How to communicate risks to the public?

Research on risk communication about the food safety of fresh produce

A dissertation submitted in fulfillment of the requirements for the degree of Doctor (PhD) in Political and Social Sciences: Communication Sciences

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NEDERLANDSTALIGE SAMENVATTING

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Risicocommunicatie staat voor grote uitdagingen wanneer oncontroleerbare risico's moeten worden gecommuniceerd. Risico's zoals nucleaire explosies, voedselveiligheidsrisico's, terroristische aanslagen of natuurrampen worden gekenmerkt door het feit dat mensen geen persoonlijke controle kunnen uitoefenen over het al dan niet voorkomen van het risico. Dit gebrek aan persoonlijke controle (c.q. lage self-efficacy) kan leiden tot negatieve emoties, welke kunnen resulteren in de afwijzing van de boodschap en/of onaangepast gedrag (Witte, 1992). Bij sommige van deze risico's (c.q. overstromingen en orkanen) kan de persoonlijke controle toenemen door informatie over zelfbeschermend gedrag te communiceren (bv. noodpakketten in huis hebben). Bij risico's zoals terroristische aanslagen of voedselveiligheidsuitbraken, is deze mogelijkheid er zo goed als niet.

Dit doctoraat focust op de communicatie over risico's waarbij (bijna) geen preventief gedrag kan gecommuniceerd worden. Niettegenstaande het onvermogen voor de consumenten om de risico's volledig te vermijden en slechts in beperkte mate te reduceren, blijft het belangrijk om deze risico's te communiceren. Niet enkel omdat consumenten het recht hebben te weten wat mogelijke bedreigingen zijn, maar ook omdat het belangrijk is consumenten goed te informeren en hen bewust te maken van mogelijke gevaren. Dit kan eventuele paniekreacties helpen vermijden wanneer een crisis (een aanval, voedseluitbraak of explosie) zich voordoet.

Aangezien er geen persoonlijke controle is en geen zelfbeschermend preventief gedrag, moet men vertrouwen op de overheid en autoriteiten om de veiligheid te garanderen. Dit benadrukt de rol van vertrouwen in de overheid bij oncontroleerbare risico's. Het belang hiervan wordt in dit doctoraat verder onderzocht. Een andere manier om om te gaan met het gebrek aan persoonlijke controle is het zoeken van informatie; ook dit zal onderzocht worden in deze dissertatie. Bovendien willen we niet dat risicocommunicatie-initiatieven leiden tot gedragsverandering, zoals dit normaalgezien wel is (Bv. stoppen met roken, mammografie laten uitvoeren, trager rijden). De bedoeling is dat mensen bewust worden gemaakt over de risico's, maar hun oorspronkelijk gedrag behouden (Bv. blijven naar het werk gaan, blijven groenten en fruit eten).

De onderzochte case in dit doctoraat zijn de opkomende risico's op verse groenten en fruit die rauw worden geconsumeerd. Niettegenstaande voedsel van dierlijke oorsprong nog altijd verantwoordelijk is voor het merendeel van de voedselvergiftigingen, blijkt uit een recente EFSA opinie (januari 2013) dat ook groenten en fruit in toenemende mate geassocieerd worden met voedselveiligheidsproblemen. Micro-organismen (bacteriën en virussen) en contaminanten (schimmeltoxines, pesticideresiduen, nitraten …) worden gezien als mogelijke dreigingen voor de voedselveiligheid van plantaardige producten. Klimaatsverandering en globalisering zijn twee factoren die een impact kunnen hebben op de veiligheid van verse groenten en fruit (Jacxsens et al., 2010).

Bij deze risico's kunnen sommige preventieve gedragingen gecommuniceerd worden zoals het wassen van handen voor en tijdens het bereiden van voeding, groenten en fruit goed spoelen met lopend water, de groenten en fruit bewaren in de juiste omstandigheden en voornamelijk het pellen of schillen van groenten en fruit. Dit kan tot op een bepaalde hoogte micro-organismen en contaminanten verwijderen, maar kan de risico's niet volledig elimineren. Als de groenten en fruit vroeger in de voedselketen werden besmet, kunnen de risico's niet afgewend worden door dit gedrag, aangezien alleen koken een adequaat middel is (EFSA, 2011).

De algemene onderzoeksvraag van dit doctoraat is:

Hoe kunnen de risico's op verse groenten en fruit effectief worden gecommuniceerd?

Het algemene doel van communicatie over de risico's op verse groenten en fruit is dus het bewustzijn hierover vergroten. Bovendien dienen deze communicatie-initiatieven om mensen voor te bereiden op een mogelijk crisis, zodat negatieve gevoelens tijdens een crisis kunnen verminderen wat op zijn beurt kan leiden tot een afname van de mogelijke negatieve effecten van een crisis zoals paniekreacties of het stoppen met eten van verse groenten en fruit.

Om de onderzoeksvraag te beantwoorden, werden vijf onderzoeken -zowel survey als experimenteel onderzoek- uitgevoerd.

Het eerste onderzoek wordt beschreven in ***hoofdstuk 2*** waar de impact van risicocommunicatie op de percepties van het publiek werd nagegaan. Menig beleidsmaker staat terughoudend tegenover risicocommunicatie uit schrik om angst op te wekken door het verspreiden van de boodschap (Sandman, 2006). Het gevoerde onderzoek toont aan dat deze vrees ongegrond is. De negatieve emoties zijn lager bij de

respondenten die een risicoboodschap ontvangen hebben dan bij deze die geen risicoboodschap hebben gelezen. Daarenboven bleek dat de intentie om groenten en fruit te blijven eten hoger is wanneer men risicocommunicatie heeft ontvangen dan wanneer geen communicatie plaatsvond. Dit effect werd volledig gemedieerd door 'negatieve gevoelens'.

Het effect van risicocommunicatie gevolgd door een crisis werd ook onderzocht, gebaseerd op de Inoculation theorie (McGuire, 1961). Deze theorie stelt, naar analogie met een griepvaccinatie, dat mensen zich zullen wapenen tegen een 'aanval' (c.q. een crisissituatie), wanneer men eerst 'gevaccineerd' werd met een lichte dosis van de mogelijke crisis. Vertaald naar risicocommunicatie kan het communiceren van risico's gezien worden als een vaccinatie tegen een mogelijke crisissituatie, welke kan resulteren in negatieve percepties van de consumenten tegenover het betrokken bedrijf, of de overheid in dit geval. De resultaten toonden aan dat het vertrouwen in de overheid hoger was wanneer risicocommunicatie heeft plaatsgevonden alvorens een crisis plaatsvond, dan wanneer alleen crisiscommunicatie plaatsvond. De toegeschreven verantwoordelijkheid aan de overheid voor de crisis was ook lager wanneer risicocommunicatie plaatsvond voor de crisissituatie. Bijgevolg werd in hoofdstuk 2 het belang van risicocommunicatie, al dan niet gevolgd door een crisissituatie, aangetoond.

Aangezien het risico op groenten en fruit zich wereldwijd kan voordoen, werd in ***hoofdstuk 3*** onderzocht of een gestandaardiseerde boodschap kan gebruikt worden om op Europees niveau te communiceren, of eerder nationale adaptatie van de boodschap aangewezen is. Om dit te onderzoeken werd dezelfde risicoboodschap naar vier verschillende landen gestuurd, namelijk Noorwegen, Spanje, Servië en België, en werd onderzocht of dezelfde reacties werden gevonden. De reacties werden onderzocht op basis van de volgende concepten: de cognitieve risicoperceptie, de emotionele reacties, het vertrouwen in de overheid, de subjectieve kennis t.o.v. het risico en de gedragsintenties na het lezen van de boodschap. De resultaten toonden het belang van nationale adaptatie aan, aangezien de individuele reacties per land t.o.v. deze concepten significant verschillen.

Daarnaast werd ook gekeken naar de voorspellende impact van zowel de cognitieve als de emotionele reacties op de gedragsintenties, zoals vooropgesteld in de Risk-as-feelings theorie (Loewenstein, Weber, Hsee, & Welch, 2001) en de Affect heuristiek (Finucane, Alhakami, Slovic, & Johnson, 2000). Uit de resultaten bleek dat de cognitieve reactie een

grotere voorspellende impact had op de gedragsintenties dan de emotionele reacties op de risicoinformatie over de voedselveiligheid van groenten en fruit.

Nu het belang van risicocommunicatie duidelijk werd gemaakt en aangetoond werd dat risicoboodschappen best nationaal worden aangepast, werd in de twee volgende hoofdstukken onderzocht hoe deze risico's het beste gecommuniceerd kunnen worden met betrekking tot de boodschapgeloofwaardigheid en gedragsintenties.

In ***hoofdstuk 4*** werd de effectiviteit van drie communicatiestrategieën nagegaan op de boodschapgeloofwaardigheid welke een belangrijke voorwaarde is alvorens er van boodschapaanvaarding kan gesproken worden. De gebruikte communicatiestrategieën waren levendigheid (vividness) in de vorm van een foto, ruimtelijke afstand vanwaar het risico kan plaatsvinden (gebaseerd op de Construal level theorie van Trope & Liberman, 2003) en de een- of tweezijdigheid van een boodschap. Deze communicatiestrategieën toonden hun belang reeds aan in strategische (risico)communicatie. Een vividness effect werd gevonden wanneer het centraal argument ook levendig werd voorgesteld, zoals aangetoond in eerder onderzoek (Guadagno, Rhoads, & Sagarin, 2011). Alleen wanneer een vividness effect plaatsvond, werd een impact van de andere communicatiestrategieën verwacht en gevonden. De hoogste boodschapgeloofwaardigheid werd gevonden wanneer het centraal argument levendig werd voorgesteld, met een ruimtelijke nabije afstand (c.q. Vlaanderen) in combinatie met een eenzijdige boodschap welke alleen het risico bevatte. Wanneer de ruimtelijke afstand groot was (c.q. wereldwijd) en een vividness effect plaatsvond, dan werd echter de hoogste boodschapgeloofwaardigheid gevonden wanneer de boodschap tweezijdig werd beschreven waar zowel het risico als de voordelen van groenten en fruit (c.q. boordevol vitaminen) werden vermeld.

Om na te gaan wat de impact is van de lage self-efficacy wanneer een risico moet worden gecommuniceerd en het feit dat het geruststellend deel alleen acties bevat die de overheid onderneemt om de veiligheid te trachten te garanderen, werd de studie in ***hoofdstuk 5*** opgezet. Wanneer het Extended Parallel Processing Model (EPPM) van Witte (1992) wordt gevolgd, bestaat een risicoboodschap steeds uit een dreigend deel dat de risicoperceptie verhoogt, gevolgd door een geruststellend deel waarin persoonlijke beschermingsmaatregelen worden gegeven om het gevoel van efficacy (c.q. zelfredzaamheid) te verhogen. Wanneer het EPPM wordt gevolgd zou een lage self-efficacy leiden tot boodschapverwerping (Witte, 1992). In dit onderzoek werd nagegaan

wat de impact is van het al dan niet expliciet vermelden van deze lage self-efficacy op gedragsintenties.

Aangezien in de onderzochte case geen persoonlijke beschermmaatregelen kunnen gecommuniceerd worden, en het geruststellend deel dus alleen kan bestaan uit de maatregelen die de overheid neemt, stelt de vraag zich of de presentatievolgorde van deze twee delen beter wordt omgedraaid, waarbij het geruststellend deel voor het dreigend deel komt. Uit de resultaten bleek dat de conventionele volgorde (dreiging gevolgd door een geruststelling) in combinatie met de expliciete vermelding van de lage self-efficacy leidde tot de hoogste gedragsintentie. De omgekeerde presentatievolgorde leidde tot de hoogste gedragsintenties wanneer de lage self-efficacy niet werd vermeld. Omwille van het recht om te weten wordt aangeraden om de conventionele presentatievolgorde te gebruiken met vermelding van de lage self-efficacy. Daarenboven werd het interactie-effect (presentatievolgorde X al dan niet vermelden van lage self-efficacy) op de gedragsintenties, volledig gemedieerd door 'negatieve gevoelens'.

In dit hoofdstuk werd ook het informatiezoekgedrag onderzocht om het gevoel van persoonlijke controle te verhogen (Griffin et al., 2008; Griffin, Dunwoody, & Neuwirth, 1999; Kahlor, 2010). Uit de resultaten bleek dat wanneer de lage self-efficacy expliciet vermeld werd en de dreigende informatie vermeld werd voor de geruststellende informatie, er een hogere intentie was om informatie op te zoeken wat kan duiden op het effect van het informatiezoekgedrag om een gevoel van controle te genereren. Dit effect werd niet gevonden op de intentie om geliefden te informeren.

In ***hoofdstuk 6*** worden *real life* reacties gerapporteerd van de *enterohemorrhagic Escherichia coli* (EHEC) O104:H4 uitbraak in Europa in mei/juni 2011. Dit artikel beschrijft de reacties van consumenten op online krantenberichten tijdens de EHEC uitbraak waarbij verschillende slachtoffers vielen in Europa. Het EPPM werd gebruikt als theoretisch kader en de belangrijkste concepten van dit model werden gemeten (c.q. efficacy, ernst van het risico, susceptibiliteit, negatieve gevoelens) samen met gedragsintenties om groenten en fruit te blijven eten, naasten op hoogte te brengen en de groenten en fruit beter te wassen.

De reacties werden verzameld door een link te plaatsen naar de survey onder Vlaamse online krantenartikelen die berichtten over de EHEC uitbraak. In totaal werd 9 dagen data verzameld, gebruik makende van 17 artikelen wat resulteerde in 6312 respondenten. Uit de resultaten bleek dat de ingeschatte ernst en susceptibiliteit, zoals

verwacht, hoog waren. De resultaten toonden ook aan dat vele respondenten veronderstelden dat ze het risico zelf konden voorkomen, wat het belang van risicocommunicatie over voedselveiligheid aantoont. Daarnaast werd een modererende rol gevonden van het vertrouwen in de overheid in interactie met de ingeschatte ernst, susceptibiliteit van het risico en efficacy op de intentie om groenten en fruit te blijven eten. Een hoger vertrouwen leidde steeds tot een hogere intentie om groenten en fruit te blijven eten. Daarnaast werden minder negatieve gevoelens ervaren wanneer het vertrouwen in de overheid hoog was dan wanneer het laag was.

Dit doctoraat toont het belang aan van risicocommunicatie, het belang van zowel cognitieve als emotionele reacties op een risicoboodschap over de veiligheid van groenten en fruit, alsook het belang van vertrouwen en informatiezoekgedrag wanneer een risico niet kan worden vermeden door het individu.

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CHAPTER 1:

Introduction

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1. UNCONTROLLABLE RISK COMMUNICATION

1.1. Risk communication: problem definition

Risk communication efforts face a great challenge when communicating uncontrollable risks such as nuclear explosions, emerging food risks, terrorist attacks, floods and hurricanes because of the lack of personal control. This lack of personal control can induce negative feelings, which in turn can lead to message rejection and/or maladaptive behavior (Witte, 1992). In some of these risks such as floods and hurricanes, personal control can be increased by providing self-protective behaviors. In other risks such as terrorist attacks and the emerging food risks personal control cannot be increased.

In this dissertation we will focus on the communication about risks for which there is (almost) no preventive behavior. The reason these risks need to be communicated is not only because of consumers' right to know about potential hazards, but also to make people aware about these potential risks, which might help to avoid panic reactions if a terrorist attack, nuclear explosion or foodborne outbreak would occur. Furthermore, we do not want people to change their current behavior (e.g., keep on eating fresh produce, keep on going to work). Hence, we will look into the effect of risk communication strategies on the intention to maintain their current behavior.

When personal control is low, individuals have to rely on the government and authorities to try to guarantee (food) safety. This lack of personal control increases the importance of trust in the government. Therefore, this dissertation stresses the role of trust in authorities as a means to enhance the feeling of safety of the consumers. Another way to uplift the feeling of personal control is by information seeking, which will also be assessed in this dissertation.

This dissertation will focus on the case of the emerging food risks on fresh produce. In this case some protective behaviors can be provided (e.g., rinsing, keeping cool). However, if the fresh produce was contaminated earlier in the food chain, the risks cannot be completely circumvented by these behaviors. In the next part, we will describe the case in more detail, but first the general research question and the structure of Chapter 1 will be discussed.

The main research question of this dissertation is:

How can the risks on fresh produce be effectively communicated?

In order to answer this research question, we first investigate the effectiveness of risk communication. Next, it will be investigated whether these food risks can be communicated on a global level or should be adapted on a national level. We also address the impact of different communication strategies (vividness, psychological distance and message sidedness) on message credibility. Furthermore, the impact of the presentation order of the threatening and reassuring information, in combination with explicit information about the low personal control to circumvent the risk on message effectiveness, will be assessed. Finally, real-life reactions of consumers to the *enterohemorrhagic Escherichia coli* (EHEC) O104:H4 outbreak in May/June 2011 will be discussed.

In what follows in this introduction chapter, the specific food safety case will be described, followed by outlining the risk communication research field. Risk perception and its influencing factors will be discussed. In addition, we will look into different theoretical frameworks which all have proven their importance in the field of risk communication, and which can explain people's reactions to risk messages. The first frameworks are the Affect heuristic (Slovic, Finucane, Peters, & Macgregor, 2004) and Risk-as-feelings perspective (Loewenstein, Weber, Hsee, & Welch, 2001), which both stress the important (direct) role of affect and feelings in risk communication. The threat appeal model, the Extended Parallel Processing Model (EPPM) (Witte, 1992), will also be discussed. The EPPM has been proven very effective in risk and health communication. The EPPM stresses both the influence of feelings in reactions towards a risk message, and the cognitive appraisal of perceived risk. However, it also stresses the importance of efficacy (i.e., the feeling of personal control), which is low when communicating uncontrollable risks. Two strategies to cope with the low feeling of personal control will then be covered: 1) the importance of trust and credibility and 2) the intention to seek information. After this overview, we will look into four communication strategies which have been frequently used in risk and health communication: presentation order, vividness, psychological spatial distance, and message sidedness. We finish this introduction by describing the research questions which will be addressed in this dissertation, followed by the dissertation outline. In **Figure 1**, a schematic overview can be found of the content of this introduction.

