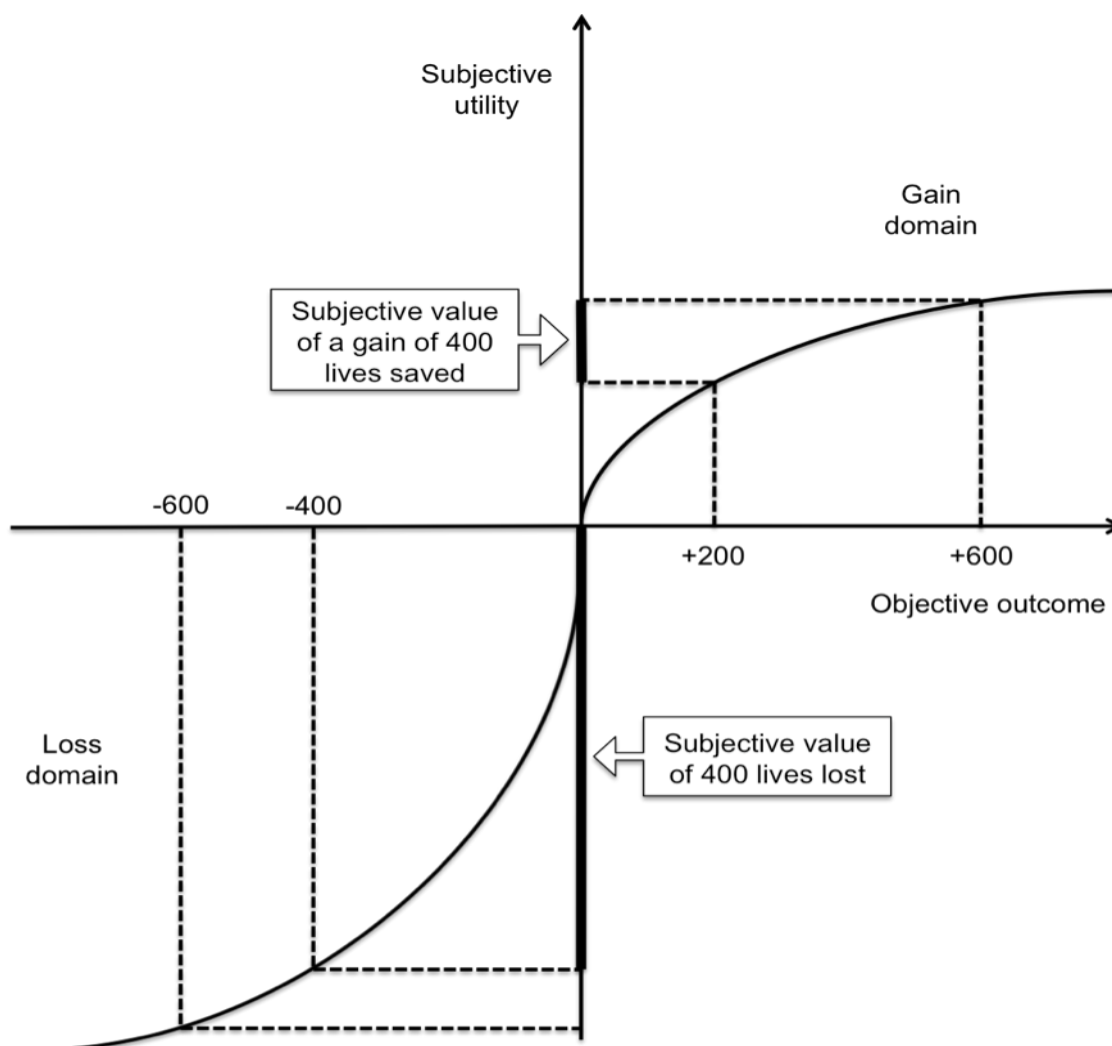
The other half of the participants were asked to choose between the following two options (loss version):

- *If program C is adopted, 400 people will die;*
- *If program D is adopted, there is a one third probability that nobody will die and two third probability that 600 people will die.*

Although these two different verbal representations are describing the same two options, their superficial description is different and this difference have been

shown to alter preferences for the alternatives of public health policy. Indeed, when choosing between options A and B, participants preferred option A (76%), whereas when choosing between options C and D, they preferred option D (67%). These results highlight the importance of the superficial representation or the different perspective concerning logically equivalent options on judgment and decision making processes. The interpretation and explanation of this preference reversal proposed by Tversky and Kahneman relies on their proposition of the Prospect Theory (see Paragraph 2.4.1). According to this theory, people are generally risk averse for gains and risk prone for losses (Kahneman & Tversky, 1979).

**Figure 2.8** Value function representing the subjective values associated with the Asian disease problem in the gain- and loss- domain.



In the Asian disease case for example, the gain perspective highlights the number of lives that would be saved (in the upper right part of Figure 2.8), while the loss perspective highlights the number of lives that would be lost (in the lower left part of Figure 2.8), thus inducing a different reference point and a different risk seeking behavior in participants. According to the prospect theory, people code outcomes either as gains or losses, depending on their reference point. Moreover, the subjective function of the value of the objective outcomes (value function) have a different shape for gains and losses: It is steeper for gains than for losses (for example the value of \$100 lost is subjectively bigger than the value of \$100 gained). Thus, the perceived or subjective value attributed to saving 400 people is much smaller than the subjective value attributed to losing 400 lives, as shown in Figure 2.8.

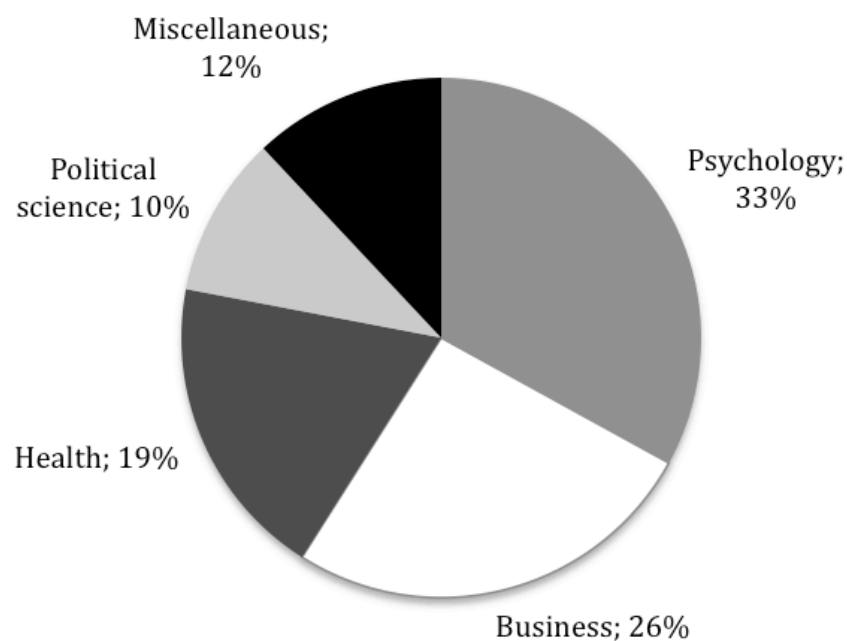
Another famous example of the shift in perspective due to the words used was found when describing an identical feature of meat but with different terms: When the beef was described as 75% lean it was rated better tasting relative to when it was described as 25% fat (Levin & Gaeth, 1988).

The framing effect is found when different descriptions of the same stimulus shift the reference point used in the evaluation, resulting in different judgments and choices. The studies on the framing effect are innumerable, they cover several topics, and they have developed in different areas of interest, including medical judgment and decision making (e.g., Kühberger, 1995; Kühberger, 1998; Levin, Schneider, & Gaeth, 1998; Rothman, Bartels, Wlaschin, & Salovey, 2006). For example, the attention of decision makers can be drawn to different aspects of the treatment depending on the question that is asked, for instance which treatment to accept *versus* which treatment to reject. In a different field, Shafir (1993) found that when participants were asked for which candidate they would vote for, they preferred (79%) the one with stronger positive traits, while when they were asked for which candidate they would *not* vote for, they still indicated the same candidate (92%), who also was described with strong negative aspects. Thus, the framing effect is not limited to the description of the same options or alternatives, but can also happen when the options are described identically, but the question to be answered focuses the attention on different aspects of the options themselves.



In general, the framing effect is not only a violation of the invariance principle, but it has important consequences in decision making, not only in consumer choice, but especially when high stakes are involved, for example in deciding a medical treatment for a disease. The framing effect in the medical domain will be discussed in more details, especially in the domain of cancer screening and prevention later on in this chapter (Paragraph 2.4). The research on framing effect has been conducted in a wide range of domains, as indicated by the classification of a literature search conducted by Maule and Villejoubert (2007), which included 371 articles, and which is shown in Figure 2.9.

**Figure 2.9** Exemplification of the domains represented in the framing effect literature (based on Maule and Villejoubert, 2007).



### **2.3.3 Survival vs. mortality data and graphs**

The two perspectives (gain and loss frame) can be easily applied in the medical domain when thinking about survival or mortality. One of the many examples of framing effect in medical decisions concerns the choice between surgery and radiotherapy for a hypothetical lung cancer (McNeil, Pauker, Sox, & Tversky, 1982). The two options were described either in gain terms (i.e., number of people surviving) or in loss terms (i.e., number of people died). For each option, the number

of people surviving or dying during the treatment, and alive or death at one and five years follow up were provided, as summarized in Table 2.1. The information was exactly the same, but when the two options were described in terms of survival participants preferred more frequently the surgery (82%) relative to when the two options were described in terms of mortality (56%). This shift in the preference was also found for physicians, and for students who had taken classes in statistics and decision theory, other than patients.

**Table 2.1** Number of people that would survive or die with the two treatments, as described in McNeil et al. (1982).

	Survival (out of 100 patients)		Mortality (out of 100 patients)	
	Surgery	Radiotherapy	Surgery	Radiotherapy
Treatment	90	100	10	0
1 year	68	77	32	23
5 years	34	22	66	78

An explanation for these findings is that the survival version highlights the higher benefits of the surgery relative to the radiotherapy in the mid-period term (+12% of survival at 5 years), while the mortality version draws attention to the lower risks of the radiotherapy during the treatment relative to the surgery (no mortality during the treatment vs. 10%). Therefore, the different perspective would induce people to focus on different aspects, even if the options described are exactly the same (McNeil et al., 1982).

In a slightly different perspective, the comparison between a condition with survival data and a condition with mortality data was used to test if the temporal inconsistency bias would be reduced (Zikmund-Fisher, Fagerlin, & Ubel, 2007). The more common format in which data are presented to patients is by using survival graphs, which represent the effectiveness information deriving from clinical trials, by depicting the increased survival relative to a baseline or placebo treatment. However, the perception of this graph is biased, especially regarding the timeline (e.g., Armstrong, Schwartz, Fitzgerald, Putt, & Ubel, 2002; Mazur & Merz, 1993). In particular, the duration represented in the graph is usually overlooked, and not

considered in judging the goodness or badness of the treatment, which is referred to as “temporal inconsistency bias”. For example, the judgments of disease seriousness and treatment effectiveness were found to be related mainly to the variations in the changes pictured graphically and not with the actual variations. Indeed, they depended on the fact that the timeline represented was either 5 or 15 years (Zikmund-Fisher, Fagerlin, & Ubel, 2005). As a possible way to reduce this bias, i.e., to help people overcome the perception of a treatment as less effective when the survival graph represent a shorter timeline, Zikmund-Fisher, Fagerlin, and Ubel (2007) compared the use of survival and mortality graphs. In line with previous findings, the treatment effectiveness ratings were found to vary significantly between the 5 year and the 15 year survival graphs (although representing the same relative risk reduction). On the other hand, the use of mortality graphs reduced significantly this variation, suggesting that the temporal inconsistency can be reduced by using mortality graphs instead of survival graphs.

#### ***2.3.4 Format of presentation of statistical information: Verbal vs. numerical (percentages vs. frequencies)***

A vast amount of literature has investigated the impact of different format of presentation of the same statistical information. In fact, when presenting the likelihood of events, several format can be used: verbal descriptors (e.g., often, frequently, rarely), or numeric descriptors, both percentages (e.g., 60%, or 3%) and frequencies (e.g., 3 in 100 or 1 in 4). A general result is that people interpret the verbal descriptors differently, and attribute highly variable meanings to the same adverb, both inter-individually (Wallsten, Budescu, Rapoport, Zwick, & Forsyth, 1986) and depending on circumstances (e.g., Amer, Hackenbrack, & Nelson, 1995; Wallsten, Fillenbaum, & Cox, 1986; Weber & Hilton, 1990). Verbal probability descriptors have been claimed to be more natural to produce, and more easy to understand, to offer an easier interpretation of the positive or negative meaning (Teigen & Brun, 2000), and to provide subtle information which influences the kinds of inference a reader draws (Moxey & Sanford, 2000). However, they were also found to be more difficult to validate, very vague in the interpretation of the correspondence with actual likelihood (Budescu & Wallsten, 1987; Zimmer, 1983),

and to induce an overestimation of the perceived risk (e.g., Berry, Knapp, & Raynor, 2002; Berry, Raynor, Knapp, & Bersellini, 2004; Knapp, Gardner, Carrigan, Raynor, & Woolf, 2009). Therefore, in order to convey precise information, whenever it is possible, it is better to avoid the use of verbal descriptors of likelihood.

The comparison between different formats for conveying information numerically has not yielded to clear and shared conclusions among researchers. The comparison has often concerned percentages and frequencies, but frequencies can be further distinguished depending on what kind of frequency is represented: 1 out of something, something out of 100, or a mix of the two. In this line of research, a strong position is held by Gigerenzer and colleagues, who advocate the use of “natural frequencies” and have promoted their use especially in the medical domain, both for patients and physicians (e.g., Gigerenzer & Edwards, 2003; Gigerenzer & Hoffrage, 1995; Hoffrage & Gigerenzer, 1998; Hoffrage, Lindsey, Hertwig, & Gigerenzer, 2000). Gigerenzer’s view is that percentages are abstract concepts that lack a concrete “reference class”, and this would prevent people to be able to place the risk in a natural context. Instead, natural frequencies, by always stating a reference class, would help better relate the concept to real world context. For example, instead of saying that there is ‘a 30 to 50% chance of developing a side effect’, the information is presented as ‘3 to 5 people out of every 10 will develop a side effect’. The use of a specific and easy to imagine reference class has been shown to improve people understanding of even quite complex conditional probabilities (Gigerenzer & Edwards, 2003). This position has been promoted also in recommendations about what kind of information to provide in patient decision aids (Elwyn et al., 2006), suggesting however to use constant denominators (e.g. 1 in 100, 5 in 100) rather than constant numerators (e.g., 1 in 100, 1 in 20) and to highlight the time reference as appropriate, possibly a 10 years time frame (Woloshin, Schwartz, & Welch, 2002).

On the other hand, this strong advocacy for using frequencies has not always been confirmed, and the debate is still opened. For example, in a simple study of gambles, the typical preference reversals found when bets were presented in probability format was only attenuated by the presentation in frequency format, but not eliminated (Tunney, 2006). Another case in which the comparison between

percentages and frequencies did not support the strong position held by Gigerenzer and colleagues comes from a study on the perception of the risk of side effects, that was presented in different formats: verbally, as a percentage, or as a natural frequency. The results were in line with previous literature, confirming that the verbal format induced a higher risk perception, but there was only some evidence of the superiority of frequencies in inducing a more accurate representation of the likelihood, resulting anyway in an overestimation of the probability of side effects (Knapp et al., 2009).

Not only it has been pointed out that nearly half of all treatments for clinical prevention or treatment in medical settings were of unknown effectiveness, and an additional 7% involved an uncertain tradeoff between benefits and harms (BMJ Clinical Evidence, 2007), but it has also been shown that physicians rarely communicate uncertainty about evidence to patients, even if the discussion of the uncertainties associated with a clinical decision is thought to be a critical element of an informed decision (e.g., Braddock, Edwards, Hasenberg, Laidley, & Levinson, 1999). Furthermore, in the medical context there are multiple types and sources of uncertainty: the uncertainty related to the state of the world (that can be quantified as a probability), the uncertainty about the uncertainty in the world (when the state of the world is difficult to quantify in a single value probability or is ambiguous, and which can be better described by a range of probability or a qualitative statement about the likelihood), the uncertainty in the structure of the decision itself (uncertainty about all the possible options available and all their consequences), and the uncertainty about preferences and values (concerning especially the patient's point of view, see Schwartz & Bergus, 2008).

Also, the communication of uncertainty may serve different purposes and goals in the medical decision making process. For instance, it can be used to convey doubts, to increase the level of confidence in a clinical finding, to inform patients about their estimated disease risk and the limitations of these estimates, or also to help patients to understand the general complexity or unpredictability of illness and its management. However, the research on communicating uncertainty has focused mainly on the communication of probabilities representing the uncertainty, without even coming to a common conclusion and letting on the side other kinds of

communication. As it has been argued, “*More conceptual, qualitative, and quantitative studies are needed to explore fundamental questions about how people process, interpret, and respond to various types of uncertainty inherent in clinical decisions*” (Politi, Han, & Col, 2007). It is worth noticing that for both informed and shared decision making, patients should not only understand their medical condition, but also know all the available treatments, their expected outcomes in terms of benefits and harms, and then integrate these expected outcomes with their personal values. In order to do so, they should be enabled to understand uncertainties. The complexity of the task and the many aspects involved call for more research on the topic.

### **2.3.5 Other ways of conveying statistical information: Visual displays**

The statistical information can be conveyed also through visual displays, such as various kind of graphs. For example, the use of a graphical representation of effectiveness was found to be beneficial in reducing the (bad) influence of anecdotal information about other people’s experiences (Fagerlin et al., 2005a). Also, using graphs can help simplifying the information about adjuvant therapy options (Zikmund-Fisher, Fagerlin, & Ubel, 2008), supporting the idea that “less is more”, especially when relatively complex information is involved.

There is a vast research on visual representations of risk, statistical information, and on their comparison. One of the first review did not come to a clear conclusion, advocating for more research (Lipkus & Hollands, 1999). Subsequently, the review has been updated (Ancker, Senathirajah, Kukafka, & Starren, 2006) suggesting in general that “*communicators should not assume that all graphics are more intuitive than text; many of the studies found that patients’ interpretations of the graphics were dependent upon expertise or instruction*”. Moreover, an interesting aspect was highlighted in this second review: The distinction between studies investigating the effect of different graphs on quantitative reasoning and those investigating the effect on real behaviors or on behavioral intentions. For instance, the graphical representations highlighting the relationship between the part and the whole (similarly to frequencies, which stress the reference class) were found helpful in the comprehension of the part-to-whole relationship, i.e., to consider the number

of people affected relative to the entire population, while graphs showing only the numerator seem to increase the perception of risk and can therefore induce risk-averse behaviors or risk-seeking behaviors depending on what is represented.

**Figure 2.10** Example of a pictograph, as in Fagerlin, Wang, & Ubel (2005).



More recently, the literature has again suggested the superiority in risk representation of the graphic formats that highlights the relationship between a part and the whole, referred to as pictograph (Fagerlin et al., 2005a; Hawley, Zikmund-Fisher, Ubel, Jancovic, Lucas, & Fagerlin, 2008), icon array (Ancker et al., 2006; Galesic, Garcia-Retamero, & Gigerenzer, 2009; Lipkus, 2007) or population figures (Timmermans, Ockhuysen-Vermeij, & Henneman, 2008). In particular, it has been

shown that a particularly effective way of increasing people's understanding of statistical information is to present it using a matrix of elements that are shaded with different colors to represent the proportion of a given population that may experience a condition, disease, or treatment complication relative to the total. An example is depicted in Figure 2.10, where the black figures represent success in curing from angina and the grey figures represent the total number of people undergoing each treatment (Fagerlin et al., 2005a).

When comparing six different kind of graphs, each representing the benefits of taking one of two drugs, as well as the risks of experiencing side effects for a hypothetical medical decision (Hawley et al., 2008), pictographs were more trusted by participants and were associated with adequate levels of both verbatim (specific numerical) and gist (general impression) knowledge, both of which were significantly associated with medically superior treatment decision making.

### ***2.3.6 Format of presentation of statistical information: Absolute vs. relative risk***

Another issue arising from the representation of statistics about risks and benefits of medical alternatives concerns whether the information is relative or absolute. Media usually prefer to represent absolute numbers without a reference class, such as the number of people dying from cancer every year, which is usually very little informative, unless we know out of how many. Even when presenting a percentage, it is usually portrayed as a an absolute rather than a relative percentage, being the value bigger and more "catchy" in the media world, where news need to gather people's attention. On the other hand, for an effective communication, especially about treatment outcomes, the distinction between relative and absolute risk is particularly relevant. The literature examining this topic suggests that comprehension is facilitated by absolute frequencies, when the class of reference is specified (as for frequencies and for pictographs) and specifically by using incremental risk, which highlights the additional risks and/or benefits resulting from a treatment. For example, a classical demonstration was reported by Slovic, Fischhoff, and Lichtenstein (1982), which deals with a simple hypothetical flu vaccination scenario. All participants were told that the flu was expected to affect 20% of the



population during that period of the year, then half of them were told that there was a vaccination which was effective in protecting from the contagion in half of the cases, while the other half of participants were told that there were two variants of the virus, each affecting 10% of the population, and that the vaccination available only protected fully from one of the two variation of the flu. Then, they were all asked if they wanted to be vaccinated. Although the outcome was exactly the same, the percentage of those who agreed to take the vaccine increased from 40% to 57% from the first to the second scenario. A more complex example of the comparison between absolute and relative risk comes from the media informative statements, as described by Gigerenzer and Selten (2002). Suppose to read that individuals with high cholesterol are 50% more likely to have an heart attack relative to those with normal cholesterol. This information is a relative risk, without any reference class. Now, suppose that, in reality, out of 100 people with normal cholesterol, 4 will die in 10 years of heart attack, whereas of those with high cholesterol, 6 will die. In this case, the news about the 50% increase would be correct, but misleading, inducing a higher risk perception and greater worry in the reader or potential patient.

Another study comparing the presentation of total vs. incremental risk, showed that the latter significantly lowered participants' worry about complications and reduced biases caused by varying the risk denominator (Zikmund-Fisher, Fagerlin, Roberts, Derry, & Ubel, 2008). The authors suggested that the additional or incremental risk presentation seems to facilitate the comprehension by highlighting the baseline risk, and thus they recommend this presentation format in communicating risk and in supporting medical decisions involving risks.

### ***2.3.7 Other factors affecting risk perception***

There are many other factors and conditions under which the perception of risk is affected. For example, when women participants were asked to estimate their risk of breast cancer before reading information including their actual risk, they felt at lower risk relative to those who did not answer the question before knowing their risk (Fagerlin, Zikmund-Fisher, & Ubel, 2005b).

Additionally, a growing body of literature has highlighted the role of individual differences in decision making and risk perception. Just to mention an example, a

considerable amount of research has been conducted on people's "numeracy", i.e., their ability to interpret and understand numerical information (Peters, Hibbard, Slovic, & Dieckmann, 2007), and on health literacy (Brewer, Tzeng, Lillie, Edwards, Peppercorn, & Rimer, 2009). In general, these studies have shown that people with low numeracy and/or low health literacy show more biases, more imprecise understanding, and overestimate risks, thus being more worried.

### **2.3.8 Summary**

To summarize, even when the options are exactly the same, but their presentation format is different, individuals can be influenced and they can make different judgments and choices, violating the invariance principle. The variety of examples presented shows how very subtle differences in presentation format can be relevant in shifting judgments and in pushing people to make different decisions. This is evidently important for informed decision making, but not only, indeed, all decision makers are affected by the way in which the information is presented, so not only patients, but also physicians and health practitioners can be affected. For instance, when looking at two treatments described in terms of survival *versus* mortality, they could recommend a different treatment. Therefore, these findings are especially relevant and have to be considered when choosing an informed approach, but they are also important in a paternalistic approach, because everybody is subject to these biases.

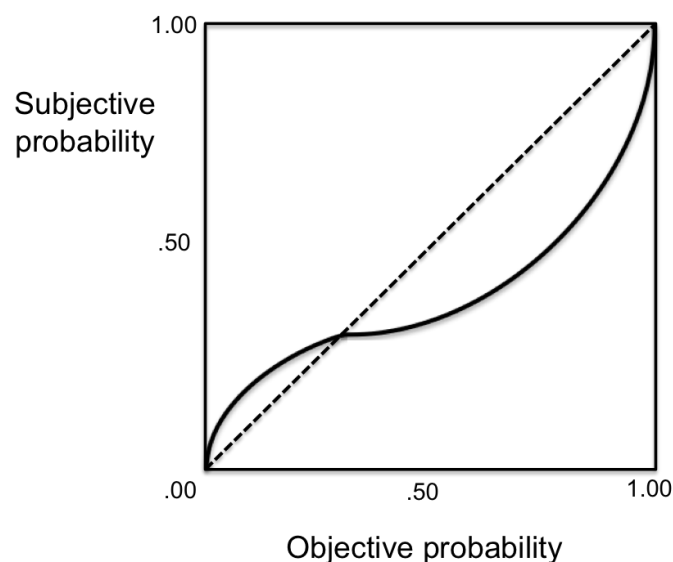
## **2.4 The Framing Effect and Health Messages**

In the next section, I will review the framing effect literature, specifically in the health context, starting from an overview of the explanation proposed according to Prospect Theory, followed by the historical development of the investigation of the effect in the medical domain, and presenting more recent findings, with particular attention to the promotion of cancer screening behaviors.

### 2.4.1 The rationale behind the framing effect according to prospect theory

The main explanation that have been suggested for the framing effect relies on the Prospect Theory, which has been proposed by Kahneman and Tversky (1979) as a general descriptive theory of judgment and decision making, as opposed to previously existing normative and prescriptive theories. According to the prospect theory, judgments and choices are described by two functions: the probability function and the value function. Both functions represent the relationship between a subjective and an objective amount. The probability function represents the perceived or subjective values attributed to corresponding objective probabilities.

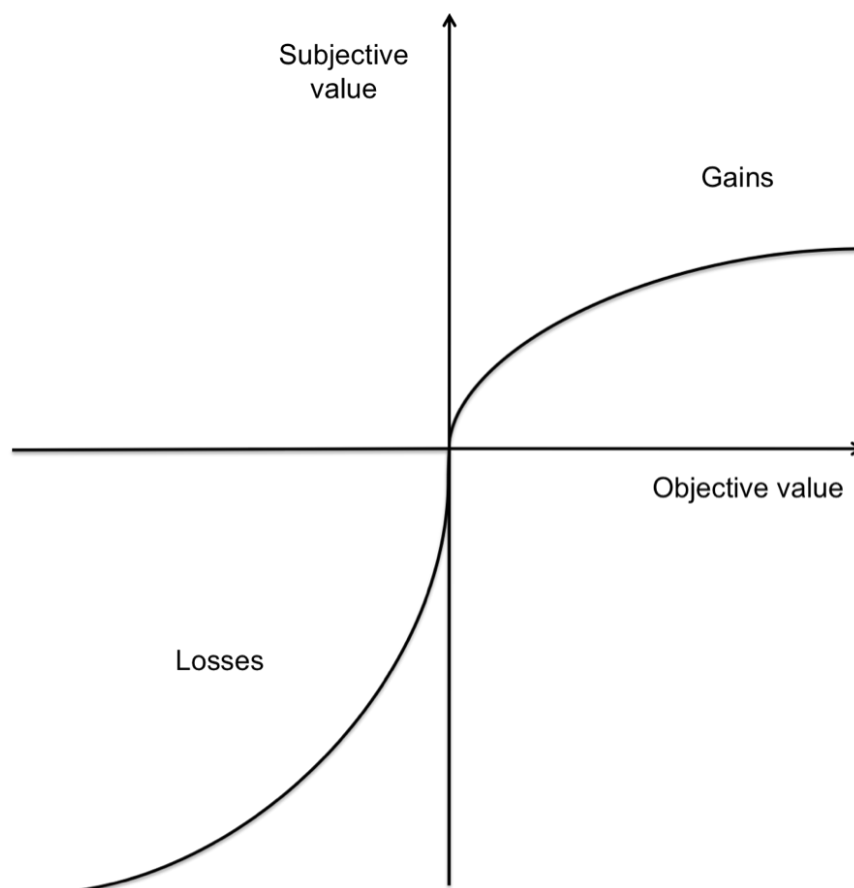
**Figure 2.11** Probability function.



As shown in Figure 2.11, it is characterized by a steeper line near the certainty extremes, i.e., close to zero and near to one, while the slope is relatively flat around the central values. This implies that people are more sensible to probabilities that are either very small or very big, close to certainty; in particular, they overestimate small probabilities and they underestimate big probabilities. Moreover, the same absolute difference is perceived as bigger at the extremes, especially when reaching certainty. For example, people are willing to pay much more money to take out the last bullet in a gun for Russian roulette than to reduce the bullets from three to two.