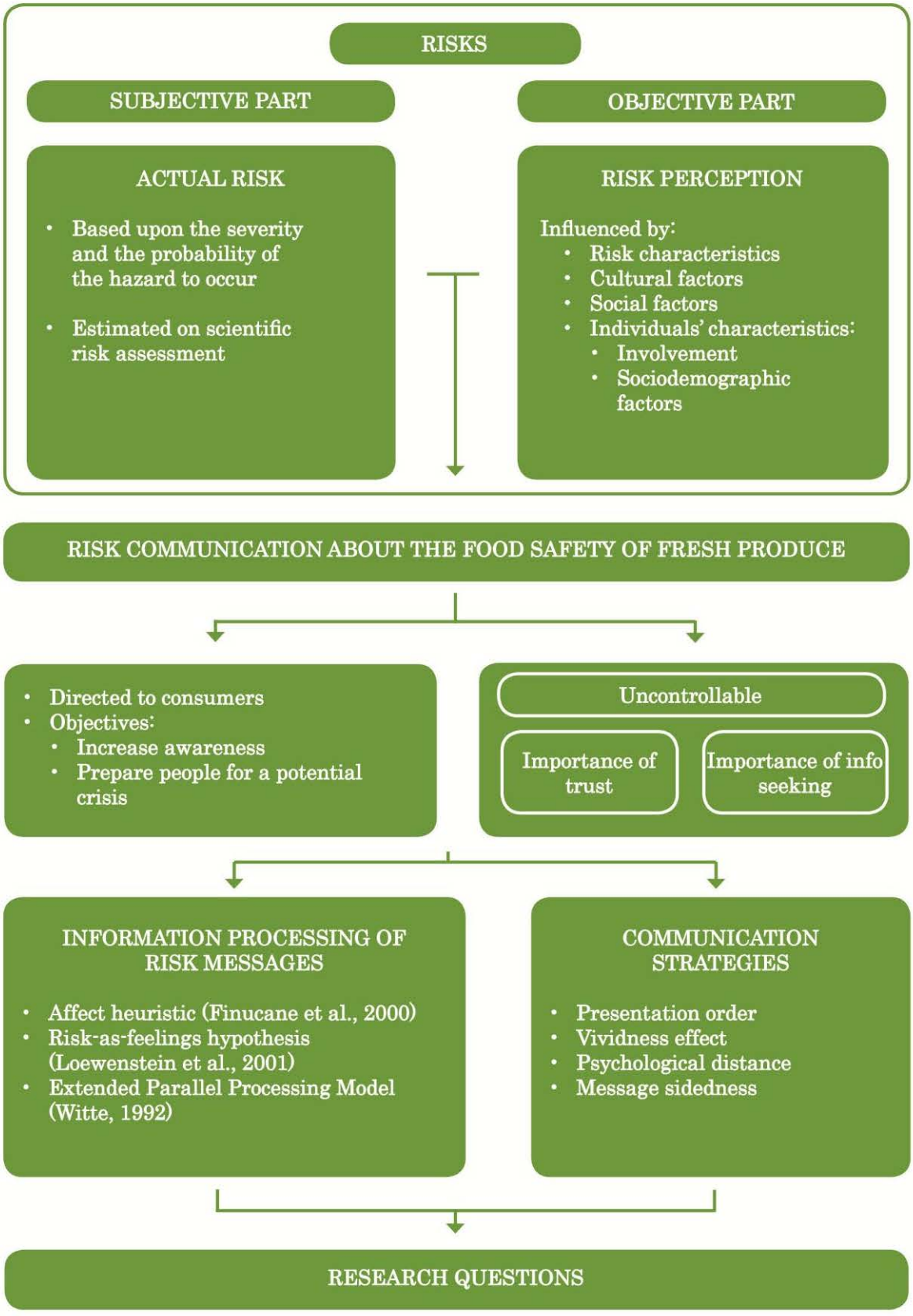

Figure 1 - Schematic overview of the introduction

1.2. Risk communication about the safety of fresh produce

Today, consumers expect absolute food safety. These high expectations were stimulated by the rigorous enforcement of regulations by the U.S. Food and Drug Administration (FDA), by the European Commission, and by local competent authorities (Kher et al., 2013; Kuttschreuter, 2006; Van Kleef et al., 2007; WHO, 2013; Wilcock, Pun, Khanona, & Aung, 2004). However, as Wilcock et al. (2004) state: *"absolute safety is just not possible"*. Food control systems cannot deliver a completely risk-free food supply (Houghton et al., 2008; WHO, 2004).

Recently, an increasing number of food safety incidents occurred such as the dioxin crisis in Belgium in 1999, the EHEC O104:H4 outbreak in May/June 2011 in Europe, the *Listeria* outbreak on cantaloupe in the same period in the United States, and the outbreak in Belgium of the EHEC O157 on raw prepared minced meat in June 2012. These outbreaks can have a direct economic impact due to a decrease in sales, import ban, food recalls, culling of animals, production drop, etc. (Calvin, 2007; De Jonge, van Trijp, Renes, & Frewer, 2007; Kuttschreuter, 2006; Wentholt, Fischer, Rowe, Marvin, & Frewer, 2010). Furthermore, a loss of trust and confidence in the product, food safety, the food safety management and the government have been associated with these outbreaks (De Jonge et al., 2007; Houghton et al., 2008; Kher et al., 2013; Pennings, Wansink, & Meulenberg, 2002; Van Kleef et al., 2007; Verbeke, Frewer, Scholderer, & De Brabander, 2007; Wentholt et al., 2010; Yeung & Morris, 2006).

Foodborne diseases and outbreaks remain a persistent problem and a major international public health concern (Kher et al., 2013; Kuttschreuter, 2006; WHO, 2013). Although food of animal origin remains responsible for the majority of food outbreaks, research showed that nuts, fruits and vegetables are increasingly associated with large outbreaks (EFSA & ECDC, 2012; EFSA, 2013; Jacxsens et al., 2010; Lynch, Tauxe, & Hedberg, 2009; Sivapalasingam, Friedman, Cohen, & Tauxe, 2004; Tobin, Thomson, & LaBorde, 2012). The European FP 7 Project Veg-i-Trade entitled: "*Impact of Climate Change and Globalization on Safety of Fresh Produce. Governing a Supply Chain of Uncompromised Food Sovereignty"* investigates the food safety of fresh produce, that is, fresh fruits and vegetables. It is coordinated by Ghent University, and assesses the impact of globalization and climate change on the food safety of fresh produce. This assessment is done by studying the organizational and economic structure of the fresh produce global market in order to assess the importance of potential microbiological (bacteria and viruses) and chemical (mycotoxins and pesticide residues) risks. The

project aims to develop strategic control measures and to formulate recommendations for best practices to minimize potential risks in the fresh produce supply chain.

Climate change and globalization are two factors that can impact the emergence of food safety hazards (ECDC, 2012; EFSA & ECDC, 2012; Jacxsens et al., 2010; Tirado, Clarke, Jaykus, McQuatters-Gollop, & Frank, 2010). Climate change can lead to an increase of extreme weather events such as heavy rainfall, more prolonged and seasonal droughts and/or increased temperature, may lead to the introduction of harmful micro-organisms and contaminants on fresh produce pre- and post-harvest. The globalization of the production chain and the international trade of fresh produce can impact the occurrence of microbiological and chemical risks worldwide. Global sourcing of fresh produce including import from low cost countries with other climate conditions, other production practices and lack of knowledge in hygiene measures and control may lead to the introduction of food safety hazards in European food products (Florkowski, 2008; Klontz, Klontz, Mody, & Hoekstra, 2010). At present, the EU is the largest importer and exporter of fresh produce in the world (Dorling, Newman, & Barford, 2008).

The main food safety hazards of fresh produce, consumed raw, are micro-organisms and contaminants (Van Boxstael et al., 2012). Microbiological contaminations are bacteria such as *Salmonella*, and viruses such as norovirus. The contaminants are substances that are normally not present on fresh produce, such as pesticide residues and toxins created by mold (mycotoxins) (Wilcock et al., 2004).

In case of microbiological contamination, the impact on human health has a quick, short term, onset of symptoms such as acute diarrhoeal illnesses, more severe diseases such as Haemolytic Uraemic Syndrome (HUS) leading to kidney failure or in worst case, mortality. The contaminants can lead to more chronic diseases that only emerge on a long term, such as cancer (Kher et al., 2013; Weisenburger, 1993).

Washing hands before and after eating fresh produce, along with thoroughly rinsing, peeling if possible and storing it at cool temperature can reduce the risks to a certain extent. However, the risks cannot be completely circumvented by consumers because of the absence of an adequate heat treatment to remove the contaminants and micro-organisms before consuming fresh produce that is eaten raw (EFSA, 2011). Hence, these risks on fresh produce cannot be completely avoided by the consumer, which consequently leads to low personal control to prevent the risk from happening.

Individuals depend on the fresh produce supply chain actors (from farm to retail/catering) and authorities at the regional and/or national level to undertake actions

to guarantee food safety. These actions are for example, intensified inspections and surveillance programs to monitor and potentially detect and eliminate the pathogenic bacteria from the market; more stringent adherence and attention for 'best practices', and respect of hygiene in agricultural production, processing, trade and distribution of food. This aspect stresses the role of trust in the government, which is an important factor in risk communication.

The general goal of risk communication about the emerging food risks is to increase awareness about the risks. Furthermore, these risk communication efforts want to prepare people for a possible crisis in order to decrease the potential negative effects of a crisis such as panic reactions or keep from eating fresh produce. Fresh produce is an important part of a healthy, daily diet, so it is important that people do not refrain from eating it.

2. RISK, RISK COMMUNICATION AND RISK PERCEPTION

2.1. Defining risk communication

Risk communication research is founded in risk analysis studies (Heath & Palenchar, 2000; Sellnow & Sellnow, 2010). Risk analysis is composed out of three integrated, but theoretically functionally separated components: risk assessment, risk management and risk communication (Amendola, 2001; FAO/WHO, 1997, 1999; Houghton et al., 2008; Renn, 2006; Van Kleef et al., 2007; Verbeke et al., 2007). In **Figure 2** the structure of risk analysis is visualized.

Risk assessment in risk analysis on food safety is, as defined by FAO/WHO (1999), "*the scientifically based process consisting of the following steps: (i) hazard identification, (ii) hazard characterization, (iii) exposure assessment, (iv) risk characterization.*" Within the scientific risk assessment, there is a difference between a risk and a hazard. A ***hazard*** (related to food) is a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect (FAO/WHO, 1999). A ***risk*** (related to food) is a function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard(s) in food (FAO/WHO, 1999).

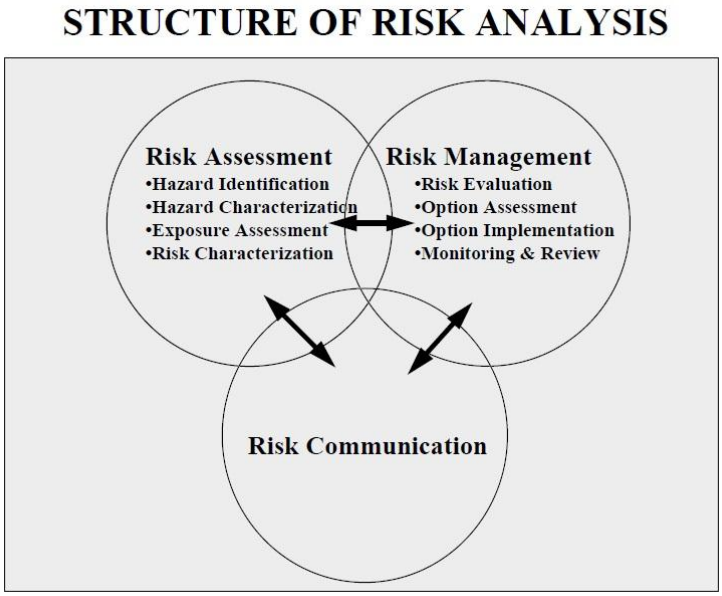

Figure 2 - The structure of Risk Analysis (Source - FAO/WHO, 1997)

Hence, a hazard is related to the possibility that it will cause an adverse health effect, whereas a risk is more related to the probability and the severity that the hazard will occur and will cause harm to a person. So, a hazard can always linger, but the risk can be minimized thanks to risk analysis efforts. For example, if there is a hole in the street, there is a hazard of falling into the hole. When the hole is barricaded with barriers then the hazard will remain, but the risk is minimized.

Risk assessment is more located in the area of natural sciences (Verbeke et al., 2007), and it focuses on estimating the risk that a hazardous event will negatively affect a population or subpopulation (Houghton et al., 2008; Van Kleef et al., 2007). Risk assessment seeks answers to questions such as: *"How high is the risk? What possibilities are there to further reduce a risk rated as being unacceptable and, if possible, to avoid or minimize it?"* (Renn, 2006).

Risk management "*is the process of weighing policy alternatives in the light of the results of risk assessment and, if required, selecting and implementing appropriate control options, including regulatory actions"* (FAO/WHO, 1997, 1999). Risk management is mainly related to politics and legislation (Verbeke et al., 2007). The primary goal is the protection of public health by controlling risks as effectively as possible through the selection and implementation of appropriate actions, such as control options and regulatory measures (FAO/WHO, 1997; Houghton et al., 2008; Van

Kleef et al., 2007). The questions risk management aims to answer are: *"How acceptable is the assessed risk? And is the risk tolerable or not?"*.

Risk communication is mostly situated in the domain of social sciences (Verbeke et al., 2007), and its activities have obvious implications for the perception of risks and the evaluation of risk management (Van Kleef et al., 2007).

As can be seen, the different components of risk analysis show some overlap, and all components interact with each other, stressing the importance of communication in risk analysis. Information that is gathered in the technical risk assessment needs to be communicated to the policy makers to make sound decisions, as to the public to make the public aware about the potential risks. In turn, the public can express their concerns and opinions about these risks. When risk management and policy decisions are made, this needs to be communicated to the public, and the public can in turn express their opinion about these decisions.

Risk communication is defined by FAO/WHO (1999) in risk analysis as *"the interactive exchange of information and opinions concerning risk and risk management among risk assessors, risk managers, consumers and other interested parties"*. However, different risk communication definitions can be found in reports of official agencies such as the World Health Organization, Food and Agricultural Organization (FAO/WHO, 1997, 1999), the European Parliament and the Council of the European Union (European Parliament and Council, 2002) and the National Research Council of the United States (NRC, 1989, p. 21). In scientific research articles, different definitions on risk communication can be found as well (Covello & Sandman, 2001; Covello, von winterfeldt, & Slovic, 1986; Leiss, 1996; McComas, 2006; Renn & Levine, 1991).

An important characteristic that return in most of the definitions is for example the *"interactivity"*. Hence it is not one-way communication, not solely educating the public, a top down approach, but it is a constructive two-way dialogue. Another characteristic involves the exchange of *"information and opinions"* among governments, agencies, scientists, corporations, industry groups, and the individual citizen. This description stresses the fact that not only objective data will be interchanged but also the perceptions and opinions of the public and "*all other interested parties",* which is the final characteristic.

This overview shows the importance of understanding the public and all other interested parties, and how they perceive risks in order to communicate effectively (Kennedy, Delaney, Hudson, McGloin, & Wall, 2010). As concluded by Hampel (2006, p. 9): *"Risk*

communication is not just information but a process where a reflexive mode increases the probability that it leads to mutual understanding".

In our opinion, the following definition of risk communication covers the meaning of risk communication best. It is based on different definitions (Covello et al., 1986; Leiss, 1996; McComas, 2006):

> *Risk communication is the interactive, iterative exchange of information, risk evaluations and opinions between interested parties (i.e., governments, scientists, corporations, interest groups, and the general public), to obtain a certain objective.*

None of the reviewed definitions included the last part of the definition *"to obtain a certain objective"*. We feel it is an important aspect, since one does not merely communicate for the sake of communication, but rather to obtain a certain objective. This aspect will be discussed in more detail in the following part.

2.2. Objectives of risk communication

Renn and Levine (1991) provide an overview of the variety of different objectives of risk communication. **Table 1** presents an overview of these objectives. The superscripts indicate other sources that also discuss (some of) these goals.

The European Food Safety Authority (EFSA) defines the ultimate goal of risk communication as: *"assist stakeholders, consumers and the general public in understanding the rationale behind a risk-based decision, so that they may arrive at a balanced judgment that reflects the factual evidence about the matter at hand in relation to their own interests and values"* (EFSA, 2012: p. 4).

Table 1 - Overview of objectives of risk communication in relation to the different functions (Based on Renn & Levine, 1991)

Function of risk communication	Objectives
Enlightenment function	To improve risk understanding among target groups, (and providing reassurance) [a, b, c, d, f, h, i]
Right-to-know function	To disclose information about hazards to potential victims [i, j]
Attitude change function	To legitimate risk related decisions, to improve the acceptance of a specific risk source, or to challenge such decisions and reject specific risk sources [a, j]
Legitimation function	To explain and justify risk management routines and to enhance the trust in the competence and fairness of the management process [c, d, h]
Risk reduction function	To enhance public protection through information about individual risk reduction measures [b]
Behavioral change function	To encourage protective behavior or supportive actions toward the communicating agency [b, c, f, g, i]
Emergency preparedness function	To provide guidelines for emergencies or behavioral advice during emergencies, (and increasing awareness) [a, b, f, h, g]
Public involvement function	To educate decision makers about public concerns and perceptions [e]
Participation function	To assist in reconciling conflicts about risk-related controversies [c]

[a] (Hansen, 2003), [b] (Palenchar & Heath, 2007), [c] (Hampel, 2006), [d] (Heath & Abel, 1996), [e] (Blanchemanche, Marette, Roosen, & Verger, 2010), [f] (Covello & Sandman, 2001), [g] (Keller, Siegrist, & Gutscher, 2006), [h] (Ter Huurne & Gutteling, 2009), [i] (Reynolds & Seeger, 2005), [j] (Nathan, Heath, & Douglas, 1992)

In this dissertation, the following objectives are applicable to the emerging food risk communication efforts:

1. The *enlightenment function* is necessary to make the people aware about the potential risks on fresh produce. By increasing their understanding, the perceived feeling of control due to information sufficiency can be achieved.
2. Furthermore, the *right-to-know function* is definitely applicable to the emerging food risks on fresh produce. Since the consumers themselves cannot completely prevent the risk from happening, one could wonder why it should be communicated in the first place. However, individuals have the right to know what potential hazards there are.
3. The *behavioral change function* is only partly applicable, because the consumers do need to become aware and execute the preventive measures they can take to minimize (but not circumvent) the risk (e.g., cool storage, profound rinsing, etc.). However, by communicating the risks we do not want them to change their current behavior (eating fresh produce), in contrast to many other risk communication efforts such as communicating anti-speeding risk messages to avoid traffic fatalities (Panić, Cauberghe, & De Pelsmacker, 2011). When communicating the emerging food risks on fresh produce, we want to make consumers aware about the possible risks, but we also want them to maintain their current behavior, that is, keep on eating fresh produce because it is part of a healthy daily diet.
4. The *emergency preparedness function* can also be applied partly to this case. By making people aware about the emerging food risks and the possible presence of the hazards on fresh produce, we want to prepare them for a possible crisis. This way, we want to try to avoid a food scare and unwanted reactions during a crisis period (i.e., a foodborne outbreak) such as panic and fear which keeps them from maintaining their behavior (Witte, 1992). This aspect can be explained by the Inoculation theory, which follows the analogy of a flu vaccine, stating that when individuals are inoculated against a possible crisis (increasing awareness – cf. the vaccine), they will be able to cope with the crisis (cf. the virus) (McGuire, 1961).

2.3. Risk perception and its influencing factors

Essential to the understanding of risk (and the practice of risk communication), is that risk involves both objective and subjective qualities. Risk judgments are, to some degree, a by-product of social, cultural, and psychological influences (McComas, 2006; Slovic, 1999). Hence, the definition of risk is different for non-scientists and scientists. *"For experts, risk is an object of knowledge, a calculation of probabilities; for the public, risk is an experience, a feeling"* (Blanchemanche et al., 2010, p. 287).