Indeed, even if the risk reduction is the same in both cases, in the first one the risk is reduced to zero, and uncertainty is eliminated, and, thus, the subjective value of the reduction is bigger than the perceived difference in the case of the reduction from three to two bullets. As mentioned before (see Paragraph 2.2.1), Hsee and colleagues (e.g., Rottenstreich & Hsee, 2001) have proposed that the shape of the value function is not constant for all stimuli, but instead depends on whether stimuli are processed and evaluated through calculation (in which case the subjective value is close to the objective one, resulting in a steep line) or through valuation by feelings (in which the slope is very steep near the axes intercept, and almost flat as it moves away from them).

**Figure 2.12** Value function.



The value function represents the subjective values that individuals perceive relative to the objective values, for example the subjective value of money relative to its actual value or the subjective value of health states. As shown in Figure 2.12, the

curve is characterized by three features: 1) the decision maker is not sensitive to the final outcome *per se* but rather to changes in states relative to the reference point; 2) the curve is “S” shaped, reflecting the diminishing sensibility to marginal outcomes, i.e., the sensibility to changes is greater for low values compared to high values; and 3) the curve is steeper in the loss domain relative to the gain domain, reflecting the different risk attitudes in the two quadrants: risk seeking in the loss domain and risk aversion in the gain domain.

These three aspects predict and explain many experimental results, including the framing effect. Indeed, one of the consequences of the three features above mentioned is that individuals are generally risk averse for gains and risk prone for losses. This different attitude depends on the reference point, which, in turn, determines whether the domain is the gain or the loss domain. The framing effect is found when the terms used to describe the same situation induce a different reference point, thus shifting the domain from losses to gains or *viceversa*. For example, going back to the Asian disease problem (Tversky & Kahneman, 1981; see Figure 2.8), the gain perspective, which highlights the number of lives that would be saved, sets the reference point as if all the 600 people expected to die had died, and could eventually be saved by the program chosen, thus becoming a “gain” relative to this reference point. On the other hand, the loss frame highlights the number of lives that would be lost, inducing as a reference point the situation in which none of the 600 people have died, but some or all of them may die. This would then be a “loss” relative to this reference point.

#### **2.4.2 Early studies**

Following the Asian disease study (Tversky & Kahneman, 1981), many studies have replicated and further explored the framing effect, expanding several different lines of research, among which its application to health messages and to the promotion of healthy behaviors. For example, one of the first studies has investigated the effect of framing a message to promote breast self-examination (Meyerowitz & Chaiken, 1987). The authors compared a loss- and a gain-framed pamphlet with a neutral one or no pamphlet. Participants who received the loss-framed pamphlet, stressing negative consequences of not performing breast self-

examination, showed more positive attitudes toward the self-examination, greater intentions to perform it, and also more frequent actual examinations at follow-up. Another example of this line of research concerns the simple way in which information about a single attribute is described. In particular, when asked their support for condom use, participants showed more support when it was described as having a 90% success rate relative to when it was describing as having a 10% failure rate (Linville, Fischer, & Fischhoff, 1993).

### **2.4.3 Typology of framing effects**

As suggested by Levin, Schneider, and Gaeth (1998), the studies on framing effect have defined framing in different ways and have targeted different underlying processes. The authors propose that framing effects can be distinguished in three different types, which they label as: standard or risky choice framing, attribute framing, and goal framing. The “standard” or “risky choice” framing is similar to the original Asian disease problem, in which the choice options differ in their level of risk (usually one option is risky and the other one is certain), which are objectively the same but described in different ways. The preferences between the two options are compared across the gain- and the loss-frame to evaluate the framing effect, which can either produce a choice reversal or simply a shift in preferences. As noted by the authors, the likelihood of finding a choice reversal is correlated with the similarity between the problem used and the original Asian disease scenario (Kuhberger, 1998; Levin et al., 1998).

The “attribute” framing is probably the simplest case of framing effect, in which only one attribute is framed from a gain or a loss perspective, such as the lean *versus* fat beef (Levin & Gaeth, 1988), survival *versus* mortality information (e.g., Marteau, 1989), success *versus* failure (e.g., Linville et al., 1993), tallness *versus* shortness of a person (Harris, 1973), or rejecting the undesirable option *versus* accepting the desirable one (Shafir, 1993). In this case, the framing effect is evaluated by comparing the judgments elicited by the two ways in which the attribute is described. To notice that in attribute framing, risk is not involved, and Levin and colleagues (Levin et al., 1998; Levin & Gaeth, 1988; Levin, Johnson, Russo, & Deldin, 1985) have suggested that a direct explanation of the attribute framing in

terms of prospect theory is not feasible because the theory posits the evaluations of changes relative to a reference point rather than the evaluation of a final state or outcome. Instead, they have suggested that *“attribute framing effects occur because information is encoded relative to its descriptive valence”* and that *“the positive labeling of an attribute leads to an encoding of the information that tends to evoke favorable associations in memory, whereas the negative labeling of the same attribute is likely to cause an encoding that evokes unfavorable associations”*.

Finally, “goal framing” concerns the way in which the goal of an action or a behavior is framed. The typical example of this kind of framing effect is found in persuasive communication studies that compare the effectiveness of a message highlighting the positive consequences of performing an action or adhering to the recommendations (gain-framed message) and the effectiveness of a message highlighting the negative consequences of not performing an action or not adhering to the recommendations (loss-framed message). Notice that the action or behavior promoted is the same in both frames, and the comparison allows to identify which frame is more effective in promoting the action or behavior. An example of this kind of framing is the study on breast self-examination previously cited (Meyerowitz & Chaiken, 1987).

#### **2.4.4 The distinction between prevention and detection behaviors**

Focusing on goal framing and restricting the attention to messages promoting healthy behaviors, the literature showed mixed results on the efficacy of one frame over the other, until the observation done by Rothman & Salovey (1997), concerning the function of the behavior promoted, namely its preventive *versus* detective function. Indeed, according to the prospect theory, individuals are risk averse when they are considering the potential gains afforded by their decision, whereas they are risk seeking when considering the potential losses. Therefore, the effect of different frames depends on whether the behavior promoted is perceived to reflect a risk averse or risk seeking course of action. While the “standard” framing effect involves explicitly stated risks (for example, a two third probability that everybody will survive in the Asian disease problem), in the context of health, the riskiness of a behavior is more fuzzy. In fact, messages that promotes healthy behaviors instead of providing

the choice between a risky and a sure option, encourage the engagement in a behavior, and the alternative is not engaging in the behavior. The authors have proposed that *“a behavior is considered a risky or safe course of action depending on the extent to which people perceive the behavior will afford an unpleasant outcome. For example, choosing to perform a detection behavior could be perceived as risky; by being screened for a potential health problem, one “runs the risk” of receiving significant, unpleasant information”* (Rothman et al., 2006). Following this conceptualization of the riskiness of the promoted behavior, Rothman and colleagues (Rothman et al., 2006; Rothman, Kelly, Hertel, & Salovey, 2003; Rothman & Salovey, 1997) have proposed that loss-framed messages are more persuasive than gain-framed ones when the behavior promoted is perceived as involving some risk of an unpleasant outcome (e.g., a health problem can be detected), while gain-framed messages are more persuasive than loss-framed ones when the behavior promoted by the message is perceived as involving a relatively low risk of an unpleasant outcome (e.g., a health problem can be prevented). In other words, since detection or screening behaviors, such as mammography or cholesterol test, have the function to detect or identify a health issue, they can be considered as a risky decision (the risk being knowing to have an issue) and they are therefore better promoted by loss-framed messages. On the other hand, since prevention behaviors, such as the use of condoms or the use of sunscreen, have the function to maintain the health status and prevent the onset of illnesses, they can be considered as a safe decision (not involving risks, which would instead be encountered if the behavior is not performed), and they are therefore better promoted by gain-framed messages. Therefore, the preventive *versus* detective nature of the behavior that is encouraged determines which frame is more effective in convincing individuals to perform it.

The different effectiveness of the two frames for detection and prevention behaviors has been further supported. Specifically, some studies have shown that the same behavior was promoted more effectively by a loss- or a gain-frame message depending on what function was attributed to the behavior: detection or prevention (e.g., Chang, 2007; Cox, Cox, & Zimet, 2006; Rothman, Martino, Bedell, Detweiler, & Salovey, 1999). For example, a message promoting a rinse for dental



hygiene presented the behavior either as a prevention behavior (the use of this mouth rinse reduces the plaque accumulation) or as a detection behavior (the use of this disclosing rinse enables to detect the areas of plaque accumulation). The message was also either framed from a gain or from a loss perspective, highlighting beneficial or negative consequences of using or not using the rinse. As expected, the gain-framed message was more effective in promoting the prevention rinse, while the loss-framed message was more effective in promoting the detection rinse (Rothman et al., 1999, Experiment 2). Moreover, the assumption that the effectiveness of the loss- or the gain-frame depends on the perception of the riskiness of the behavior, more than on the distinction between prevention and detection, has also been confirmed. Indeed, when manipulating the function of the behavior (prevention or detection) and the riskiness of the behavior (low or high), other than the frame of the message, the loss-framed message was found to be more persuasive when the risk involved was high, whereas the gain-framed message was more effective for behaviors involving a low risk (Bartels, Kelly, & Rothman, 2009).

#### **2.4.5 Reviews and meta-analyses**

The research on framing effects have been extensive, and several authors have reviewed, synthesized, and analyzed previous findings. For example, Kühberger (1998) has meta-analyzed 136 studies on risky choice framing, highlighting that the overall framing effect was of small to moderate size, but also that research designs and the scenarios used widely varied among studies. Among the possible characteristics that were hypothesized to play a role, two resulted to be important: Whether the framing was manipulated by changing reference points or by manipulating outcome salience, and whether the response was expressed through choices or through judgments. Other relevant characteristics that were shown to affect the presence and the size of the framing effect were: Whether the available options differed qualitatively or quantitatively in risk, whether there was one or multiple risky events, whether framing was manipulated by gain/loss or by task-responsive wording, whether dependent variables were measured between- or

within- subjects, and problem domains. The author suggested that a very important distinction is the one between outcome salience manipulations and reference point manipulations. Moreover, he warned that many features of the experimental setting have a considerable effect on effect sizes in framing experiments, and that the choice reversal is more likely to be found the more the experimental setting is similar to the original Asian disease problem (Tversky & Kahneman, 1981). Notice that a limitation of this meta-analysis (Kühberger, 1998) is the failure to take into account the distinction between prevention and detection behaviors.

Reviews and meta-analyses concerning specifically the health domain have been published too. When Rothman and Salovey (1997) proposed the distinction between prevention and detection, they already reviewed the existing literature to make their point. Later, the same group of co-workers analyzed again the use of gain- and loss-framed messages to promote healthy behavior (Rothman et al., 2006), confirming that gain-framed messages are more effective when targeting behaviors that prevent the onset of a disease, whereas loss-framed messages are more effective when targeting behaviors that detect the presence of a disease.

On the other hand, more recently, O’Keefe and Jensen (2008; 2009) have performed meta-analyses on studies on framing effects in promoting healthy behaviors, focusing specifically on disease prevention and detection behaviors. These two meta-analyses have concluded that the framing effect is very weak. In the first study, the gain-frame was found to have a small but significant advantage over the loss-frame in encouraging preventive behaviors. However, this advantage was found to be attributable to the studies on dental hygiene behaviors only. In the second study, loss-framed messages were only slightly more persuasive than gain-framed messages in promoting detection behaviors, and this superiority was driven by the effects found in studies promoting breast cancer detection behaviors. The authors’ suggestion is for health communicators not to use loss-framed messages in promoting detection behaviors because they are unlikely to be more persuasive than gain-framed messages.

In replying to the comments by O’keefe and Jensen, Latimer, Salovey, and Rothman (2007) have argued that “not all hope is lost”, being the future of framing research developing in several directions. On one hand, the previously proposed

distinction between detection and prevention behaviors (Rothman & Salovey, 1997) seems to need to be further specified according to the risk involved in the behavior promoted (as suggested by Bartels et al., 2009 and by Rothman et al., 2006). On the other hand, individual characteristics and dispositional sensitivity to outcomes has been found to play also a role (e.g., Rothman, Wlaschin, Bartels, Latimer, & Salovey, 2008).

Many possible moderators of the framing effects have been investigated, among which individual differences and situational variables. For example, participants' intentions and goals may moderate the framing effect, as showed by Wong and McMurray (2002) with smokers, who were differently affected by the message frame depending on their prior intentions about quitting smoking: Those who previously intended to quit smoking seemed to be more persuaded to do it by the loss-framed message at three months follow-up, whereas those who were not previously intentioned to quit smoking seemed to be more persuaded by the gain-framed message. A similar but distinct variable that has been proven to moderate framing effect is people's involvement with the issue. Indeed, a significant interaction between framing and involvement showed that loss-framed messages were more persuasive under high involvement, while gain-framed messages were more persuasive under low involvement (Maheswaran & Meyers-Levy, 1990).

#### ***2.4.6 Mixed framing: when both perspectives are included***

Some studies on the framing effect have investigated the effect of using a mixed framing, i.e., presenting the information in both the gain and the loss perspective. For example, in the hypothetical choice between two pharmaceutical treatments (A and B) for a severe disease, the results highlighted the typical framing effect: When framed in terms of gain, 61.2% of the participants chose the treatment A, while the loss frame lead 73.4% of participants to prefer the treatment B. However, when both frames were used, the preferences were evenly distributed between the two treatments (49.4 and 50.6%). Thus, the choices elicited by a double framed message were less extreme than those obtained with either frames (Bernstein, Chapman, & Elstein, 1999). This result is in line with what Kühberger

(1995) found when expliciting the options in the Asian disease problem. Another study conducted in the medical domain concerned the informed decision to take part in an experimental trial, and supports the idea that a double frame is more clear for patients' decision making (Schwartz & Haising, 2002). Finally, when comparing the benefits deriving from a single framed message and a double framed one, Chang (2007) observed that the mixed framing was more effective only for familiar products, but not for new and previously unknown products. In other words, providing both perspective resulted more effective than providing only one when people already knew and understood the risks and/or benefits delivered in the message.

Taken together, these findings suggest that the double frame could be the better way of framing information, if the message is aimed at informing patients. This is not limited to the specific case of gain and loss frames, but could also be generalized to other alternative ways of presenting information, for example, it could be advisable to present both the probability of surviving and the probability of death of treatments (to reduce the effect of different descriptions). Another case in which multiple perspectives can be useful is the difference between choosing for someone else or choosing for oneself (e.g., Zikmund-Fisher et al., 2006), or the difference between choosing for a single patient *versus* for a group of patients (e.g., when a doctor is recommending a treatment to one patient vs. when advising policy decision making). More generally, the explicit consideration of different alternatives from different points of view can help protect against many cognitive errors, for example, in the unpacking phenomenon or for the compromise effect. For instance, in the compromise effect (see Paragraph 2.1.1), the introduction of a third option C shifts people's preferences. A possible solution would be to frame the choice differently, taking different perspectives, i.e., considering only two options at a time, thus weakening the effect of the presence of the third option.

On the other hand, framing the information both from the gain and from the loss perspective may result in higher cognitive burden for patients, especially when the information is extensive, include many options and/or options with many characteristics. The information could be simply redundant, or could even harm the patients' ability to process and understand all the information. Indeed, a recent emerging idea is that "less is more" (e.g., Hsee, 1998; Peters, et al., 2006a; Peters,

Dieckmann, Dixon, Hibbard, & Mertz, 2007; Schwartz, 2000; Schwartz, 2004; Schwartz & Chapman, 1999). This perspective has drawn attention to the fact that we assume that more options among which to choose are better than less options, or, more generally, that the more information we have about the options, the better. However, this assumption is deceptive, and when the information or the options are too many, they can indeed worsen the judgment and decisional process. A simple example of this concept has been demonstrated in the marketing of products (Iyengar & Lepper, 2000; see also Schwartz, 2004). Specifically, consumers were offered to taste jams and then received a coupon for a discount in purchasing them. When they were presented with 24 different kinds of jam, more people stopped to taste them relative to when the choice set was smaller (6 kinds of jam), but the larger set was also found to be less effective in promoting the actual purchase relative to the smaller one. Schwartz (2004) refers to this phenomenon as the “paradox of choice”, meaning that we like better more options, but the idea that more options are always better can be misleading because they “freeze” the decisional process. For both this fact and the cognitive burden of elaboration of longer information, the presentation of messages framed both from a gain and from a loss perspective could not be the best way to present patients with information.

## **2.5 Summary of the introduction and overview of the studies presented**

In this chapter, I have reviewed and discussed some of the factors affecting the way in which people judge and decide among options (context effects), in terms of the paternalistic or informed perspectives, by classifying them into three broad categories: 1) when the options available affect people’s preferences, i.e., the choice between the same two options is “biased” by which options are available to the decision maker (for example, the dominated option is preferred); 2) when judgments and decisions are affected by external cues that should not affect them (for example by the evaluability of options or who the decision is made for); and 3) when the available options are actually the same but are nevertheless perceived to be different (e.g., the framing effect) because of the way in which they are presented. Finally, I have reviewed more specifically the literature on framing effects in the context of

medical decisions. This background is useful in the comprehension of the studies which I will present next. Each of the following chapters will present one or two studies, focusing on specific aspects of medical decisions and investigating specific context effects. The first study (Chapter 3) explores the effect of three factors on the choice between a safe and a risky option by comparing the effect of pursuing a hedonic *versus* an utilitarian purpose and the effect of the presence of specific information on risk attitude in two different domains: the medical and financial domains. Next, I will present a study on omission bias concerning the treatment choice for a slow growing thyroid cancer (Chapter 4). The first part of the study investigates the effect of the way in which one of the most common options of treatment is described (i.e., watchful waiting, described as either including or excluding the possibility to undergo later treatment, or without specification) on the treatment choice. The second part of the study explores some aspects that could determine the preference for action when the diagnosis is a malignant tumor, as opposed to the more common preference for inaction (i.e., omission bias). Then, the third study will briefly assess the effect of irrelevant information in physicians' decisions about prioritization for surgery (Chapter 5). Subsequently, I will present two studies on the effect of the way in which information on subsequent decisions is presented (sequentially vs. all at once) on the decision to undergo prostate cancer screening tests (a PSA test and eventually a biopsy), from the perspective of informed decision making (Chapter 6). After that, I will take a different perspective (a paternalistic approach) to prostate cancer screening (Chapter 7), and I will examine the effect of two factors: the verbal framing of the consequences (gain-framed, loss-framed, or both), and the presentation format of cumulative risk (numerical-only, or including a pictograph). Finally, I will present a study conducted in collaboration with a local screening program for the prevention of colon cancer, in which I was able to assess the real screening behavior of patients (Chapter 8). In this study, the variables manipulated are verbal framing (gain vs. loss) and lexical valence (expressing the consequences with positive or negative terms) on the real decision to comply with the campaign promoting colorectal cancer screening, i.e., on the actual undertaking of a screening test (either a rectosigmoidoscopy or a

colonoscopy). The last chapter of the dissertation will draw conclusions on these results and highlight future directions.

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## CHAPTER 3

### COMPARING RISK ATTITUDE IN THE MEDICAL AND FINANCIAL DOMAINS: EFFECTS OF PURPOSE AND INFORMATION

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*The first experimental study presented explored the effect of three contextual factors on the choice between a safe and a risky option, by comparing the effect of pursuing a hedonic versus an utilitarian purpose and the effect of generic versus detailed information on risk attitude in two different domains: the medical and financial domains.*

People evaluate the risk of an activity in a way that is often different from what statistical models forecast (Slovic, 2000), and cognitive psychologists have demonstrated that risk perception is influenced by heuristics and biases that lead people to have a distorted impression of the actual level of risk characterizing different activities, behaviors or environments (Slovic, Fischhoff, & Lichtenstein, 2000). Such a mismatch arises because risk is assessed in highly subjective terms and people often rely on their intuition rather than on quantitative data (Lichtenstein, Slovic, Fishhoff, Layman, & Combs, 1978; Tversky & Kahneman, 1974).

Another central finding of the literature on risk perception is that risks and benefits are usually perceived as inversely related (Alhakami & Slovic, 1994). In other words, activities that are judged high in risk tend to be judged low in benefit and vice versa. This means that people's perceptions are at odds with the fact that in the real world risks and benefits are often positively related (e.g., x-rays in medicine). These findings have enabled researchers to understand why a particular activity can lead to widespread differences in risk perception (e.g., different individuals having dissimilar opinions about the riskiness of the same activity).

In the present paper, we aim to show that individuals have inconsistent preferences between risky and safe alternatives depending on the interplay of a series of contextual factors. Following the distinction between utilitarian and hedonic



goods used in marketing research (e.g., Dhar & Wertenbroch, 2000), we use the term *utilitarian* purpose to refer to a useful, practical, and important purpose, and the term *hedonic* purpose to refer to a pleasant but not essential purpose. People continuously face decisions in their lives; however, the very same decision can be faced in order to fulfil different purposes. For instance, when deciding whether or not to accept a new job, an individual's goal might be simply to make more money than she/he is currently making and become wealthier as a result. On the other hand, a second person who is facing the same decision may want to make just enough money in order to support her/his family. While for this second individual earning more money is essential in order to achieve a functional goal (utilitarian purpose), for the first one it is not (hedonic purpose). We asked participants to imagine themselves pursuing either a utilitarian or a hedonic purpose in a medical or financial situation. Participants were faced with two alternatives, one riskier than the other, described either generically or in detail, and they had to choose the option they thought would better help them reach their goal. Specifically, we manipulated: the domain in which the decision was made (i.e., medical vs. financial), the purpose of the decision (i.e., utilitarian vs. hedonic), and the level of detail of information, either low (a generic description of options) or high (detailed description of the likelihood of the benefits and risks associated with each alternative). We then measured participants' preferences and their judgments about how risky they perceived each alternative to be.

Originally, the study of judgment and decision making has been applied in the economics domain (Tversky & Kahneman, 1974), and the early findings have been generalized from economic decision making to other fields (e.g., the medical domain). Currently, despite the amount of literature that has investigated how people perceive risk within either the financial or the medical domain (Arrow, 1981; "Cancer Risk Communication", 1999; Ganzach, 2000), there is a lack of systematic research comparing individuals' risk perception across these two domains. The few studies addressing this issue showed that decision processes may differ between these two fields. For instance, Chapman (2002) showed that discounting preference for health and money are in agreement only when both domains are perceived as tradable. In

other words, there is agreement only if people perceive that they can trade one domain (e.g., health) for the other (e.g., money).

As for the pursued purpose, it is plausible to assume that people are more willing to take some risks if they perceive that the associated benefits are necessary and essential. For instance, Sokolowska (2006) showed that people are more willing to choose a risky option when the safer one does not allow them to realize their aspirations. However, to our knowledge there are no studies showing that the specific purpose of a decision (e.g., hedonic vs. utilitarian) may have an impact on people's preference for a riskier option over a safer one.

On the other hand, the impact of the level of detail regarding the expected outcomes has been investigated more intensively. Modern theories in cognitive psychology indicate that there are two fundamental ways through which human beings comprehend and process risk: the *heuristic* system (System 1) responsible for forming selective representations of problem content, and the *analytic* system (System 2) that reasons with such representations. The term heuristic refers to processes that operate pragmatically at a preconscious level, determining automatically what gets represented as relevant. Analytic processes, instead, refer to more or less effective procedures for generating inferences and decision from such information (Evans, 1984). Only the information that people consider as "relevant" is subjected to analytic processing.

There is evidence showing that the level of detail of the information provided about each alternative affects people's decision making. When the information about the benefits and risks expected for each alternative is provided, decision-makers consider that information relevant for the decision and therefore process it analytically (Evans, 1984; Epstein, 1994; Sloman, 1996), relying on it in order to make a decision consistent with the trade-off between benefits and risks. In other words, a choice context enriched with relevant and detailed information encourages the use of that information in order to generate decisions or judgments enhancing the analytic processing (or System 2). For example, individuals might be informed that by accepting to undergo a surgical intervention, they would face a certain likelihood to treat their disease as well as a chance to incur some sort of side effects. In this case people will rely on that information to decide whether the benefits

outweigh the risks. We hypothesized that people who are presented with detailed information about the expected outcomes of the alternatives use that information and process it analytically. Therefore, in such a condition, what is more relevant is the information about the likelihood of outcomes resulting from each alternative, and the decision will thus be driven by this information. Moreover, since the available options are the same within each domain, the decision will be relatively insensitive to the purpose that the decision maker is pursuing and will be based mainly on the trade-off between risks and benefits.

Contrastingly, when there are no clues about the expected outcomes of the alternatives, the decision-maker is likely to rely on his/her subjective opinions and to use an intuitive thought process (Slovic et al., 2004). For example, there are some situations in which decision-makers are confronted with decisions under conditions of ambiguity, that is decisions in which the probability of an outcome is not specified (Einhorn & Hogarth, 1986). In such circumstances, people need to formulate an evaluation of how risky an alternative is and they are likely to rely on their previous experiences and knowledge, as well as on their affective reactions, since they have no other information to rely on (Slovic et al, 2004). We hypothesized that when no detailed information is presented, individuals will choose in a less consistent fashion than when detailed information is presented, because of the increased difficulty in recognizing what information is relevant in order to make a choice. Therefore, if the decision-makers are not informed about the likelihood of each outcome, then they will base their evaluation of the alternatives only on their subjective judgments about the effectiveness and riskiness of the alternatives. In such a condition, we expected to find increased influence of the way the decision is framed, because contextual factors might be considered as relevant to the decision and they are one of the few pieces of information upon which people can base their evaluation of the alternatives. In particular, we hypothesized an interaction between the purpose and domain factors. In the financial domain, individuals should be more willing to choose the safer option when they have a utilitarian goal (such as saving money for retirement) rather than a hedonic goal (such as getting richer). This hypothesis is grounded on previous research on investment decisions, showing both that people do not usually save enough for retirement (Thaler & Benartzi, 2004), and that people

tend to invest on more risky assets only when they are aiming to increase their wealth (Shefrin & Statman, 2000).

In the medical domain, on the other hand, we expected individuals to be more likely to choose the safer option when the purpose of their choice is hedonic (such as improving the appearance of their face) rather than utilitarian (such as solving a chewing problem). In this domain, people should perceive lower benefit and fewer reasons to undergo surgery when their goal is hedonic. Individuals might think that surgery can compromise their health and that their life should not be put at risk for unnecessary reasons, especially if alternative treatments are available. Previous research on people's perceptions of the relationship between risks and benefits suggests that in such a condition, individuals should overweigh the risks associated with the surgery and, consequently, feel that the benefits are not enough to counterbalance the risks (Alhakami & Slovic, 1994). In contrast, when individuals have a utilitarian purpose, they should be more willing to undertake the surgery since they might find more reasons in favor of such a choice, and they may perceive the benefits as higher.

Finally, we hypothesized that the perceived riskiness of the available alternatives also influences people's choices. In particular, we expected people to be more willing to take a risk when they perceive only a small difference between the riskiness of the two alternatives, relative to when one alternative is perceived to be much riskier than the other one. A small difference in how risky the two alternatives are perceived, indeed, implies that people consider the riskier option almost as safe as the safer one. As a consequence, when the riskiness of the options is similar, people will prefer the riskier option because it has larger benefits than the safe one. On the other hand, when the safer alternative is perceived to be much less risky, people will underweight the benefits of the riskier option and they will end up preferring the safer one (Finucane et al., 2000).

To summarize, we hypothesized that when detailed information is provided, the choices will be based on tradeoffs between the stated risks and benefits, and people will be insensitive to the fact that the purpose is utilitarian or hedonic. When generic information is provided, we hypothesized that the choices will differ depending on the purpose, and we expected this difference to depend on the domain.

### 3.1 Method

#### 3.1.1 Participants

Three hundred thirty-nine students ( $n = 184$  females) recruited at the University of Padova participated in this study. Their age varied from 18 to 33 years ( $M = 21.59$ ,  $S.D. = 3.18$ ;  $Mdn = 20$ ). Participants were contacted at the university and asked to read and fill a questionnaire. Participants were assigned randomly to one of the eight experimental conditions.

#### 3.1.2 Procedure and material

We constructed eight scenarios, manipulating three between-subject factors: the decision domain (medical vs. financial), the purpose (utilitarian vs. hedonic), and the level of information provided about each alternative (generic information vs. detailed information).

**Table 3.1** Description of the type of hedonic and utilitarian purposes used in the medical and financial domains and respective options.

Domain	Purpose		Options	
	Utilitarian	Hedonic	Riskier	Safer
Medical (malocclusion of teeth)	Solving a chewing problem	Refining the appearance of the face	Maxillo-facial surgery	Orthodontic treatment
Financial (investing money in the stock market)	Saving money for retirement	Getting richer	Investment in stocks	Investment in bonds

Participants were asked to imagine themselves in either a medical or a financial situation, pursuing either a utilitarian or a hedonic purpose (for a description, see Table 1). In the generic information condition, only a brief description of the two alternatives was presented; in the detailed information condition, the same

description was followed by a clarification about the possible outcomes associated with each alternative (see Table 2).

**Table 3.2** Alternatives presented to participants.

<i>Medical domain</i>		
Information	Riskier Option	Safer Option
Generic Information	Surgery for the skeletal system around the mouth	Corrective treatment by means of retainers
Detailed Information	The surgery on the skeletal system around the mouth is often effective, but there is a small probability that you do not reach your purpose in a satisfactory way, and a 5% probability of severe complications.	The corrective treatment by means of retainers is often effective in reaching the purpose and lasts for long time. It is often followed by the use of removable retainers to preserve the correction; however, compared with the surgery, it is more likely that the correction obtained will not reach the purpose satisfactorily.
<i>Financial domain</i>		
Information	Riskier Option	Safer Option
Generic Information	Investment in stocks	Investment in bonds
Detailed Information	Investing in stocks is often profitable in the long term, but there is a small probability that you do not gain enough to reach the purpose, and a 5% probability of serious losses.	Investing in bonds is often profitable in the long run, but compared with the investment in stocks, it is likely that the gain obtained is not sufficient to reach the purpose.

The two options were constructed in such a way that one was riskier than the other, but in order to measure the perceived risk, we asked participants to judge the riskiness of each option on a 7-point scale, ranging from 1 (*not at all risky*) to 7 (*extremely risky*). After rating the riskiness of each alternative, participants were asked to choose the option they thought would better reach the goal described in the scenario. In the analysis, the difference between the perceived riskiness of the two options has been considered as a predictor of people's preference. Finally, to check the experimental manipulation, we asked participants to judge the decision purpose on the utilitarian-hedonic dimension, by means of a semantic differential. The semantic differential was made up of 5 different 7-point scales: Essential/superfluous; irrelevant/relevant; unimportant/important; utilitarian/hedonic; useless/useful. After reporting their age and gender, participants were thanked and debriefed.

### 3.2 Results

The semantic differential measuring the utilitarian *versus* hedonic dimension of the decision purpose was analyzed in order to check the experimental manipulation. First, the scales were recoded in such a way that lower scores indicated that the purpose was perceived as hedonic, whereas higher scores indicated that the goal was perceived as utilitarian. Then, since the internal consistency between the five different scales was high (Cronbach's  $\alpha = .89$ ), we collapsed them into a unique variable by computing the mean across all scales. In the hedonic condition, participants' scores were significantly lower ( $M = 0.64$ ) than those of participants in the utilitarian condition ( $M = 1.85$ ), confirming that the manipulation had the expected effect,  $t(337) = 9.37$ ;  $p < .001$ .

In order to investigate the effect of the independent variables, we performed a logistic regression on participants' choices (0 = riskier, 1 = safer). Independent variables included in the model were: domain (0 = medical, 1 = financial), purpose (0 = utilitarian, 1 = hedonic), information (0 = generic, 1 = detailed), as well as their two-way and three-way interactions. We also included the difference score between the two ratings of riskiness (the higher this value, the bigger the difference perceived) as

predictor. Overall, the model had a Nagelkerke  $R^2$  of .18 and classified 65% of the choices correctly. As can be seen in Table 3, the significant predictors between the factors were: The purpose ( $OR = 3.57, p < .01$ ), the two-way interactions between purpose and domain ( $OR = 0.07, p < .001$ ), and between purpose and information ( $OR = 0.20, p < .05$ ), and the three-way interaction between purpose, domain, and information ( $OR = 15.58, p < .005$ ). Also, the difference in perceived riskiness of the options was significant ( $OR = 1.34, p < .001$ ).

**Table 3.3** Predictors of participants' choice of the safer option relative to the riskier option.

	B	S.E.	$\chi^2$	df	Sig.	Odds Ratio	95,0% CI for OR	
							lower	upper
domain (financial)	0.414	0.431	0.925	1	0.336	1.513	0.651	3.519
purpose (utilitarian)	1.203	0.474	6.443	1	0.011	3.331	1.315	8.437
information (detailed)	0.176	0.444	0.157	1	0.692	1.193	0.499	2.850
domain (financial) by purpose (utilitarian)	-2.564	0.669	14.686	1	$p < .001$	0.077	0.021	0.286
information (detailed) by purpose (utilitarian)	-1.538	0.673	5.214	1	0.022	0.215	0.057	0.804
domain (financial) by information (detailed)	-0.822	0.630	1.705	1	0.192	0.439	0.128	1.510
domain (financial) by information (detailed) by purpose (utilitarian)	2.702	0.951	8.072	1	0.004	14.915	2.312	96.215
difference in riskiness	0.296	0.074	15.856	1	$p < .001$	1.344	1.162	1.555
constant	-0.722	0.357	4.103	1	0.043	0.486		



To facilitate the understanding of the three-way interaction, its representation has been divided into two figures. The condition with detailed information is shown in Figure 3.1a. In the financial domain, participants preferred the riskier option over the safer one, both when the purpose was hedonic,  $\chi^2(1, 39) = 4.33; p < .05$ , and when it was utilitarian,  $\chi^2(1, 43) = 3.93; p < .05$ . In the medical domain, for both purposes participants were indifferent between the two options.

**Figure 3.1** Percentage of choices for the riskier alternative expressed: a) when detailed information was presented; and b) when generic information was presented.

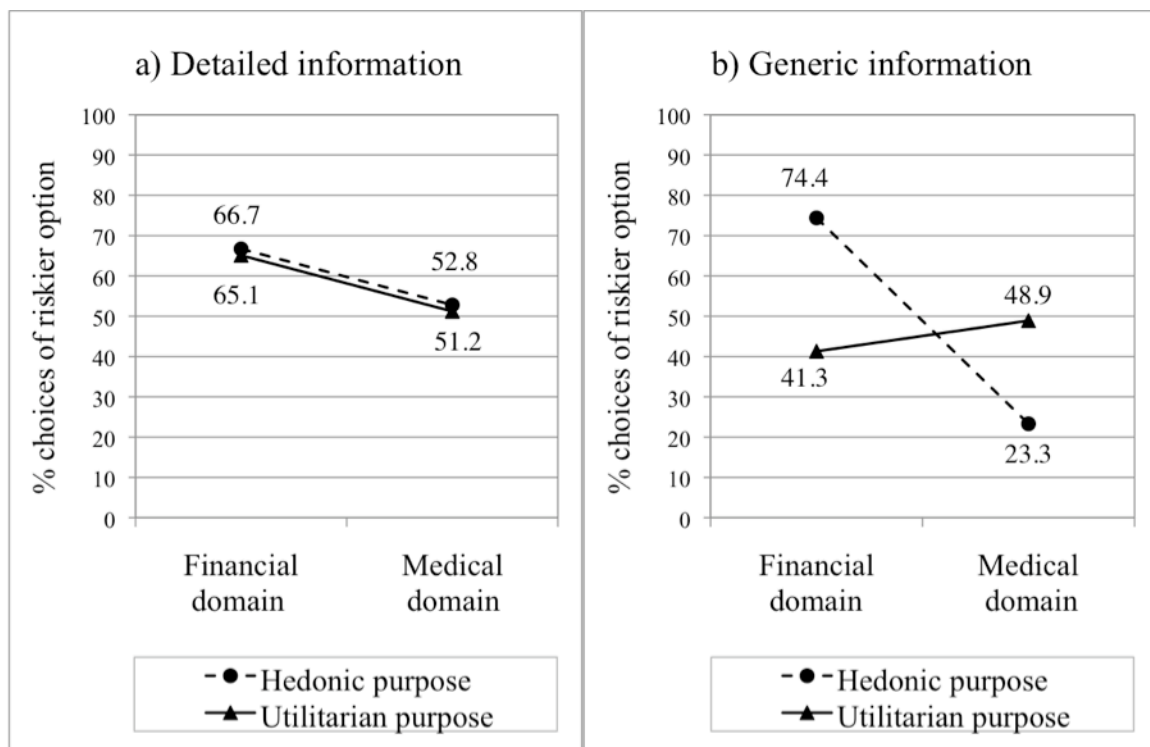


Figure 3.1b shows the results of the condition with generic information. In this case, the effect of the purpose was different across domains. In both domains, the utilitarian purpose did not lead to a preference for one option over the other. In contrast, for the hedonic purpose, participants chose the riskier option more often in the financial domain,  $\chi^2(1, 43) = 10.26; p < .001$ , and the safer option in the medical domain,  $\chi^2(1, 43) = 12.30; p < .001$ .

Finally, in addition to the three-way interaction, we found that a significant predictor of participants' choices was the difference in how risky each alternative was judged to be. The higher the difference, the more participants chose the safer option. In particular, for each additional point of perceived difference in riskiness, the probability of choosing the safer option increased about 1.3 times, holding constant the other variables in the model.

### **3.3 Discussion**

The present paper aimed to show that individuals have inconsistent preferences among risky and safe alternatives depending on contextual factors. In particular, we investigated the effect of the interplay of the detail of information about each alternative (generic vs. detailed), the decision maker's purpose (utilitarian vs. hedonic), and the decision domain (medical vs. financial).

Especially interesting is the different pattern of choices found depending on the detail of information provided about each alternative. The results showed that in both the financial and medical domains there was no significant effect of the type of purpose when detailed information was provided (although people facing a financial decision were more risk seeking than people facing a medical decision).

On the other hand, when only generic information was presented, there was a significant interaction between purpose and decision domain. The utilitarian purpose did not lead to a preference for either option in either the medical or in the financial domain, whereas the hedonic purpose induced the participants to be more risk seeking in the financial domain and more risk averse in the medical domain. The explanation for this pattern of results might be that, with generic information, people rely much more on their intuition (Epstein, 1994) and are more prone to consider relevant contextual factors, such as the purpose. In other words, when people have to guess the riskiness of a certain choice, they have to find the relevant information in their memory, a process prone to biases like availability (Tversky & Kahneman, 1974), and may be led to choose on the basis of a subjective interpretation of the alternatives. Therefore, in such circumstances people's affective reactions gain a central role in influencing their judgments (Finucane et al., 2000). In contrast, the

lack of an interaction effect when participants were presented with detailed information may denote a tendency to rely less on intuition and to use the provided data when judging the trade-offs between risks and benefits. In this case, people may reason about the two options in a more systematic way, with probability judgments that are based on the information provided.

As expected, when presented with a hedonic purpose and generic information, people were more risk seeking in the financial domain compared with the medical one. In the financial domain, people were told that their purpose was to get richer; therefore they might have felt that taking a risk was required to achieve the goal. In addition, they might have thought that if their goal was to improve their wealth, then they should already have enough money to cope with a potential loss. Differently, in the medical domain, individuals could have considered that, instead of money, their life was at stake, since complications may have arisen as a consequence of the surgery. The results showed that people were skeptical about undergoing surgery when an alternative treatment was available. They were slightly more willing to accept such a risk when the information was generic and the surgery could help them overcome a severe health problem; however, even in this condition, participants did not express a clear preference in favor of the surgical intervention. It is possible that our participants have a rather negative affective reaction toward the surgery, which induced them to overestimate the chances of suffering from some sort of complication. It seems reasonable to conclude that people are less willing to “play” with their lives than with their money. Such a pattern of results is also consistent with previous work in the financial domain showing that people who only have the purpose of improving their wealth are likely to choose riskier portfolios (e.g., Shefrin & Statman, 2000).

Finally, as expected, the difference between how risky each alternative was perceived proved to be a good predictor of participants’ willingness to choose the riskier option *versus* the safer one. This result can be explained in the terms of the inverse relationship between risks and benefits that has already been described in the realm of risk perception. The inverse relationship is robust and indicative of a confounding of risk and benefit in people’s mind, and this confounding is linked to a person’s overall evaluation of an activity or of a particular situation (Alhakami &

Slovic, 1994). In fact, as the perceived difference in riskiness between the two alternatives widens, participants' preference for the riskier alternative decreases, suggesting that they expected less benefit from the risky option when it was judged as much more dangerous than the safe one. On the contrary, when the two alternatives were perceived as having a similar riskiness, participants were more willing to choose the risky one since the safe alternative allowed them to avoid negative outcomes (e.g., to lose money or to suffer from surgery complications), but at the same time did not fully achieve the decision maker's purpose (saving enough for retirement or solving the malocclusion issue definitively). One limitation of the present study is that generalizing the results should be done with caution, since we used only two hypothetical scenarios. Future studies are needed to clarify the extent to which the results are generalizable to other situations and also the extent to which they are reflected in real world decision making.

Nevertheless, we think that our findings could help clarify the role that contextual factors and their interplay have on decision making. A first implication concerns the generalization of findings about judgment and decision making from the economic domain to other domains. Indeed, the results obtained indicate that preferences in the medical domain can be different from preferences in the financial domain, suggesting a field-specificity. Therefore, the generalization from one domain to another should be performed cautiously, as previously suggested (Chapman, 2002). Additionally, the results indicate that factors affecting choice are not independent, but interact with each other, which would recommend taking into account the interplay of more than one factor, rather than their separate effect on choice. Finally, our findings indicate that the purpose driving decision makers' choices might be more relevant in the decision itself when no detailed information is available about the consequences of the options available. In daily life, having only a vague knowledge of the potential outcomes happens quite frequently, and often the first judgment drawn from the generic idea about the options available will drive or anchor the following judgments, even if they are based on additional information. In part, that happens because the judgments made using System 1 are faster and may influence the type of information System 2 will focus on. In this perspective, it is important that both medical and financial experts provide their patients or clients with

accurate information as soon as possible. That would avoid or reduce the effect of contextual factors that could mislead their judgments.

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## CHAPTER 4

### WHY AND WHEN DOES A TUMOR DIAGNOSIS NOT LEAD TO OMISSION BIAS?

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*In this chapter, the focus is on omission bias (see Chapter 2, Paragraph 2.1.5) and on the opposite result (preference for action or action bias), which was found for cancer treatment decisions. The first part of the study investigated the effect of the way in which one of the most common options of treatment is described (watchful waiting, described as either including or excluding the possibility of undergoing later treatment, or without specification) on the treatment choice. The second part of the study explored some aspects that could be determining for the preference for action when the diagnosis is a malignant tumor, as opposed to the more common preference for inaction (omission bias).*

When choosing among medical treatments, patients have to consider the risks and benefits of each available option. When two options are equally effective and have the same probability of the same negative consequences, they should be considered equal, regardless of whether these negative consequences result from the commission or from the omission of an action. However, as noted in Chapter 2 (Paragraph 2.1.5), several studies have repeatedly found an “omission bias”: People prefer to risk negative consequences caused by omissions to equal or lesser risk of harm caused by commissions. For example, Ritov and Baron (1990) showed that participants preferred not to vaccinate their child for a flu that could be fatal (omission or inaction), even if this choice would lead to a higher risk of death than the vaccination itself (commission or action). As previously mentioned, this is a situation in which people violate rationality principles, by choosing an option that is not the best one, or by strongly preferring an option to the other even if they are equivalent options. Numerous studies have replicated the omission bias finding in real decisions

(Aberegg, et al., 2005; Asch et al., 1994; DiBonaventura & Chapman, 2008; Meszaros et al., 1996), in moral judgments (Royzman & Baron, 2002; Sunstein, 2005), and in other medical situations (Aberegg, et al., 2005; Cohen & Pauker, 1994). There are also some findings in the opposite direction, suggesting an action bias. However, this result is not limited to a different domain, i.e., environmental choices (Patt & Zeckhauser, 2000; Tanner & Medin, 2004; for a critique on these findings see Baron & Ritov, 2004), but was also found with medical scenarios very similar to the vaccination scenario (Fagerlin, Zikmund-Fisher, & Ubel, 2005c), and therefore, the possible explanation based on the difference of topic and issues involved can not be applied.

Based on clinical experience, Fagerlin and colleagues (2005c), noted that, in the real world, when patients are diagnosed with cancer and face the decision of what treatment to adopt, they often favor an active treatment, especially when it is a surgical treatment and even when its risks are higher than those of other treatments available (for example, radical prostatectomy is often preferred for prostate cancer even if other treatments available are equally effective but with less serious side effects). In the light of this observation, the authors investigated the hypothetical choice between an active treatment (either surgery or medication) and the omission of the active treatment (watchful waiting), in a scenario of cancer diagnosis (Fagerlin et al., 2005c). The results supported the intuition derived from clinical practice: Participants favored the active treatment, in particular surgery, even when the risks associated with the action were greater than those associated with the omission. According to the authors, the diagnosis of cancer is a “call to action” for patients. In this situation, unwilling to be passive bystanders, patients would feel a strong need to do something to face up to the cancer, a need that could be fulfilled through the choice of surgery that would remove the cancer from their bodies.

The goals of the present study were to investigate: 1) To what extent the preference towards active treatment for a cancer diagnosis is attributable to the way the inaction option is described; and 2) what aspects of the diagnosis give rise to the preference for action. As far as the first issue is concerned, when describing the watchful waiting option, Fagerlin et al. (2005c) explicitly stated that if the tumor were to worsen, it would be too late to undergo a surgical treatment. In other words, it was

specified that this choice would have not allowed surgery treatment in the future. Although this description made the options very similar to those used by Ritov and Baron (1990) in the vaccination scenario (action vs. inaction), it does not reflect what is usually considered the function of watchful waiting. In fact, the watchful waiting typically allows the patient and the physician to defer the potential decision to undergo a surgical treatment or another active treatment (Driffield & Smith, 2007). That is, by choosing watchful waiting, the default option is continuing to wait, but new information is still gathered regularly; the tradeoff between the risks and benefits of waiting and those of the active treatment are reassessed in light of the new information gathered, allowing the shift to the active treatment if its result would be better than continuing to wait. Thus, watchful waiting is usually conceived of as allowing active treatments when needed, and not necessarily as a definitive choice. The first aim of this study was therefore to investigate the effect of the way in which watchful waiting is described on people's preferences. In particular, we compared three scenarios that were exactly identical except for the presence or absence of a sentence that specified either that watchful waiting would have not allowed for eventual surgical treatment in the future, or that an eventual surgical treatment would have been allowed (see the Material section for the exact wording). We predicted that surgery would be chosen more frequently in the scenario that described the two treatments as mutually exclusive (i.e., the choice of watchful waiting would exclude surgery in the future), relative to the neutral scenario in which no further information about watchful waiting was provided. Moreover, we expected that the scenario explicitly stating that watchful waiting would not exclude surgery in the future would make participants focus on future options, leading them to prefer more often watchful waiting over surgery relative to the neutral scenario. Thus, we hypothesized that the preference for action found with cancer scenarios (Fagerlin et al., 2005c) could be, at least partially, accounted for by the way in which watchful waiting was described.

As for the second aim, we wanted to explore what kinds of tumor diagnoses induce people to take action. One difference between the vaccination scenario (Ritov & Baron, 1990) and the cancer scenario (Fagerlin et al., 2005c) is the fact that one is an illness that could arise in the future, whereas the other is an illness already diagnosed; thus, the treatment options are preventive in one case and curative in the



other one. Another difference is the kind of illness: Unquestionably, cancer and flu are very different. But what made the cancer diagnosis a call to action? Was it the fact that it was a malign tumor, or simply the fact that it was a tumor (that could be also benign)? And, if it was the fact that it was a tumor, was it the possibility that it might degenerate that made people favor the surgery? In order to identify the critical aspects that determined the preference for action, we compared scenarios that differed in, the kind of illness (malignant or benign tumor or non tumor), the present status of the illness (already present illness vs. illness that could arise in the future), and the possible development (growth vs. degeneration) of the benign tumor. All the diagnoses were described in the scenarios as resulting in exactly the same likelihood of life threatening consequences (see the exact text in the Material section).

In sum, we aimed first at studying the effect of the meaning attributed to the inaction option on the preference for the active treatment in presence of a cancer diagnosis. We hypothesized that compared to the neutral description (scenario 1) the preference for action would be stronger when the watchful waiting excluded surgery in the future (scenario 2), whereas the preference for watchful waiting would be stronger when it did not exclude future surgery (scenario 3; H1). Secondly, we aimed at exploring in depth the kind of diagnosis that gives rise to the preference for action. We predicted that the surgery would be chosen more frequently than watchful waiting when the tumor was diagnosed as malignant (scenario 1) rather than as benign (scenarios 4 and 5) or when the illness was not a tumor (scenario 6; H2a). Furthermore, we expected that the preference for action would have been stronger when the diagnosis is of an already present illness relative to an illness that could arise in the future due to a genetic predisposition (paired scenarios 1 and 7 for tumor and 6 and 8 for non tumor; H2b). Finally, we expected that possible degeneration (scenario 4) would have given rise to more action preferences than the possible growth of a benign tumor (scenario 5; H2c). In addition, we were interested in assessing how each diagnosis was perceived in terms of severity by participants, in order to test if the perceived severity, dependent on the diagnosis, was related to the treatment choice.

## **4.1 Method**

### **4.1.1 Participants**

Seven hundred thirty-five students ( $n = 577$  females) took part in this study, aged between 18 and 37 ( $M = 20.89$ ;  $S.D. = 2.14$ ;  $Mdn = 20.00$ ). Participants were contacted at the University of Padova and asked to fill out an Internet survey for course credit. Each participant faced one of the eight scenarios we constructed. After completion, they were thanked and debriefed.

### **4.1.2 Procedure and Material**

The first part of the scenarios was the same for all participants and contained a brief, general description of the thyroid and its functions (see later). Then, participants were asked to imagine having received one of six hypothetical diagnoses concerning their thyroid. Next, it was explained that, at the moment, the diagnosed illness was not causing any problems to them but, according to medical statistics, in 5% of cases life threatening consequences could arise. The specialists they consulted had proposed two treatment options: surgery and watchful waiting. Both the options implied a risk of incurring negative outcomes in 5% of cases that could be either severe complications due to the surgical treatment, or life threatening conditions caused by the illness itself with the watchful waiting option. The order of the presentation of the options was counterbalanced across subjects.

Eight hypothetical scenarios were used, describing realistic but not real situations (i.e., not only hypothetical scenarios, but also describing medical conditions not always existing, in order to test our hypotheses). The first three scenarios presented a diagnosis of malignant tumor of the thyroid, but they differed in the way treatments were described. While the first scenario did not specify what options were possible after having chosen watchful waiting (neutral description;  $n = 93$ ), the second scenario specified that watchful waiting excluded the possibility of undergoing surgery in the future (i.e., explicitly stating that if the tumor were to worsen, it would be too late to undergo a surgical treatment, as in Fagerlin et al., 2005c ;  $n = 93$ ), and the third scenario specified that watchful waiting did not exclude future surgery ( $n = 96$ ). Specifically, the scenarios stated:

*“The thyroid is an endocrine gland located in the front part of the neck. Its main function is to secrete some hormones that considerably affect all the metabolism. Imagine that you have been diagnosed with a malignant tumor of the thyroid. Right now, it is not causing you any trouble. According to medical statistics, in most cases this tumor will grow so slowly it will not cause any trouble.*

*But, in 5% of cases the tumor will grow quickly compressing nearby organs (larynx, esophagus and trachea) and causing phonation, deglutition and respiration troubles, which can worsen till compromise life.*

*On the basis of the controls, the specialists you have consulted think that there are two available options:*

*- the first option consists in watchful waiting, that is periodical controls of the tumor by specialists. This option has no side effects, however, in 5% of cases, the tumor will grow quickly,*

*[scenario 1] causing compressing troubles on nearby organs and related consequences.*

*[scenario 2] spreading and compressing nearby organs. Although it would be too late to be operated, specialist will treat every symptom that will arise, so that you will be pain free.*

*[scenario 3] causing compressing troubles on nearby organs and related consequences. This option does not exclude that thyroidectomy is performed in the future.*

*- the second option consists in thyroidectomy, that is the surgical removal of the thyroid. This option will completely remove the tumor, however, in 5% of cases, severe complications due to the surgery will arise.”*

The other scenarios described the treatment options analogously to the first scenario, namely in a neutral way, without specifying whether the two options excluded each other and the first part of information provided was identical. The fourth and fifth scenarios both presented participants with a diagnosis of a benign tumor that could compromise life in 5% of cases by compressing nearby organs. In the fourth scenario, this consequence was caused by the degeneration of the benign tumor into a malignant tumor ( $n = 95$ ), while in the fifth scenario this was caused by the growth

of the benign tumor ( $n = 93$ ). The sixth scenario described a diagnosis of a non tumor illness with similar life threatening consequences ( $n = 82$ ). Finally, the seventh and eighth scenarios both described a diagnosis of genetic predisposition for an illness that could (in 5% of cases) develop in the future, leading respectively to a malignant tumor ( $n = 92$ ) or to a the same non tumor illness as scenario 6 ( $n = 91$ ). The prognoses in these scenarios were described as follow:

*“Right now, it is not causing you any trouble. According to medical statistics, in most cases*

*[scenario 1] this tumor will grow so slowly it will not cause any trouble.*

*[scenario 4] the nodule will not degenerate.*

*[scenario 5] the nodule will not grow.*

*[scenario 6] the disease develop so slowly that it will not cause any trouble.*

*[scenario 7] the tumor will not develop.*

*[scenario 8] the disease will not develop.”*

And the 5% risk was described as follow:

*But, in 5% of cases*

*[scenario 1] the tumor will grow quickly*

*[scenario 4] the nodule will degenerate into neoplasia (malignant tumor),*

*[scenario 5] the nodule will grow,*

*[scenarios 2-4-5] compressing nearby/close organs (larynx, esophagus and trachea) and causing phonation, deglutition and respiration trouble, that can worsen till compromise life.*

*[scenario 7] the tumor will develop,*

*[scenarios 2-4-5-7] compressing nearby organs (larynx, esophagus and trachea) and causing phonation, deglutition and respiration trouble, that can worsen till compromise life.*

*[scenario 6] the disease will develop quickly*

*[scenario 8] the disease will develop,*

*[scenarios 6-8] causing the hyperthyroidism (serious disabling syndrome resulting from a dysfunction of the thyroid gland, which causes an excess of thyroid hormones in blood circulation). The hyperthyroidism can lead to serious*

*damages to important organs (first of all the heart) that can worsen till compromise life.*

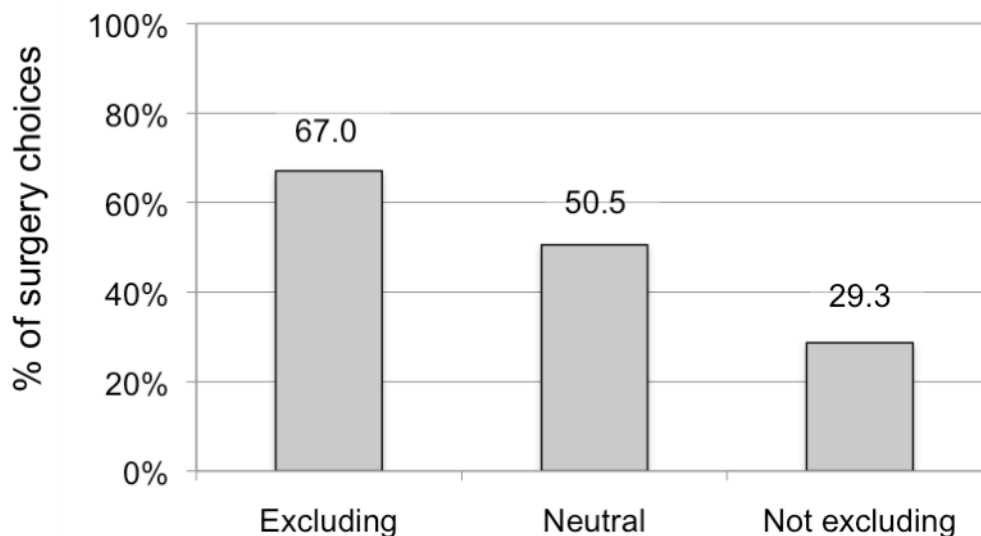
After reading each of them one scenario, participants expressed the choice of which option they preferred and then judged the severity of the diagnosed illness on a 5-point scale, ranging from 1 (“not at all serious”) to 5 (“extremely serious”). Finally, they reported their age and gender.

## 4.2 Results

### 4.2.1 Effect of the explicit exclusivity of treatment options on choice (H1)

In order to investigate the effect of the way in which watchful waiting was described on choice, we compared the first three scenarios that differed only for the presence or absence of the sentence that specified whether treatment options excluded each other.

**Figure 4.1** Percentage of surgery choices expressed in the first three scenarios, depending on the way in which watchful waiting is described (H1).