To understand the gap between experts and lay people's differences in perceptions, risk perception research was developed (Baron, Hershey, & Kunreuther, 2000; Bickerstaff, 2004; Hohl & Gaskell, 2008). At the beginning of risk communication and risk perception research, lay people's risk perception was seen as irrational, excessive, illogical, and as public ignorance (Bickerstaff, 2004; Hansen, 2003). In this traditional view, it was concluded that this irrationality was caused by lack of knowledge or a poor understanding of the technical aspects. Therefore, lay persons were not able to make an objective risk assessment, as is being done in the expert's technical risk assessment (Bickerstaff, 2004; Hansen, 2003; Rogers, Amlôt, Rubin, Wessely, & Krieger, 2007). The technical risk assessment refers to risk as defined by experts and is based on the probability of the risk and on the probability of fatality, (i.e., severity) (Bickerstaff, 2004; Blanchemanche et al., 2010; Nathan et al., 1992; Renn & Levine, 1991; Renn, 2006; Slovic, 1999; Yeung & Morris, 2006).

Hence, it was considered important that the "correct" scientific knowledge and objective risk assessment was educated to the public to change the lay misperceptions or misunderstandings of the objective risk (Bickerstaff, 2004; Frewer, 2000). This approach exemplifies what has been labelled the "knowledge deficit" model, also referred to as the "knowledge gap" or "cognitive deficit" model (Bickerstaff, 2004; Hansen, 2003; Van Kleef et al., 2007). The knowledge deficit model was characterized by one-way communication. It aimed at educating the "dumb" people in order to bridge the knowledge gap, to make them understand the serious, real risks which they should attend to, and to avoid being too scared about modest risks (Frewer, 2000; Nathan et al., 1992). This traditional knowledge model neglects the role of trust in institutions and sources, the importance of an interactive exchange of information, the importance of individual differences when responding to risk messages, and above all, it neglects the importance of psychological factors influencing the differences in risk perception. Therefore, it only considers the difference as a knowledge gap.

Lay people do not act irrationally, even though they may appear to do so. Instead, they use a different rationality and consider other qualitative characteristics of the risk than the purely technical risk assessment (Heath & Abel, 1996; Nathan et al., 1992). Lay people apply their own subjective evaluations to assess a risk, and they perceive risks as a qualitative and complex, situational sensitive, multidimensional phenomenon (Bickerstaff, 2004; Blanchemanche et al., 2010; Fischhoff, Slovic, Lichtenstein, & Read, 1978; Hampel, 2006; Hansen, 2003; Hohl & Gaskell, 2008; McComas, 2006; Nathan et al., 1992; Slovic, 1991, 1999; Verbeke et al., 2007). Therefore, it is argued that both experts and lay perspectives need to be incorporated into risk analysis activities (Hohl & Gaskell, 2008; Kher et al., 2013).

Different influencing factors of risk perception exist. These factors influence both the perceptions of the public as well as those of the scientists (Slovic, 1999). These influencing factors are based on a) risk characteristics, b) social factors, c) cultural factors. Hence, risk perception is multi-dimensional and influenced by complex social, political psychological and cultural processes (Bickerstaff, 2004; Dosman, Adamowicz, & Hrudey, 2001; Hampel, 2006; Hansen, 2003; Renn, 2006; Sjöberg, 2000a; Yeung & Morris, 2006).

2.3.1. Risk characteristics

The insights on the characteristics of risks that affect people's subjective feelings of being at risk, stem from the work of Slovic, Fischhoff and their colleagues on the psychometric paradigm (Finucane, Alhakami, Slovic, & Johnson, 2000; Fischhoff et al., 1978; Slovic, Fischhoff, Lichtenstein, & Roe, 1981; Slovic, 1987, 1991). This paradigm was developed in the late 70's and has originated in cognitive psychology (Hansen, 2003; McGloin, Delaney, Hudson, & Wall, 2009). It helps to clarify how the lay public interprets, understands and responds to general risks (Slovic, 1991) as for food related risks (Fife-Schaw & Rowe, 1996; Frewer & Miles, 2003; Sparks & Shepherd, 1994).

To identify which characteristics influenced which kinds of risks, the researchers (Fischhoff et al., 1978; Slovic, Fischhoff, & Lichtenstein, 1985; Slovic, 1987) gave respondents different sets of risks and they needed to rate these risks on eighteen characteristics. This approach resulted in two dimensions that influence the public reactions towards different types of risk: the perceived control over the risk, that is, "dread risk", and the perceived knowledge about the risk, that is, "unknown risk".

The first dimension, *"dread risk"* is defined by the extent of perceived lack of control, feelings of dread, perceived catastrophic potential, severity of the consequences involuntariness, increasing probability of occurrence, dangerous to future generations and the inequitable distribution of risks and benefits (Bickerstaff, 2004; Breakwell, 2000; Dohle, Keller, & Siegrist, 2010; Peters, Burraston, & Mertz, 2004; Siegrist, Keller, & Kiers, 2005; Slovic, 1991). Nuclear weapons are typical examples of dread risks (Bouyer, Bagdassarian, Chaabanne, & Mullet, 2001). The characteristics linked to dread risks trigger our emotional early warning system, in which our heart rate speeds up and makes us anxious (Weber, 2006).

The second dimension, *"unknown risk"* is related to the knowledge about the risk, the extent to which a hazard is judged to be unobservable, unknown, new to science, familiar, and delayed in producing harmful impacts (Bickerstaff, 2004; Breakwell, 2000; Dohle et al., 2010; Peters et al., 2004; Siegrist, Keller, et al., 2005; Slovic, 1991). Chemical technologies are an example of unknown risks.

In **Figure 3**, the two-dimensional space of different hazards is demonstrated. In **Figure 4**, the different characteristics are placed on the two axes. As can be seen, nuclear power and DNA technology scored high on both factors, and higher than other technologies which shows the focus of the public concern at that time. The place of these technological risks in the two-dimensional space can fluctuate, for instance when people start to know more about these risks, when they obtain more positive experiences, etc. Everyday risks such as car and bicycle accidents, scored low on both dimensions. Pesticides are situated in the middle of the upper half of "unknown", and are positioned at the side of "dread" risk.

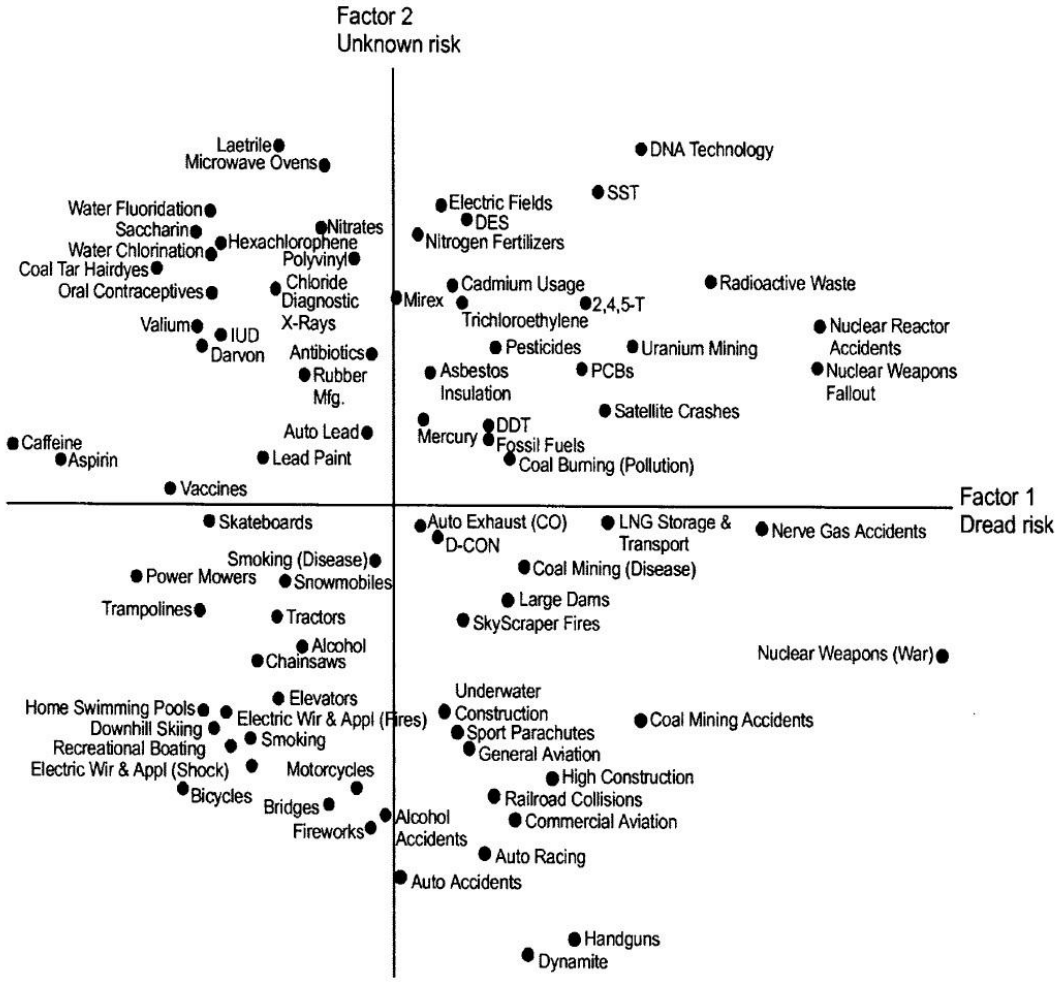

Figure 3 - Two-dimensional space of the different hazards (Source: Slovic, 1991)

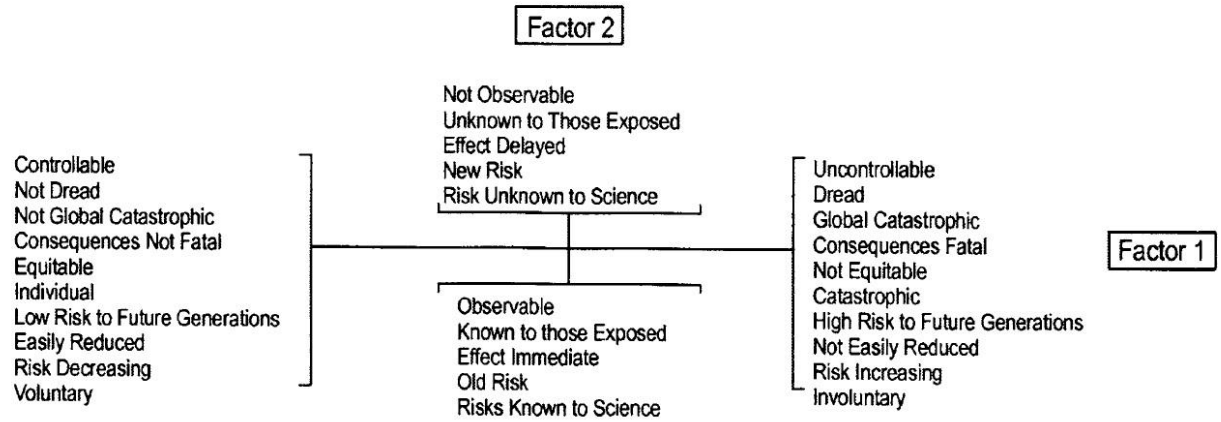

Figure 4 - Combination of characteristics (Source: Slovic, 1991)

Both dimensions influence the perception of the risk (Das, 2011; Fischhoff et al., 1978; Hampel, 2006; Renn, 1998), with the dimension 'dread' having the most impact on risk perception (Bouyer et al., 2001; Covello, von winterfeldt, & Slovic, 1987; Das, 2011; Fischhoff et al., 1978; Slovic, Finucane, Peters, & Macgregor, 2007; Slovic, 1991). Risks that score high on both dimensions (risks which are uncontrollable, potentially catastrophic, novel, unobservable, etc.) lead to a higher risk perception (Das, 2011; Fischhoff et al., 1978) which in turn can influence the people's behavioral intentions (Witte, 1992).

The psychometric paradigm has also been applied on the specific domain of *food risks* (Fife-Schaw & Rowe, 1996; Sparks & Shepherd, 1994). The results showed that the same dimensions could be found with regard to food safety which they labeled "severity" (similar to "dread risk") and "awareness" (similar to "unknown risk") (Fife-Schaw & Rowe, 1996; Sparks & Shepherd, 1994).

Dietary and nutritional risks (such as high-fat and alcohol consumption), were rated low on both dimensions (Sparks & Shepherd, 1994). Microbiological risks were rated high in the 'severity' scale, but were considered rather known (Fife-Schaw & Rowe, 1996; Sparks & Shepherd, 1994) which is in line with the results of Dosman et al. (2001) who showed that food safety risks, (i.e., pesticides on food, food bacteria and food additives) are perceived by the consumers as moderate-to-high risks. Technological risks such as hormones, pesticides were rated relatively high (Sparks & Shepherd, 1994). Kher et al. (2013) also found that both microbial as chemical contaminants were associated with the potential to have severe consequences. Hohl & Gaskell (2008) showed that people worried the most about chemical contamination, compared to microbial contaminants, as did Kher et al. (2013). The latter is in line with the extra characteristic that Fife-Schaw and Rowe (1996) investigated, that is, "manmade" (naturalness), which plays an important role when food risks are being perceived. Sjöberg (2000a, 2000b) also found the factor "naturalness" as a third dimension when assessing the general risks, as did Breakwell (2000) when applying it only to food risks. Naturalness is the extent to which the hazard was considered naturally occurring versus a product of human interference (Breakwell, 2000). Unnatural risks are perceived as more risky than natural risks (Covello & Sandman, 2001; Hampel, 2006). Furthermore, risks are seen as more familiar when it is a natural risk than when it is a manmade (unnatural) risk (Fife-Schaw & Rowe, 1996; Renn, 2006).

When applying the psychometric paradigm to food risks, the specific features of food need to be taken into account. For example, food is required for life and survival, and we cannot escape it as it becomes part of the consumer's body on a daily basis (Jung, 2006; Kuttschreuter, 2006; Lofstedt, 2006). Fife-Schaw and Rowe (1996) state that we can always withhold eating some kind of food. However, we can never stop eating in general, and with regard to fresh produce, it is part of a healthy diet so it would not be healthy to refrain from consuming it.

Another feature is that food has immediate and obvious anticipated benefits (Fife-Schaw & Rowe, 1996). However, fresh produce can contain risks, as can meat and fish. The inequitable distribution of risks and benefits, as part of the "dread risk" dimension, can influence the perceived risk. Furthermore, many of the risks have an impact on human health. However, the consequences of eating contaminated food are not always immediately visible (cf. cancer on the long run) and if they are immediately visible, they are often being assessed to another cause (e.g., having a stomach flu) (Fife-Schaw & Rowe, 1996). This aspect is part of the "unknown risk" dimension. People appear more concerned when the effects of the risk appear immediate than when there is a delayed effect. (Hampel, 2006; McGloin et al., 2009). The increase of foodborne outbreaks in recent years, can induce the feeling of personal experience with food risks, which –as part of the dimension "unknown risk"– can have an impact on risk perception (Ding, Veeman, & Adamowicz, 2013; Loewenstein & Lerner, 2003; Terpstra, Lindell, & Gutteling, 2009).

People do perceive general food risks as familiar (Breakwell, 2000; Eurobarometer, 2010). However, emerging diseases and outbreaks such as SARS or avian flu HN51, create frightening scenarios of widespread harms to the public health (Reynolds & Seeger, 2005). The EHEC outbreak undoubtedly belongs to this list as well, since fresh produce is generally perceived as healthy and not associated with food risks (Eurobarometer, 2010). These emerging risks include organisms that cannot be seen, and symptoms that have not been evident before in the general population (Reynolds & Seeger, 2005), such as HUS in case of the EHEC outbreak. In addition, the risks are new to the public, include therefore low familiarity, are seen as unnatural and exotic, create high levels of uncertainty, which can in turn increase risk perception (Reynolds & Seeger, 2005).

Furthermore, the specific risks on fresh produce cannot be completely controlled by the consumers, so it will score high on the more affective dimension "dread". This dimension

is, mainly influenced by the characteristic controllability, besides the feelings of dread (i.e., feelings of fear, concerns that something bad is going to happen).

The two-dimensional model has been widely cited, replicated, and validated in various countries (Bickerstaff, 2004; Bouyer et al., 2001; Breakwell, 2000; Covello & Sandman, 2001; Frewer & Miles, 2003; Griffin, Dunwoody, & Neuwirth, 1999; Hampel, 2006; Hansen, 2003; Heath & Abel, 1996; Hohl & Gaskell, 2008; Kahlor, 2010; Kennedy et al., 2010; Kher et al., 2013; Lu, Xie, & Zhang, 2013; McComas, 2006; McGloin et al., 2009; Palenchar & Heath, 2007; Renn, 1998; Siegrist, Gutscher, & Earle, 2005; Sjöberg, 2000a; Slovic, 1991; Terpstra et al., 2009; Trumbo & McComas, 2003; Williams & Bolanle, 1998).

Nevertheless, the psychometric paradigm should be used with care, since individuals' perceptions are influenced by psychological, societal and cultural factors. It could therefore be that several "cognitive" maps are needed to explain the full variance of risk perception (Covello & Sandman, 2001; Siegrist et al., 2005).

2.3.2. Cultural factors

From a cultural perspective, the cultural theory of risk states that risk perception is a reflection of the social context an individual finds him- or herself in (Sjöberg, 2000a). The Cultural Theory of Risk Perception was developed by Douglas and Wildavsky (1983), and it sees the identification of risks as a social process, neglecting that risks can exist in objective reality. It delineates four types of people based on four worldviews: egalitarian, individualistic, hierarchic, and fatalistic. Each type of person is more concerned with different types of hazards, as can be seen in **Table 2** (Sjöberg, 2000a; Slovic, 1999).

People differ from one another in these views. *Fatalists* tend to think that what happens in life is inevitable. *Hierarchists* like a society organized in a way that commands flow down from authorities and obedience flows up the hierarchy. *Egalitarians* prefer a more evenly distributed world with regard to power and wealth. *Individualists* like to do their own thing, unhindered by government or any other kind of constraints (Slovic, 1999, p. 694).

Table 2 - Cultural theory of risk perception

Worldviews	Examples of how worldview influences the way one thinks (Slovic, 1999)	Concerned about:
Egalitarians	*"If people were treated more equally, we would have fewer problems"*	Technology and environment
Individualists	*"In a fair system, people with more ability should earn more."*	War and other threats to markets
Hierarchists	*"Decisions about health risks should be left to the experts."*	Law and order
Fatalists	*"I feel I have very little control over risks to my health."*	None of the above

It has been showed that these four worldviews (or cultural biases), influence the way risks are being perceived (Bouyer et al., 2001; Dake, 1991). Furthermore, trust is correlated with worldviews as well (Slovic, 1999). Worldviews are general social, cultural, and political attitudes that appear to have an influence over people's judgments about complex issues (Dake, 1991; Douglas & Wildavsky, 1983; Slovic, 1999). Peters et al. (2004) found that perceived risk was only indirectly influenced by worldviews. Other studies did find direct (but sometimes weak) relations (Bouyer et al., 2001; Dake, 1991; Peters & Slovic, 1996; Sjöberg, 2000a). These worldviews may help us to quickly and efficiently navigate through a complex, uncertain, and sometimes dangerous world, as do emotions (Slovic, 1999).