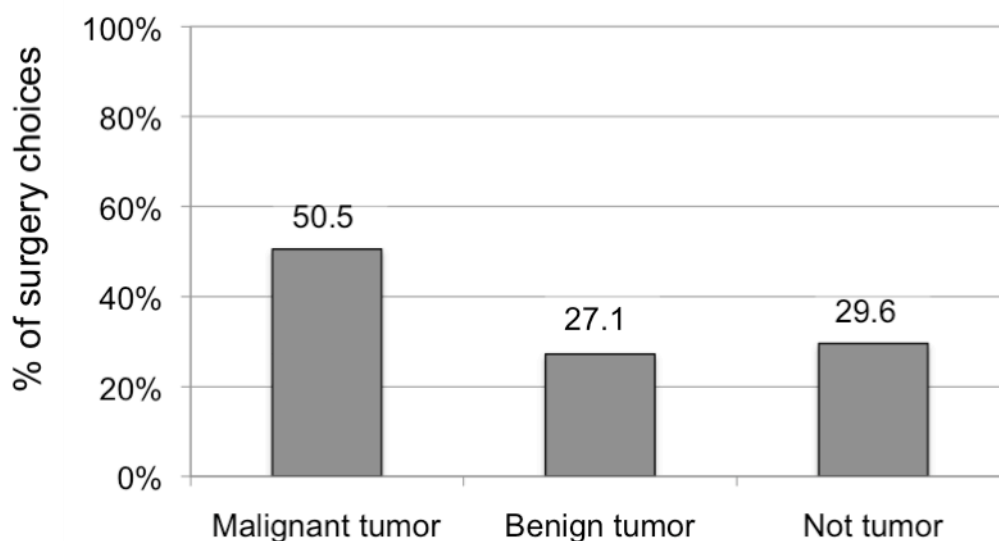
As shown in Figure 4.1, the preference for active treatment was stronger when the watchful waiting excluded surgery in the future (scenario 2; 67.0%), compared to the neutral scenario (scenario 1; 50.5%,  $\chi^2(1, N = 186) = 4.99, p = .026$ ), and the

preference for watchful waiting was stronger when it was specified that it did not preclude future surgery (scenario 3; 70.7%) than when it was not specified (scenario 1; 49.5%;  $\chi^2 (1, N = 189) = 10.96, p = .001$ ). In other words, in line with H1, the preference for the active treatment depended on the way the watchful option was described and it was limited to the scenario that made clear the mutual exclusivity of the options, while no preference or the opposite preference emerged with the other descriptions.

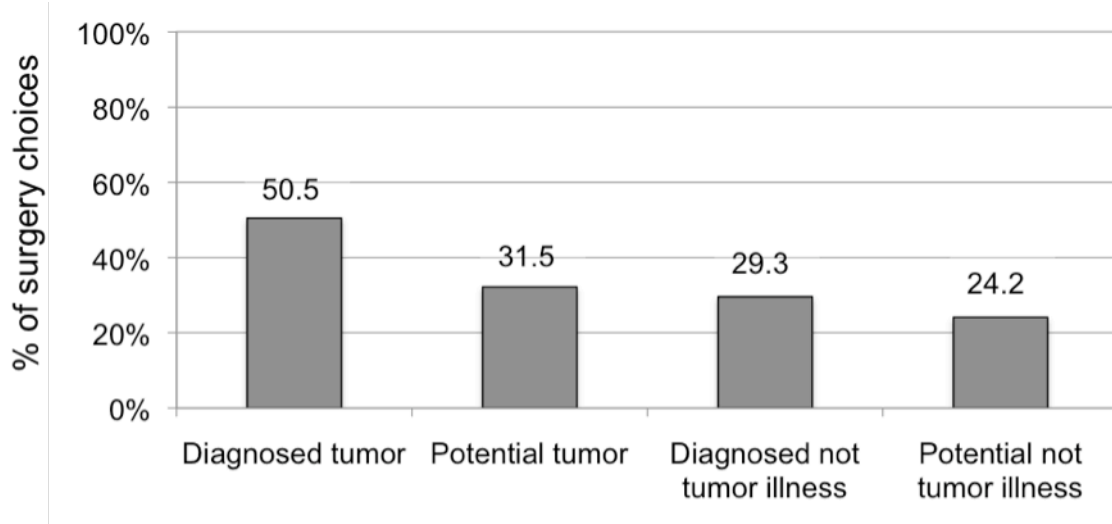
#### 4.2.2 Effect of different kinds of diagnoses on treatment choice (H2)

The effect of different kinds of diagnoses on treatment choice was examined by comparing scenarios 1, and 4 through 8 (see Figure 4.2 through 4.4). In line with H2a, the active treatment was preferred more frequently when the diagnosis was a malignant tumor (scenario 1; 50.5%) relative to when the diagnosis was a benign tumor (scenarios 4 and 5; 27.1%;  $\chi^2 (1, N = 281) = 15.01, p = .0001$ ) and also relative to the diagnosis of a non tumor illness (scenario 6; 29.3%;  $\chi^2 (1, N = 175) = 8.18, p = .004$ ), while the choice did not differ between benign tumor and non tumor diagnoses ( $p = .718$ ).

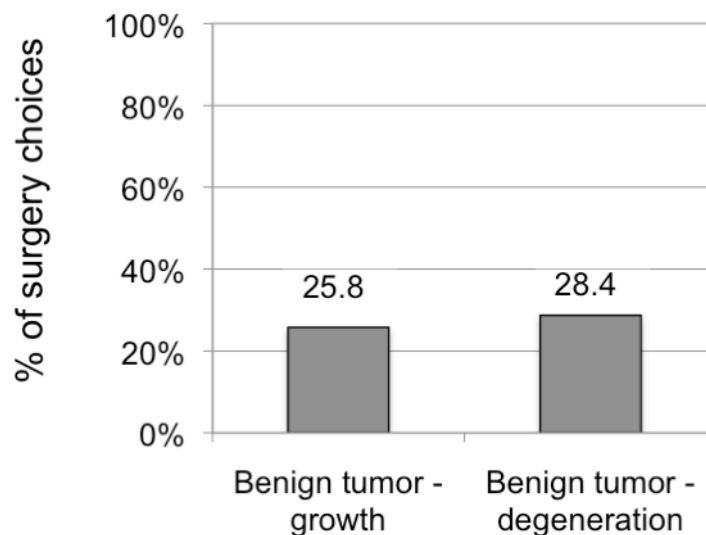
**Figure 4.2** Percentage of surgery choices expressed for the malignant and benign tumor diagnoses and for the non tumor diagnosis (H2a).



**Figure 4.3** Percentage of surgery choices depending on the diagnosis (tumor vs. not tumor) and the status of the illness (already diagnosed vs. potentially developing in the future; H2b).



**Figure 4.4** Percentage of surgery choices expressed for the benign tumor depending on the prognosis (potential degeneration vs. potential growth; H2c).



Hypothesis 2b received mixed support (see Figure 4.3), indeed when diagnosed with an already present malignant tumor (scenario 1), participants were more likely to chose surgery (50.5%) relative to when the diagnosis was of genetic predisposition for the tumor that could then arise in the future (scenario 7; 31.5%;  $\chi^2(1, N = 185) = 6.91, p = .009$ ), in line with the hypothesis. However, no differences

on preference for surgery emerged when comparing an already diagnosed non tumor illness (scenario 6; 29.3%) with the genetic predisposition for the same illness (scenario 8; 24.2%;  $p = .449$ ).

Finally, contrary to H2c, the preference for surgery did not differ between the case in which the benign tumor prognosis was characterized by potential degeneration (scenario 4; 28.4%) and when it was characterized by potential growth (scenario 5; 25.8%;  $p = .687$ , see Figure 4.4).

#### **4.2.3 Relationship between perceived severity, diagnosed illness, and treatment choice**

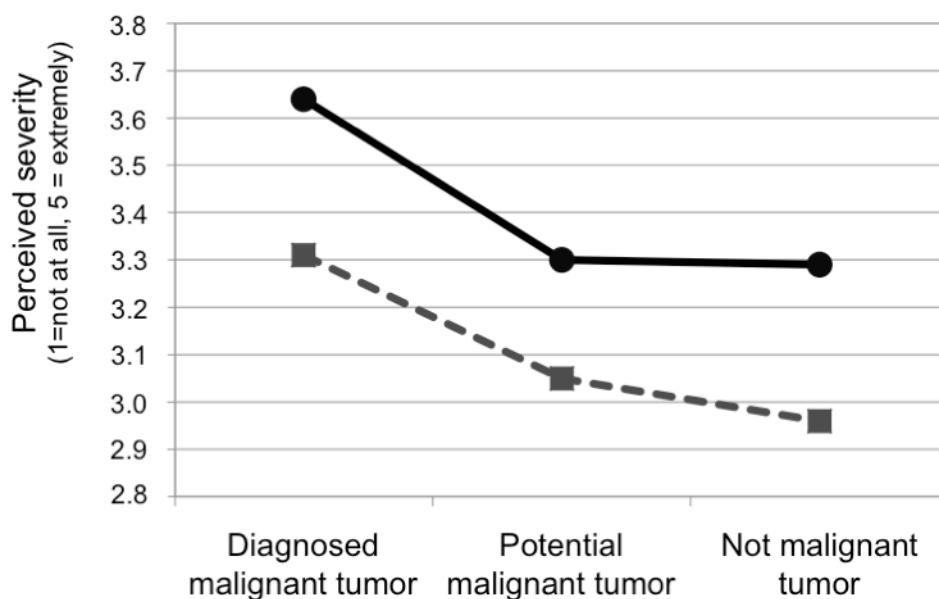
The perceived severity of the diagnosis depended on whether the illness was already a malignant tumor, a potentially malignant tumor or a non tumor illness ( $F = 24.87$ ,  $p < .001$ ). Post hoc analysis, using Tukey test, indicated that participants perceived malignant diagnoses as more severe (scenarios 1 through 3;  $M = 3.47$ ;  $S.D. = .75$ ) both relative to potentially malignant diagnoses (scenarios 4 and 7;  $M = 3.13$ ;  $S.D. = .82$ ;  $p < .001$ ) and relative to non-malignant diagnoses (scenarios 4, 6, and 8;  $M = 3.05$ ;  $S.D. = .65$ ;  $p < .001$ ).

At the same time, the perceived severity was different depending on the treatment option chosen by participants: Those who chose the surgery judged the diagnosed illness as more severe ( $M = 3.47$ ;  $S.D. = .71$ ) than those who chose the watchful waiting ( $M = 3.09$ ;  $S.D. = .78$ ;  $t(490.94) = 6.45$ ,  $p < .001$ ). And this holds true regardless of the kind of condition, as shown in Figure 4.5. Those who preferred the surgery judged the malignant illness condition to be more severe ( $M = 3.64$ ;  $S.D. = .06$ ) both than those who received a potentially malignant diagnosis ( $M = 3.30$ ;  $S.D. = .10$ ) and those who received a non malignant diagnosis ( $M = 3.29$ ;  $S.D. = .09$ ), who did not differ. Similarly, also those who preferred the watchful waiting judged the severity of the malignant diagnosis as higher ( $M = 3.31$ ;  $S.D. = .06$ ) both than the severity of the potentially malignant tumor ( $M = 3.05$ ;  $S.D. = .06$ ) and that of the non malignant tumor ( $M = 2.96$ ;  $S.D. = .05$ ). Indeed the results of the ANOVA on the perceived severity predicted by the kind of diagnosis and the choice confirmed that both the factors had a significant main effect (respectively  $F(1,721) = 26.64$ ,  $p < .001$ ; and  $F(2,721) = 16.68$ ,  $p < .001$ ) and that they did not interact ( $p = .877$ ). A post



hoc test also confirmed that the malignant diagnosis differed both from the potentially malignant diagnoses ( $p < .001$ ) and from the non malignant diagnoses ( $p < .001$ ), which did not differ between them ( $p = .511$ , Tukey test).

**Figure 4.3** Perceived severity across malignant, potentially malignant, and non-malignant scenarios, and separated depending on choice (where the solid line represents the choice of surgery, while the dotted line represents the choice of watchful waiting).



Therefore, the treatment choice was affected both by whether the diagnosed illness was malignant or not and by the perceived severity. This is supported by the results of a logistic regression on treatment choice (0 = watchful waiting, 1 = surgery) as the dependent variable, and perceived severity and kind of diagnosed condition (0 = non-malignant, 1 = malignant, 2 = potentially malignant) as independent variables. Overall, the model had a Nagelkerke  $R^2$  of .10 and classified correctly 70% of choices. Both the independent variables were significant predictors of the choice made. In particular, when controlling for the kind of diagnosed condition, the higher the perceived severity, the higher the probability that the treatment chosen was the surgery ( $OR = 1.91$ ,  $p < .001$ ; 95% CI 1.47; 2.49), and, keeping constant the perceived severity, when the diagnosed condition was malignant, the surgery was

chosen more than twice as frequently as when the condition was not malignant ( $OR = 2.35$ ,  $p < .001$ ; 95% CI 1.41; 3.90), while the choice did not differ significantly for potentially malignant and non malignant diagnoses ( $p = .511$ ; 95% CI .75; 1.77). The interaction of the factors was not significant, and therefore has not been considered in the model.

### **4.3 Discussion**

When deciding between two medical treatment options, people should base their choice on the risks and benefits of the options available, without being affected by the set of circumstances under which negative outcomes could occur, i.e., by deciding to undergo a treatment (action or commission) or by deciding not to undergo a treatment (inaction or omission). While people usually seem to prefer inaction, showing an omission bias (Aberegg, et al., 2005; Asch et al., 1994; Cohen & Pauker, 1994; DiBonaventura & Chapman, 2008; Meszaros et al., 1996; Ritov & Baron, 1990; Royzman & Baron, 2002; Sunstein, 2005), an action bias was found by Fagerlin et al. (2005c), who proposed that cancer diagnoses are a “call to action.” In the present study, we addressed two issues to further explore people’s preference for action when diagnosed with cancer: The way in which watchful waiting is described, and some possible aspects of the diagnosis that could be critical for the preference for action over inaction.

First, we hypothesized that the preference for surgery over watchful waiting was at least partially accounted for by the explicit statement that by choosing the watchful waiting, were the cancer to develop, it would be too late to treat it. Our results supported this hypothesis (H1): on one hand, showing that the surgery was preferred over watchful waiting only when this exclusivity statement was present (scenario 2) relative to the neutral scenario (scenario1), and on the other hand, showing that the preference for watchful waiting was stronger when it was specified that it did not preclude future surgery (scenario 3) than when it was not specified (scenario 1). In other words, when comparing the excluding scenario with the not excluding one and the neutral one, rather than preclude themselves the chance of having surgery in the future, a percentage ranging from 16.5% to 40% of participants

would have preferred to face the surgery immediately. Therefore, the previously found preference for the surgical option described by Fagerlin et al. (2005c) was partially due to the unusual description of the watchful waiting option. Our result is in line with Driffield and Smith's proposal (2007), suggesting that watchful waiting is seen more as a repeated or deferred decision than as a definitive decision. Indeed, when participants were forced to decide in that moment between the two options, they strongly preferred surgery, whereas when they were not forced (in the neutral condition), they did not show a preference for a treatment over the other. In this condition, the choice of watchful waiting can be seen as the deferral of the decision while waiting to gather more information. Moreover, this was further supported by the choices of participants in the condition that explicitly reminded them that watchful waiting would have not excluded surgery in the future. When pointing this out, participants were even more likely to prefer watchful waiting relative to the neutral scenario, again in line with the conception of watchful waiting as a repeated or deferred decision rather than as a definitive decision.

Another consideration is that the way in which watchful waiting was described in Fagerlin et al.'s study (2005c), as well as in our second scenario, closely reflects the description of the inaction option of the vaccination case (Ritov & Baron, 1990). In both cases, the options are mutually exclusive, being a choice between taking and not taking the vaccination, or the choice between undergoing and not undergoing the surgery. Thus, one could expect to find similar results. This is not the case, and we hypothesized that one of the possible explanation of the difference in the results could rely on the kind of diagnosis. We thus compared the scenarios in which the diagnosis was a malignant tumor, a benign one or a non tumor pathology (H2a). The results are in line with the idea that the malignant tumor is a special case. Indeed, the surgery was preferred more frequently relative to both other diagnoses. Moreover, due to the malignancy of the tumor, the diagnosis was perceived as more severe than other diagnoses, even if the actual prognoses were the same. Furthermore, the more severe people perceived a diagnosis to be, the more likely they were to take risks to treat it, and choose the surgical option.

Another possible explanation for the difference in the results could have been the difference in the present status of the illness. While the flu could arise in the

future, the cancer has already been diagnosed, and, even if its consequences could also arise in the future, the illness is present right now. Therefore, the omission of the vaccination could have been preferred because it was a preventive treatment, while the surgical treatment could have been preferred because it was considered a curative treatment (H2b). To test if this would explain the different results, we compared two couples of scenarios in which the diagnosis was either a tumor or a non tumor pathology, and in which participants were either already diagnosed with the illness or were diagnosed a genetic predisposition for the same illness that in 5% of cases could develop, leading to life-threatening consequences equivalent to those of the diagnosed illness. The results ,again, suggest that the malignant tumor is a peculiar case. In fact, the difference in the choices between the preventive and the curative perspective was only found for cancer, while for the non tumor illness participants' treatment choice did not depend on the preventive or curative perspective.

Contrary to our prediction (H2c), participants' choices were similar both when the benign tumor could grow (scenario 4) and when it could degenerate, becoming malignant (scenario 3). A possible reason for this result is that the benign tumor was perceived as equally severe, regardless of the way in which it could cause negative consequences, i.e., through degeneration or growth. And, according to the explanation proposed above, the perceived severity being a predictor of participants' choice, the treatment favored in both scenarios was the same.

Even though we have proposed that the more people perceive a diagnosis as severe, the more they are likely to take risks to treat it, our results do not exclude that the direction of the causality is the opposite. That is, participants could have rated the illness' severity according to their choice, and in order to justify the risk-taking choice of surgery, they could have rated the severity as higher relative to those who chose the watchful waiting. In other words, one limitation of this study is the lack of control for the direction of the relationship between choice and perceived severity.

Other than possible explanations for the present findings, a practical consideration stemming from the results obtained concerns the time perspective in which negative consequences can arise. Although the probability of life threatening

consequences was held constant between the options, while the surgery could cause immediate harm, the watchful waiting option allowed for a longer life. From this point of view, the fact that participants presented with a diagnosis of malignant tumor did not prefer watchful waiting to surgery can be seen as a biased decision and has, therefore, practical implications. Since it has been recently shown that people whose choices are biased on hypothetical scenarios also make worse real-world decisions (DiBonaventura & Chapman, 2008), from the applied point of view our results highlighted a situation in which debiasing seems to be necessary. Therefore, from a clinical perspective, future research should focus on testing the direction of the relationship between choice and perceived severity, and analyze in depth the reasons for a preference for action when the diagnosis is malignant, in order to inform the possible debiasing interventions.

Another limitation of the present study is that while the inaction option in the vaccination scenario was a real inaction, the “inaction option” in the cancer scenario was not. Although it could be and it has been considered the omission of surgery, the watchful waiting is not in the proper sense inaction, and this is even more true in our scenarios 1 and from 4 to 8, in which we did not specify the exclusivity between options. For a theoretical purpose, future studies should investigate whether present findings are generalizable to scenarios with a real inaction option or not.

In general, this study has confirmed the existence of a situation in which action is preferred to inaction, specifically when the diagnosis is of a malignant tumor and the watchful waiting option excludes the possibility of future intervention. On one hand, this result sheds light on previous findings in the omission bias literature by explaining why previous works found a commission bias for cancer diagnosis, in contrast to an omission bias found with other medical scenarios. On the other hand, this result suggests that, in clinical practice, it is very important to make explicit to patients what the choice of watchful waiting will allow them to do in future. Indeed, some people might be more willing to choose to undergo a surgical intervention because they are worried that the choice of watchful waiting would preclude future surgical treatment.

Another important point emerging from the results is the relevance that the actual diagnosis has in the choice between treatments. In fact, on one hand, the fact

that the illness was already present or potential was critical to participants' preferences only in the case of a malignant tumor. On the other hand, when again the tumor was malignant, participants did not strongly prefer the watchful waiting option; however, they did when the tumor was benign, even when it could have become malignant later. Thus, from these results, it seems that it is more relevant whether the actual diagnosis is malignant or not, relative to what it could become in the future. Overall, these results suggest that under certain conditions there is an action bias. However, in most cases people either have no preference for treatment or a preference for inaction.



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## CHAPTER 5

### WHEN PHYSICIANS ARE AFFECTED BY CONTEXTUAL FACTORS

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*This short study is an example of a case in which also physicians are subject to biases. In particular, we have assessed the effect of irrelevant information on physicians decisions about prioritization for surgery, in the context of the disturb effect (see Chapter 2, Paragraph 2.1.2).*

When people decide among options, they have been shown to be affected by the available options. This is a bias, because, according to the regularity principle (see Chapter 2), the probability of the choice of one option should not increase when more options are added (Köhler, 2007; Tversky & Simonson, 1993). However, under some circumstances, this principle is violated, and people's choices are sensitive to the options available. These violations are usually shown comparing two conditions. In the first condition, participants choose between two options (A and B) which are described by two attributes; each option has a high value on one attribute and a low value on the other. In the second condition, a third option (C) is added. According to the regularity principle, the order of preference between A and B should not change when also option C is available. One of the violations found with this paradigm is the "disturb effect" (see Paragraph 2.1.2). This effect happens when option C is very similar to one of the other options, say option A (the more frequently chosen between A and B). The introduction of the third option creates a "disturb" to the previously preferred choice. In particular, while A is preferred to B when they are the only available options, B is preferred to A when also C is available.

This phenomenon has been investigated in medical choices too. For example, in a study by Redelemier and Shafir (1995), participants were presented with a scenario with either two or three options among which choose. Participants were family physicians, neurologists, neurosurgeons, and legislators, and each group received a scenario concerning their field of expertise. One of the scenario used



described a patient with osteoarthritis, and the decision concerned whether to start him on a new medication or not. Half of the family physicians had to choose between: a) referring him to an orthopedic consultant for consideration for hip replacement surgery; and b) starting the patient on ibuprofen or simply referring him to the orthopedic consultant without starting him on ibuprofen. The other half of family physicians were given also a third option, another medication that the patient has not tried yet, piroxicam (which is a nonsteroidal anti-inflammatory, as ibuprofen is). The choice of referring the patient without starting him on any new drug was chosen significantly more often when the options were three (73%) relative to when the options were only two (53%). The explanation proposed by the authors concern the similarity between the two medication options (that would be options A and C). they assumed that some physicians, in order to avoid the (though) decision, recommended instead not to start any new medication (option B, previously chosen less frequently).

A more general explanation that has been proposed for the effects of the available options (not only the disturb effect, but also the attraction effect and the compromise effect, see Chapter 2) concerns the accountability of the decision (e.g., Baron, 2008). For example, when participants had to explain and justify their choices to others, they showed a greater attraction effect than when not asked to justify their choice (Simonson, 1989). This explanation received support also from a study on physicians' decision making (Schwartz et al., 2004), which showed that when physicians were held accountable for their decision (i.e., when they were asked to provide a written defense of their decision that they would discuss later), the attraction effect was stronger compared to the case in which they only choose without defending the choice made. The accountability explanation is not limited to the attraction effect, indeed it has been shown that some decision-making biases become stronger when the decision makers are held accountable for their choice (Lerner & Tetlock, 1999).

In the present study, we were interested in investigating whether providing a possible reason for the choice would have affected the disturb effect. Specifically, we provided participants with some information about option B (the one usually

preferred when the three options are presented together), which was clinically not relevant, but could constitute a reason for the choice.

We based the choice of the information provided on the literature on the influence of affect on decisions (e.g., Peters et al., 2006b; Slovic et al., 2004; Slovic et al., 2007; Slovic & Peters, 2006; Slovic et al., 2005). The term “affect” in this context refers to a feeling of “goodness” or “badness” of a stimulus, it is short in duration, and it is evocated (with or without consciousness) rapidly and automatically in response to a stimulus. For example, when reading the word “hate” or “cancer” the affect is negative, when reading “love” or “holiday” the affect is positive, while other things like “table” or “bottle” do not evoke affect. The affect heuristic is the reliance on these feelings or affective responses in making judgments and decisions.

An example of a study showing the affect heuristic at work, concerns the effect of emotional first impressions on judgment and decision making. The judgment about the degree to which a Chinese ideograph was liked was affected by the kind of subliminal priming stimulus: More positive when the prime was a smiling face, and more negative when it was a frowning face, relative to when the prime was a neutral geometric shape. Moreover, when repeating the task with the same ideograph but preceded by a different prime, participants carried over the first impression they had, for example they would still like more the ideographs that were first preceded by a smiley face even when preceded by a frowning face in the second task (Winkielman et al., 1997).

Our study adapted one of the scenarios used by Redelmeier and Shafir (1995), in which two or three patients are scheduled for a surgical operation, but the surgery room has been occupied by emergency cases. The participants have to choose which patient should be the first to be operated, based on a series of information (age, past medical history, severity of the illness). In order to manipulate the information about patient B (the one that is usually preferred when the three patients are listed together), we introduced a sentence with a negative affective feeling. Specifically, we introduced in the description of the past medical history of the patient either neutral or guilty information: The patient was hospitalized for a cranial trauma suffered after a road accident in which the patient was run over by a car while crossing on the crossing lines (neutral information) or suffered after an automobile

accident in which the patient was involved for driving under the influence of alcohol (guilt information).

We hypothesized that participants would rely on the feelings or affective responses elicited by the guilt sentence in making judgments and decisions. Moreover, we expected that this added sentence would not only create an emotional first impressions, affecting judgment and decision making, but also that it would make the choice of another patient more accountable, thus leading to lower choices of patient B when he was “guilty” relative to when information about him was neutral.

## **5.1 Method**

### **5.1.1 Participants**

Participants were 160 ( $n = 82$  females) medical students in their 5th or 6th year of study. Their age ranged from 22 to 34 years ( $M = 24.49$  e  $S.D. = 1.73$ ;  $Mdn = 24$ ). They were contacted at the University of Padova or University of Catania and they were asked to read and fill a brief questionnaire.

### **5.1.2 Procedure and material**

There were four scenarios, depending on the level of the two manipulated factors: the number of options (choosing between 2 vs. 3 patients) and the kind of irrelevant information about patient B (neutral vs. guilty).

The scenarios were adapted from Redelmeier and Shafir (1995). They first described the situation, by stating:

*“Several patients are on the waiting list for a surgery to the carotid artery, but it is necessary to establish the priority because of the limited availability of the surgery room,*

*Two [three] patients are scheduled for carotid endarterectomy, however one operating room slot [two operating room slots] has been taken by emergency cases (and more slots will not be available for the next two weeks).”*

Then, participants were provided with the following information about patients (the guilty version on patient B description is in brackets):

*“Patient A is a 52-years old employee with transient ischemic attacks experienced as transient aphasia. She has had the last of such episodes occurring 10 days ago, which lasted approximately 12 hours. Angiography shows a 70% stenosis of the left carotid. Past medical history highlights for a cholecystectomy 2 years ago. At present, the patient has no concurrent medical problems and is in generally good health.*

*Patient B is a 72-years old retired factory worker with transient ischemic attacks experienced as left hand paralysis. He has had two such episodes during the last 3 months with the last occurring 1 month ago. Angiography shows a 90% stenosis of the right carotid. Past medical history highlights a hospitalization 1 year ago for cranial trauma, suffered after a road accident in which the patient was run over by a car while crossing on the crossing lines [suffered after an automobile accident in which the patient was involved for driving under the influence of alcohol]. Subsequent TAC reports, shows the progressive reabsorption of a small extradural right temporal hematoma (not surgical). At present, the patient has no concurrent medical problems and is in generally good health.”*

Those who were presented with three patients among whom to choose, were also shown information about the third patient, as follows:

*“Patient C is a 55-years-old employed bartender with transient ischemic attacks experienced as transient monocular blindness. She has had one such episode 1 week ago, which lasted less than 6 hours. Angiography shows a 70% stenosis of the ipsilateral carotid. Past medical history is highlights an appendicectomy 5 years ago. At present, the patient has no concurrent medical problems and is in generally good health.”*

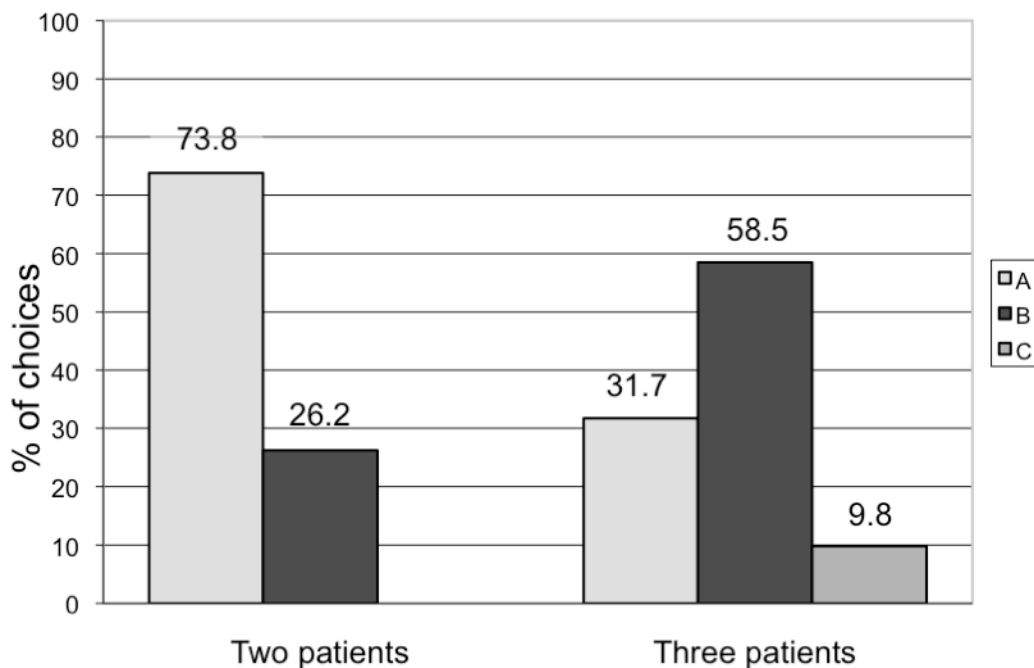
Participants were asked which patient they would operate first. They were then asked their gender, age, and year of study attended at the University.

## **5.2 Results**

The percentage of choices expressed by participants in the four experimental conditions are shown in Figure 5.1 and 5.2. When the information in the scenarios was neutral, we observed the “classical” disturb effect in line with previous results

(Redelmeier & Shafir, 19995, Study 2). The majority of the participants indicated that patient A was the first that needed to be operated when they were choosing between patients A and B (73.8% and 26.2% respectively,  $\chi^2 = 9.52, p < .01$ ). However, when also patient C was listed among patients waiting for surgery, participants indicated more frequently that patient B was the first one that needed to be operated relative to patient A (58.5% and 31.7% respectively,  $\chi^2 = 3.27, p = .07$ ). The choice of patient B as the first patient needing surgery passed then from 26.2% to 58.5%, by simply adding a third patient to the waiting list, and this difference was statistically significant ( $\chi^2 = 4.83, p < .05$ ).

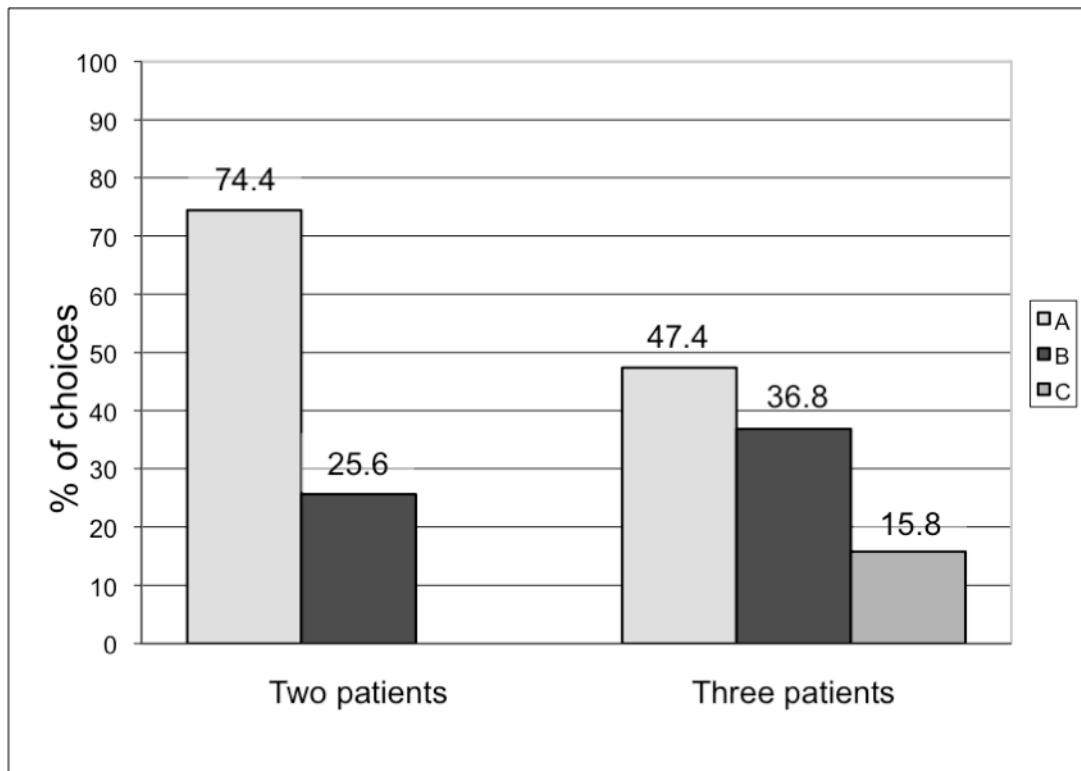
**Figure 5.1** Choices expressed when the information about patient B was neutral.



On the contrary, when the irrelevant information in patient B's description depicted him as guilty in the automobile accident, the pattern of results changed. When two patients only were on the waiting list, similarly to the scenario with neutral information, participants favored patient A, indicating that she should be the first to undergo the surgery more frequently than patient B (74.4% and 25.6% respectively,  $\chi^2 = 9.26, p < .01$ ). However, when adding a third patient, the fact that patient B was

guilty changed the choices. Specifically, participants favored neither patient A (47.4%) nor patient B (36.8%,  $\chi^2 = 0.5$ ,  $p = .48$ ). In this case, the choice of patient B as the first patient needing surgery only slightly increased from 25.6% to 36.8%, and this difference was not statistically significant ( $\chi^2 = 0.67$ ,  $p = .41$ ).

**Figure 5.2** Choices expressed when patient B was guilty.



### 5.3 Discussion

We have investigated the disturb effect with a medical decision, with a sample of medical students. As previously shown with doctors (e.g., Redelmeier & Shafir, 1995; Schwartz et al., 2004), experts are subject to bias in judgment and decisions as everybody is. Our results have indeed confirmed that the regularity principle is violated by the introduction of a third option to the two previously available. In the present study, we were interested in testing whether the affect heuristic would have changed the usual patten of results, by providing participants with a first impression and feeling that was then used in the judgment and choice about the patients. In

particular, we did not only manipulated the number of patients (two vs. three), but also the information provided about patient B (guilty vs. neutral). When the information was neutral, in line with our expectations based on previous findings, we replicated the usual pattern of choices. Indeed, patient A was preferred to patient B when two options were available, but this order of preferences was the opposite (patient B was preferred to patient A) when the third option was introduced.

On the other hand, we hypothesized that the guilty information would have affected participants choice, by affecting their first impressions and judgments and by providing them with a possible reason to justify their choice. The results were in line with our hypothesis. The usual pattern of preference for patient A was found when only A and B were available, similarly to when information about patient B was neutral. However, when introducing the third patient C, we did not find the usual reverse pattern of choices. Instead, participants favored neither patient A, nor patient B. Moreover, while when the information provided was neutral the choices of patients B increased significantly with the introduction of patient C, when the information provided was on guilt, the choices of patients B only slightly increased with the introduction of patient C, and the difference was not statistically significant.

One limitation of the study is that we did not ask participants the reasons for their choices, which could have confirmed the higher accountability of the choice in the guilt condition. However, the questionnaire was paper and pencil, and we were concerned that by asking for the reasons, participants could have turned the pages and would therefore have been affected in their choice (in line with previous findings: Lerner & Tetlock, 1999; Schwartz et al., 2004; Simonson, 1989). A further limitation is that we were not able to counterbalance the order of patients' presentation to participants, due to the limited sample size. However, we have no reason to hypothesize that this would have affected only the comparison about "guilty" patient B. Since the comparison about "neutral" patient B was in line with previous results, we have no reasons to suspect that we would have obtained different results if we did counterbalance the presentation of the patients to participants.

In general, our results confirm the role played by the available options on people's choices, regardless of whether they are patients, physicians or medical students. Our results also confirm the role that incidental information can have in

decision making. Indeed, the decision of which patient should be operated first was not only affected by the patients that were waiting for surgery (which obviously should not affect the decision, i.e., the order of preference between two patients should not change by adding a third patient), but it was also affected by incidental and irrelevant information (which also should not affect the decision).

These findings can be counted among other findings on biases that can create problems in health practitioners' decision making. Moreover, in the perspective of the two possible approaches to medical decision making, these and previous findings highlight the importance of the study of factors affecting medical decision making. Indeed, we have shown that, even in a paternalistic approach, the decision might be biased also when it is taken by physicians, who are subject to biases, as everybody else is.





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## CHAPTER 6

### INFORMING PROSTATE CANCER SCREENING DECISION MAKING

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*While in the previous chapters I have presented studies investigating factors that are relevant to medical decision making in general, and more from a theoretical perspective, in this chapter the perspective is more specifically applied. In particular, it presents two studies on the effect of the way in which information on subsequent decisions are presented (sequentially vs. all at once) on the decision to undergo prostate cancer screening tests (a PSA test and eventually a biopsy).*

In the perspective of shared or informed medical decision making, an essential prerequisite of patient decision making is that the patient is fully informed, in order for him or her to make a good decision. This is especially important when the decision is a preference-sensitive one, i.e., when it is affected by patients' preferences and values, as the decision to have a PSA (prostate-specific antigen) test for prostate cancer early detection (e.g., Gattellari & Ward, 2003). As discussed in Chapter 1, a preference-sensitive decision is a decision for which there is not a best option for everybody, but which option is better for each person depends on that person's individual preferences and the weight that he or she gives to certain features of the options. In other words, preference sensitive decisions are situations in which the tradeoff between the benefits and the harms is not certain and/or the strength of the scientific evidence is low, and patients' values can tip the scales in favor of one of the options (O'Connor et al., 2003a). Examples of other preference sensitive decisions are: antenatal screening, management of symptoms of menopause, menorrhagia, benign prostate enlargement, back pain, or treatment for early stage breast or prostate cancers. For all these cases, there is usually not a right or wrong

decision. For this reason, when investigating factors that could affect judgments and decision making, the use of the judgment or decision in itself as a proxy for good decision making is not possible. However, it is possible to use indicators of the quality of the decision, for instance patient's satisfaction with it. It is also possible to compare judgments and decisions under different experimental conditions, to test if they are affected by the conditions themselves, for example the effect of presenting testimonials on the decisions can be tested by comparing the decisions made by patients to whom testimonials were presented and the decisions made by patients who were not exposed to testimonials. In this case, the conclusion that can be drawn is that the presentation of testimonials affects (or does not affect) the decision, but it is not possible to qualify the shift in preferences as positive or negative, for the nature of the decision (i.e., preference sensitive decision).

The PSA testing case is a good example of a preference-sensitive decision. Indeed, despite the seriousness of prostate cancer, not only the evidence that early detection has higher benefits than harms as a screening tool is not convincing, but also the harms that could result include the high frequency of false-positive results, the over-diagnosis of a disease that is often slow-growing, and thus might not threaten patients' lives, and the possibility of over-treatment, implying also highly frequent side effects like impotence and incontinence (Woolf & Krist, 2009). Moreover, all of these aspects can have different weight in the eyes of each patient. For these reasons, a shared or an informed decision making approach seems to be the recommended approach for prostate cancer screening decision making.

Historically, the approach that doctors used to have with their patient was paternalistic, i.e., the doctor would recommend what in his opinion was the best option for the patient, for example a doctor could have recommended or even ordered, along with routine blood tests, a PSA test because the guidelines suggested men over 50 years old to be screened, and the doctor might have considered the scientific evidence to be supporting the validity of PSA test as a screening tool for prostate cancer screening. As discussed in Chapter 1, alternative approaches are informed decision making and shared decision making, both of which requires the patient to be informed about all the possible options, including the option to do nothing, and their consequences. While informed decision making gives

the patient the full responsibility to make the decision on his/her own, for shared decision making both the patient and the doctor are equally involved in the process of making the decision (Rimer et al., 2004). In other words, shared decision making can be seen as a middle ground between the paternalistic approach, in which the decision is taken by the doctor, and the informed decision making approach, in which the decision is taken by the patient (Elwyn et al., 2000). For the purpose of this paper, it is relevant that both informed and shared decision making require that the patient is fully informed. Therefore, situations of preference sensitive decisions, which necessitate informed or shared decision making, require that the patient is fully informed.

In the case of prostate cancer screening, while in the past decades the PSA test was recommended to asymptomatic men aged over 50, or earlier when risk factors were presents, nowadays several societies (for example the American College of Preventive Medicine, and the American College of Physicians) encourage shared decision making between patients and physicians, taking into account both the potential benefits and harms of prostate cancer screening, as well as other factors such as life expectancy and personal preference of one alternative over others (Lim & Sherin, 2008).

One of the reasons that has driven the choice of recommending shared or informed decision making is the recent publication of two longitudinal studies on the effect of prostate cancer screening, which have been conducted both in the USA and in Europe and have been recently published (Andriole, Crawford, Grubb, III, Buys, Chia, Church, et al., for the PLCO Project Team, 2009; Schröder, Hugosson, Roobol, Tammela, Ciatto, Nelen, et al., for the ERSPC Investigators, 2009). The results found only a modest reduction in prostate cancer mortality rate as a result of screening, but at the cost of many over-diagnoses and over-treatments (Holmberg, 2009). As a result, this evidence suggests that prostate cancer screening decision should be based on the single patient's values and preferences.

A peculiar feature of prostate cancer that is worth noticing, which differentiate it from other kinds of cancer, is that prostate cancer is usually slow growing, and most men who have it die with it but not because of it, and, as of today knowledge, it is not yet possible to identify which cancers are going to grow fast, and target them only for

treatment (and this is the reason for the actual over-diagnosis). Also, the active treatments available can have serious side effects, like impotence and incontinence, that might strongly affect the patient's quality of life, but many patients often prefer active treatments over watchful waiting, fearing that the cancer will spread or grow fast (and this is the reason for the actual over-treatment), even if there is not convincing evidence that active treatments are better than watchful waiting.

To summarize, the existing scientific evidence about PSA testing as a tool for prostate cancer screening is not conclusive nor strong, and there is still need for more data, for example on the comparison between the effectiveness of watchful waiting (or active surveillance) and active treatments. The existing controversy about prostate cancer screening has highlighted that the tradeoffs between benefits and harms of PSA testing depends on patients' values, i.e., it is a preference-sensitive decision. For instance, for someone it might be reasonable to accept the risk of over-diagnosis and over-treatment in order to feel better having done whatever he could to prevent him from dying of prostate cancer. For another person, it might seem unreasonable the need for 1410 men to be screened and 48 to be treated along with the possible side effects of active treatments in order to save one life (as resulting from the ERSPC study, 2009). In order for a patient to make a decision, he needs to be informed about the options available, including their effectiveness, their risks, the likelihood of possible outcomes like side effects, their effect on life expectancy, and so on. In other words, informed patient decision making is an essential prerequisite for good quality preference-sensitive medical decision making.

On the other hand, a huge body of literature, not limited to medical decision making, has shown that the way information is presented to people, can affect their decisions (as extensively reviewed in Chapter 2). One aspect that is relevant to the present study, is that, in order for the patients to be informed when making decisions, not only the content of the information provided is important, but also its presentation format. For example, statistical information can be presented verbally by qualitative quantifiers, by numerical estimates, or in different graphical formats, and the format used can affect knowledge, comprehension and decision making (e.g., Hawley et al., 2008; Yamagishi, 1997). The fact that the way information is presented to people can affect their decisions, and the previously mentioned reasons

for an informed or shared approach, made us wondering what could be the best way to provide patients with information about prostate cancer screening in order to facilitate a high quality decision.

One feature that is peculiar to the PSA testing decision, is that it can be seen as the first of a potential sequence of decisions, the following decisions being the decision whether to have biopsy in case of a suspect PSA result, and eventually (if the biopsy was positive) the decision about treatment. The fact that there are concerns about over-diagnosis and over-treatment, together with the lack of evidence for the superiority of active treatments, like radiation or surgery, relative to watchful waiting (or active surveillance), and also the recent shift from the recommendation of prostate cancer screening to the recommendation of a shared or an informed decision, makes the need for studying what affects the decision to undergo PSA test a critical and pressing issue. Indeed, knowing whether the way information about the potential subsequent decisions are presented affect patients' decisions, has relevant practical implications for clinical practice, other than being of theoretical interest, because it could affect important decisions.

On one hand, the decisional path can be seen as a series of separate and subsequent decisions. First, the patient decides whether or not he want the PSA level in his blood tested. If he does, and the result is higher than the suspicious level, he then has to decide whether he want further testing, i.e., a biopsy that will detect whether the blood test was a false positive result or there is actually cancer. If he decides to have the biopsy, and it turns out he has an early stage prostate cancer, the patient has then to decide how to manage it, choosing between active treatments and watchful waiting (or active surveillance). On the other hand, the decisional path can be seen as a series of interconnected decisions. To help clarifying this perspective, think in general about a decisions that is characterized by three phases. In each phase, a decision has to be taken. Imagine that the first decision is between A and not A, and that by choosing A, the second decision would be between B and not B. If the decision maker in the second decision would not want B, he should decide for not A in the first decision. The same logic applies to the subsequent decision: Knowing what would be next, should affect the previous choices. Going back to prostate cancer decision, the patient considers what he would do next

already before deciding whether he wants to have the PSA test. Specifically, if he would not have the biopsy, it could be reasonable for him not to undergo the PSA test. Also, if he would choose watchful waiting, it could be reasonable for him to decide not to undergo the PSA test in the first place. Being provided with the full information all at once before deciding about screening for prostate cancer, could therefore resulting in lower willingness to undergo it and in higher consistency among the three choices. On the other hand, deciding at each step, one decision at a time, could lead to a higher preference for being screened in the first place because screening is seen as a beneficial practice in general, and people could not thinking about the consequences, thus increasing their willingness to be screened, but, at the same time, leading to less consistency among the three decisions.

The objective of the present study was to compare two presentation methods to provide information about prostate cancer screening: sequential *versus* all at once. The sequential method presented information about each decision, and participants express their opinion about each decision one at a time, whereas in the all-at-once method participants expressed their opinion about all of the decisions at once, after having read all the information. The aim of this study was explorative, i.e., we aimed at investigating whether the presentation manipulation would affect participants' judgments and decisions. Study 1 addressed the issue with a simplified version of the decision, presenting the information for a generic cancer, which was described as characterized by features similar to prostate cancer. Moreover, the participants were a generic internet sample, without restrictions of age and gender. In order to generalize the findings observed in Study 1, in Study 2 we investigated specifically prostate cancer, with a larger and more specific sample (only males above 40 years), providing detailed and longer information, similarly to what would be the content of a patient decision aid.

## **6.1 Study 1: Effect of the way in which information on subsequent decisions is presented on the decision to undergo a cancer screening test**

### **6.1.1 Method**

#### **6.1.1.1 Participants**

Web-survey of 336 participants ( $n = 218$  females), aged between 25 and 71 ( $M = 38.06$ ,  $S.D. = 11.24$ ,  $Mdn = 35$ ). Participants were recruited through Mechanical Turk and were paid \$.10 for participation.

#### **6.1.1.2 Procedure and material**

The between subject design manipulated the presentation method: sequential *versus* all-at-once. Participants were provided with short information about a generic cancer with the same incidence as prostate cancer, then half of them (sequential condition) were asked if they would undergo the screening blood test. Then, everybody read information about treatments available. After this information, the sequential group was asked about treatment choice, whereas the all-at-once group was asked the same questions (both blood test and treatment choice) after having read all the information. Finally, both groups were asked their willingness to undergo a more invasive test (a biopsy) if that was the diagnostic test instead of the blood test. The main dependent variables were: willingness to undergo the blood test, willingness to undergo biopsy, and choice between active treatment and watchful waiting, all measured on a 6-point scale (where 1 = “definitely not” or “definitely watchful waiting”, and 6 = “definitely yes” or “definitely active treatments”).

### **6.1.2 Results**

Results are summarized in Table 6.1. Willingness to have blood test was higher in the sequential condition ( $M = 4.52$ ,  $S.D. = 1.49$ ) than in the all-at-once condition ( $M = 4.07$ ,  $S.D. = 1.78$ ),  $t(334) = 2.520$ ,  $p = .012$ . When dichotomized by the midpoint of the scale, 77% of participants in the sequential condition would have the



blood test, whereas only 66% in the all-at-once condition would,  $\chi^2 (1,336) = 4.878, p = .027$ .

**Table 6.1** Willingness to undergo blood test, active treatment, and biopsy, depending on the method of presentation of the information: sequential vs. all-at-once.

	Sequential ( $n = 165$ )	All-at-once ( $n = 171$ )	$t (334)$	$p$
Blood test	4.52 (1.49)	4.07 (1.78)	2.520	.012
Active treatment	2.65 (1.67)	3.29 (1.87)	-3.333	.001
Biopsy	4.07 (1.67)	3.66 (1.88)	2.093	.037

Willingness to have active treatment was lower in the sequential condition ( $M = 2.65, SD = 1.67$ ) than in the all-at-once condition ( $M = 3.29, SD = 1.87$ ),  $t (334) = -3.333, p = .001$ . When dichotomized in choices, watchful waiting would be preferred by 73% and 57% of participants, respectively in the two conditions,  $\chi^2 (1,336) = 10.165, p = .001$ .

Willingness to have biopsy (if it was the initial test instead of the blood test) was also slightly higher in the sequential condition ( $M = 4.07, SD = 1.67$ ) than in the all-at-once condition ( $M = 3.66, SD = 1.88$ ),  $t (334) = 2.093, p = .037$ . Moreover, it lowered in both conditions relative to the willingness to undergo the blood test (sequential:  $t (164) = 3.782, p < .001$ ; all-at-once:  $t (170) = 3.458, p = .001$ ). But when dichotomized in choices, the difference was no longer significant (63.0% of the participants in the sequential condition wanted to be tested vs. 55.0% of those in the all-at-once condition,  $\chi^2 (1,336) = 2.254, p = .133$ ).

Another way to analyze the answers to the three questions is by checking the consistency of each participant's answers. To this aim we considered a participant to be consistent if he chose either to have the blood test, the biopsy, and then active treatments, or if he chose not to have the blood test, nor the biopsy and watchful waiting. All the other combinations of answers were considered inconsistent. Participants receiving the information all-at-once were more consistent (49.7%) than those receiving the information sequentially (38.2%),  $\chi^2 = 4.526, p = .033$ .

### **6.1.3 Discussion**

The decision on whether to have a blood test to detect cancer resulted to be affected by the method of presentation of information. Indeed, on one hand participants receiving information sequentially were more likely to want to be tested for cancer, both with the blood test and with the biopsy; on the other hand, they were more likely to prefer watchful waiting over active treatments compared to participants receiving information all at once. However, since this decision is preference-sensitive, it is not possible to know which one of the choices is better, but the analysis of the consistency of the choices suggests that the decisions made by those who received all the information at once were more consistent relative to those who received the information sequentially.

These results suggest, therefore, caution in the way in which patients are provided with information about prostate cancer screening. Indeed, even in a paternalist approach, and for sure in a shared or informed decision making approach, the doctors could inadvertently affect their patients' choice simply using a different way of presenting the information about prostate cancer screening. However, the generalizability of these results is also restricted by several limitations and need further research: First, it was a hypothetical study on a generic cancer, and the information provided was simplified; second, the blood test was described as diagnostic, and the biopsy question was made at the end; third, the treatment options did not include the possibility to express indecision; and, finally, participants were relatively young, and comprised also females. Most of these limitations are addressed in Study 2.

### **6.2 Study 2: Effect of the way in which information on subsequent decisions is presented on the decision to undergo prostate cancer screening tests (PSA test and eventual biopsy)**

Study 2 was aimed at addressing limitations of Study 1. In particular, instead of using a simplified version of the information concerning PSA, we used extensive

information, as if it was a patient decision aid. Also, we described more accurately the blood test as a potential indicator of anomalies, instead of describing it as a diagnostic test, and the sequence of blood test, biopsy, and treatment was more close to the real sequence (relative to a simple blood test detecting cancer and then treatment, as in Study 1). Another difference relative to the previous study concerned the treatment choice options, which include also the possibility to express indecision, also more similarly to the real decision making. Finally, participants were limited to males only, and their age lower limit was set to 40 years old, in order to include only participants with a relative high involvement in the issue discussed.

## **6.2.1 Method**

### **6.2.1.1 Participants**

Web-survey of 1541 male participants in the age group for whom PSA test is suggested (age range 40-71,  $M = 54.51$ ,  $S.D. = 8.27$ ,  $Mdn = 55$ ). Participants were recruited through an internet panel, which include a representative sample of the American population, and were paid \$ 6.00 for participating in a series of studies, including the present one.

### **6.2.1.2 Procedure and material**

As for Study 1, the between subject design manipulated the presentation method: sequential vs. all-at-once. Differently from Study 1, participants were provided with extensive information about the prostate, prostate cancer, PSA testing, biopsy, and treatment options. The dependent variables were: willingness to undergo the PSA test, and willingness to undergo the biopsy measured on a 6-point scale (where 1 = “definitely not”, and 6 = “definitely yes”), and the choice among treatment options: two active treatments (radiation or surgery), watchful waiting, or not sure about the treatment. As in the previous study, those in the sequential conditions answered the questions at each step, after having read the relevant information, while those in the all-at-once condition answered all three questions after having read all the information.

## 6.2.2 Results

Results are summarized in Table 2. With a sample of men only, in the age range close to that for prostate cancer screening, the willingness to have PSA test did not differ significantly between the two conditions. Moreover, the willingness to have biopsy in case of a suspect PSA result was statistically significantly higher in the sequential condition than in the all-at-once condition, but the significance was reached because of the dimension of the sample and the difference is not clinically relevant.

**Table 2.** Willingness to undergo PSA test, biopsy, and treatment preference, depending on the method of presentation of the information: sequential vs. all-at-once.

	Sequential ( <i>n</i> = 736)	All-at-once ( <i>n</i> = 798)	Test	<i>p</i>
PSA test	4.98 (1.35)	5.07 (1.28)	$t(1,1503.32) = -1.250$	.211
Biopsy	5.06 (1.24)	4.89 (1.35)	$t(1,1523.82) = 2.584$	.010
% Watchful waiting	34.0%	28.9%		
% Active treatment	27.0%	27.1%	$\chi^2(2,1528) = 5.475$	.065
% Not sure	39.0%	44.0%		

As for the treatment choice, overall there was a slight difference between the two conditions that did not reach statistical significance ( $\chi^2(2,1528) = 5.475$ ,  $p = .065$ ). Anyway, it is worth noticing that the proportion of participants choosing active treatments was equal in the two conditions, whereas in the sequential condition participants preferred slightly more the watchful waiting and in the all-at-once condition they expressed more uncertainty about the treatment decision.

## 6.2.3 Discussion

Results of Study 2 disconfirmed the effect of the method of presentation of information on prostate cancer screening found in Study 1. One of the possible

explanation is that the cognitive burden of a long and detailed information has vanished the effect of the way in which information is presented, relative to the easier and simplified presentation provided to participants in Study 1. Another factor that might have affected the result is the identification of a specific cancer instead of a general one (as in Study 1). Indeed, it is possible to argue that a specific reference to prostate cancer is not only more concrete, but elicits also more vivid thoughts and can be more easily linked to personal experiences and knowledge, relative to a generic and not specified kind of cancer. Finally, another aspect that could have played a role in determining different results is the involvement of participants. In fact, the Study 1 included not only males but also females, and, more importantly, the age range and the mean age were relatively young; whereas in Study 2, the sample was restricted to men only, and, above all, whose age was at least 40 years old. Therefore, the salience and relevance of the topic to participants may have contributed to the findings, too.

### **6.3 General Discussion**

In general, the results from Study 1 suggest that presenting information sequentially or all-at-once can affect decision making. In fact, the presentation of the information in single subsequent steps led to higher willingness to undergo screening tests, but also to a stronger preference for watchful waiting relative to the presentation of information all-at-once. Also, since prostate cancer screening is a preference-sensitive medical decision (e.g., Gattellari & Ward, 2003; Watson, Hewitson, Brett, Bukach, Evans, Edwards et al., 2006), it is unknown which of the two presentation method would be advisable because by definition it is a situation in which it is not clear which option is better (Elwyn et al., 2000). However, the analysis of the consistency of the three decisions for each participant suggests that the presentation of all the information is better, because it led to a higher rate of consistent decisions than the sequential presentation of information.

On the other hand, the results from Study 2 have pointed out a completely different picture, i.e., the lack of effect of the way in which information is presented on prostate cancer screening decisions. The possible explanations for this result

have to be searched among the aspects that differentiate the two studies. One possibility is that the extensive information was overwhelming and a cognitive burden, and has limited the extent to which it was understood and used in the decision process. Indeed, decision making abilities impair when making complex medical decisions, because they are both cognitively demanding and emotionally stressful, and this can lead to a slower processing of information, less deep analysis of information, and also to withdraw from the decision making process itself (Iyengar & Lepper, 2000; Luce, Bettman, & Payne, 1997). Moreover, as discussed in Chapter 2, emerging evidence has supported in numerous domains the idea that “less is more”, for example the satisfaction and happiness of consumers is higher when they have fewer options among which to choose even if they think they would be better off with more options (e.g, Schwartz, 2004). In the medical decision making domain, for instance, the simplification of the format of presentation of information significantly improves the comprehension of information essential for informed decision making about adjuvant therapies (Zikmund-Fisher et al., 2008b). The idea of “less is more” was also supported in the comparison among quality reports aimed at informing consumer decision making in health care, especially among participants with low numeracy (Peters et al., 2007b). In this perspective, if the “less is better” approach would be adopted in presenting information for prostate cancer screening decision, the present results suggest caution on the choice of the method of presentation. Indeed, the simplified scenario (Study 1) yielded to an effect of the presentation format, i.e., participants’ decisions were different depending on whether the information was presented sequentially or all at once.