2.3.3. Social factors

Another theory that analyses the psychological, social, cultural, and institutional processes on risk perception, is the Social Amplification of Risk Framework (SARF) as presented in **Figure 5** (Kasperson, Kasperson, Pidgeon, & Slovic, 2003; Kasperson & Kasperson, 1996). The starting point of SARF is that risks are interactive phenomena that involve both the biophysical and social worlds, the dualism of risk as both an objective threat as a social construct (Kasperson & Kasperson, 1996; McComas, 2006;

Renn, 1998). Hence, as stated by Kasperson and Kasperson (1996, p. 96), *"the human experience of risk is simultaneously an experience of potential harm and the ways by which institutions and people process and interpret these threats"*.

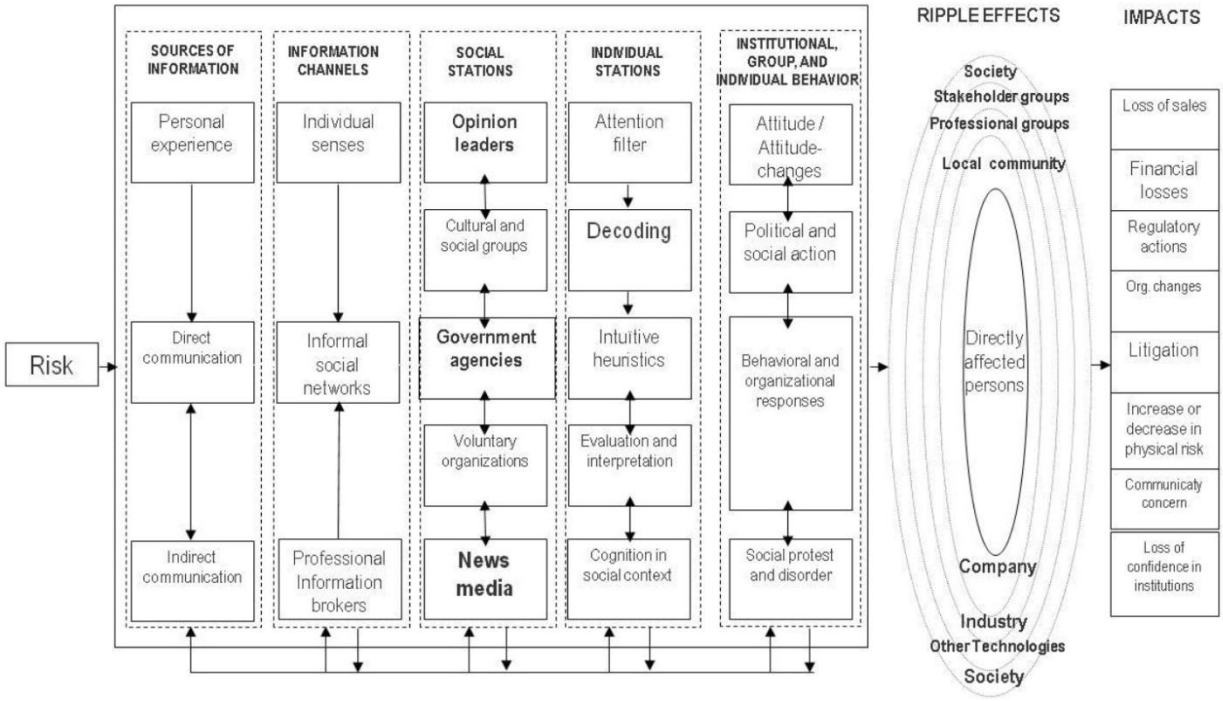

Figure 5 - Social Amplification of Risk Framework (Source: Kasperson et al., 2003)

SARF tries to explain why some risks that are considered "minor" by scientists are eliciting such strong public responses and vice versa (Kasperson & Kasperson, 1996; McComas, 2006; Verbeke et al., 2007). It demonstrated that risks interact with psychological, social, institutional, and cultural processes in ways which amplify (or attenuate) people's risk perceptions and concerns, and subsequently shape risk behavior, influence institutional processes and affect risk consequences (Breakwell, 2000; Kasperson & Kasperson, 1996). So, the behavioral responses can trigger secondary consequences that have indirect effects (such as economic costs, loss of trust, stigmatization) which can exceed the risk of direct harm to humans. When these indirect effect trigger additional institutional responses, a risk amplification is occurring (Kasperson et al., 2003; Kasperson & Kasperson, 1996; Smith & McCloskey, 1998).

The role of the media, which in most cases acts as the "transmitter", was especially scrutinized in SARF, since the news media can amplify or attenuate risks (Kasperson et

al., 2003; Kasperson & Kasperson, 1996). The extensive media attention to GMO's, vaccines, food scares such as BSE, or nuclear risks, are examples of how risks can be amplified by the media (Blanchemanche et al., 2010; Das, 2011; De Jonge et al., 2007; Kasperson & Kasperson, 1996; Kennedy et al., 2010; Kuttschreuter, 2006; McComas, 2006; Rutsaert, Pieniak, Regan, McConnon, & Verbeke, 2013). The transmission by the media or an interpersonal network that attenuated or amplified the risk will be continued by the members or the institutions in the society, which can also attenuate or amplify the risk. This is called the "ripple-effect" (Kasperson et al., 2003; Kasperson & Kasperson, 1996; Lofstedt, 2006). When the consequences of the risks are widespread and large-scale, it increases risk perception as well, which is also influenced by the greater media attention these risks get (Yeung & Morris, 2006). Hence, the SARF demonstrates that it is difficult to anticipate and control the impact of risk communication, because of all the influencing and interactive processes.

2.4. Moderating factors of the public

The public reactions and perceptions of risk might differ individually. There is no such thing as "the public", only different audiences, such as the scientists, industry, authorities, suppliers of products, environmental agencies, consumer agencies, the media, and the consumers (Renn, 2006). In the scope of this dissertation, we will only focus on communication towards the general public: the consumers. Understanding the target audience and their perceptions of risks, is an important prerequisite to effective risk communication (Dosman et al., 2001; Jung, 2006; Kennedy et al., 2010; Renn, 2006). It has been shown that the same potential hazards will result in different perceptions within different populations (Sparks & Shepherd, 1994; Wilcock et al., 2004).

In the framework of the psychometric paradigm, some receiver characteristics have been touched upon such as prior/perceived knowledge. If risks are perceived as unknown, people will perceive a higher risk (Dosman et al., 2001; McGloin et al., 2009; Nathan et al., 1992; Perko, van Gorp, Turcanu, Thijssen, & Carle, 2013; Renn & Levine, 1991; Stewart-Knox et al., 2013; Wills, Storcksdieck Genannt Bonsmann, Kolka, & Grunert, 2012). Personal experience with the risk can also influence the perceived risk (Ding et al., 2013; Keller et al., 2006; Kuttschreuter, 2006; Loewenstein et al., 2001; Rogers et al., 2007). In what follows, we will focus on involvement and sociodemographic variables which have been shown to influence the public's reactions.

2.4.1. Involvement

Involvement results *"from individuals' perceptions that an issue affects their self-interest (Grunig, 1989), is important to them, and reflects their altruism toward the well-being of others"* (Heath, Liao, & Douglas, 1995, p. 90). Involvement has been identified by Salmon (1986) in different ways. Involvement can either be seen as *a)* a personality trait, an interest into an issue of an individual, as salience, relevance, future consequences of a stimulus for an individual, or as *b)* a characteristic of a product, issue or situations that arouses concern (Salmon, 1986). In either form, it influences the acquisition and the processing of information (Nathan et al., 1992).

Increasing public involvement is one of the objectives of risk communication (Renn & Levine, 1991), as it plays an important role in risk communication. The importance of involvement has been shown in the dual processing theories (cf. 3. Information processing of risk messages, p. 58), where a high involvement leads to more systematic processing of the information. Furthermore, threat appeals such as the EPPM (cf. 3.2. The Extended Parallel Processing Model, p. 66), also result in more involvement when a danger process is initiated (Cauberghe, De Pelsmacker, Janssens, & Dens, 2009; Witte, 1992). Additionally, it has been shown that the level of involvement is positively correlated with familiarity and risk perception (De Pelsmacker, Cauberghe, & Dens, 2011; Keller & Lehmann, 2008). Also, when there is a high personal relevance, there will be a high involvement (Frewer & Miles, 2003). Research has shown that food risks have a high personal relevance, since food is an important part of daily life (Frewer, Howard, Hedderley, & Shepherd, 1997; Frewer & Miles, 2003; Lofstedt, 2006).

2.4.2. Sociodemographic factors

The most widely demonstrated and most consistent findings in risk perception research is that of *gender* (Frewer, 2000; Sundblad, Biel, & Garling, 2007). Women tend to judge risks larger and more problematic than men (Weber, 2006), they worry more, and express higher concerns than men (Dosman et al., 2001; Siegrist, Keller, et al., 2005; Sjöberg, 1998). Women tend to be less confident about food safety than men (De Jonge et al., 2007; Tobin et al., 2012), and will be more concerned about health and safety (Keller & Lehmann, 2008; Slovic, 1999). Furthermore, women tend to distrust the government and doubt their risk reducing actions more than men do (Frewer, 2000; Slovic, 1999). Kuttschreuter (2006) found that women tended to avoid the food risks more, and felt more efficacious than men.

The gender differences can be attributed to the fact that women, giving birth, are socialized to nurture and maintain life (Slovic, 1999). Furthermore, the differences in risk perceptions with regard to food risks can be explained because of the fact that women still do most of the cooking and have a caretaking role in the household (Breen & Cooke, 2005; Brines, 1994; Cooke, 2004). However, it was shown, that these gender differences only existed between white males and white females (Dosman et al., 2001; Slovic, 1999).

Research showed that *nonwhites* might be less influenced by health and risk communications than *whites* (Keller & Lehmann, 2008). The reason for these differences might be that they have lower access to communications, greater influence of family and peers, and poorer access to health care (Keller & Lehmann, 2008). Nonwhites would perceive greater risks in the safety of the food supply; however Tobin et al. (2012) did not find these differences. Slovic (1999) states that trust is correlated with race.

Some *national differences* can be found. For example, public trust is high in the Scandinavian countries, as well as the U.K., but low in Southern Europe, as in Germany (Lofstedt, 2006). In Europe, Hohl and Gaskell (2008) found similar levels of concern about food risks. However a North-South divide was visible, with Northern people worrying less than Southern Europeans. Hohl and Gaskell (2008) also found cross-national differences about risk sensitivity and personal risks perceptions. Differences in perceptions with regard to different risks might exist because of the national differences of crises that occurred in each country (e.g., floods, natural disasters, food outbreaks), and the way these risks and crises were dealt with (Van Kleef et al., 2007).

The effect of *age* is ambiguous. Some literature suggests that young people perceive lower risks than older people, other literature suggests the opposite. Hamilton (1985) for example, found that younger people were more concerned than older people, and attributed this difference to the impact of the parenthood effect. However, others (Dosman et al., 2001; Keller & Lehmann, 2008; Tobin et al., 2012) stated that age is positively correlated with behavioral intentions and perceived risk. Kuttschreuter (2006) also found that age was positively correlated with risk avoidance, information seeking, trust, risk perception and outcome expectancy. A possible explanation could be that younger people have less experience with the impact of possible risks, and therefore perceive the risks as lower (Dosman et al., 2001). Another possibility might be that young people are more familiar with these risks, or hear about so many risks that it leads to lower perceptions (Dosman et al., 2001).

The "*parenthood*" effect can influence risk perception as well. This effect states that people who have children will be more concerned and have higher risk perceptions about health and food risks (De Jonge et al., 2007; Dosman et al., 2001; Hamilton, 1985; Sjöberg, 1998; Sundblad et al., 2007). The full-time house(wo)men were more concerned about food safety than individuals who worked outside the home, as shown in the overview by Dosman (2001).

Kuttschreuter (2006) showed that respondents with a higher *education* worried more, felt less efficaciousness, and had a lower level of trust in the safety of food products. On the contrary, De Jonge et al. (2007) shows that a higher education leads to less worries and lower risk perceptions about food safety issues, as does Tobin et al. (2012). Slovic (1999) and Sjöberg (1998) also stated that there is an inverse relationship between risk perception and feelings of worry on the one hand and education level on the other hand. However, Sundblad et al. (2007) did not find any differences based on educational differences.

3. INFORMATION PROCESSING OF RISK MESSAGES

In this dissertation we will focus on two different theoretical frameworks that analyses the way risk information is processed and evaluated. On the one hand there are the "Risk-as-feelings & risk-as-analysis" theories, consisting of the Affect heuristic (Finucane et al., 2000; Slovic et al., 2004) and the Risk-as-feelings hypothesis (Loewenstein et al., 2001). On the other hand there is the Extended Parallel Processing Model (EPPM) (Witte, 1992).

All these theories build on the premise that there is a dual way of processing information. This premise is based on the dual processing theories, such as the Elaboration Likelihood Model (ELM) (Cacioppo, Petty, Kao, & Rodriguez, 1986; Petty & Cacioppo, 1984), and the Heuristic-Systematic Information Processing Model (HSM) (Chaiken & Maheswaran, 1994; Eagly & Chaiken, 1993; Trumbo & McComas, 2003). These theories discuss the systematic (or central) processing versus the heuristic (or peripheral) processing of information. Systematic processing takes place when an individual carefully analyses the different arguments and bases his judgment on this evaluation. If an individual uses simple decision rules, cues (heuristics) to make a judgment, heuristic processing takes place. These heuristics could be source characteristics, low prior knowledge (Petty & Cacioppo, 1984), (source) credibility (Frewer & Miles, 2003; Hansen, 2003; Renn & Levine, 1991), trust (Siegrist, Cvetkovich,

& Roth, 2000; Visschers & Siegrist, 2008), and message factors such as length, attractiveness, vividness (Cacioppo et al., 1986; Eisend, 2006; Petty & Cacioppo, 1984; Renn & Levine, 1991). Decisions resulting from systematic information processing have been shown to have a more enduring and positive effect on behavior than decisions based on heuristics. The latter is seen as less stable and less tied to subsequent behavior (Cacioppo et al., 1986; Petty & Cacioppo, 1984; Trumbo & McComas, 2003; Wathen & Burkell, 2002).

The Affect heuristic and Risk-as-feelings perspective, based on the premise that there are two ways in which humans comprehend risk: the experiential (affective) system and the analytical system (Dohle et al., 2010; Keller et al., 2006; Slovic et al., 2004; Weber, 2006), which are similar to the dual processing conceptualization of the heuristic and systematic processing of information. However, the difference between affective and cognitive reactions is emphasized more in the Affect heuristic and Risk-as-feelings perspective than in the dual processing theories. The following part of the introduction discusses both the Affect heuristic and the Risk-as-feelings perspective.

The EPPM by Witte (1992) states that cognitive appraisals take place when one receives a risk message, which might lead to protective motivation actions or to negative feelings which in turn leads to message rejection. The negative feelings can indirectly influence adaptive behavior, because they can influence the cognitive appraisals when a feedback loop takes place. Furthermore, research has shown that these negative feelings can directly influence adaptive behaviors (Cauberghe et al., 2009; Popova, 2012). Hence, in the EPPM, the dual importance of both cognitive and emotional reactions is visible as well. We will elaborate more on the EPPM later (p. 66).

3.1. Risk-as-feelings & risk-as-analysis

Psychological research identified affect and emotion as key ingredients in risk perceptions (Dohle et al., 2010; Keller et al., 2006; Loewenstein et al., 2001; Peters et al., 2004; Slovic et al., 2004). Risks can be dealt with in three fundamental ways, as stated by Slovic et al. (2004, p. 311): "*Risk as feelings*, refers to our fast, instinctive and intuitive reactions to danger; *Risk as analysis* brings logic, reason, and scientific deliberation into play. When our ancient instincts and our modern scientific analyses clash, we become painfully aware of a third reality—*risk as politics*."

The risk as feelings way, is still the predominant way by which human beings evaluate risk (Slovic et al., 2004). As can be seen in the cartoon by Garry Trudeau (**Figure 6**), it becomes clear that no one in such a situation will be that analytical. On the contrary, most risk judgments are handled quickly and automatically, that is the experiential mode of thinking (Slovic et al., 2004).

Figure 6 - Street Calculus (Source: Slovic et al., 2004 - by Garry Trudeau)

The Affect heuristic and Risk-as-feelings perspective state that there are two ways in which humans analyze risk: the experiential system and analytical systems (Dohle et al., 2010; Keller et al., 2006; Slovic et al., 2004; Weber, 2006).

The experiential (affective) system is intuitive, fast, mostly automatic, and not very accessible to conscious awareness (Slovic et al., 2004). It relies on past experiences, images, metaphors, and narratives (Dohle et al., 2010; Keller et al., 2006; Slovic et al., 2007, 2004). *The analytical system* relies on probabilities, formal logic, evidence and risk assessment. It works slower than the experiential system, is more effortful and requires awareness and control which leads to the fact that it does not get triggered automatically (Keller et al., 2006; Slovic et al., 2004; Weber, 2006). The main characteristic of the experiential system is its affective basis (Slovic et al., 2004). *"Although analysis is certainly important in some decision-making circumstances, reliance on affect and emotion is a quicker, easier, and more efficient way to navigate in a complex, uncertain, and sometimes dangerous world"* (Slovic et al., 2004, p. 313).

Both processing systems operate in parallel and interact with each other, which has been called *"the dance of affect and reason"* (Slovic et al., 2004; Weber, 2006). Affect is essential to rational action, as stated by Slovic et al. (2004, p. 314), *"we can do the right thing without analysis (e.g., dodge a falling object), but it is unlikely that we can employ analytical thinking without guidance from affect somewhere along the line."*

The balance of these two processing systems can be influenced by different factors such as prior knowledge, stress, time, cognitive resources, etc. For example, some decisions about risks can be too complex for lay people, and therefore can lead to the use of the experiential system (Dohle et al., 2010; Slovic, Peters, Finucane, & Macgregor, 2005). Furthermore, time pressure and limited cognitive resources can also lead to reliance on the experiential system and, therefore, on affect (Dohle et al., 2010; Slovic et al., 2005).

When the experiential and analytical systems are in conflict, it has been shown that the affective/intuitive system may overrule the cognitive evaluations (Kobbeltvedt & Wolff, 2009; Loewenstein et al., 2001; McComas, 2006). However, Visschers & Siegrist (2008) found, based on their literature review, that the affective feeling has an important influence on the risk perception but that cognition and deliberation could overrule the affective influence in risk perception when people have sufficient time, cognitive resources and motivation.

In the following part, both theories (Affect heuristic and Risk-as-feelings perspective) will be discussed separately.