A second possible explanation lies in the specificity of the topic, i.e., the fact that in the first study the scenario presented an unspecified cancer (and thus unknown to participants), while in the second study it was specified that the information and the questions concerned prostate cancer, therefore eliciting previous knowledge about the topic, especially among a sample of men who are involved directly, being in the age range for prostate cancer screening.

Finally, the personal relevance and the prior knowledge could have also played a role in determining the difference in results between Study 1 and Study 2. Remember that Study 1 included also females participants, and that the age range

and the mean age of the sample were relatively low. All these three factors could have played a role (not only independently but also in synergy), and the present results do not allow for a precise explanation of the results reached by Study 2.

Nevertheless, some comments based on this findings are possible. First, these results suggest caution when generalizing claims based on research results. This is relevant not only for medical decision making, when reporting their findings sometimes researchers over-claim the importance of their results and their implications. This aspect is particularly relevant in the medical decision making context but more in general for research, because the study of real world judgments and decisions is particularly difficult (for instance, for the variation in the severity of patient's illness) and it can be unethical to investigate the effect of variables influencing decisions when the life or well-being of patients is at stake. On the other hand, when studying ways to improve medical decision making, the aim is real-world oriented, i.e., the final goal is to improve real-world medical decisions. Therefore, the best approach could be a two step approach: In the first step of the research, the use of hypothetical scenarios and hypothetical judgments and choice would allow for the explorations of relevant factors which could affect medical decisions, while, at the same time, "protecting" real patients from potential bias resulting from the test of these factors on their decisions; in the second step of the research, the findings from primary research would be tested in real-world applications. In this perspective, the present study has tested the effect of the presentation of information in a sequential or all-at-once format with hypothetical scenarios and has found an effect (Study 1). When moving to a situation closer to real-world decision making (Study 2), the effect was no longer confirmed. In this situation, the investigation in a real-world setting would no longer be necessary.

Another important observation based on these results concerns the general investigation of context effects in the informed or shared decision making perspective: as previously noted, the study of factors affecting a preference sensitive decision is limited. Indeed, since there is not a best or better decision, the outcome of interest cannot be the decision in itself. This limitation is addressed by using indicators of the quality of the decision (as the patient's satisfaction with it) or by simply comparing judgments and decisions under different experimental conditions

to test if they are affected by the conditions themselves. Subsequently, it is possible to investigate what methods are effective in debiasing patients' decisions, i.e., in prevent them from being affected by context effects. For example, if the "less is better" approach would be applied to prostate cancer screening decision making, and this resulted in the use of a simplified version of the information, similar to what was shown in Study 1, it would then be essential to investigate how to better prevent people from being affected by the presentation format.





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## CHAPTER 7

### PROMOTING PROSTATE CANCER SCREENING: FRAMING EFFECTS AND VISUAL REPRESENTATIONS OF RISK

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*The study presented in this chapter is also on prostate cancer screening, as the previous chapter, but from a different perspective (a paternalistic approach). In particular, we have examined the effect of two factors on the willingness to undergo a prostate cancer screening test (the DRE): verbal framing of the consequences (gain-framed, loss-framed, or both), and the presentation format of cumulative risk (numerical-only, or including a pictograph).*

Prostate cancer is the third most commonly diagnosed cancer in men and the most common cancer in men in most western countries (Parkin, Whelan, Ferlay, Raymond, & Young, 1997). Moreover, the past two decades have shown a large increase in both incidence and mortality rates of this type of cancer (Hsing, Tsao, & Devesa, 2000).

The increase of incidence rate is mainly due to the widespread use of the prostate-specific antigen (PSA) test in the USA and in most western countries. The introduction of PSA test has highlighted the importance of the early detection of prostate cancer, because the identification of this disease in the earliest stages can be considered a prerequisite to successful treatment. In this perspective, instead of informing the patient and leave him decide whether or not he wants to be screened for prostate cancer as done in the previous studies, a paternalistic approach could be taken, by using persuasive messages aimed at promoting the screening for prostate cancer in men over 50 years. While the two studies presented in Chapter 6 were aimed at investigating context effects on the decision to undergo prostate cancer screening in an informed decision making perspective, the present study takes the paternalistic approach, by investigating other context effects, but from a different perspective, i.e., promoting prostate cancer screening.

Some studies showed that the predictive accuracy of PSA test unquestionably outperforms the digital rectal examination (DRE), particularly in men with low PSA levels (Bozeman, Carver, Caldito, Venable, & Eastham, 2005; Schröder, van der Maas, Beemsterboer, Kruger, Hoedemaeker, Rietbergen, & Kranse, 1998). Therefore, some authors expressed some doubt about the meaningfulness of continuing to use the DRE in a screening setting because of the relative inaccuracy and subjectivity of this examination (Schröder et al., 1998). However, a number of studies have shown the importance of combined use of the two tests for detecting cancer. Indeed, on one hand there is evidence that DRE has positive predictive value even for people with a PSA lower than what is usually considered suspect (Bozeman et al., 2005; Carvalhal, Smith, Mager, Ramos, & Catalona, 1999); on the other hand, potentially aggressive cancers (Gleason score  $\geq 7$ ) are not only more prevalent among men who present an abnormal DRE compared with men with a normal DRE (Gosselaar, Roobol, Roemeling, & Schröder, 2008), but also 20% of the cancers detected with DRE alone have features associated with clinically aggressive cancers (Okotie, Roehl, Han, Loeb, Gashti, & Catalona, 2007). Thus, although some doubts have been raised on the use of DRE for screening, these findings seem to suggest the further benefit of DRE relative to PSA test alone. As stated by Yossepowitch (2008), no data exist to support one method of screening as undeniably superior to others, but he also recommended not discarding the DRE too hastily, considering that it may often provide the sought information.

The use of DRE might be an obstacle that prevents some men from being screened, due to fear of embarrassment or to its invasiveness (Nagler, Gerber, Homel, Wagner, Norton, Lebovitch, & Phillips, 2005). Thus, persuading people to make healthier behavioral choices, even when unappealing, may help reduce illness morbidity and premature mortality. To this end, we aimed at investigate two factors that may influence the persuasiveness of materials promoting DRE: The first factor concerns how the message is verbally framed; the second one relates to how certain statistical information is communicated.

In the past two decades many efforts have been devoted to investigate the factors that may influence the effectiveness of a message, especially in promoting healthy behaviors. Researchers generally agree that one factor involved is the

framing of the message (e.g., Maule, 1989; Tversky & Kahneman, 1981), which has been discussed in Chapter 2. In the present study, we investigated the usual two ways of framing information, either a loss-framed message (highlighting the benefits of undergoing DRE) or a gain-framed message (highlighting the negative consequences of not undergoing DRE). In line with the literature on framing effect in promoting healthy behaviors, since DRE is a detection behavior, we expected the loss-framed message to be more effective in promoting prostate cancer screening. Moreover, studies on people's involvement with an issue found that loss-framed messages were more persuasive with high involvement (Greenwald & Leavitt, 1984; Kardes, 1988). Thus, the evidence from both the framing and the involvement studies converges in predicting that a procedure such as DRE would be favored by loss-framed messages.

In addition to the two usual frames, we were interested in investigating the effect of a message containing both the positive consequences of undergoing DRE and the negative consequences of not undergoing DRE (i.e., mixed frame). To our knowledge, the effect of a complete description of both gain and loss has not been widely investigated, especially not in regards to promoting healthy behaviors (e.g., Kühberger, 1995; Schwartz, & Hasnain, 2002). As noted in Chapter 2, the studies that have explored the mixed frame have suggested that the double perspective could be the best way of framing information (Bernstein et al., 1999; Chang, 2007; Schwartz & Haising, 2002). For example, the choices between pharmaceutical treatments were found to be less extreme when framed from both perspectives relative to those obtained with either of the frames (Bernstein et al., 1999). On the other hand, the mixed frame could also be a burden for cognitive resources, and the idea that "less is more" (e.g. Hsee, 1998; Peters et al., 2006a, Peters et al., 2007a; Schwartz, 200; Schwartz, 2004; Schwartz & Chapman, 1999) suggests that the mixed frame could not be the best way of presenting information. In the present study we tested the effect of the mixed frame on intentions to undergo DRE, with an explorative intent.

The second factor we examined concerns certain information that is usually contained in health communication, that is, statistical information about the cumulative risk of a particular disease. For example, in the case of prostate cancer,

in Italy it is estimated that 1 of every 16 men develops prostate cancer in his life (AIRT Working Group, 2006). Such information should provide individuals with the knowledge about their degree of risk; however, statistical information is abstract in nature and it has been shown that some basic statistical concepts are hard to understand for many people (Schwartz, Woloshin, Black, & Welch, 1997; Yamagishi, 1997). As noted in Chapter 2, previous research has shown that frequencies are better understood than probabilities (Gigerenzer, 1996; Hoffrage & Gigerenzer, 1998) and that portraying the statistical information graphically improves people's understanding of what is conveyed by numerals (Feldman-Stewart, Kocovsky, McConnell, Brundage, & Mackillop, 2000). In particular, it has been shown that an especially effective way of increasing people's understanding of statistical information is to present it using a matrix of elements that are shaded with different colors to represent the proportion of a given population that may experience a condition, disease, or treatment complication relative to the total. This kind of representation has been referred to as a pictograph (Fagerlin, et al., 2005a; Hawley et al., 2008), an icon array (Ancker et al., 2006; Lipkus, 2007) or population figures (Timmermans et al., 2008); we will refer to it as a pictograph (see Figure 2.10 and Figure 7.1 for examples).

To sum up, the purpose of the present study was twofold. First, we investigated the role of framing to improve men's intention to undergo a DRE, contrasting three framed-messages. On the one hand, we intended to confirm that loss-framed messages are more effective than gain-framed messages in the domain of prostate cancer prevention; on the other hand, we were interested in assessing the effectiveness of mixed framing. Second, to improve people's understanding of statistical information regarding the cumulative risk of developing a prostate cancer, we compared two kinds of format: In one condition, participants were presented only with a description in which it was stated that 1 every 16 men develop prostate cancer in his life (numerical-only); in the other condition, the same description was accompanied by a pictograph (numerical plus pictograph). Since previous studies have shown that frequencies are superior to probability in understanding statistical information (Gigerenzer, 1996; Hoffrage, & Gigerenzer, 1998), and since pictographs emphasize frequencies over probabilities, other than improving the understanding of

statistical information (Fagerlin, et al., 2005a), we expected that enhancing standard prose statistics with a pictograph would have an additive effect on men's intention to undergo a DRE.

## **7.1 Method**

### **7.1.1 Participants**

Two hundred fifty-three men aged between 45 and 74 years ( $M = 58.00$ ,  $S.D. = 8.74$ ) took part in this study. Inclusion criteria were: age between 45 and 75, and no previous DRE. Data were collected between November 2007 and February 2008.

### **7.1.2 Procedure**

Participants were asked to participate in this research and informed about the possibility to withdraw at any moment or not to answer all the questions. When they accepted, they filled the first part of the questionnaire, which they completed after reading a leaflet containing the experimentally manipulated message.

### **7.1.3 Material**

First, participants were asked whether they had ever undergone a PSA test. Then, a brief definition of DRE was provided and participants were asked if they knew that it was a screening test for prostate cancer before reading it. From these two variables, the index *Degree of Contact* was coded into 3 levels: low, when participants reported neither previous PSA testing, nor previous knowledge about DRE; medium, when they reported one of them; and high, when they reported both.

Subsequently, before reading the leaflet, three questions assessed the attitude of participants for their own health (*General Attitude for Health*, Table 7.1), and after reading the leaflet participants answered four questions about their attitude toward DRE and intention to undergo a DRE (*Attitude and Intention*, Table 7.1). Six variables on participants' perceptions and judgment about the topic were measured both before and after reading the leaflet (Table 7.2).

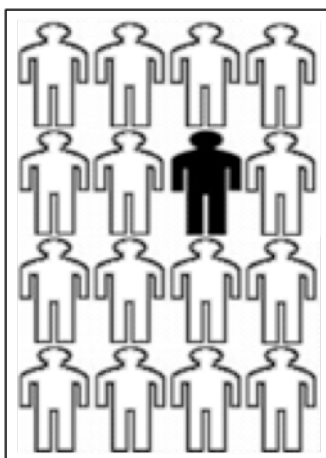
The six leaflets resulted from the combination of the two manipulated factors: the message frame (gain-, loss-, and mixed-framed), and the presentation format of

cumulative risk (numerical-only vs. plus pictograph). The leaflet comprised: a general description of the prostate, statistical information, information about prostate cancer risk factors, symptoms and diagnosis, and the importance of early detection.

Message framing was applied both to the section describing the statistical information and to the section describing the importance of early detection. The message content was the same, but the wording with which it was expressed was different, highlighting positive consequences of adherence to the message recommendations (gain-framed), negative consequences of non-adherence (loss-framed), or both (mixed-frame). For example, the gains [losses] of undergoing DRE were described as follow: “By [not] taking the DRE regularly, it is possible to detect a potential growth of the prostate already in an early stage [only in an advanced stage]. This means that it is possible to detect an anomaly when it is still limited to [already spread over] the prostate capsule. In this case, the treatment options are wider [more limited] and the pathology is easier [more difficult] to treat.

All the leaflets presented the statistical information about the cumulative risk in frequency format. Half of them also presented a pictograph representing 16 stylized men, one of which was black, while the others were white (see Figure 7.1). This pictograph of the cumulative risk was located near the numerical information.

**Figure 7.1** The pictograph representing the cumulative risk of being affected by prostate cancer.



## 7.2 Results

The reliability of two subsets of variables was computed (see Table 7.1).

**Table 7.1** Means (standard deviations) of variables measuring the General Attitude for Health (rated on a 7-point scale, ranging from 1 = “not at all” to 7 = “extremely”) and the Attitude and Intention (rated on a 7-point scale, ranging from 1 = “completely disagree” to 7 = “completely agree”).

		Mean (SD)
General	Self evaluation of Attention to Health	5.02 (1.46)
Attitude for Health	<i>“To what extent do you consider yourself a person attentive to his own health?”</i>	
	Regularity of checkups	4.28 (2.15)
	<i>“Even if you do not have specific symptoms, to what extent do you undergo medical checkups?”</i>	
	Waiting for Medical Consultation	4.81 (1.87)
	<i>“If you are worried about a symptom or a bodily discomfort, how long do you wait before consulting a doctor?”</i>	
	Mean	4.70 (1.39)
Attitude and Intention	Importance Regular DRE	6.19 (1.45)
	<i>“It is the right thing to undergo DRE regularly”</i>	
	Decrease Mortality	6.17 (1.44)
	<i>“Undergoing DRE decrease the probability of death from prostate cancer”</i>	
	Correct Screening Procedure	6.41 (1.26)
	<i>“I think that undergoing DRE is a correct screening practice”</i>	
	Intention to undergo DRE	5.38 (1.96)
	<i>“I intend to undergo a DRE within one year”</i>	
	Mean	6.04 (1.19)

As for the variables measuring the attitude of participants for their own health (Cronbach’s  $\alpha = .62$ ), after reversing the Waiting for Medical Consultation answers, we computed an index of General Attitude for Health by averaging the answers to



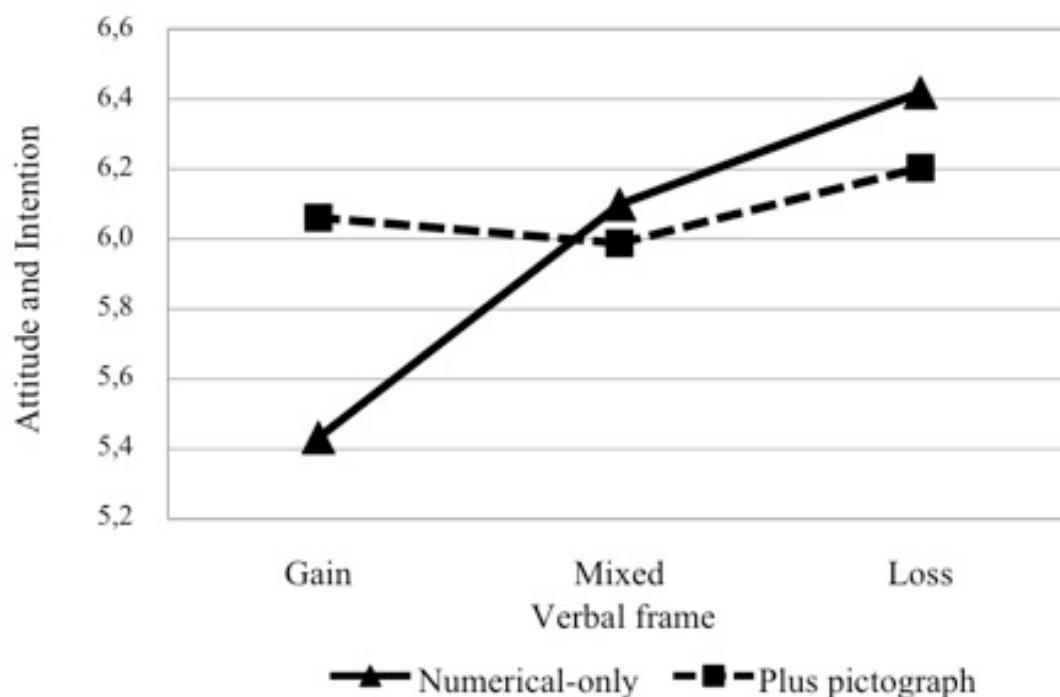
these three questions ( $M = 4.70$ ,  $S.D. = 1.39$ ). As for the items measuring agreement on Regular DRE, Decrease Mortality, Correct Screening Practice, and Intention to Undergo DRE, expressed after reading the message (Cronbach's  $\alpha = .77$ ), we averaged them and constructed an index of Attitude and Intention ( $M = 6.04$ ,  $S.D. = 1.19$ ).

**Table 7.2** Means (standard deviations) of variables (rated on a 7-point scale, ranging from 1 = “not at all” to 7 = “extremely”) measured both before and after reading the leaflet,  $t$ -test (degrees of freedom) and  $p$ -values.

	Before	After	$t$ (df)	$p$
Perceived Information <i>“How much do you consider yourself informed about the DRE?”</i>	3.26 (2.07)	4.21 (2.05)	7.75 (252)	< .001
Perceived Efficacy <i>“To what extent do you consider the DRE an effective test to detect a possible prostate cancer?”</i>	5.23 (1.71)	6.18 (1.29)	9.29 (251)	< .001
DRE Anxiety <i>“How anxious are you thinking about undergoing a DRE?”</i>	4.42 (2.32)	4.67 (2.30)	2.69 (252)	.008
Result Worry <i>“To what extent would you be worried about the result of the DRE?”</i>	4.66 (2.06)	5.01 (1.95)	3.10 (252)	.002
Perceived Severity <i>“To what extent do you think that prostate cancer is a severe illness?”</i>	6.02 (1.36)	6.41 (1.03)	5.33 (252)	< .001
Perceived Individual Risk <i>“How likely do you think you are to be taken by prostate cancer?”</i>	3.43 (1.54)	3.87 (1.72)	4.22 (252)	< .001

The descriptive statistics of variables measuring perception and judgments about the topic before and after reading the leaflet are shown in Table 7.2. The results showed that Perceived Information, Perceived Efficacy, DRE Anxiety, Result Worry, Perceived Severity, and Perceived Risk increased after reading the leaflet. However, a MANOVA showed no significant effect of the manipulated factors (message frame and presentation format) on the change of these variables, suggesting that the increase was probably due to a general interest for the information provided and for the topic addressed, that presumably increased participants' attention also because of their involvement due to their age.

**Figure 7.2** Attitude and intention depending on the verbal frame (gain, mixed, or loss) and the presentation format of cumulative risk (numerical-only vs. plus pictograph).



We were also interested in verifying that the General Attitude for Health did not differ across the experimental conditions; this was confirmed by the lack of statistical significance of the ANOVA model with the message frame and the presentation format as independent variables ( $p = .413$ ). The correlation between Attitude and

Intention and General Attitude for Health, although significant, was low ( $r = .15$ ,  $p = .019$ ). Moreover, the degree of contact with the prostate cancer screening tests was high in 34.4% of participants, medium in 45.8%, and low in 19.8%.

The effect of the message manipulation on the Attitude and Intention measure was assessed with an ANOVA, including as independent variables: message frame, presentation format, and degree of contact. Results showed that the model was statistically significant ( $F(7, 245) = 4.00$ ,  $p < .001$ ), there was a significant main effect of the degree of contact ( $F(2, 245) = 5.37$ ,  $p = .005$ ), a significant main effect of the message frame ( $F(2, 245) = 4.90$ ,  $p = .008$ ), and a significant effect of the interaction between the message frame and the presentation format ( $F(2, 245) = 3.99$ ,  $p = .020$ ). As for the degree of contact, the higher the Degree of Contact, the higher the Attitude and Intention (low: 5.72; medium: 5.69; and high: 6.32). A post-hoc test revealed that the Attitude and Intention was statistically different only between those with low and those with high degree of contact ( $p = .010$ ). The message frame had a main effect on the Attitude and Intention; specifically, it increased from those reading the gain-framed message (5.74), to those reading the mixed-framed message (6.08) and the loss-framed message (6.29). A post-hoc test revealed a statistically significant difference in attitude and intention only between the gain- and the loss-framed groups ( $p = .005$ ). As for the interaction between the message frame and the presentation format, since it was hypothesized, we performed planned comparisons between the numerical-only and the numerical plus pictograph version within each message frame. Results (see Figure 7.2) showed that there was a significant difference only when the message was gain-framed ( $t(247) = 2.44$ ,  $p = .016$ ), while the other contrasts were not statistically significant.

### **7.3 Discussion**

When assuming a paternalistic approach, the available data and the scientific evidence have to be reviewed in order to make a recommendation about the best decision. Unfortunately, the evidence on prostate cancer screening is mixed. The optimal screening strategy for prostate cancer has not yet been defined. While the European Association of Urology, the American Urological Association, and the

American Cancer Society suggest offering an annual prostate cancer screening test to asymptomatic men aged 50 or more, the American College of Preventive Medicine and the American College of Physicians encourage shared decision making between patients and physicians, taking into account both the potential benefits and harms of prostate cancer screening, as well as other factors such as life expectancy and personal preference of one alternative over others (Lim, & Sherin, 2008).

At present, some research shows that screening with both PSA test and DRE detects a higher number of cancers (Bozeman et al., 2005; Carvalhal et al., 1999; Gosselaar et al., 2008; Okotie et al., 2007), but also that acceptance and intention to take part in a prostate cancer screening decrease when a DRE is part of the testing (Nagler et al., 2005). Therefore, when taking a paternalistic approach to prostate cancer screening, the study of persuasive factors and the identification of effective messages to increase willingness to undergo a DRE are relevant not only from a theoretical but also from a practical perspective.

This study investigated some factors that may influence the persuasiveness of materials promoting the DRE. In particular, we examined how the persuasiveness of a message on the DRE examination is affected by two factors: Whether the consequences of screening were framed in terms of potential gains, potential losses, or both; and whether the information relative to the presentation format of cumulative risk was communicated using only numerical information or also including a pictograph.

As for the first factor, we confirmed that participants exposed to loss-framed messages were more motivated to undergo a DRE than participants exposed to gain-framed messages, in line with our expectations based on prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). Furthermore, we were interested in assessing the effectiveness of a mixed-framed (comprising both gain- and loss consequences, i.e., describing both the positive consequences of adherence to the message recommendations and the negative consequences of non-adherence), since it has not been widely investigated in past research (Bernstein et al., 1999; Chang, 2007; Kühberger, 1995; Schwartz, & Hasnain, 2002). The results showed that the mixed-framed message was not more effective in

persuading people to undergo the DRE than the loss-framed message. In other words, it seems that the persuasiveness of the mixed-framed message is due mainly to the highlighting of the negative consequences that could arise in the case of non-testing. In line with previous research (Rothman et al., 1999; Rothman et al., 2006), these findings provide further evidence that loss-framed messages are more effective than gain-framed messages in promoting detection behaviors and suggest the relatively greater salience of losses than gains, by confirming that the effect of mixed-framed messages is more similar to the effect of loss-framed ones (Schwartz, & Hasnain, 2002).

The second aim was to compare two kinds of methods in which the statistical information regarding the cumulative risk of developing a prostate cancer could be presented: only with numerical information or also with a pictograph. Based on previous findings (Fagerlin, et al., 2005a; Feldman-Stewart et al., 2000; Gigerenzer, 1996; Hawley et al., 2008; Hoffrage, & Gigerenzer, 1998), we expected that enhancing standard prose statistics with the pictograph would result in a better understanding of the probability of developing the cancer and would make this information more salient, leading to stronger intention to undergo a DRE. The results showed that the presentation format did not have an effect *per se*, rather that it modulated the framing effect. Indeed, when the message was gain-framed, the Attitude and Intention was higher when the cumulative risk information was presented both numerically and with a pictograph relative to when it was only verbally presented. This finding is consistent with the hypothesis that the pictograph has an additive effect on intention to undergo DRE. We propose that it was observed only in the gain condition because of a ceiling effect in the mixed and loss conditions. Recent findings suggest that when the statistical information is represented by population figures (differently shaded human figures), participants are more frightened, worrisome, perceive the condition as more severe, and judge it more likely to occur, relative to when the statistical information is conveyed only by frequencies or probability (Timmermans et al., 2008). However, our results did not highlight differences in perceived severity and perceived likelihood of occurrence between the group presented only with the description of the frequency, and the group presented also with a pictograph.

Finally, we found a significant effect of the degree of contact on the attitude and intention. Participants with a high degree of contact (i.e., those who had already had a PSA test and with previous knowledge about DRE) had a significantly better attitude toward DRE and were significantly more willing to undergo DRE in the next year relative to those with a low degree of contact (i.e., who neither have ever had a PSA test nor knew about DRE). We also found a significant positive correlation between the general attitude for health and the attitude and intention, but the size of this effect was small. Taken together, these results suggest that the more general attitude for health has little or no effect on the intention to undergo the DRE and the attitude toward the test, while the more specific experience and knowledge about prostate cancer screening tests seems to have a greater effect. Note that the degree of contact did not interact with the independent variables, suggesting that the results obtained do not depend on the previous experience with PSA testing and knowledge about DRE, but rather on the effect of the manipulated variables. A limitation of our research is that it only tested participants' intention to perform the DRE examination. Although there is evidence that intention to engage in a behavior is the best predictor of the engagement in the behavior itself (Ajzen & Fishbein, 1977), future research should assess whether our findings are confirmed when considering the participants' behaviors.

As stated by Yossepowitch (2008) three issues have to be taken into account when considering the exclusion of DRE from screening programs: the probability that a positive DRE results in an unnecessary biopsy; the incremental benefits resulting from the use of both DRE and PSA as screening test relative to using only PSA, and the psychological effect of including DRE on patients' willingness to participate in the screening program. While the first and second issues can be addressed only by large scale randomized screening trials, the third issue deals with more broad investigations about the acceptance and the intention to participate in screening programs that include DRE. In this perspective, previous research (Nagler et al., 2005) suggests that there would be a significant reduction in willingness to get screened if the testing for prostate cancer included also DRE besides PSA test. The results of the present study indicate that loss-framed messages are more persuasive than gain-framed messages in promoting DRE, and that the inclusion of a pictograph

representing the cumulative risk of prostate cancer further increases willingness to undergo DRE. Therefore, when taking a paternalistic approach to the issue of prostate cancer screening, and if scientific evidence will confirm the usefulness of both PSA and DRE, the message that seems to result in a higher willingness to undergo a DRE is the message highlighting the potential harms deriving from not undergoing it, and showing the incidence by means of a graphic representation.

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## CHAPTER 8

### EVALUATING THE EFFECT OF FRAME AND LEXICAL VALENCE ON COLON-CANCER SCREENING UPTAKE

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*The last study also took a paternalistic approach to a cancer screening decision, i.e., the decision whether to undergo colon cancer screening by means of a colonoscopy or a rectosigmoidoscopy. One of the peculiar aspects of this study is that it was conducted in collaboration with a local screening program for the prevention of colon cancer; therefore, we were able to assess the real screening behavior of patients. In the message sent to invite patients to participate in the screening program, two factors were manipulated: verbal framing (gain vs. loss) and the lexical valence of the consequences (expressing the consequences with lexically positive or negative terms).*

One of the factors that has been considered as a potential moderator of framing effect is the kind of outcome which is described in the message, specifically, whether it is a desirable or an undesirable outcome. This aspect has been referred to as “valence” (Rothman et al., 1999), “hedonic tone” (Levin et al., 1998), or “kernel state” (O’Keefe & Jensen, 2009). As specified by Rothman and Salovey (1997), and shown in Figure 8.1, the combination of the kind of action (attain vs. not attain) and the desirability of the outcome (desirable vs. undesirable) gives rise to four possible ways of framing information: two gain-frames (attaining a desirable outcome or not attaining an undesirable one) and two loss-frames (attaining an undesirable outcome or not attaining a desirable one).