3.1.1. Affect heuristic

As mentioned above, the Affect heuristic distinguishes two modes of thinking: the experiential (affective) system and the analytical (deliberative) system (Slovic et al., 2007, 2004). As can be seen in **Figure 6,** the latter is not the most convenient way if a risk judgment needs to be made quickly. Affective responses occur rapidly and automatically, which becomes clear when noting how quickly you sense feelings associated with the word "treasure" or "hate" (Slovic et al., 2004). The reliance on such feelings is what has been called the "Affect heuristic" (Slovic et al., 2007, 2004). Affect, a "faint whisper of emotion" is defined as "*the specific quality of "goodness" or "badness" (1) experienced as a feeling state (with or without consciousness) and (2) demarcating a positive or negative quality of a stimulus"* (Slovic et al., 2004, p. 312). Affect is the collection of good or bad feelings towards an external stimulus, and occurs rapidly and automatically (Das, 2011; Peters et al., 2004; Slovic et al., 2004; Slovic, 1999).

Hence, the Affect heuristic states that people base their risk judgments not only on what they think (and know) about the risk but also on how they feel about it. If people have positive feelings about an activity, they tend to judge the risks as lower than if they have negative feelings about the activity and vice versa (McComas, 2006; Perko et al., 2013; Peters et al., 2004; Slovic et al., 2004).

The Affect heuristic is linked to the Availability heuristic developed by Tversky and Kahneman (1982). The Availability heuristic states that people use the ease with which examples of a risk come to mind as a cue to estimate the probability of a hazard (Keller et al., 2006; Tversky & Kahneman, 1982). Slovic et al. (2007, 2004) suggested that the Availability heuristic might not only work through ease of recall or imagination, but also because remembered images are tagged with affect (Keller et al., 2006). The basic principle of the Affect heuristic is that images guide judgments and decision making, as stated by the Availability heuristic, but in addition, these images are marked by positive and negative affective feelings (Slovic et al., 2007, 2004). Hence, if people need to make a judgment or decision, they will consult or refer to an "affect pool" containing all the positive and negative tags. These mental shortcuts, or heuristics can serve as a cue for judgments (Slovic et al., 2007, 2004). "*Using an overall, readily available affective impression can be far easier—more efficient—than weighing the pros and cons or retrieving from memory many relevant examples, especially when the required judgment or decision is complex or mental resources are limited."* (Slovic et al., 2007, p. 1336). Using those cues for judgments can have an impact on the behavioral intentions as well,

for example unpleasant affective cues such as worry can motivate to take actions to avoid these feelings (Rogers et al., 2007; Sundblad et al., 2007).

The Affect heuristic (Finucane et al., 2000; Slovic et al., 2004) was developed based on the finding that there is an inverse relationship between perceived risk and perceived benefit of an activity, and that this inverse relationship was based on the strength of positive or negative affect associated with that activity (Slovic et al., 2004).

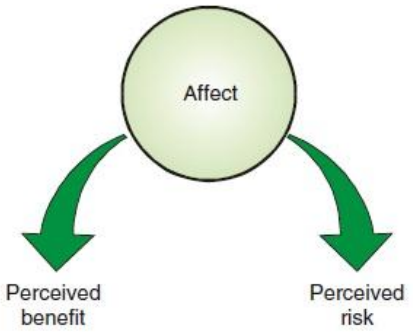

Figure 7 - The Affect heuristic (Source: Finucane et al., 2000 & Slovic et al., 2007)

In **Figure 7**, a model of the Affect heuristic is shown, demonstrating that judgments of risks and benefits are based on an overall affective (positive or negative) evaluation of the activity (Finucane et al., 2000; Slovic et al., 2007, 2004).

Furthermore, Finucane et al. (2000) showed that if a general affective view guides perceptions of risk and benefit, giving information about the benefit changed the perception of the risk, and vice versa as can be seen in **Figure 8** (Peters et al., 2004; Slovic et al., 2004). In Figure 8, the different models show how information about benefit (A) or information about risk (B) could increase the global affective evaluation of nuclear power and lead to inferences about risk and benefit that are affectively congruent with the information input. Similarly, information could decrease the global affective evaluation of nuclear power as in C and D, resulting in inferences that are opposite to those in A and B (Finucane et al., 2000; Peters et al., 2004; Slovic et al., 2007, 2004).

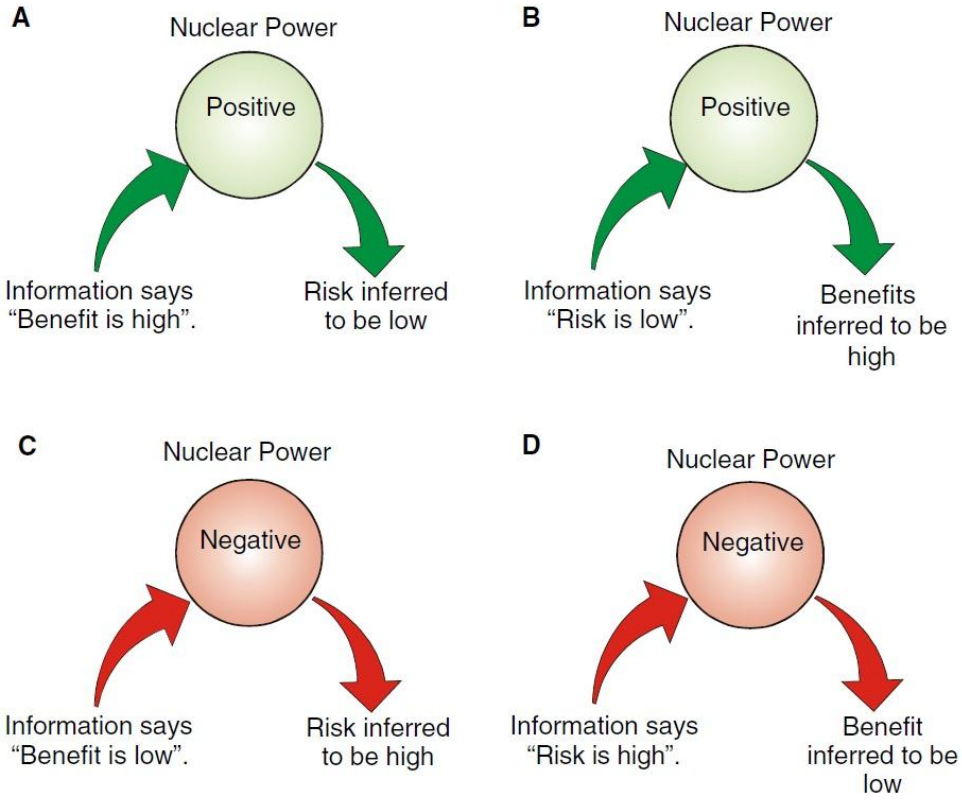

Figure 8 - Influence of affect on the evaluation of nuclear power (Source: Finucane et al., 2000 & Slovic et al., 2007)

Finally, as shown by Finucane et al. (2000), when there is less deliberation of the information (because of time restraints for example), it greatly increases the inverse relationship between perceived risks and benefits. This aspect shows the balance of the affective and deliberative systems (Peters et al., 2004). When deliberation decreases, affect plays a more important role if evaluations and decisions need to be made.

3.1.2. Risk-as-feelings hypothesis

The Risk-as-feelings perspective or hypothesis (Loewenstein et al., 2001) is similar to the Affect heuristic, highlighting both the role of affect experienced at the moment of decision making, as importance of the dual processing of the information (McComas, 2006; Perko et al., 2013; Slovic et al., 2007, 2004; Sundblad et al., 2007). However, in the Risk-as-feelings perspective, the emphasis does not solely lay on the affect as defined in the Affect heuristic, but Loewenstein et al. (2001) differentiates between anticipated emotions and anticipatory emotions.

The (specific, immediate) anticipatory emotions, such as fear, worry and anger, represent an "immediate visceral reaction" to the possibility of harm (Sheeran, Harris, & Epton, 2013). They are experienced at the time of decision making and are produced by the anticipated outcomes and other factors (Loewenstein & Lerner, 2003). The anticipatory emotions can influence decision making in a direct and indirect way (Loewenstein & Lerner, 2003). To show that visceral emotions can directly influence behavior, and that emotions are not solely reactions because of cognitive evaluations, Loewenstein et al. (2001) gives the example of phobias, or for example people feeling powerful experiences of fear about outcomes that they recognize (cognitively) as highly unlikely (such as airplane crashes) or as objectively not as terrible (such as public speaking) (Loewenstein et al., 2001).

Anticipated or expected emotions are not experienced as emotions per se, but they are expectations about emotions that will be experienced in the future, such as guilt, regret and shame (Loewenstein & Lerner, 2003; Sheeran et al., 2013). The anticipated emotions can produce affect, since thinking about negative consequences normally produces negative affect (Loewenstein & Lerner, 2003). In **Figure 9,** an overview is presented of the Risk-as-feelings perspective.

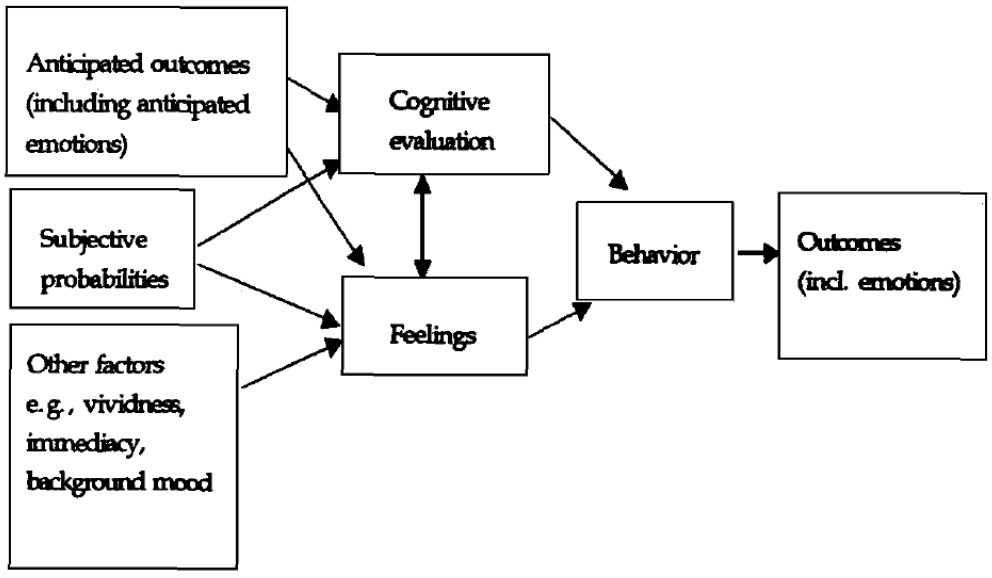

Figure 9 - Risk-as-feeling perspective (Source: Loewenstein et al., 2001)

According to the Risk-as-feelings hypothesis, responses to threats result in part from emotional influences such as feelings of worry, fear, dread, or anxiety, the anticipatory emotions, that is, "feelings" in **Figure 9** (Loewenstein et al., 2001). These anticipatory emotions are influenced by the subjective probabilities, anticipated outcomes and emotions, and other factors.

The subjective probabilities are the probability assessment that an event/risk will take place, influenced by subjective biases and errors. The subjective probabilities can influence both the cognitive evaluation as the feelings. Other factors (such as the immediacy of the risk, vividness, personal experience) can also influence the feelings (anticipatory emotions) (Loewenstein et al., 2001).

Furthermore, the feelings can also influence cognitive evaluations (Loewenstein et al., 2001). The cognitive evaluation (based on probabilities and assessments of outcome severity) will also take place, influencing these feelings as well (Loewenstein et al., 2001). This evaluation results in behavior being influenced by the interplay between the cognitive and emotional evaluation, two often conflicting responses to a situation (Loewenstein et al., 2001). Hence, what Finucane et al. (2001) called "*the dance of affect and reason"*, is implemented in the Risk-as-feelings hypothesis as well, additionally acknowledging the conflicting nature of these two, since they are being influenced by different factors (Kobbeltvedt & Wolff, 2009; Loewenstein et al., 2001). The anticipatory feelings can at times overrule the cognitive evaluations when these are in conflict (Kobbeltvedt & Wolff, 2009; Loewenstein et al., 2001; McComas, 2006).

Hence, the two most important aspects of the Risk-as-feelings hypothesis are that the feelings can arise without cognitive mediation and that the impact of cognitive evaluations on behavior is mediated, at least in part, by emotional responses (cognitive evaluation gives rise to feelings that in turn affect behavior) (Loewenstein et al., 2001).

3.2. The Extended Parallel Processing Model

The Extended Parallel Processing Model (Witte, 1992, 1998) is a frequently used model to communicate (health) risks. It has been widely used and cited (Peters, Ruiter, & Kok, 2013; Popova, 2012; Sheeran et al., 2013; Witte & Allen, 2000).

The EPPM is based on threat appeal theories. Threat appeals are *"persuasive messages designed to scare people by describing the terrible things that will happen to them if they do not do what the message recommends"* (Witte, 1992, p. 329). The EPPM

integrates different perspectives that can be classified into three major groups: 1) Drive theories (such as the "fear-as-acquired drive model") (Hovland, Janis, & Kelly, 1953), 2) The Parallel Response Model (PRM) by Leventhal (1970), and 3) Subjective expected utility (SEU) models such as the Protection Motivation Theory by Rogers (1975). This dissertation will not elaborate on all the different theories, but an excellent overview of these theories can be found in the meta-analysis of Witte and Allen (2000).

According to the EPPM, threat appeals can trigger a process by which individuals appraise two components of the message: the *perceived threat* of the risk and the *perceived efficacy* to overcome the risk (Witte, 1992). In **Figure 10** (p. 69) an overview is given of the EPPM, its different components, appraisals and outcomes.

3.2.1. Cognitive appraisals

The perceived threat consists of the perceived susceptibility and the perceived severity (Witte, 1992). The *perceived susceptibility* is the belief that the risk could affect you (e.g., the risk of skin cancer due to too much sun tanning, can affect you when you sunbath a lot). Beliefs about the seriousness of the threat (e.g., skin cancer can be perceived as a severe threat) are referred to as the *perceived severity*. If the perceived severity or the perceived susceptibility is perceived as low, irrelevant or not serious, individuals will not be motivated to process the message in depth, leading to no response to the threat appeal. When both the perceived susceptibility and severity are appraised as high, this will elicit negative feelings such as worry and fear. Therefore the individuals will further process the message and evaluate the perceived efficacy (Witte, 1992).

The perceived efficacy is the feeling of personal control, consisting of self-efficacy and response efficacy (Witte, 1992). The latter is the belief individuals have that the recommended behavior will prevent the risk from happening (e.g., believing that applying sun screen will prevent the risk of skin cancer). Self-efficacy is related to the individuals' belief in their ability to do what the message recommends (e.g., applying sun screen regularly) (Witte, 1992). Mostly, people do believe in the recommended behavior (high response efficacy), but they lack the feeling that they will be able to behave (and continue to behave) as the recommended behavior suggests (low self-efficacy). Smoking is an example in which smokers normally recognize the perceived threat, and the recommended behavior, but they perceive a low self-efficacy as they do not feel capable to stop smoking. Nonetheless, efficacy is important to reduce the negative feelings and to behave as recommended.

3.2.2. Danger and fear control process

Only when both the threat and the efficacy are perceived as high, a danger control process is initiated (Witte, 1992). The danger control process leads to the motivation of the individuals to be willing to protect themselves, therefore accepting the message and adapting the protective behavior (Witte, 1992, 1998). When the threat appraisal is high, but the efficacy appraisal is low, a fear control process is initiated. The elicited feelings of fear and worry are too high and cannot (or will not) be reduced by the recommended behavior since people feel incapable to follow these recommendations. This process is typically associated with counter argumentation to reduce the negative feelings, as "*my grandfather has smoked since he was 14 years old and he turned 101 years old*" and negation "*I do not believe this, it must be the pharmacy lobby stating all this*", which eventually leads to message rejection. However, Witte (1992) states that fear can indirectly influence adaptive outcomes as well, when it is cognitively appraised, due to the 'feedback loop'. The feedback loop makes it possible to reconsider the perceived threat, when experiencing fear and can lead to adaptive outcomes, that is, message acceptance (Witte, 1992, 1998).

Hence, the EPPM states that fear can directly influence maladaptive responses, and may indirectly affect behavioral intentions (Witte & Allen, 2000; Witte, 1992). However, research (Arthur & Quester, 2004; Cauberghe et al., 2009; de Hoog, Stroebe, & De Wit, 2005; Lewis, Watson, & White, 2010; Popova, 2012) showed that fear can directly affect message acceptance and in turn adaptive behavior. Popova (2012) even suggested based on a review of the EPPM literature, that there is not one feedback loop, but a continuous back-and-forth influence between fear and threat. The latter can be closely linked to the *"dance of affect and reason"* as discussed in the Affect heuristic and the Risk-as-feelings perspective.

So, fear should not be solely seen as an effect after cognitive appraisals of the threat and efficacy, but an effect of fear can be assumed above and beyond cognitive threat and efficacy appraisal (Arthur & Quester, 2004; Cauberghe et al., 2009; de Hoog et al., 2005; De Pelsmacker et al., 2011). Hence, fear should be seen *"in its own right and in combination with the cognitive appraisal of threat and response efficacy for developing adaptive attitudes and behavior"* (Cauberghe et al., 2009, p. 267).

Furthermore, research (Dickinson & Holmes, 2008; Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996; Witte & Allen, 2000) showed that fear is not the only emotion experienced when an individual is exposed to a threat message. Other negative feelings

such as worry and anger, can be aroused as well, after reading a risk message. The sum of the average value of these feelings will be called "negative feelings" in this dissertation.

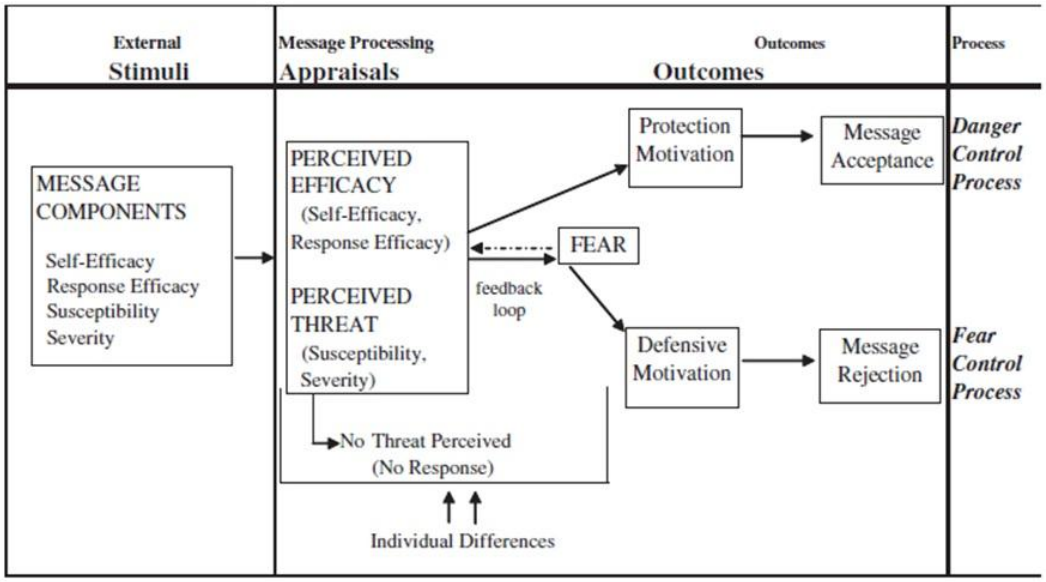

Figure 10 - The Extended Parallel Processing Model (Witte, 1992)

3.2.3. The EPPM and the uncontrollable food risks

The EPPM makes clear that a feeling of self-efficacy is essential in order to obtain message acceptance turning into adaptive behavior. However, in risk situations where individuals cannot prevent the risk from happening, as the emerging risks on fresh produce eaten raw, there will be an actual low self-efficacy, that is, a low feeling of personal control. Nonetheless, the perceptions of self-efficacy might differ, because people might not yet be aware about their impossibility to circumvent the risk from happening, which stress the importance of risk communication. If people are made aware about the low actual low self-efficacy, in combination with a severe perceived threat, it could lead to the fear control process which in turn could lead to message rejection (Witte, 1992). Hence, another way to communicate the risks and to sufficiently reassure the people to avoid message rejection needs to be found.