Something similar has been proposed by Levin and colleagues (Levin et al., 1998), who, when they reviewed the literature and proposed the distinction between three types of framing effects, noticed that the “hedonic tone” of the outcome could be either positive or negative (e.g., life or death). Thus, as of late 90s, both Levin and colleagues and Rothman and Salovey (1997) pointed out that the framing studies



have almost always involved the attainment or the failure to achieve a desirable or positive outcome. When comparing directly the two couples of possible frames, the desirability of the outcome did not result in any differences, so that the two gain frames and the two loss frames were collapsed and analyzed together (Rothman et al., 1999). A similar conclusion was reached by O’Keefe and Jensen in their meta-analysis (2009); they included the desirability of the outcome (called “kernel state”) as a possible moderator of framing effect, and the results did not show any moderating role of the kind of outcome on the framing effect.

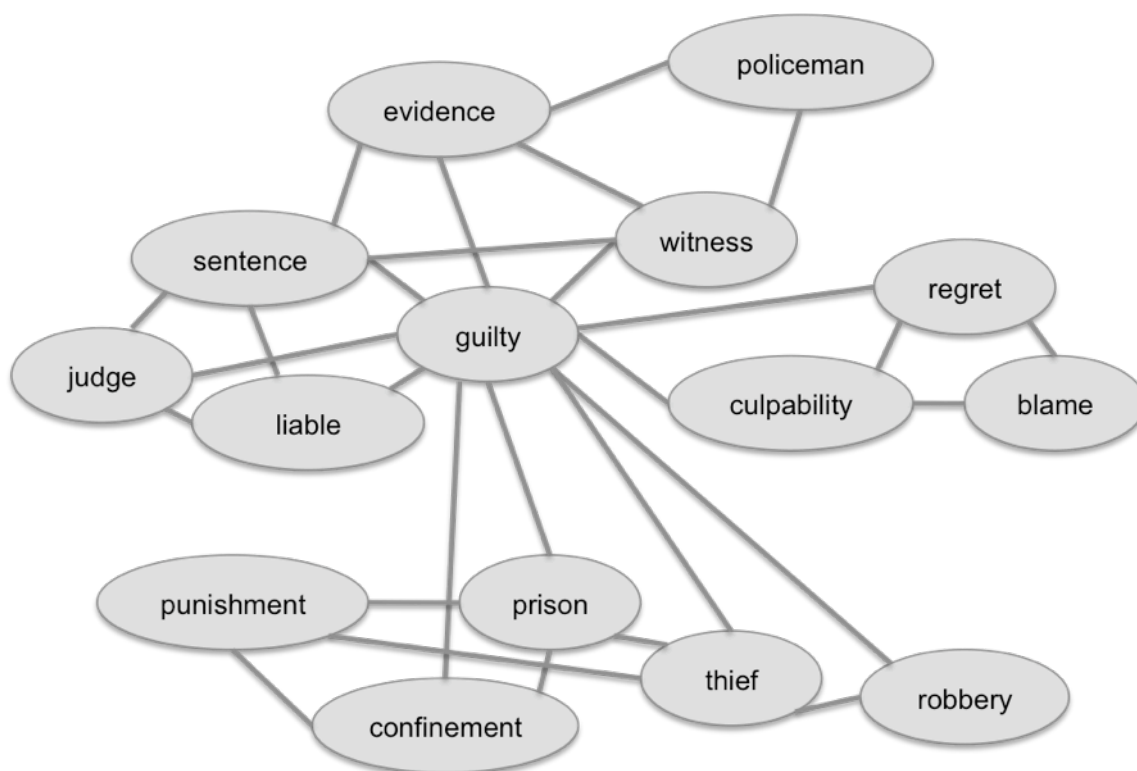
**Figure 8.1** The four messages and their frames, resulting from the combination of the action taken and the desirability of the outcome (as in Rothman and Salovey, 1997).

		Outcome	
		Desirable	Undesirable
Action	Attain	Gain frame	Loss frame
	Not attain	Loss frame	Gain frame

However, a similar but distinct aspect that has not been considered previously (to our knowledge), is the “lexical valence” of the words describing the outcome. For instance, it can be said that an eventual surgery will be a conservative surgery (positive valence) or a radical surgery (negative valence). Note that the lexical valence and the desirability of the outcome are orthogonal factors; indeed an undesirable outcome can be described with either terms that are lexically positive (e.g., “a skin cancer can be found in an early stage”) or negative (“a skin cancer can be found only in a late stage”), and a desirable outcome can as well be described with either terms that are lexically positive (e.g., “a healthy skin can be preserved for a long time”) or negative (“a healthy skin can be lost in a short time”). The evidence of the relevance of this factor comes both from the attribute framing literature and from the psycholinguistic literature. On one hand, as cited in the introduction (see

Paragraph 2.4), even single attributes can be framed in a positive or negative perspective, for example, lean *versus* fat beef (Levin & Gaeth, 1988), survival *versus* mortality information (e.g., Marteau, 1989), success *versus* failure (e.g., Linville et al., 1993), tallness *versus* shortness of a person (Harris, 1973), or rejecting the undesirable option *versus* accepting the desirable one (Shafir, 1993). Since the way in which a single attribute is described in positive or negative terms has been found to affect judgments, it is plausible to hypothesize that the same happens when these terms are included in a broader message, in which also the frame of the consequences (or goal framing) is manipulated. On the other hand, also findings in the domain of language processing support the idea that the lexical valence of the terms used in framed messages might be relevant. For example, when investigating how the language used in media titles affected readers impressions, Wegner, Wenzlaff, Kerker, and Beattie (1981) presented different participants with four hypothetical titles: an affirmative one (“Bob Talbert Linked With Mafia”), an interrogative one (“Is Bob Talbert Linked With Mafia?”), a negative one (“Bob Talbert Not Linked With Mafia”), and a neutral one (“Bob Talbert Celebrates Birthday”). Analyzing the judgments of various positive and negative aspects on semantic differential scales, the authors found, not surprisingly, that the affirmative title induced the more negative judgment (mean 4.25 on a scale from 1 to 7, where lower numbers indicate a positive judgment and higher numbers a negative one), while the neutral title induced the less negative judgment (mean 3.00). More surprisingly, the interrogative title and the negative one generated quite high ratings (respectively 4.33 and 3.73). Focusing on the negative title, the results showed that the affirmation of one thing and the negation of its opposite are not equivalent; for example, stating that someone is “not guilty” is not equivalent to the assertion that he is “innocent”. Indeed, not only negative sentences have been shown to require more elaborations than positive sentences, but also, the analysis of the adverbs modifying the meaning happens only in a later phase (Gilbert, 1991). The way in which the semantic knowledge is organized, according to psycholinguistic theories, is a network of nodes and links. The nodes represent concepts, whereas the links represent the relationships between them. An example of a semantic network is represented in Figure 8.2.

**Figure 8.2** An example of a semantic network, where the nodes represent the concepts and the links represent the relationships between the concepts.



In this multidimensional space, different kinds of connections coexist (Collins & Quillian, 1969). Specifically, the relationships between concepts can be: categorical (e.g., mouse-lion), hierarchical (e.g., mouse-animal), associative (mouse-cheese), and mixed (e.g., dog-cat). Moreover, the relationships differ also for their strength, which reflects how close are the meanings in the semantic space: The concepts that are semantically related, are also close in the semantic space. Within the network model, the retrieval of information depends on the activation of the concepts (or nodes) through the mechanism of the spreading of activation among the nodes themselves (Collins & Loftus, 1975). When a node is activated, after the activation of its lexical form, the node activation spreads to close nodes, and the spreading strength decreases both with the distance of the node which originated the process and with the time passed since the activation. The amount of the activation is, thus,

inversely related to the distance among the nodes of the network, since the strength of the activation progressively diminishes when spreading throughout the network. One of the evidence supporting the concept of the network representation and of the spreading of activation in the semantic system is the phenomenon of “priming”. The priming effect consists in facilitation (faster reaction time) in word recognition tasks, when there is a semantic relationship between the prime and the target words, relative to when the words are semantically unrelated.

This suggests that when we process the sentence “Bob Talbert is not guilty”, the concept which is activated is the concept of guiltiness, which in turn spreads activations to semantically negative related concepts. When the “not” is then processed, the negative concepts remain activated and thus the judgment about “not guilty” is more negative than the judgment about “innocent”. Similarly, we assumed that, when processing a negated concept such as “not conservative”, the lexical form of the concept is activated first (i.e., “conservative”), spreading the activation to connected concepts (which in this case are positive), and the negation is processed only afterwards. The same happens when the negated concept is negative, thus having a positive meaning, but with the activation in memory of negative concepts. Applying this to persuasive messages promoting health behaviors, we expect that framed messages expressed with the appropriate lexical valence are more effective relative to when the valence is discordant. In particular, we expect the gain-framed message with lexically positive terms to be more effective than the one expressed with negated negative terms (negative valence), and the loss-framed message to be more effective when expressed with lexically negative terms relative to the one expressed with negated positive terms (positive valence). In the prospect theory perspective (Kahneman & Tversky, 1979), the use of concordant lexical valence terms would reinforce the perception of the message as a gain or as a loss, thus strengthening the effect of the framed message on behavior.

Therefore, both the literature about attribute framing and the psycholinguistic literature suggest that the lexical valence of the words used in messages is a relevant factor in their processing, in the judgments made based on them, and in the decisions taken based on them. However, when reviewing the literature about the framing effect in promoting health behaviors, this aspect has not been considered.

Our knowledge of the literature have suggested us that most studies have constructed the loss frame by adding a negation to the positive frame, which is in line with the previous observation that the outcomes used in framing studies are usually desirable outcomes (Levin et al., 1998; Rothman & Salovey, 1997). In this perspective, taking as a reference the recent meta-analysis conducted by O’Keefe and Jensen (2009), we have analyzed the 25 articles that we were able to retrieve from those analyzed in the meta-analysis. Six of these studies did not provide the text of the message used or only provided one frame (Keller, Lipkus, & Rimer, 2003; Lerman, Ross, Boyce, Gorchov, MacLaughlin, Rimer, et al., 1992; Schneider, Salovey, Apanovitch, Pizarro, McCarthy, Zullo, et al., 2001; Urban, Stout, Zimet, & Blake, 2006; Williams, Clarke, & Borland, 2001). Among the remaining studies, three (16%) used words of mixed lexical valence (Banks, Salovey, Green, Rothman, Moyer, Beauvais, et al., 1995; Block & Keller, 1995; Finney & Ianotti, 2002), two (11%) expressed the gain frame with positive valence terms and the loss frame in negative valence terms (Rothman et al., 1999, Study 1; van’t Riet, Ruiter, Werrij, & de Vries, in press), one (5%) used both the frames and both the lexical valence terms (Apanovitch, McCarthy, & Salovey, 2003), and thirteen (68%) expressed both the gain and the loss frames in positive terms (Broemer, 2004; Chang, 2007; Cherubini, Rumiati, Rossi, Nigro, & Calabro, 2005; Cox, et al., 2006; Cox & Cox, 2001; Lotto, Tasso, Carnaghi, & Rumiati, 2006; Maheswaran & Meyer-Levy, 1990; Meyerowitz & Chaiken, 1987; Rothman, et al., 1999, Study 2; Ruiter, Kok, Verplanken, & van Eersel, 2003). This review highlights the fact that previous works have used mainly the same terms in both frames, and have created the loss frame by adding negative adverbs to the gain frame message. Therefore, in most studies the lexical valence of gain-framed message was concordant with the frame, whereas the lexical valence of loss-framed messages was not. Based on these findings, on the psycholinguistic findings and theoretical assumptions, and on findings concerning the distinction between prevention and detection behaviors (Rothman & Salovey, 1997; Rothman et al., 2006), we hypothesized that: 1) when promoting a detection behavior, the usual pattern of the advantage in effectiveness of the loss-framed message (expressed with positive terms) relative to the gain-framed message (also expressed with positive terms) will be enhanced when using a loss-

framed message with negative terms; and 2) when promoting a prevention behavior, the usual pattern of the advantage in effectiveness of the gain-framed message (expressed with positive terms) over the loss-framed message (expressed with positive terms) will be reduced when using a loss-framed message with negative terms.

In the present study, we developed and tested a message to promote colon cancer screening. According to the distinction proposed by Rothman and Salovey (1997; see also Rothman et al., 2006), this behavior is a detection behavior, allowing for the early detection of cancer, and thus consenting to have better treatment options. We therefore expected that when comparing the usual formulation of the gain- and loss-framed messages (both expressed with positive terms), the loss-framed message would be more persuasive than the gain-framed one. We also expected that the loss-framed message expressed with negative terms would be more effective in promoting screening relative to the loss-framed message expressed with positive terms. Thus, we expected the difference in effectiveness between the negative loss-framed message and the positive gain-framed message to be enhanced relative to the usual framing effect, found when both frames are expressed with positive terms. Additionally, in the present study, we investigated the real actual behavior performed by participants. This aspect is important because many of the previous studies investigated intentions (with real or hypothetical behaviors) and sometimes the reported behavior at a later follow-up, whereas the participants in this study were actually undergoing a screening test at a local hospital. The study of the application of hypothetical and intentions studies in real-world situations is essential in medical decision making, even if it might not be easy to accomplish.

To summarize, this study investigated the effect of two variables on the undertaking of a colon cancer screening test: the framing of the message (gain vs. loss-frame) and the lexical valence of the message (positive vs. negative terms). Based on the previous literature, we expected the positive loss-framed message to be more effective in promoting screening for colon cancer relative to the positive gain-framed message. Moreover, we expected the negative loss-framed message to be more effective than the positive loss-framed message.

## **8.1 Method**

### **8.1.1 Participants**

In collaboration with a local colon-cancer screening project (conducted at the S. Antonio Hospital in Padua), we invited 1754 people aged 60 to perform a screening test for colon cancer (either colonoscopy or rectosigmoidoscopy), during the years 2007 through 2009. This campaign aim was to reach all residents in the local sanitary district who were 60 years old, who had not undergone a colonoscopy in the previous five years, and who did not show any symptoms. Among the 1754 people invited ( $n = 892$  females, 51.2%), 422 ( $n = 193$  females, 43%) decided to participate to the screening campaign and underwent a colon cancer screening test.

### **8.1.2 Procedure**

Within the colon cancer screening campaign, potential participants were invited to take part in the screening program, through an invitation envelope that contained an informative leaflet and a letter with an appointment. The information in the leaflets included the message promoting the adoption of the screening behavior that was either framed in gain- or in loss terms, combined with the use of lexically positive or negative terms. Participants received one of the four leaflets along with the invitation letter. Those who decided to take part in the screening program and underwent the exam, were asked to fill a questionnaire when they arrived at the appointment.

### **8.1.3 Material**

The leaflet included in the invitation to adhere to the colon cancer screening campaign contained a general introduction about this kind of cancer, its incidence, risk factors and possible symptoms. The message presented one of the four possible ways of expressing the consequences of adherence to the message recommendation, in a 2 (message frame) by 2 (lexical valence) design. Specifically, participants were presented information about the possible consequences of their decision (either in a gain frame, which highlighted the consequences of undergoing the test, or in a loss frame, which highlighted the consequences of not undergoing

the test), which were lexically described either with positive or negative words (e.g., “early” vs. “advanced” stage; “conservative” vs. “radical” surgery). For example, the framed part of the message in the loss-negative (loss-positive in brackets) condition was:

*By not undergoing regularly rectosigmoidoscopy, it is [not] possible to detect a potential anomaly only in an advanced stage [in an early stage]. This means that it is [not] possible to detect a polyp only when it has already degenerated [it is yet unaltered].*

*In case the rectosigmoidoscopy detect a cancer, detecting it in an advanced stage [in an early stage] means that it is already of big size [it is not yet of small size].*

*The potential surgery would be radical [would not be conservative], i.e., it would be necessary to remove a big portion [it would not be sufficient to remove a small portion] of intestine apart from the cancer.*

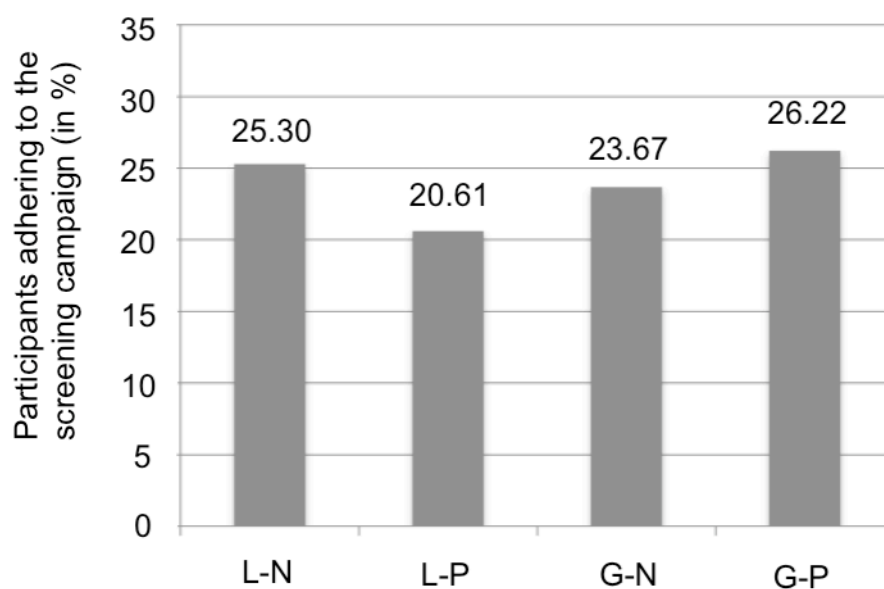
The questionnaire filled before the colonoscopy or rectosigmoidoscopy included five questions on a 7-point Likert scale (where 1 = “not at all” and 7 = “extremely”) concerning: the perceived probability of developing colon cancer (i.e., perceived probability); the perceived severity of colon cancer (i.e., perceived severity); the expectation of painfulness of the exam (i.e., expected pain); the perceived information held about the exam (i.e., perceived information); and the perceived efficacy of the exam as a diagnostic test (i.e., perceived efficacy). Participants were also asked their gender and if any of their family members or close friends have or have had cancer. The original leaflet and questionnaire were in Italian.



## 8.2 Results

Among the 1754 people invited ( $n = 892$  females, 51.2%), 431 ( $n = 220$  females) received the gain-negative leaflet, 423 ( $n = 214$  females) the loss-negative, 427 ( $n = 214$  females) the loss-positive, and 468 ( $n = 220$  females) the gain-positive. In total, 422 ( $n = 193$  females) persons decided to undergo the screening test, and among them 265 ( $n = 127$  females) have filled the questionnaire.

**Figure 8.2** Percentage of participants who underwent colon cancer screening depending on the leaflet they received (where L-N corresponds to loss-negative, L-P to loss-positive, G-N to gain-negative, and G-P to gain-positive).



The percentage of participants who decided to undergo the test depending on the leaflet is shown in Figure 8.2. To test our main hypotheses, we compared the gain-positive condition with the loss-positive one and the loss-positive condition with the loss-negative one, using a 1-sided Fisher test (since we hypothesized a specific direction, while the other comparisons were performed with chi square tests). When comparing the two usual ways in which framing has been usually studied (i.e., with the positive valence), the gain frame message was more effective (26.22%) than the loss frame message (20.84%) in promoting the screening exam ( $p = .035$ ). Since this result was opposite to our hypothesis, we also tested the difference with a chi square

test, confirming the result ( $\chi^2 (1,900) = 3.59, p = .058$ ). The loss frame message expressed with negative terms was tendentially significantly more effective (25.30%) than the loss frame message expressed with positive terms (20.84%,  $p = .072$ ). On the other hand, there was no difference between the two gain messages ( $p = .377$ ), nor between the loss-negative message and either the gain-negative one ( $p = .580$ ), or the gain-positive one ( $p = .753$ ).

While the undertaking of the exam was an outcome available for all participants, the other variables were available only for those who filled the questionnaire, who were 267 out of the 422 people who underwent the exam (63.3%). The reasons for not answering the questionnaire were mainly practical reasons, for example, when the participants arrived early but the doctor and the endoscopy team were ready to perform the exam, the priority was given to the efficiency in the medical procedure, so the questionnaire was not administrated. Among those who filled the questionnaire, the evaluations of the perceived probability, perceived severity, expected pain, perceived information, and perceived efficacy did not depend on the message received, as shown by the lack of statistical significance of a MANOVA conducted on them and including the frame and the lexical valence as factors ( $p$  values ranging from .230 to .843). The descriptive statistics of these variables are shown in Table 8.1.

**Table 8.1** Means and standard deviations of measured variables, which did not differ across frame and lexical valence.

	<i>M (S.D.)</i>
Perceived probability	2.67 (1.64)
Perceived severity	6.17 (1.09)
Expected pain	2.89 (1.68)
Perceived information	3.80 (1.92)
Perceived efficacy	6.25 (0.93)

The presence of family members or close friends who have or have had cancer was also limited to participants who filled the questionnaire. Among them, 195 reported to have a family member or a close friend who have or had cancer

(73.59%). Among those, 28.73% received the gain-positive message, 28.23% the loss-negative message, 24.63% the gain-negative message, and 17.96% the loss-positive one. Since the number of participants who did take part in the exam and who filled the questionnaire differed in the four conditions, these results are only descriptive, and no inference is possible based on them.

### **8.3 Discussion**

We investigated the effect of two variables on participants' undertaking of a colon cancer screening test: the framing of the message (gain vs. loss-frame) and the lexical valence of the message (positive vs. negative terms). Based on the previous literature, we had two main hypothesis: a) We expected the positive loss-framed message to be more effective than the positive gain-framed message; and b) we expected the negative loss-framed message to be more effective than the positive loss-framed message. The data collected supported the second hypothesis but were contrary to the first one. Indeed, the loss-negative message was more effective than the loss-positive one, however, the gain-positive message was more effective than the loss-positive one.

We think that the explanation of this finding depends on the double function of colonoscopy and rectosigmoidoscopy. Indeed, these exams do not only allow for the detection of tumors, but they also enable the actual prevention of cancer, by removing polyps, which are precursors of the cancer in itself (e.g., Winawer, 2007). Since we were not using hypothetical scenario in an experimental setting, but real patients facing a real decision, for ethical reasons we had to highlight also this function of the screening tests in the message promoting them. The first part of the message we used, indeed, stressed the preventive function of colon cancer screening, by stating that one out of four people above 50 years old have polyps, that five out of 100 polyps can develop and transform into cancer, and that colonoscopy or rectosigmoidoscopy are able to detect most polyps and remove them, preventing their evolution into cancer. In this perspective, these exams can be seen not only as detection behaviors, but also as prevention behaviors, depending on which information is emphasized in the message. Previous findings have confirmed

the different effectiveness of the two frames depending on the nature of the behavior promoted not only when promoting different behaviors (see Rothman & Salovey, 1997; Rothman et al., 2006), but also when promoting the same behavior highlighting either its preventive or its detective nature (Chang, 2007; Cox et al., 2006; Rivers, Salovey, Pizarro, Pizarro, & Schneider, 2005; Rothman et al., 1999; Salovey & Wagner, 2003). Therefore, our results would be explained by the two possible functions of the screening test: The loss-framed message was effective in promoting the screening test as a detection behavior (and the higher effectiveness of the loss-negative message relative to the loss-positive one is in line with this proposal), whereas the gain-framed message was effective in promoting the screening tests as a preventive behavior. This interpretation is supported by the difference found between the two loss messages. In particular, and in line with our hypothesis concerning detection behaviors, the loss-negative message was more effective than the loss-positive message.

In general, the results confirmed the role of the lexical valence, which was hypothesized based on previous findings from both the literature on attribute framing and the literature on language processing. This is, to our knowledge, the first study in which the lexical valence of the terms used in the message has been investigated. Prior works have considered a close distinction: the desirability of the outcome (or hedonic tone or kernel state, Levin et al., 1998; O’Keefe & Jensen, 2009; Rothman et al., 1999; Rothman & Salovey, 1997). However, while when manipulating the desirability of the outcome, the outcome in itself is different depending on the gain or loss condition (e.g., health skin vs. skin cancer), the lexical valence manipulation does not change the outcome in itself, but only its description, by using in the loss message the antonyms instead of the use of the negation of the positive terms used in the gain message, in a similar way to what is done when manipulating attribute framing. Note that the desirability manipulation does not only requires that the outcomes are different, but it also has the limitation that they are not the opposite, for example, the opposite of “healthy skin” is unhealthy, ill, or damaged skin, and not necessary skin cancer (which is only one of the possible skin illnesses), whereas the opposite of skin cancer is cancer-free skin. The lexical valence manipulation, instead, enables the use of the same outcome regardless of the frame.

Since this is the first finding suggesting the role of the lexical valence in framing effects, it needs to be replicated also with other behaviors. One important test that is critical to the confirmation of our hypotheses and interpretation of results concerns the study of the lexical valence in promoting behaviors that have only one function, i.e., detection behaviors and, separately, prevention behaviors. This future direction of research would allow to test whether the prediction that framed messages expressed with lexically concordant terms would reinforce the perception of the message as a gain or a loss, thus strengthening the effect of the framed message on behavior (in the prospect theory perspective; Kahneman & Tversky, 1979).

A limitation of this study is that we were able to collect data only on a subsample of participants, i.e., those who underwent the exam. For example, we were interested in exploring if the personal experience with family members or close friends with cancer would moderate the effect of the message. However, the way in which participants were invited allowed us to collect this datum only from those who underwent the exam, therefore not allowing for the assessment of any hypothesis, nor the comparison between conditions on the exposure to people with cancer. This limitation applies also to other potential moderators that could have been measured. Note that this limitation is inherent to the research design, since it was not possible to contact all potential participants. On the other hand, we were able to investigate the real behavior performed by the invited participants, and not only the assessment of the willingness to undergo the exam or the reported behavior. There is evidence that intention to engage in a behavior is the best predictor of the engagement in the behavior itself (Ajzen & Fishbein, 1977). However, the test of the effect on real behaviors is essential, considering that basic research is aimed at informing its application in real-world medical decision making.

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## **CHAPTER 9**

### **GENERAL DISCUSSION AND CONCLUSIONS**

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Medical decision making is a complex field of study, in which basic research informs practice on the best way to help people make decisions concerning their health. Usually, these kind of decisions are extremely relevant, because they affect people's lives. Similar to other applied fields of study, research is usually conducted in two phases: In the first phase, judgment and decision making are investigated in a more rigorous experimental setting, in which hypothetical scenarios can also be used, whereas in the second phase, the results from basic research are investigated in the context of real medical decisions. Within this perspective, the work I have presented is mainly pertinent to the first phase (Chapters 3 through 7), with the exception of the last study on the real decision whether to undergo colon cancer screening (Chapter 8).

Another important aspect that differentiates the studies presented concerns the chosen approach to medical decision making: the paternalistic approach opposed to the informed decision making approach. As noted in Chapter 1 and throughout the dissertation, approaches to medical decision making can be seen as a range or continuum between the two extremes of the paternalistic approach (in which the doctor makes the decision with little or no input from the patient), and the informed medical decision making approach (in which the patients, after being fully informed, makes the decision with little or no input from the doctor). Between these two extremes, a relevant middle option to approach medical decisions is shared decision making, in which the patient needs to be fully informed, but the decision is discussed and "shared" between the patient and the doctor. Depending on the approach that is chosen, health messages also can take different forms. When promoting a health behavior using the paternalistic approach, the messages aim at persuading people to engage in a given behavior, such as dieting or undergoing a screening test. When

informing a patient about the options available, the message should not be designed to influence the patient's decision, i.e., it should be neutral relative to the decision.

The choice of which approach to take often depends on the status of the clinical evidence about the options available. On the one hand, when a clearly better option is available, the paternalistic approach is almost always used. On the other hand, when the evidence does not indicate a clearly better option, the options available offer an uncertain mix of costs and benefits, or when the importance of benefits and costs to the patient might depend on the patient's values, then informed or shared decision making may be preferred. Both approaches have positive and negative aspects; for example the paternalistic approach may save time and avoids giving the burden of the decision to the patient, but at the same time, it does not take into account the patient's values and preferences, thus limiting the role that they could play in the decision.

The informed approach, in contrast, allows the inclusion of patient's values and preferences into the decision process, but it also assumes that the patient is able to make the better decision when fully informed. Unfortunately, this assumption has been repeatedly proven wrong. Indeed, many factors have been proven to affect decision making in general, and medical decision making specifically. In Chapter 2, I have presented an overview of some of the relevant context effects. Specifically, I have classified them into three broad categories: 1) when the options available affect people's preferences, i.e. when the choice between the same two options is "biased" by which options are available to the decision maker (for example, the "dominated" option is preferred); 2) when judgments and decisions are affected by external cues that should not affect them, for example the evaluability of options, or who the decision is made for; and 3) when the options available are actually the same but they are perceived to be different (e.g., the framing effect) because of the way in which they are presented. On one hand, these three classes of effects are a challenge to informed decision making, because they all highlight how judgments and decisions are subject to the influence of many factors that are not to be relevant. On the other hand, they can also be a challenge when using the paternalistic approach, since everybody is affected by these factors, including physicians, health practitioners, and policy makers.

The study of these factors is therefore extremely important, because it can inform health communicators and health practitioners of the known effects and, thus, what they should or should not include in communication provided to patients and how they should present information to them, in order to avoid context effects.