It has been shown that in those risks, which the consumers cannot avoid nor prevent from happening, the role of trust in the government or responsible authorities comes to the fore (Frewer, 2004; Siegrist et al., 2000; Ter Huurne & Gutteling, 2009; Yeung & Morris, 2006). Since consumers cannot circumvent the risk, they need to rely on the

actions taken by the government to try to guarantee food safety. When communicating these actions to the public to reassure them, it will only be effective if there is trust in the government. Furthermore, the mere act of information seeking about the risk can help to increase the feeling of personal control (Ford, 2004; Kievik & Gutteling, 2011; Palenchar & Heath, 2002; Shiloh, Berkenstadt, Meiran, Katznelson, & Goldman, 1997).

Hence, there are two potential ways to cope with this actual low self-efficacy: 1) Information seeking behavior and 2) Trust. Before elaborating on these two coping strategies, we will first discuss the differences and similarities of the Risk-as-feelings & risk-as-analysis frameworks and the EPPM.

3.3. The EPPM vs. Risk-as-feelings & risk-as-analysis

When looking at the EPPM on the one hand, and to the Affect heuristic and Risk-as-feelings perspective on the other hand, it becomes clear that there are some similarities and differences. In **Table 3**, a schematic overview can be found of the different theories.

Both the EPPM as the Risk-as-feelings & risk-as-analysis theories make a difference between a cognitive (analytical) appraisal of the risk (perceived threat and efficacy beliefs in the EPPM), and an emotional appraisal (feelings and affect). All theories attribute a significant role to the emotional appraisal. It has a direct influence on behavior/response before (even without) any cognitive appraisal. Furthermore, the constant interplay between the cognitive and emotional appraisal, (i.e., *the dance of affect and reason*), can be found in all theories.

The difference between these theories lies in the conceptualization of the emotional appraisal. The Affect heuristic focuses on affect, but does not neglect the role of emotions such as fear and anger (Peters et al., 2004). The emotions are thought to be derived in part from feelings of goodness or badness (i.e., affect).

Affect, according to this viewpoint[1], is different from emotions, which are specific feelings (e.g., anger, sadness, disappointment) that are intense, not subtle, short lived, have a definite cause, and a conscious cognitive content (Finucane, Peters, & Slovic, 2003; Forgas, 2013). These emotions are in line with the emotional appraisal of the EPPM, which focuses only on emotions, not on affect (Witte, 1992).

[1] In literature, different conceptualizations have been found of affect: as a background mood, as a holistic term including mood and emotions, and as specific emotions (Finucane et al., 2000; Sundblad et al., 2007; Visschers & Siegrist, 2008; Weber, 2006).

The Risk-as-feeling hypothesis uses on the one hand this conceptualization of emotions, and named it anticipatory emotions. However, Loewenstein et al. (2001) states that emotions have not always conscious cognitive content (cf. phobias). On the other hand, it also uses anticipated emotions which can produce affect (Loewenstein & Lerner, 2003).

Furthermore, the focus of the EPPM is more on these emotions (i.e., the negative feelings), how these emotions can be induced, and subsequently can be attenuated. This attenuation can mainly be carried out by the appraisal of the efficacy. The acknowledgment and the importance of efficacy is a major difference between the EPPM and the other perspectives.

Hence, the Affect heuristic focuses mainly on affect, the EPPM focuses mainly on emotions, and the Risk-as-feelings hypothesis uses both affect and emotions. In this dissertation we will look at risk perception as the cognitive appraisal of risks (the perceived threat, linked to the EPPM) and for the emotional appraisal (the emotional reactions) we will use the term negative feelings, defined as the specific, short lived feelings.

Table 3 - Schematic overview of the different theoretical frameworks

	Processing types	Role of Affect	Role of feelings	Role of cognition	Role of efficacy - personal control	Investigates the impact on …
Affect heuristic	Experiential and analytical system	Major importance of affect	Feelings have no central role, Feelings are influenced by affect	Acknowledged	Not explicitly mentioned	Risk judgments
Risk-as-feelings Hypothesis	Experiential and analytical system	Acknowledged affect	Acknowledged, 2 types: anticipatory & anticipated feelings	Acknowledged	Not explicitly mentioned	Risk judgments and behavioral outcomes
EPPM	Cognitive and emotional appraisals	Not explicitly mentioned	Acknowledged, originally only indirect effect, later direct effect as well	Acknowledged	Major importance of efficacy	Message acceptance and behavioral outcomes

4. COPING STRATEGIES TO DEAL WITH THE UNCONTROLLABLE RISKS

As touched upon earlier (See 3.2.3. The EPPM and the uncontrollable food risks, p. 69), there will be an actual low self-efficacy in the case of the emerging food risks. This could lead to a fear control process, and in turn to message rejection (Witte, 1992). In what follows, two potential ways to cope with this actual low self-efficacy, 1) Trust and credibility and 2) Information seeking behavior, will be discussed.

4.1. Trust and credibility

Trust and credibility are some of the key principles of effective risk communication, and a prerequisite for effective risk communication (Lofstedt, 2006; Pornpitakpan, 2004; Renn, 2006; Siegrist, Cousin, Kastenholz, & Wiek, 2007; Slovic, Fischhoff, & Lichtenstein, 2000; Visschers & Siegrist, 2008). When risk communication programs fail, it can often be attributed to the public's distrust and credibility problems (Ding et al., 2013; Lofstedt, 2006). If people do not trust the messenger, they will not trust the message (Hansen, 2003; Rogers et al., 2007).

It has been shown by Ter Huurne and Gutteling (2009) that when risks are not personally controllable, people want to know what official agencies and governments could do, are doing, or have done about it. The latter will be necessary to communicate in the case of emerging risks, because it is the only reassuring information that can be given. However, it will only be effective and reassuring if there is trust in those agencies and governments.

In risk communication about uncontrollable risks, it is important that people trust the government, in order to be able to reassure them after they received the threatening information. Furthermore, it is essential that the risk messages that are being disseminated to the public, are perceived as credible. Hence, both trust and credibility are important when communicating risks. However trust is also essential because it can be used to counter the effects of the actual low self-efficacy.

4.1.1. Social trust

This dissertation focuses on social trust, since it is especially important when risks are difficult for the public to control or understand (Ter Huurne & Gutteling, 2009). Social (or institutional trust) is the willingness of individuals to rely on those who have the responsibility for making decisions and taking actions related to the management of

technology, the environment, or other realms of public health and safety (e.g., risk management institutions and the individuals operating them) (McComas, 2006; Siegrist et al., 2000; Ter Huurne & Gutteling, 2009; Trumbo & McComas, 2003; Visschers & Siegrist, 2008).

Literature shows that there are different components of trust, some using five components: Perceived competence and efficiency; Objectivity; Fairness; Consistency; Faith (Renn & Levine, 1991). Others merged these five components into three determinants: *1) knowledge and expertise* (related to competence), *2) openness and honesty* (related to objectivity and fairness), *3) concern and care* (related to consistency and faith) (Peters, Covello, & McCallum, 1997).

Social trust is closely related to source credibility, which is trust that is placed in specific individuals based on the perceived presence or absence of certain traits (McComas, 2006; Ter Huurne & Gutteling, 2009). Another, broader definition of source credibility is: *"people's perceptions of the motivations of institutions or individuals providing information to the public"* (Frewer, Scholderer, & Bredahl, 2003; Van Kleef et al., 2007). The components of source credibility are expertise and trustworthiness (or honesty) (Frewer et al., 2003), which are very similar to the components of trust.

When discussing trust in the remainder of this dissertation, we will mainly focus on social trust, because of the uncontrollability of the communicated risk and because the communicating source is the government. Characteristics of trust in the government such as knowledge to guarantee safety, open and honest communication will be used, together with more general statements related to social trust such as "I trust the government that they adequately regulate food safety", "the government does a great job with regard to food safety".

4.1.2. Influence of social trust on the effectiveness of risk communication

It has been shown that the level of trust is negatively correlated with perceived risk. The higher the level of trust, the lower the perceived risk (Covello & Sandman, 2001; Ding et al., 2013; Frewer & Miles, 2003; Frewer, 2000; Kuttschreuter, 2006; Lofstedt, 2006; Siegrist & Cvetkovich, 2000; Ter Huurne & Gutteling, 2009; Trumbo & McComas, 2003; Visschers & Siegrist, 2008). Siegrist et al. (2005) also observed that high levels of trust and confidence reduce perceived risks. Yet, they found that trust and confidence only explained a small part of the variance of perceived risk.

Therefore, a lack of trust can amplify the risk perceptions. This can in turn lead to feelings of worry and anxiety (Griffin et al., 2008; Ter Huurne & Gutteling, 2009; Witte, 1992). Studies have shown that trust influences negative feelings (Kuttschreuter, 2006; Siegrist et al., 2007), but the opposite has been found as well (Poortinga & Pidgeon, 2005). Hence, negative feelings and trust influence each other, although the relation itself is not clear (Slovic, 1999; Visschers & Siegrist, 2008).

Contextual factors such as hazard knowledge and perceived uncertainty may be important factors influencing the relationship between trust and risk perception (Visschers & Siegrist, 2008; Wachinger, Renn, Begg, & Kuhlicke, 2012). When there is a lack of knowledge to make a decision about the risk, one will need to rely on other cues such as trust (Visschers & Siegrist, 2008). Research suggest that trust is more important for perceived risks and perceived benefits when people know little about the hazard (Siegrist & Cvetkovich, 2000; Wachinger et al., 2012). Trust can compensate for individuals' lack of knowledge by heightening individuals' feelings of confidence (De Jonge et al., 2007; Ding et al., 2013; Siegrist & Cvetkovich, 2000; Van Kleef et al., 2006).

When there is a high perceived uncertainty, trust also has a substantial impact on risk perception (Nathan et al., 1992; Wachinger et al., 2012). It is stated that trust can reduce the feeling of uncertainty (Rogers et al., 2007).

4.1.3. Trusted and credible sources

Source credibility, has been extensively researched in the field of risk communication (Kiousis, 2001; Lord, 1994; McComas & Trumbo, 2001; Peters et al., 1997; Pieniak, Verbeke, Scholderer, Brunso, & Olsen, 2007; Pornpitakpan, 2004; Renn & Levine, 1991; Trumbo & McComas, 2003; Wathen & Burkell, 2002). Generally, physicians and medical institutes are the most trusted sources. Nongovernmental organizations (NGOs) and consumer organizations are also highly trusted, whereas government and industrial risk regulators are less or not trusted at all (Frewer & Miles, 2003; Palenchar & Heath, 2007; Slovic, 1993; Trumbo & McComas, 2003; Van Kleef et al., 2007).

In *food risk communication*, the most trusted sources are consumer organizations, followed by experts. Government sources and environmental groups were less trusted and industry is seen as the least trusted source (Frewer & Miles, 2003; Lofstedt, 2006). Medical sources such as the World Health Organizations and consumer organizations are seen as a favorite source to obtain information about food-related hazards (Frewer &

Miles, 2003). Hence, government sources are not always trusted. However, research showed that people still believe the risk messages provided by the government (Frewer & Miles, 2003).

4.1.4. Message credibility

Credibility plays a major role in the selection and evaluation of messages (Cacioppo et al., 1986; Renn & Levine, 1991; Wathen & Burkell, 2002), and is therefore an important component in risk communication. Renn & Levine (1991) define credibility as the *"degree of shared and generalized confidence in a person or institution based on their perceived performance record of trustworthiness".* Wathen & Burkel (2002) show that, simply put, credibility can be seen as believability.

Credibility appears to be a variable that can be studied within the context of the communicator, channel, or message itself (Kiousis, 2001; Wathen & Burkell, 2002; Wei, Lo, & Lu, 2010). The credibility of the communicator (source credibility) has an important impact on risk communication, risk perceptions and attitudes (Eisend, 2007; Frewer et al., 2003; Hovland et al., 1953; Wathen & Burkell, 2002). It influences the individual's reaction to the message, leading to less attributed credibility to the message when a distrusted source communicates and vice versa (Kuttschreuter, 2006; McGloin et al., 2009; Verbeke, Viaene, & Guiot, 1999).

Message credibility is the perception of the message being credible, clear, understandable, believable and likely (Gürhan-Canli & Maheswaran, 2000). It is an essential variable in risk communication, as it is an important prerequisite to message acceptance (Beltramini, 1988; Bickerstaff, 2004; Mackenzie & Lutz, 1989; Renn & Levine, 1991; Slater & Rouner, 1996; Verbeke et al., 2008; Wathen & Burkell, 2002). Message credibility has also been shown to be an important predictor of risk perception (McComas & Trumbo, 2001).

In this dissertation we will focus on message credibility, because it has been shown to increase message acceptance, awareness, and/or attitude changes (Beltramini, 1988; Bickerstaff, 2004; Mackenzie & Lutz, 1989; Renn & Levine, 1991; Slater & Rouner, 1996; Verbeke et al., 2008; Wathen & Burkell, 2002).

4.2. Information seeking behavior

Information seeking behavior plays an important role in risk communication research because it can reduce uncertainty, by increasing the feeling of personal control (Ford, 2004; Kievik & Gutteling, 2011; Palenchar & Heath, 2002; Shiloh et al., 1997; Ter Huurne & Gutteling, 2008). Different models have investigated the influencing determinants of information seeking behavior, with Risk Information Seeking and Processing (RISP) (Griffin et al., 1999), Framework for Risk Information and Seeking (FRIS) (Ter Huurne, 2008), and Planned Risk Information Seeking Model (PRISM) (Kahlor, 2010) as the most recent and complete models. These models suggest that there is a perceived discrepancy between the actual level of knowledge and the desired level of knowledge, which is called the knowledge gap or information insufficiency. This information sufficiency is influenced by emotional responses to a risk and beliefs about what others think they should know about the risk (Griffin et al., 1999; Griffin, Neuwirth, Giese, & Dunwoody, 2002; Kahlor, 2010). The perceived knowledge gap can lead to negative feelings such as worry and fear, and can induce uncertainty (Griffin et al., 1999; Kahlor, 2007, 2010; Ter Huurne & Gutteling, 2008). When one seeks information, these negative feelings can be reduced.

People are mostly unaware of information insufficiency, but when risks are being communicated they will recall what they know about the risk, which can make them aware of their possible lack of knowledge (Baker & Pettigrew, 1999; Baker, 1996). Consequently, when there is a lack of knowledge, the need for information will emerge, which is one of the key motivators to seek information (Griffin et al., 1999, 2002; Kahlor, 2007; Kellens, Zaalberg, & De Maeyer, 2012; Kuttschreuter & Gutteling, 2004; Ter Huurne & Gutteling, 2008, 2009; Yoon & Nilan, 1999). Information seeking is therefore seen as a self-protective behavior that can close a knowledge gap, reduce the uncertainty and can lead to a perception of control (Baker & Pettigrew, 1999; Baker, 1996; Griffin et al., 2008, 1999; Kievik & Gutteling, 2011; Miller & Mangan, 1983; Shiloh et al., 1997; Thompson, 1981).

Hence, if people perceive a threat, they will try to reduce the negative feelings by inducing efficacy (Witte, 1992). When people cannot circumvent the risk from happening (i.e., low self-efficacy), they might try to substitute this lack of personal control by seeking more information (i.e., perceived information seeking control) (Kahlor, 2010; Stevens, 2010). Besides information seeking, the behavioral intention to alert loved ones could also be seen as a way for consumers to share their information need with others as

a potential information resource (Yoon & Nilan, 1999), and can therefore be seen as a way to increase the perceived feeling of control.

5. COMMUNICATION STRATEGIES

How the information is presented can have a large impact on how individuals respond to risks and benefits (Slovic et al., 2005). In this dissertation four different communication strategies with regard to message design will be discussed. By using these communication strategies, we will try to increase message credibility, and the behavioral intentions to increase the feeling of personal control, (i.e., intention to seek information and the intention to alert loved ones).

The chosen communication strategies in this dissertation are: 1) vividness of a message; 2) framing of the psychological distance; 3) message sidedness and 4) presentation order of the threatening and the reassuring part of the message. These communication strategies have been chosen because each one of them has proven its relevance in advertising and health communication. However, in risk communication, and especially about risks which are not completely controllable by consumers, their impact has not extensively been investigated. Furthermore, to our knowledge, the interaction effect on message effectiveness of the first three communication strategies has not yet been investigated.

5.1. Vividness

Vividly presented information has been shown to be an effective tool to increase the perceived threat and fear of the communicated risk, and thus the effectiveness of the risk message (Block & Keller, 1997; Chang, 2013; De Wit, Das, & Vet, 2008; Lee, Cameron, Wünsche, & Stevens, 2011; Meijnders, Midden, & Wilke, 2001; Witte, Cameron, McKeon, & Berkowitz, 1996).

"*Information may be described as vivid, that is, as likely to attract and hold our attention and to excite the imagination to the extent that it is emotionally interesting, concrete, and imagery-provoking, and proximate in a sensory, temporal, or spatial way.*" (Nisbett & Ross, 1980, p. 49). The vivid element in a message can consist of concrete and colorful language, colors, graphics, animations, pictures, concrete information, specific examples or stories, narratives, use of metaphors, or television presentations (Beltramini, 1988; Block & Keller, 1997; Collins, Taylor, Wood, & Thompson, 1988; De

Wit et al., 2008; Fortin & Dholakia, 2005; Frey & Eagly, 1993; Hong, 2011; Keller & Lehmann, 2008; Kisielius & Sternthal, 1986; Taylor & Thompson, 1982).

Vividly presented information can trigger the vividness effect. This effect results in more attention, more persuasiveness and more memorability than pallid information. It also leads to more positive attitudes, more credibility and more effectiveness (Blanchemanche et al., 2010; Fortin & Dholakia, 2005; Guadagno, Rhoads, & Sagarin, 2011; Hong, 2011; Kisielius & Sternthal, 1986; Nisbett & Ross, 1980; Perko et al., 2013).