### **9.1 Comparing Risk Attitude in Medical and Financial Domains: Effects of Purpose and Information**

My dissertation has focused on the study of some specific context effects. In the first study (Chapter 3), we explored the effect of three contextual factors on the choice between a safe and a risky option by comparing the effect of pursuing a hedonic *versus* a utilitarian purpose and the effect of providing generic *versus* detailed information on risk attitude in two different domains: the medical and financial domains. Based on the literature, we hypothesized that when detailed information was provided, the choices would be based on tradeoffs between the stated risks and benefits, and thus participants would be insensitive to whether the purpose was utilitarian or hedonic. The results confirmed that participants focused on the detailed information provided and chose accordingly, without being affected by the purpose. On the other hand, in line with our hypotheses, when only generic information was provided, the choices were affected by the contextual factors. Specifically, there was a significant interaction between the purpose and the decision domain: The utilitarian purpose (e.g., “solve the mouth problem or save money for retirement”) did not lead to a preference for either option in either the medical or the financial domain, whereas the hedonic purpose (e.g., “refine the appearance of the face or get richer”) induced the participants to be more risk seeking in the financial domain and more risk averse in the medical domain.

We propose that given generic information, people rely much more on their intuition (Epstein, 1994) and are more influenced by their affective reactions (Finucane et al., 2000), and thus are more prone to consider relevant contextual factors, such as the purpose and what is at stake. With detailed information, instead, participants focused on the provided information about the risks and benefits of the options when judging the trade-offs between them, thus relying more on valuation by



calculation than on valuation by feeling (Hsee & Rottenstreich, 2004; Hsee et al., 2005; Rottenstreich & Hsee, 2001; see Chapter 2, Paragraph 2.2.1)

In daily life, it is quite common to have only vague information about the potential outcomes of a choice, and often the first judgment drawn from the generic idea about the options available will drive or anchor the following judgments, even if they are based on additional information. With this perspective, our results suggest that it is important that both medical and financial experts provide their patients or clients with accurate and detailed information. This would avoid or reduce the effect of contextual factors that could mislead their judgments and decisions. Notice that we did not test whether the effect of generic information would be carried over when detailed information is provided later. However, since the first judgment usually anchors following judgments, it is likely that the effect of contextual factors would be carried over also when additional information is provided. If this were to be confirmed, both medical and financial experts should not only provide their patients or clients with accurate and detailed information, but they should also do it as early as possible.

A second interesting point that emerged from this study concerns the opposite risk attitude found in the medical and the financial domains when participants with generic information had a hedonic purpose. Participants' choices were risk-seeking in the financial domain and risk-avoidant in the medical domain. When the purpose was to get richer, participants might have thought that if their goal was to improve their wealth, then they should already have enough money to cope with a potential loss, and they might have felt that taking a risk was required to achieve their goal. Conversely, in the medical domain, participants could have considered that it was their life at stake, since complications may have arisen as a consequence of the surgery, and they were therefore more skeptical about undergoing surgery when an alternative treatment was available. Also, participants did not strongly prefer surgery when the information was generic, even if it could have helped them overcome a severe health problem; indeed, they equally chose the risky and the safe alternatives. From this observation, it is possible to hypothesize that our participants had a rather negative affective reaction toward the surgery, which induced them to overestimate the chances of suffering from some sort of complication. We think that

the results of this study suggest that people are less willing to “play” with their lives than with their money.

A further finding emerging from this study concerns the role played by the perceived riskiness of the alternatives. In line with our hypothesis stemming from previous research on the inverse relationship between risks and benefits (e.g., Alhakami & Slovic, 1994), the difference between how risky each alternative was perceived proved to be a good predictor of participants’ willingness to choose the riskier option *versus* the safer one. Specifically, the bigger the perceived difference in riskiness between the two alternatives, the more likely that participants preferred the safe alternative, suggesting that they expected less benefit from the risky option when it was judged as much more dangerous than the safe one. Conversely, when the two alternatives were perceived as having a similar level of risk, participants were more willing to choose the risky one since the safe alternative allowed them to avoid negative outcomes (e.g., to lose money or to suffer from surgery complications), but at the same time did not fully achieve the decision maker’s purpose (saving enough for retirement or solving the malocclusion issue definitively).

Finally, the results obtained indicate that preferences in the medical domain can be different from preferences in the financial, suggesting a field-specificity. This suggests that generalization from one domain to another should be performed cautiously, as previously suggested (Chapman, 2002). Moreover, we have proven that factors affecting choice can act simultaneously and can interact with each other. Usually, basic research uses simple paradigms in which the variables that could affect judgments and decisions are studied one or two at a time. There is an obvious practical advantage in this choice; however, interaction among factors could pass undetected using this research design. Recently, the use of a fractional factorial design instead of a full factorial design (e.g., Louviere, 1988) has been proposed in order to overcome this issue. The general idea of fractional factorial designs is that instead of testing all the possible combination of the factors, only a subset of interactions are tested, depending on the hypotheses. This allows for the test of the interaction of several factors, with the advantage of avoiding the need for huge samples. On the other hand, this kind of design requires specific hypotheses, and

the choice of the subsample of interactions to be tested is critical in designing the study.

## **9.2 Why and When does a Tumor Diagnosis Not Lead to Omission Bias?**

The second study (Chapter 4) concerned the treatment choice for a slow growing thyroid cancer from the perspective of omission bias. Previous studies have repeatedly found that people generally prefer harms of omission rather than harms of commission (e.g., Ritov & Baron, 1990, see Chapter 2, Paragraph 2.1.5). However, in the case of a cancer diagnosis, people seem to prefer active treatments (commission, Fagerlin et al., 2005c). The study presented aimed to clarify and investigate possible explanations for the difference between these findings. Specifically, the goal of the study was twofold: to investigate to what extent the preference towards active treatment for a cancer diagnosis is attributable to the way the inaction option is described, and to explore what aspects of the diagnosis give rise to the preference for action. The results were in line with our hypothesis, i.e., that the preference for surgery over watchful waiting previously found for cancer was (at least partially) accounted for by the explicit statement that by choosing the watchful waiting, were the cancer to develop, it would be too late to treat it. In fact, when the description of the watchful waiting option explicitly stated that its choice would have excluded future surgery, a percentage ranging from 16.5% to 40% of participants would have preferred to face the surgery immediately relative to when the description was neutral (without specification) or to when it was explicitly stated that it would have been possible to undergo surgery later, if needed. On one hand, this result confirmed that the previously found preference for the surgical option described by Fagerlin et al. (2005c) was partially due to the unusual description of the watchful waiting option, in line with the idea that watchful waiting is seen more as a repeated or deferred decision than as a definitive decision (Driffield & Smith, 2007). On the other hand, this finding also has a relevant practical implication, since it has highlighted the importance of the way watchful waiting is described on people's decision. Particularly relevant is the fact that when participants were explicitly reminded that watchful waiting would have not excluded surgery in the future, they

were more likely to choose it relative to when no specification was added. Therefore, these results suggest that health practitioners should be extremely clear when explaining the available options to patients, and they should specify whether the watchful waiting option allows to do this in the future, because this aspect seems to be highly valued in the decision. This is an example of the more general idea that investigating context effects is important in order to help patients make a good decision. In a clinical encounter, a physician could assume that the patient knows what watchful waiting means, or explain the aspects and not specify what the available future treatments are, and thus inadvertently affecting the patient's decision.

The second part of the study explored some aspects that could be determining factors for the preference for action when the diagnosis is a malignant tumor. Specifically, we compared the choices made with seven scenarios that differed in the kind of illness (malignant or benign tumor, or no tumor), the present status of the illness (already present illness vs. illness that could arise in the future), and the possible development (growth vs. degeneration) of a benign tumor. Taken together, the results suggest that a malignant tumor is a special case in the decision between omission and commission, and only when it has been already diagnosed, i.e., it is not potential. Indeed, in this situation the active treatment was chosen more frequently relative to situations in which the diagnosis was only potential (either a benign tumor that could become malignant, or a genetic predisposition for cancer), and relative to situations in which the diagnosis was not malignant (either a benign tumor that could grow or non-tumor illnesses). Moreover, we found that in general, the more people perceive a diagnosis as severe, the more likely they are to take risks to treat it, and that the diagnoses of malignant tumors were perceived as more severe than those not involving malignity, even if the potential consequences were equal. Although we have proposed that the perceived severity had a role in the treatment choice, our results do not exclude that the direction of causality is the reverse. That is, participants could have rated the illness' severity according to their choice, and in order to justify the risk-taking choice of surgery, they could have rated the severity as higher relative to those who chose watchful waiting. In other words, future studies should control for the direction of the relationship between choice and

perceived severity in order to confirm the present suggestion. Moreover, it is notable that, while the inaction option in the vaccination scenario was a real inaction (e.g., Ritov & Baron, 1990), the “inaction option” in the cancer scenario was not (Fagerlin et al., 2005c; present study). Although it could be and has been considered the omission of surgery, watchful waiting is not in the proper sense inaction, rather it involves regular checks and medical examinations, and it can also include future treatment if needed. Therefore, this could be a further explanation for the findings which have not been tested.

To summarize, the results confirmed the existence of a situation in which action is preferred to inaction, specifically, when the diagnosis is of a malignant tumor and the watchful waiting option excludes the possibility of future intervention. On one hand, this result sheds light on previous findings in the omission bias literature by explaining why previous works found a commission bias for cancer diagnosis, in contrast to an omission bias found in other medical scenarios. On the other hand, this result suggests that, in clinical practice, it is very important to make explicit to patients what the choice of watchful waiting will allow them to do in future. Indeed, some people might be more willing to choose to undergo a surgical intervention because they are worried that the choice of watchful waiting would preclude future surgical treatment.

### **9.3 When Physicians are Affected by Contextual Factors**

While in the previous studies we investigated factors that affect patients' decision making, in Chapter 5 I presented a short demonstration of the fact that physicians are not immune to context effects (i.e., the disturb effect, see Chapter 2, Paragraph 2.1.2), and that they can also be affected by irrelevant information when deciding the prioritization order for surgery. Specifically, in this study we indirectly tested the accountability explanation of the effects of the options available on choices (see Chapter 2.1). As suggested by previous work (e.g., Baron, 2008; Lerner & Tetlock, 1999; Schwartz et al., 2004; Simonson, 1989), the options available affect the choice by affecting the accountability of the choice in itself. For example, in the disturb effect, where the third option introduced is very similar to one of the other two

(the one that was preferred), it would be difficult to justify the choice between the two similar options. This would result in the more frequent choice of the option previously not favored, resulting in the disturb effect. Indeed, the order of preferences is reversed when the third option is introduced. We indirectly investigated the accountability explanation by examining whether providing a possible reason for the choice would alter the disturb effect. Specifically, we provided participants with some information about option B (the one usually preferred when the three options are presented together), which was clinically not relevant, but which could constitute a reason for the choice.

Based on the literature on the influence of affect on decisions (e.g., Peters et al., 2006b; Slovic et al., 2004; Slovic et al., 2007; Slovic & Peters, 2006; Slovic et al., 2005), we included a sentence aimed at influencing participants' affective reactions. We expected that, with the expectation that the first impression and feeling resulting from that sentence would then be used in the judgment and choice about the patients. In order to test our hypothesis, we adapted one of the scenarios used by Redelmeier and Shafir (1995), in which two or three patients are scheduled for a surgical operation, but the surgery room has then been occupied by emergency cases. The participants have to choose which patient should be the first to be operated on, based on a series of information (age, past medical history, severity of the illness). In order to manipulate the information about patient B (the one that is usually preferred when the three patients are listed together), we introduced a sentence with a negative affect. Specifically, we introduced information that was either neutral or portrayed the patient in a negative light in the description of the past medical history of the patient; i.e., that the patient was hospitalized for cranial trauma suffered after a road accident in which the patient was run over by a car using the crosswalk (neutral information), or that the patient was injured in an automobile accident while driving under the influence of alcohol (negatively charged information).

As expected, when the information was neutral, we replicated the usual pattern of choices, in which patient A was given preference over patient B when two options were available, but then the order of preferences was reversed (patient B was preferred to patient A) with the introduction of a third option. On the other hand, also

in line with our hypothesis, when patient B was perceived to be guilty, the usual pattern of preference for patient A was found when only A and B were available, similar to when information about patient B was neutral. However, when introducing the third patient C, we did not find the usual reversed pattern of choices. Instead, participants favored neither patient A nor patient B.

Broadly speaking, our results show that even medical students are affected by context information that should not affect their decisions (and the decisions of their future selves, as physicians, especially!). The decision about which patient should be operated on first was affected both by the patients that were waiting for surgery (which obviously should not affect the decision, i.e., the order of preference between two patients should not change by adding a third patient), but it was also affected by incidental and irrelevant information (which also should not affect the decision).

As previously noted, many studies have found that physicians are also affected by contextual factors when making judgments or decisions. This is a relevant observation for the two possible approaches to medical decision making. Indeed, these and previous findings highlight the importance of the study of factors affecting medical decision making, because, even in a paternalistic approach, the decision is made by physicians who are subject to biases, as is everyone.

#### **9.4 Informing Prostate Cancer Screening Decision Making**

In Chapters 6 through 8, I have focused more specifically on the study of messages promoting cancer screening decisions. In both Chapters 6 and 7, the topic covered was prostate cancer screening, but with a different approach: informed and paternalistic, respectively, whereas in Chapter 8 the approach was also paternalistic, but applied to the decision to screen for colon cancer or not. Since recently, medical guidelines recommend that men above 50 years old undergo prostate cancer screening. However, more recent evidence has fueled skepticism for this recommendation, suggesting instead to take an informed or shared approach to the issue. When assuming an informed perspective, the way in which information is provided to patients should not affect their decisions. Indeed, prostate cancer screening is a good candidate to be investigated within this approach. One of the

aspects that characterizes prostate cancer screening, other than the fact that the patient is asked to decide, is its sequential nature. Indeed, first the patient undergoes a PSA (prostate specific antigen) level measurement through a blood test and/or DRE (digital rectal examination). When the results are suspicious and suggest the possible presence of cancer, a biopsy is usually performed in order to determine whether cancer is actually present. Finally, in the event that cancer was diagnosed, the options available include watchful waiting or active treatments (such as radiation or surgery), which have been proven to be equally effective. The research question we have investigated concerned the effect of the way in which these three steps are presented on the decision to undergo prostate cancer screening. Specifically, we compared a presentation format that could be considered similar to what usually happens in the medical encounter, i.e., a sequential version of the three subsequent decisions, with a presentation format in which the information is presented all at once, and one in which the three decisions are taken altogether after having received all the information. The results of the first study have shown an effect of the manipulation on participants' hypothetical decisions. Although the decision is a preference sensitive decision, implying that it is not possible to know which of the two presentation formats is better, the analysis of the consistency among participants' decisions suggested that the all-at-once presentation format was more suitable. However, when investigating the same issue with a larger sample of males only, and providing them with extensive information about prostate cancer and screening methods (Study 2), the presentation format no longer affected their decisions. The two studies were different in several aspects, which may have contributed to the difference in results: In the second study, the information was specifically about prostate cancer, thus eliciting prior knowledge and attitudes; participants were more involved with the topic, being in the age range in which prostate cancer screening is recommended, and the information provided was much longer and extensive, and could have been overwhelming and more difficult to process. Any one or more of these aspects may have contributed to the discrepancy between the results of the two studies.

This finding has implications that go beyond the scope of this research . An initial suggestion that stems from the findings of these two studies concerns the



importance of the test in realistic or real situations. Indeed, the claims that are made based on basic research findings sometimes overreach their actual importance and implications. Furthermore, it is more difficult to perform tests in real-world settings relative to the study of hypothetical decisions, particularly in the medical context, where health and lives are at stake. Nevertheless, the aim of the research into medical decision making is to improve real-world decisions, therefore testing in real-world settings is essential. This is not a new or original suggestion, but the conflicting results of the two studies presented in Chapter 6 are examples of the potential overextension of the results obtained through basic research. Indeed, based on the results of the first study, it could be argued that caution is needed in the manner in which physicians or health care communicators present information to patients who have to decide whether to undergo prostate cancer screening. However, this claim would have reached beyond the real implications of the study in itself. Therefore, caution is recommended when asserting the implications of the findings from basic research.

A second implication concerns, in general, the investigation of context effects in the informed or shared decision making approach. Indeed, the study of factors affecting a preference sensitive decision is limited because since there is not a best or better decision, the outcome of interest cannot be the decision in itself. For example, if the second study, hypothetically, would have confirmed the results of the first study, the conclusion would have been that the presentation format matters in deciding whether or not to undergo prostate cancer screening. Which one of the two formats would have been recommended might have been based on the consistency results or could have been further investigated through the use of indicators of the quality of the decision (for example, the patient's satisfaction with it). Next, the research would have focused on potential methods for debiasing patients' decisions, i.e., preventing them from being affected by context effects such as the format of the presentation. This sequence is valid in general for the research on preference sensitive decisions.

On the other hand, when a clearly better option is available, the study of factors affecting judgments and decision making is simpler. In this case, the outcome of investigations is the decision in itself, which is easily measurable, ensures a more

direct measurement of the effect that context factors have on the decision making process, and, more importantly, permits us to determine the direction of the effect, i.e., to identify under which conditions contextual effects are not affecting the decision. In this perspective, there is no need (or less need, depending on the circumstances) to investigate methods of debiasing. It could therefore be reasonable to suggest that it would be better that investigation of the factors affecting medical decision making would betake place in situations where there is an option that is clearly the best one. Subsequently, the findings could be generalized to situations in which a clearly best option is not available. In this way, it could be easier to assess the influence that context factors have on decisions and it would also be possible to know the direction of the effect.

### **9.5 Promoting Prostate Cancer Screening: Framing Effects and Visual Representations of Risk**

Assuming a paternalist approach, in which the desired decision is known, I have investigated the same topic (prostate cancer screening) in the subsequent study (Chapter 7). Participants were presented with a message that promoted adherence to prostate screening behavior, specifically another exam (i.e., DRE) was promoted. In this study, I have investigated, with my coauthors, the effect that two factors have on the persuasiveness of the message: Whether the consequences of screening were framed in terms of potential gains, potential losses, or both; and whether the information relative to the presentation format of cumulative risk was communicated using only numerical information or also including a pictograph. The paternalistic approach was taken based on the recommendations that some associations (e.g., the European Association of Urology, the American Urological Association, and the American Cancer Society) give concerning prostate cancer screening, and on the literature that has suggested that screening using both the PSA test and a DRE detects a higher number of cancers (Bozeman et al., 2005; Carvalhal et al., 1999; Gosselaar et al., 2008; Okotie et al., 2007).

Since prostate cancer screening is a detection behavior, our results are in line with previous results based on prospect theory (Kahneman & Tversky, 1979;

Tversky & Kahneman, 1981). Indeed, we confirmed that participants exposed to loss-framed messages were more motivated to undergo a DRE than participants exposed to gain-framed messages. Furthermore, we assessed the effectiveness of a mixed-framed message (comprising both gain- and loss consequences, i.e., describing both the positive consequences of adherence to the message recommendations and the negative consequences of non-adherence), and we found that it was not more effective in persuading people to undergo the DRE than the loss-framed message. It seems therefore that the persuasiveness of the mixed-framed message was due mainly to the highlighting of the negative consequences that could arise in the case of non-testing. The results have also showed that the presentation format (numerical only or including also a pictograph) did not have an effect *per se*, rather that it modulated the framing effect. Indeed, the pictograph enhanced the intention to undergo a DRE when the message was gain-framed, consistent with our hypothesis that the pictograph has an additive effect on the intention to undergo a DRE. It is likely that this effect was observed only in the gain condition because of a ceiling effect in the mixed and loss conditions.

More generally, three issues should be considered when deciding whether or not to include the DRE in prostate cancer screening programs (Yossepowitch, 2008): The probability that a positive DRE would result in an unnecessary biopsy; the incremental benefits resulting from the use of both a DRE and the PSA as screening tests relative to using only the PSA; and the psychological effect of including a DRE on patients' willingness to participate in the screening program. While the first two issues can be addressed only by large scale randomized screening trials, the third one deals with more broad investigations about the acceptance and the intention to participate in screening programs that include the DRE. The results of the study presented in Chapter 7 indicate that loss-framed messages seem to be more persuasive than gain-framed messages in promoting the DRE, and that the inclusion of a pictograph representing the cumulative risk of prostate cancer seems to further increase willingness to undergo the DRE.

If the medical literature confirms the usefulness of both the PSA and the DRE in reducing the mortality resulting from prostate cancer, and a paternalistic approach is chosen, the message that seems to result in a higher willingness to undergo a

DRE is the message highlighting the potential harm deriving from not undergoing it, and showing the incidence by means of a graphic representation. On the other hand, if the scientific evidence does not confirm the benefits of prostate cancer screening in reducing the mortality resulting from prostate cancer, and an informed or shared approach to the decision making is chosen, the way in which information is presented to patients does not seem to have an effect on their decision. If, however, a “less is more” approach were to be applied to this decision, and information was only briefly presented, then the results from the first study of Chapter 6 suggest caution in the choice of the presentation format, or that at least further investigations are warranted.

## **9.6 Evaluating the Effect of Frame and Lexical Valence on Colon-cancer Screening Uptake**

The last study presented was conducted in collaboration with a local screening program for the prevention of colon cancer, an aspect that enabled the assessment of real screening behavior of patients (Chapter 8). Also in this study, the perspective taken was a paternalist approach, based on the evidence that colon cancer screening reduces mortality, therefore aiming at persuading participants to undergo a screening test (either colonoscopy or rectosigmoidoscopy). The variables manipulated in the message that was sent to potential participants were: the verbal framing (gain vs. loss) and the lexical valence (expressing the consequences with positive or negative terms).

Relative to prior research on framing effects in promoting health behaviors (e.g., O’Keefe & Jensen, 2009; Rothman & Salovey, 1997; Rothman et al., 2006), we introduced the distinction between the lexical valence of the terms used in expressing the consequences of the behavior advocated. For example, with the appropriate negations, it can be said that in case a tumor was found, the surgery would be a conservative surgery (positive valence) or a radical surgery (negative valence). The evidence supporting the relevance of this factor comes both from the attribute framing literature and from the language processing literature. On one hand, as cited in the introduction (see chapter 2.4), even single attributes can be framed in

a positive or negative perspective, for example, the lean *versus* fat content of beef (Levin & Gaeth, 1988), or survival *versus* mortality information (e.g., Marteau, 1989). Therefore, it is plausible to hypothesize that the way in which a single attribute is described in positive or negative terms affects judgments also when it is included in a broader message in which the frame of the consequences (or goal framing) is also manipulated. On the other hand, findings and theory in the domain of language processing support the idea that the lexical valence of the terms used in framing messages might be relevant as well (e.g., Wegner et al., 1981; Mayo, Schul, & Burnstein, 2004). Specifically, when processing a negated concept (e.g., not conservative surgery), first the concept itself is activated, and the processing of adverb occurs only later (Gilbert, 1991). According to the more common model of representation of semantic knowledge, concepts are organized in a semantic network (see Figure 8.2), in which the concepts are represented by nodes and the connections between concepts by links. Concepts which are closely related in meaning are also close in the semantic space. When the lexical form of a concept is activated, the activation spreads to connected concepts, and how far the activation spreads depends on the distance in the network (Collins & Loftus, 1975). Thus, when processing a negated concept (e.g., “not conservative”), the lexical form of the concept is activated first (i.e., “conservative”), spreading the activation to connected concepts (which in this case are positive), and the negation is processed only afterwards. Within this perspective, we advocate that framed messages expressed with the appropriate lexical valence should be used in promoting health behaviors. Specifically, gain-framed messages should be expressed with lexically positive terms, whereas the loss-framed message should be expressed with lexically negative terms. From the perspective of prospect theory, the use of concordant lexical valence terms would reinforce the perception of the message as a gain or a loss, thus strengthening the effect of the framed message on behavior.

On the one hand, both the literature regarding attribute framing and the psycholinguistic literature suggest that the lexical valence of the words used in messages is a relevant factor in their processing, in the judgments made based on them, and in the decisions taken based on them. On the other hand, this distinction has not been previously considered, neither in studies on framing effect, nor in the

meta-analyses conducted on them. The conclusion reached through the recent meta-analysis by O'Keefe and Jensen (2009) is that framing effects are weak, and that the overall effect is driven by the studies promoting breast cancer screening. However, they did not consider the lexical valence of the terms used. Therefore, their results may have been biased. One of the directions for future research is indeed to re-analyze the same studies and perform a meta-analysis which takes the lexical valence into account. As for now, I have analyzed 25 of these articles (see Chapter 8). Among those for which the text of the message was available, 16% used words of mixed lexical valence, 11% expressed the gain frame with positive valence terms and the loss frame in negative valence terms, 5% used both the frames and both the lexical valence terms, and 68% expressed both the gain and the loss frames in positive terms.

Thus, on the one hand, this analysis showed that previous studies have almost always used terms with a positive valence in both frames, with the loss-framed message obtained the gain one through the addition of negation terms. On the other hand, the evidence from psycholinguistics suggests that the use of concordant lexical valence would reinforce the perception of the message as a gain or a loss, thus strengthening the effect of the message on behavior. Moreover, previous findings have shown that the preventive *versus* detective nature of the behavior that is encouraged in the message determines which frame is more effective in convincing individuals to perform it. Specifically, loss-framed messages are more effective in promoting detection behaviors, and gain-framed messages are more effective in promoting prevention behaviors (Rothman & Salovey, 1997; Rothman et al., 2006; see Chapter 2, Paragraph 2.4.4). Two predictions follow from these premises: 1) when promoting a detection behavior, the usual pattern of the advantage in effectiveness of the loss-framed message (expressed with positive terms) relative to the gain-framed message (also expressed with positive terms) will be enhanced when using a loss-framed message with negative terms; and 2) when promoting a prevention behavior, the usual pattern of the advantage in effectiveness of the gain-framed message (expressed with positive terms) over the loss-framed message (expressed with positive terms) will be increased when using a loss-framed

message expressed with negative terms (i.e., the loss-negative message would be less effective in promoting the behavior relative to the loss-positive message).

Based on these predictions, we expected that, in promoting colon cancer screening, we would find an advantage of the loss-framed message over the gain one. We also expected that the loss message expressed with lexically negative terms would be more effective than the one expressed with lexically positive terms. This second prediction was supported by the data. However, the results showed that the loss-negative message was as effective as the gain-positive message in promoting colon cancer screening uptake. We propose that the explanation of this finding concerns the double function of colonoscopy and rectosigmoidoscopy. Indeed, these exams do not only allow for the detection of tumors, but they also enable the actual prevention of cancer, by removing polyps, which are precursors of the cancer itself (e.g., Winawer, 2007). Since we were not using a hypothetical scenario in an experimental setting, but real patients facing a real decision, for ethical reasons we also had to highlight this function of the screening tests in the message promoting them. Therefore, we think that the following would explain our results: The loss-framed message was effective in promoting the screening test as a detection behavior (and the higher effectiveness of the loss-negative message relative to the loss-positive one is in line with this proposal), whereas the gain-framed message was effective in promoting the screening tests as a preventive behavior. Previous findings have confirmed the differing effectiveness of the two frames depending on the nature of the behavior promoted, not only when promoting different behaviors (see Rothman & Salovey, 1997; Rothman et al., 2006), but also when promoting the same behavior, but specifically highlighting its preventive or detective nature (Chang, 2007; Cox et al., 2006; Rothman et al., 1999; Salovey & Wagner, 2003). This result has been confirmed in actual medical decisions for cancer screening as well. Indeed, when investigating the effect of message framing on Pap test utilization, the message emphasized either the prevention or detection function of the test (Rivers et al., 2005). The results confirmed that the same screening behavior was better promoted by the loss-framed message when its detection nature

was stressed, while it was better promoted by the gain-framed message when its prevention nature was stressed.

An alternative explanation of these findings would be in line with the conclusion reached by O’Keefe and Jensen (2009). They claimed that the framing effects are of a small size, and that the overall effect of framing is due to the subset of those investigating the promotion of breast cancer screening. Our finding that the loss-negative and the loss-positive messages were equally effective could, thus, be interpreted as a confirmation of their conclusion. However, we found a difference between the loss- and gain-framed messages expressed with positive terms, which is how they were more commonly expressed in the articles included in the meta-analysis. Moreover, the difference found between the effectiveness of the loss-positive and the loss-negative messages is in line with our predictions. Finally, since O’Keefe and Jensen (2009) did not consider lexical valence in their analysis, their conclusion could be biased by this uncontrolled factor. We think that future studies will be critical to test our explanation. In particular, the effect of manipulation of the lexical valence should be tested in situations that promote exclusively prevention behaviors and exclusively detection behaviors.

Another factor that was not considered in the meta-analysis, but which may be relevant, is the outcome measured. Indeed, previous studies have very often measured the intention to perform a behavior after having received a framed message (as we also did in Chapter 7). Although there is evidence that intention to engage in a behavior is the best testing the effect on real behaviors is essential. In the present study, we were able to test the effect of different messages on participants’ actual decisions. As previously noted, the goal of basic research is to ultimately inform application in real-world decisions, therefore the investigation of the impact of the context effect should not be limited to hypothetical scenarios or laboratory studies, but rather confirmed within real-world medical decision making.





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