If vivid main information is used, it is said to increase the cognitive elaboration of the message, because the vivid cues can grab the receiver's attention (Boer et al., 2006; Chang, 2013; Guadagno, et al., 2011; Perko et al., 2013; Petty & Cacioppo, 1986). On the other hand, vividness is also one of the factors that influences the emotional responses, as shown in the Risk-as-feelings perspective (Loewenstein et al., 2001). Furthermore, vivid information can increase the ease of imagination and is easier to remember, which makes it more and faster accessible when a judgment needs to be made about a related topic, showing again the importance of the experiential system (Das, 2011; De Wit, et al., 2008; Chang, 2013; Loewenstein et al., 2001; Slovic et al., 2004).

Some authors questioned the existence of the vividness effect because many studies failed to support the vividness effect hypothesis on persuasiveness and on the judgment of decisions (for an overview see Taylor and Thompson, 1982). Others (Collins et al., 1988) even suggested that the vividness effect is only an illusion, and that it only exists due to the belief people have in the vividness effect and its susceptibility on the people.

A possible explanation for the lack of supportive results is that the information itself is not vivid, but only the presentation around the information is vivid: "*for a vivid message to be persuasive, the message itself has to be vivid not the trappings that surround it*" (Taylor & Thompson, 1982, p. 173; McGill & Anand, 1989). This hypothesis was tested by Guadagno et al. (2011). They concluded that vivid information can increase persuasiveness and attention-getting if the central argument only is vivid, not the background information of the message. Hence, the vividness effect works when the central message is presented vividly (Guadagno et al., 2011).

This dissertation assesses the impact of vividly presented information on message credibility. In case of the emerging food risks, the risk (bacteria on fresh produce) might be difficult to imagine, and therefore a picture can be useful to increase the ease of imagination (Babin & Burns, 1997; Chang, 2013; Keller & Block, 1997). It will be investigated what the impact is of vividly presented information when the main

argument is vividly presented compared to when the main argument is not vividly presented.

5.2. Framing of the spatial distance

The spatial distance is one of the four psychological distances that is used by the Construal Level Theory (CLT) (Liberman & Trope, 2008; Trope, Liberman, & Wakslak, 2007; Trope & Liberman, 2010). The other distances are temporal, hypothetical and social distance. The CLT links these distances with the abstraction of processing, stating that individuals use different psychological associations and mental representations depending of the psychological distances they perceive. By differentiating the psychological distance into a distant or near event, the level of construals -and thus the way individuals process information- will vary, which influences people's reactions towards the message. According to the CLT, near events are represented and evaluated at a lower level construal, defined as more concrete, specific and detailed. Distant events are represented and evaluated at a higher level construal, which are more abstract, decontextualized and general (Bonner & Newell, 2008; Liberman & Trope, 2008; Trope et al., 2007; Trope & Liberman, 2003, 2010).

Trope et al. (2007) provides the following example: picture two children playing with a ball in a backyard. A low-level construal of this activity might include details such as the age of the children, the color of the balls, and the temperature outside. A high-level construal of this activity might be "having fun" (Trope et al., 2007). This high-level construal does not include unique features of the events and involves an implicit decision about which features are central to the event and which are peripheral (Trope et al., 2007). Another example, moving house within a week will be described in concrete, specific actions such as packing boxes. Moving house next year can result in a more abstract and global description such as "a new phase of life" (Bonner & Newell, 2008).

All four psychological distances (i.e., temporal, spatial, hypothetical and social) influence in the same way the representations and evaluations of the situation (Chandran & Menon, 2004; Liberman & Trope, 2008; Stephan, Liberman, & Trope, 2011; Trope et al., 2007). A temporal distance can be next week or next year for example, a spatial distance can be the occurrence in Italy versus the U.S. (Liberman & Trope, 2008; Trope et al., 2007). A hypothetical distance is related to the likeliness (real vs. hypothetically, or probable vs. improbable) that an event would take place (Liberman & Trope, 2008; Trope et al., 2007). The social distance is related to the fact whether the other person is more or

less like oneself. For example, an employee will perceive a boss as more socially distant than a colleague. It was also shown that if people themselves perceive more power, they are more likely to involve in abstract thinking (Trope et al., 2007).

Chandran and Menon (2004) extended the CLT to risk communication, looking at the effects of message cues related to the CLT on judgments of health risk. By manipulating the temporal frame (day vs. year frame), the impact on risk perception and message effectiveness was assessed. Their results showed that the risk was construed more proximal and concrete in day frame than in year frame, leading to a higher risk perception, greater anxiety, more concerned attitudes, higher intentions to behave in a precautionary manner, and a higher perceived effectiveness of the risk communication (Chandran & Menon, 2004). The perceived effectiveness of the risk communication was measured using three different sets: the effectiveness of the message, persuasiveness of the message, and attitude to the message. The latter resembled the measurement of the credibility to the message.

In this dissertation, the message will be framed based on the spatial distance to the risk. Earlier research manipulated spatial distance based on places (e.g., Florence, Italy vs. USA) (Henderson, Fujita, Trope, & Liberman, 2006), but only to assess the liability of the CLT, not related to risk communication. Other research did use spatial distance in a risk communication context, but used it to assess the perceptions of flood threats by differentiating the place of residence (for an overview see Wachinger et al., 2012). The impact of spatial distance on message credibility will be assessed in interaction with vividness and message sidedness.

5.3. Message sidedness

Risk communication can be presented by communicating only the risk (one-sided) or communicating the risk and the benefits (two-sided). Two-sided messages acknowledge opposing views, or address the pros and cons which can be more effective than presenting only one side (Crowley & Hoyer, 1994; Ein-Gar, Shiv, & Tormala, 2012; Eisend, 2006, 2007, 2013; Rucker, Petty, & Briñol, 2008).

Two-sided messages have mainly been applied in marketing and advertising research, in which normally only the positive arguments (one-sided) of a product are communicated, as opposed to both positive and negative arguments (two-sided). The idea of two-sided messages is that, by giving both sides of the issue or the information, the message

appears more balanced and informative. This results in positive attitudes, enhanced attention, more motivation to process the information, favorable reactions and it increases the credibility of the message and the communicator (Crowley & Hoyer, 1994; Eisend, 2007; Rucker et al., 2008). The effectiveness of two-sided messages has been shown in different domains such as advertising research (for an overview see the meta-analysis by Eisend, 2006) and health and risk communication research (Cornelis, Cauberghe, & De Pelsmacker, 2013a, 2013b; Ford & Smith, 1991; Keller & Lehmann, 2008; Verbeke et al., 2008).

There are three different theories explaining the positive effect of two-sided messages (Crowley & Hoyer, 1994; Eisend, 2007). The effectiveness of two-sided messages can be attributed to the perceived novelty of the message, based on *the Optimal Arousal Theory* (Berlyne, 1971). This perceived novelty can be seen as pleasant, which motivates the people to pay more attention and to process the message, yielding positive effects (Eisend, 2006, 2007).

Another theory that explains the effect of two-sided messages, which has been used in the majority of two-sidedness studies, is the *Attribution theory* (Jones & Davis, 1965). The logic of this theory is that the addition of negative information in a message leads the consumer to conclude that the communicator is telling the truth, which increases the credibility of both the message and the communicator (Crowley & Hoyer, 1994; Ein-Gar et al., 2012; Eisend, 2006, 2007; Rucker et al., 2008).

The *Inoculation theory* (McGuire, 1961) is the third theory that could explain the importance of two-sided messages. Using the analogy with a flu vaccine, it states that attitudes can be strengthened by providing some mild attacks towards an issue followed by providing counter arguments to counter these attacks (Eisend, 2006, 2007; McGuire, 1961). In this theory, refutational messages will be used, which contain an attack, followed by the refutation of this first attack, which have been studied by Cornelis and colleagues (2013a, 2013b), Ford and Smith (1991), and Wood (2007).

Most research uses positive one-sided communication (stressing the benefits of a product or the benefits of the desired adaptive healthy behavior), and the two-sidedness is obtained by adding some negative features or consequences of the behavior (e.g., Eisend, 2006; Ford & Smith, 1991). However, most commonly used health and risk communication strategies focus on the negative consequences of a specific issue or behavior (i.e., a negative one-sided message) (Witte, 1992).

Jung (2006) suggests in his overview on food risk communication that more balanced information should be used because of the increase in food scares. Moreover, by using balanced information, it is acknowledged that food can contain risks as well. Furthermore, providing balanced information about the risks and benefits of fish or fresh produce for example, is the most realistic reflection based on the current scientific knowledge (Van Boxstael et al., 2012; Verbeke et al., 2008). Hence, this dissertation will investigate the impact of negative one-sided messages (containing only the risk) and two-sided messages (providing both risk and benefit) on message credibility.

5.4. Presentation order effects

The information in a (risk) message can be presented in different presentation orders. For example, when communicating both benefits and risks, one can start with the risks followed by benefits, or the other way around. The EPPM suggests starting with the threatening information, followed by the reassuring information. Two-sided messages can start with either the benefits of a product or issue, or with the negative features. In what follows, different mechanisms and theories will be discussed, explaining the different impact of presentation order of information.

The primacy and recency effects are two types of order effects identified by researchers in risk communication, marketing and psychology. These effects explain the impact of either the first or the last part of the message on message acceptance and attitudes (Asch, 1952; Chiou, Wan, & Lee, 2008; Ein-Gar et al., 2012; Hogarth & Einhorn, 1992; Petty, Tormala, Hawkins, & Wegener, 2001). A primacy effect occurs when the judgment (impression) is formed using the first presented information. The recency effect occurs when the last presented information generates a stronger effect than earlier presented information.

A recency effect is expected when there is a high motivation to process information (Ein-gar et al., 2012; Kruglanski and Freund, 1983; Kruglanski and Webster, 1996; Petty et al., 2001). The reasoning behind this is that withholding judgment until all information has been processed asks more motivation than immediately forming judgment (Ein-Gar et al., 2012). A high motivation to process is expected for food risks, because food entails a high involvement given its importance in daily life, leading to more systematic processing (Frewer et al., 1997; Frewer & Miles, 2003; Lofstedt, 2006; Petty & Cacioppo, 1984; Pieniak et al., 2007; Renn & Levine, 1991).

Furthermore, following the *belief adjustment model* by Hogarth and Einhorn (1992), a recency effect is expected when a message contains mixed information (e.g., positive vs. negative; threatening vs. reassuring) and when a decision needs to be made immediately upon receiving the information. This model posits that a general, sequential anchoring-and-adjustment process is initiated when a belief is formed. In other words, that succeeding information will adjust the primary opinion, called the anchor (Buda & Zhang, 2000; Hogarth & Einhorn, 1992).

Eisend (2006) mostly found proof for a primacy effect: when negative information is placed first, it leads to negative effects on source credibility, attitudes and purchase intentions. On the other hand, the perceived novelty of the message will be enhanced when the negative information is presented first. Hence, based on Eisend's meta-analysis, no conclusion can be made on which information should be presented first, since the impact of the primacy effect differs. Furthermore, Fischer and Frewer (2009) conclude that risk information is influential, regardless whether it is presented before or after the information about benefits. However, in this dissertation, the message about the food safety risks will contain mixed information (threatening and reassuring information) and there will be a high motivation to process because of the high involvement with food risks, and therefore a recency effect can be expected.

6. RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

The general research objective of this dissertation is to investigate how the emerging food risks on fresh produce, which cannot be completely controlled by individuals, can be effectively communicated to the general public. The general goal of this risk communication effort is to increase awareness about the potential emerging risks. This increase in awareness can be translated into behavioral intentions such as information seeking and the intention to alert loved ones. Furthermore, these risk communication efforts want to prepare people for a possible crisis in order to decrease the potential negative effects of a crisis.

In five empirical chapters, we will seek answers to different research questions which will be outlined in the following part. In **Figure 11**, the theoretical overview is shown, in which the research questions and the chapters are indicated as well.

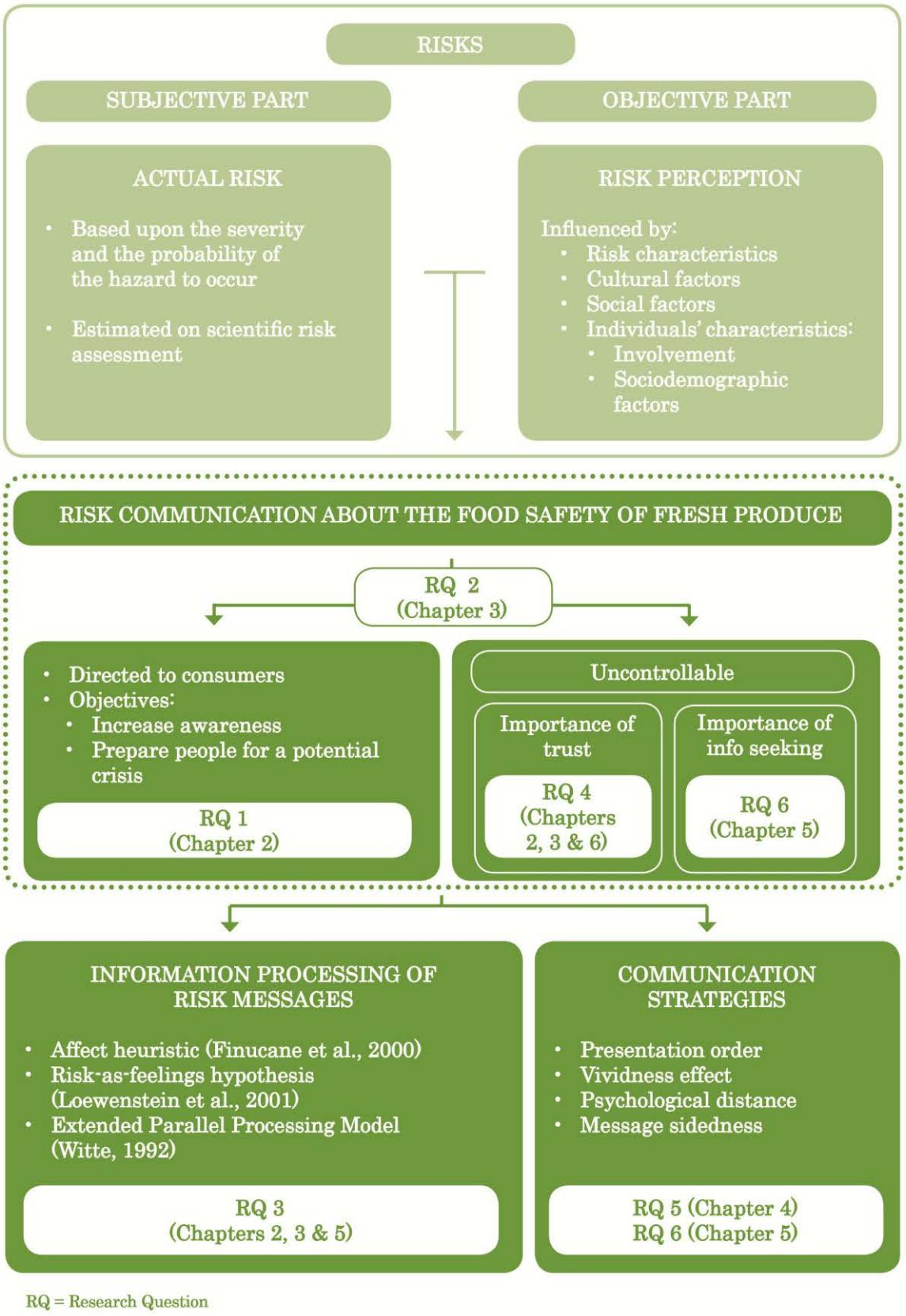

Figure 11 - The different research questions (and chapters) situated in the theoretical overview

RQ 1: Is communication about food safety risks effective in terms of increasing awareness and crisis preparedness?

One of the functions of risk communication is crisis preparedness (Renn & Levine, 1991). When communicating risks that cannot be controlled by the consumers by carrying out self-protective behaviors, the only way people can be prepared for a crisis is by increasing the awareness, by informing them about the possible risks. Informing individuals about potential risks may prevent the crisis to evoke unwanted reactions, such as panic, too much negative feelings and unwanted behavior. This can be explained by the Inoculation theory (McGuire, 1961), stating that when individuals are inoculated against a possible crisis, they will be able to cope with the crisis, leading to less negative feelings. Hence, chapter 2 investigates the impact of risk communication when a crisis hits, on trust in the government and the attributed responsibility to the government. Organizational crisis communication research suggests that by self-disclosing information (providing risk information) it leads to more credibility through inoculation, and this might be the case in public risk communication efforts by the government (Arpan & Roskos-Ewoldeson, 2005; Claeys & Cauberghe, 2012). Chapter 2 will look at the effectiveness of risk communication in terms of crisis preparedness.

RQ 2: Does a standardized risk message about the food safety risks elicit the same reactions across different European countries or should it be nationally adapted?

The emerging risks on fresh produce can occur worldwide, therefore the question arises if a standardized risk message is effective to use on a global level or if it should be adapted on a national level. Past research has shown that attitudes towards issues, risk perceptions and levels of trust in the government can differ per country (Cope et al., 2010; Frewer et al., 2011; Lofstedt, 2006). Furthermore, the socio-economic context differs worldwide and within Europe (Cope et al., 2010; Pornpitakpan, 2004). Because of these differences, the impact of risk communication efforts can differ as well. Furthermore, the need for more insights into effective risk communication strategies in different national contexts has been stressed in earlier research (Cope et al., 2010). Chapter 3 will investigate if a standardized risk message that is disseminated in four European countries (Norway, Spain, Serbia and Belgium) elicits the same reactions in terms of emotional and cognitive reactions, trust in the government, subjective knowledge and behavioral intentions.

RQ 3: What is the importance of emotional and cognitive reactions induced by risk messages?

Research question 3 contains two sub questions, one that focuses on the emotional reactions only, the other investigating both emotional and cognitive reactions. Next, both sub questions will be discussed.

RQ 3a: What is the mediating impact of emotional reactions on the (interaction) effects on the desired behavioral intentions?

The emotional and cognitive reactions play an important role in risk communication as they impact the outcome and consequences of the risk messages (Loewenstein et al., 2001; Slovic et al., 2004; Witte, 1992). In this dissertation, the cognitive reactions are the perceived severity of the risk and the perceived susceptibility of the risk (i.e., risk perception). The emotional reactions consist of negative feelings that are induced after reading the risk message. This terminology is in line with those applied by Sheeran et al. (2013). The EPPM (Witte, 1992), originally only discusses the emotion fear. However, research (Dickinson & Holmes, 2008; Dillard et al., 1996; Witte & Allen, 2000) showed that fear is not the only emotion experienced when an individual is exposed to a threat message. Other negative feelings such as worry and anger, can be aroused as well. These negative emotions play an important role, since they can lead to message rejection if they are perceived as too high, in turn indirectly influencing behavioral intentions (Witte & Allen, 2000; Witte, 1992). Therefore, the mediating impact of these negative feelings will be assessed in chapter 2 and chapter 5. In chapter 2, the mediating effect of negative feelings on the impact of risk communication on intended behavioral changes will be investigated. Chapter 5 will look more closely into the effects of the EPPM when risks that contain a low self-efficacy should be communicated. The mediating role of negative feelings will be assessed on the impact of the different presentation styles on the desired behavioral intentions.

RQ 3b: What is the impact of emotional and cognitive reactions, induced by risk messages, on behavioral intentions?

The EPPM states that fear can directly influence maladaptive responses, and may indirectly affect behavioral intentions (Witte & Allen, 2000; Witte, 1992). However, further research on the EPPM showed that fear (and other negative feelings), does not only emerge and influence the adaptive outcome after the cognitive appraisal of the risk

(the perceived severity and the perceived susceptibility), but also directly affects message acceptance and adaptive behavior (Arthur & Quester, 2004; Cauberghe et al., 2009; de Hoog et al., 2005; Lewis et al., 2010; Popova, 2012). Popova (2012) even suggested, based on a review of the EPPM literature, that there is not one feedback loop but a continuous back-and-forth influence between fear and threat. The latter can be closely linked to the "*dance of affect and reason*" as discussed in the Affect heuristic (Slovic et al., 2004) and the Risk-as-feelings perspective (Loewenstein et al., 2001). The "*dance of affect and reason*" will be investigated in chapter 3.

Both emotional and cognitive reactions impact the behavioral responses as a consequence of the risk message (Loewenstein et al., 2001; Messer, Kaiser, Payne, & Wansink, 2011; Sandman, 2006; Sheeran et al., 2013; Slovic et al., 2004; Witte & Allen, 2000; Witte, 1992). However, it has been shown that the influence of the cognitive reactions on the one hand and the emotional reactions on the other hand, can differ depending of the risk type (Slovic, Peters, Finucane & Macgregor, 2005; Rogers, Amlôt, Rubin, Wessely et al., 2007). The question arises which reactions will have the most influence on individuals' behavioral intentions in the case of the uncontrollable food risks. Knowing that uncontrollable food risks score high on the more affective dimension "dread", it might be that emotional responses have a higher impact than cognitive reactions (Loewenstein et al., 2001; Slovic, 1991). Furthermore, although the specific emerging risk on fresh produce is not well-known among the public, people do perceive food risks as familiar (low unknown risk) (Breakwell, 2000; Eurobarometer, 2010). Furthermore, risks are seen as more familiar when it is a natural risk than when it is a manmade (unnatural) risk (Fife-Schaw & Rowe, 1996; Renn, 2006), and both risks (micro-organisms and pesticide residues) are communicated in the case of the uncontrollable food risks. Familiar risks are perceived as less risky (Reynolds & Seeger, 2005), and therefore less negative feelings such as worry and fear can be expected (Witte, 1992).

Hence, chapter 3 will investigate how the desired behavior is influenced by emotional and cognitive reactions, as is also suggested by Sjöberg (1998). Furthermore, we will assess which reaction (emotional or cognitive) has the most influence after reading a risk message about the emerging risks on fresh produce.

RQ 4: What is the moderating and predicting role of trust in the government when communicating about the emerging food risks?

It has been shown that in those risks that the consumers cannot avoid nor prevent from happening, the role of trust in the government comes to the fore (Frewer, 2004; Siegrist et al., 2000; Ter Huurne & Gutteling, 2009; Yeung & Morris, 2006). Trust is important because people need to rely on the reassuring information that stresses the governmental efforts taken to prevent and control the risks from happening. *"Generating or maintaining trust, then, often becomes a primary goal of risk communication."* (Ter Huurne & Gutteling, 2009, p. 810). Trust in the government is expected to have a main impact on the desired behavioral intentions. Furthermore, it is expected that trust in the government has a moderating effect on the impact of the cognitive reactions, emotional reactions, and perceived efficacy on the intention to keep on eating fresh produce. Chapter 6 will address the moderating effect of trust.

Besides, research showed that trust can influence risk perceptions (i.e., cognitive reactions) and studies showed the influence of trust on emotional reactions (Kuttschreuter, 2006). The impact of trust will be addressed in chapter 3.

RQ 5: Can the different communication strategies (vividness, psychological distance and message sidedness) increase the message credibility?

Message credibility is an important factor to increase message acceptance, to increase awareness, and/or attitude changes (Beltramini, 1988; Bickerstaff, 2004; Mackenzie & Lutz, 1989; Renn & Levine, 1991; Slater & Rouner, 1996; Verbeke et al., 2008; Wathen & Burkell, 2002). Chapter 4 investigates how the highest message credibility in a food risk message can be achieved, by examining three different communication strategies: vividness of the risk message, sidedness of the message and framing of the psychological distance. These three communication strategies have shown to influence message credibility when communicating risks (Chandran & Menon, 2004; Chang, 2013; Eisend, 2006; Verbeke et al., 2008). The communication strategies advice how one should develop its message to increase message credibility. Since a picture is superior in attracting and capturing attention (Pieters & Wedel, 2004), it should induce a vividness effect (Guadagno et al., 2011). The impact of the text on message credibility can be influenced by the psychological distance to the message and message sidedness (Chandran & Menon, 2004; Eisend, 2006). The psychological distance will be manipulated as the framing of the risk as a spatially near event or as a spatially distant event (Liberman &

Trope, 2008). Messages can be presented as one-sided (risk only) or two-sided (risk and benefit). Psychological near events are shown to increase message credibility (Chandran & Menon, 2004), as does presenting the information two-sided (Eisend, 2006). However, the intertwined effect of the three strategies is unclear and has not yet been investigated.

RQ 6: What is the impact on behavioral intentions when the uncontrollability of the emerging food risks is explicitly communicated using the EPPM?

Following the EPPM, communicating a high risk in combination with a low self-efficacy, will induce a fear control process, leading to message rejection (Witte, 1992). The question arises what the influence on the adaptive outcomes is when the low self-efficacy is explicitly mentioned. Furthermore, the reassuring part of the message can only consist of the preventive actions that the government undertakes to try to guarantee food safety. It is unclear in this context whether the reassuring part that contains the information of the governments' efforts, will be reassuring enough to avoid a fear control process. Therefore, the influence of the presentation order of the threatening part and reassuring part on message acceptance will be examined in this study.

In chapter 5 the impact of these presentation styles (mentioning vs. not mentioning the low self-efficacy and the presentation order) on the intention to seek information and the intention to alert loved ones will be assessed. This way, the importance of information seeking behavior in cases that involve a low personal control, will be investigated as well.

7. DISSERTATION OUTLINE

This dissertation aims to investigate how the emerging food risks can be effectively communicated. In order to investigate and answer the research questions, five empirical chapters will describe research, using both surveys as experimental research.

In Chapter 2, *"Won't we scare them? The impact of communicating uncontrollable risks on the public's perception",* the impact of risk communication on the public's perceptions is investigated. The results show that risk communication in comparison to no communication, leads to less negative feelings and more intentions to maintain the current behavior. Furthermore, if a crisis hits and it is preceded by risk communication, the attributed responsibility of the government for the crisis is lower than when no risk

communication is given before the crisis communication. In addition, trust in the government is higher when risk communication is presented before the crisis hits, than when only crisis communication is presented. These results show the importance of risk communication, whether or not followed by a crisis situation.

Chapter 3, *"Emotional and cognitive reactions towards emerging food safety risks in Europe",* investigates the impact of a standard risk message disseminated in four different European countries (i.e., Norway, Spain, Serbia and Norway). This way, national differences regarding reactions towards the risk message can become apparent. The impact of the risk message on emotional and cognitive reactions is assessed, as on trust in the government, subjective knowledge and behavioral intentions. The results indicate that national adaptation is necessary, since the measured concepts differ significantly per country.

Now that it became clear that risk communication should be nationally adapted, chapter 4 *"How to communicate emerging food risks? The impact of vividness, the framing of spatial distance, and message sidedness on message credibility",* examines different communication strategies to effectively communicate the emerging food risks. The used communication strategies are vividness, framing of the spatial distance and message sidedness. The results show that when the risk message vividly presents the main argument, a vividness effect emerges. Only when the vividness effect occurs, an interaction effect is found between spatial distance and message sidedness. When the main argument is vivid, and the occurrence of the risk is near, the message credibility is higher when the message contained a one-sided message than a two-sided message. When the main argument is vivid, and the occurrence of the risk is distant, using a two-sided message leads to higher message credibility, than a one-sided message.

In chapter 5, *"Communicating uncontrollable risks: The impact of the presentation order of threatening and reassuring information"*, it is examined what the influence is of the actual low self-efficacy if it is explicitly mentioned or not. An interaction effect emerges of explicitly mentioning the low self-efficacy or not on the one hand, and the presentation order of the threatening and the reassuring information on the other hand, on behavioral intentions. From the results it can be concluded that the highest behavioral intentions can be found if the conventional presentation order is used (threatening information followed by reassuring information) and the low self-efficacy is explicitly mentioned. Furthermore, when the reassuring information preceded the threatening information, the highest behavioral intentions were found when the low self-efficacy is not mentioned.

Given the right-to-know of the consumers about the potential risks, it is therefore advised to use the conventional presentation order, explicitly mentioning the low self-efficacy.

Chapter 6, *"Analyzing consumers' reactions to news coverage of the 2011 Escherichia coli O104:H4 outbreak, using the Extended Parallel Processing Model"*, gives the results of a survey of real-life reactions to the news coverage on online newspapers of the EHEC outbreak. All the EPPM concepts were measured (i.e., perceived severity, perceived susceptibility, negative feelings and efficacy), and trust in the government and behavioral intentions were assessed. The results show that, as expected, people perceived the risk as severe and felt susceptible. However, people do feel efficaciousness to prevent the risk from happening, resulting in lower negative feelings. These outcomes stress the importance of risk communication to increase awareness about the emerging food risks. Furthermore, the results show the moderating role of trust. People who have trust in the government, perceive a lower risk, leading to higher desired behavioral intentions.

In chapter 7, *"Conclusions, contributions, and further research"*, an overview of the five empirical chapters will be provided, followed by the answers to the research questions. We will end this chapter with managerial implications, limitations and future research.

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CHAPTER 2:

The impact of communicating uncontrollable risks on the public's perception

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CHAPTER 2: Won't we scare them?
The impact of communicating uncontrollable risks on the public's perception

ABSTRACT

Authorities often refrain from communicating risks out of fear to arouse negative feelings amongst the public and to create panic reactions. This study assessed the impact of communicating an uncontrollable risk on the public's feelings and behavioral intentions. In addition, we examined the impact of risk communication on the public's perceptions of the communicator when a crisis actually hits. The results showed that communicating risks has a positive impact on behavioral intentions compared to when no communication takes place, because it reduces negative feelings amongst the public. In addition, the findings showed that when a risk develops into an actual crisis, risk communication resulted in greater trust in the government and reduced perceived government responsibility for the crisis. Therefore, based on these findings it can be suggested that that risk communication is an effective tool for authorities in preparing the public for potential crises. The results showed that communicating risks does not raise panic amongst the public, on the contrary, and it turned out in more positive perceptions of the authorities.

KEY WORDS

Risk communication; Crisis communication; Emotional reactions; Trust; Attributed responsibility

1. INTRODUCTION

Health and environmental risks are increasingly communicated via the media, leading to a continuous stream of risk messages (Perko, van Gorp, Turcanu, Thijssen, & Carle, 2013; Renn & Levine, 1991; Renn, 2006). Risk communication attempts to inform and make people aware of (emerging) risks such as food risks, nuclear risks, climate change, natural hazards, terrorist attacks and health risks. In doing so, risk messages try to persuade people (if appropriate) to take protective actions or change behaviors on the one hand (Witte, 1992). On the other hand the aim of risk communication is to reassure individuals (Reynolds & Seeger, 2005; Rogers, Amlôt, Rubin, Wessely, & Krieger, 2007; Witte, 1992).

Sometimes risks turn into crises, such as the BSE (commonly known as mad cow disease) crisis in the U.K., the *enterohemorrhagic Escherichia coli* (EHEC) O104:H4 outbreak on fresh produce in Europe, natural disasters such as floods, hurricanes and emerging diseases such as Severe Acute Respiratory Syndrome (SARS) and avian influenza (Kellens, Zaalberg, & De Maeyer, 2012; McGloin, Delaney, Hudson, & Wall, 2009; Van Kleef et al., 2007). These crises may result in casualties and fatalities, and can lead to a scare amongst the public. In addition, crises can lead to loss of trust in products, the industry and the government (De Jonge, van Trijp, Renes, & Frewer, 2007; Wentholt, Fischer, Rowe, Marvin, & Frewer, 2010). Risk communication can minimize these harms and therefore its importance has been widely recognized in both risk and crisis communication research (Heath & Palenchar, 2000; Kellens et al., 2012; McComas, 2006; Sellnow & Sellnow, 2010; Williams & Bolanle, 1998).

However, as Sandman (2006) and Sjöberg (1998) point out, sometimes governments and organizations refrain from communicating risks out of fear to arouse negative feelings amongst the public. Communicating risks that cannot be completely circumvented by the public, such as emerging food risks, could elicit negative feelings (Witte, 1992). Nevertheless, people need to be informed about those risks and the potential preventive actions that they can take to reduce the likelihood of a crisis. In case of health risks, preventive actions can consist of behaviors such as breast examination, applying sun screen, or smoking cessation. Self-protective actions such as making emergency kits, can be taken to prepare for a possible hurricane or flood.

When the public receives enough and reassuring information (i.e., measures taken by the authorities to control the risk), risk communication will be able to reduce these elicited negative feelings (Griffin, Dunwoody, & Neuwirth, 1999; Lofstedt, 2006; Palenchar &

Heath, 2002; Slovic, 1991). As such, a crucial factor in the success of risk messages is the public's trust in the authorities that communicate them. Trust in authorities will be especially important when a risk develops into a crisis (Renn, 2006; Reynolds & Seeger, 2005).

Therefore, this study aims to show organizations and governments that communicating uncontrollable food risks does not raise too high negative feelings or panic reactions amongst the public. In addition, this study allows us to examine the impact of proactive risk communication about the emerging food risks on perceptions of communicating authorities when risks develop into crises.

2. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

2.1. Risk communication

Organizations and governments sometimes fear to communicate risks because they worry it may induce negative feelings amongst the public (Sandman, 2006; Sjöberg, 1998). This fear is induced by the assumption that people do not assess a risk in the same objective way as experts, but that they rely on both their cognitive and emotional evaluations of the risk (Loewenstein & Lerner, 2003; Slovic, Finucane, Peters, & Macgregor, 2004). Lay people carry out a subjective risk assessment in which emotions interfere with more objective criteria. Other factors such as knowledge, involvement, familiarity, perceived dread, voluntariness, controllability, perceived risk versus benefit, play a role as well (Frewer, 2000; McGloin et al., 2009; Nathan, Heath, & Douglas, 1992; Renn, 2006; Slovic, 1991; Visschers & Siegrist, 2008).

Nevertheless, people want transparency and openness, not only because it is their right to be informed about possible risks, but also because they can make more informed decisions and reduce uncertainties (Lofstedt, 2006; Palenchar & Heath, 2002; Reynolds & Seeger, 2005; Sellnow & Sellnow, 2010; Williams & Bolanle, 1998). As Renn (2006) points out: *"We can deal with dangers better when we are well aware of them and when we can prepare ourselves for them"* (Renn, 2006, p. 837). When people become aware of a risk and they feel they do not have sufficient information regarding that risk, uncertainty and negative feelings can be induced (Griffin et al., 1999; Kahlor, 2010; Ter Huurne & Gutteling, 2008; Witte, 1992). This aspect is especially the case when a risk is perceived as severe and uncontrollable (Witte, 1992). By giving enough information the

uncertainty and negative feelings can be reduced (Lofstedt, 2006; Palenchar & Heath, 2002; Slovic, 1991).

Consequently, we expect the following:

H1: The public experiences less negative feelings regarding potential risks if risk communication is provided compared to when no such information is offered.

Communicating uncontrollable risks not only helps to reduce negative feelings that are induced when the public becomes aware of a risk, but also minimizes panic reactions in terms of the public's behavior (e.g., afraid to visit large cities, afraid to eat fresh fruits and vegetables etc.). If people are aware and well-informed about such risks and the measures taken by authorities, they will be able to assess the potential risks better and therefore maintain their current behavior. However, the public's behavior in response to risk communication is likely to be determined by the degree to which they experience negative feelings regarding the risks. Prior research illustrates that negative feelings can guide risk perceptions, judgments and behavior (Griffin et al., 1999; Loewenstein, Weber, Welch, & Hsee, 2001; McComas, 2006; Sandman, 2006; Slovic et al., 2004; Witte, 1992; Wong & Cappella, 2009). Threat appeal research shows that when a risk message induces too much negative feelings, it might evoke unwanted behavior such as ignorance of the message or counter behavior (cf. fear control) (Witte, 1992). Consequently, unwanted behaviors might be avoided by communicating risks followed by reassuring information, (i.e., the measures taken to minimize the risks), since this will reduce negative feelings. This leads to the second hypothesis:

H2: The impact of risk communication on intended behavioral changes is fully mediated by the experienced negative feelings.

2.2. The impact of risk communication on the public's perceptions when a crisis hits

Research in the context of organizational crises indicates that risk communication may inoculate the public against potential crises and therefore ensure a positive attitude towards involved parties such as the government (Wan & Pfau, 2004). According to the Inoculation theory, people protect their beliefs against dissonant information the same way they would try to protect themselves from diseases (McGuire, 1961). Just as people build disease resistance by means of a vaccine that pre-exposes them to a weakened form of the virus, organizations in crisis can develop resistance to the impact of negative

events by pre-exposing stakeholders to weakened forms of an external attack (Easley, Bearden, & Teel, 1995).

In doing so, organizations confronted with crises may preserve consumers' trust. Trust is one of the key principles of effective risk communication (Breakwell, 2000; Lofstedt, 2006; Nathan et al., 1992; Renn, 2006; Sellnow & Sellnow, 2010; Visschers & Siegrist, 2008; Wachinger, Renn, Begg, & Kuhlicke, 2012). A number of studies illustrate the importance of government trust in the field of risk communication. Not only as the main objective of risk communication, but also as a mean to achieve other objectives such as the acceptance of the provided risk information, raising awareness and behavioral adaptations (Heath & Palenchar, 2000; McGloin et al., 2009; Perko et al., 2013; Renn & Levine, 1991; Renn, 2006; Van Kleef et al., 2007). Trust in authorities is especially important when a risk turns into a crisis.

Research on organizational crisis communication illustrates that when organizations disclose incriminating information before a third party does so, journalists find their public relations practitioners more credible (Arpan & Pompper, 2003). Additional research illustrates that organizations that self-disclose a crisis are considered more credible and suffer less reputational damage than those that do not self-disclose (Arpan & Roskos-Ewoldsen, 2005; Claeys, Cauberghe, & Leysen, 2013; Claeys & Cauberghe, 2012). Risk communication attempts to make the public aware of what might go wrong in the future (Reynolds & Seeger, 2005; Rogers et al., 2007; Witte, 1992). Therefore, risk communication may operate in the same manner as an organizational self-disclosure and thus positively affect trust in the government through inoculation. Trust is closely related to credibility (Redmond & Griffith, 2005; Trumbo & McComas, 2003):

H3: Trust in the government will be higher when risk communication was presented before the crisis, than when no risk communication was given before the crisis hits.

Similar to organizational crisis communication, risk communication may not only affect the public's trust in the government, but also the amount of responsibility they attribute to the government for the crisis as well. Responsibility is a crucial factor used by the public when forming their attitude towards organizations (Coombs, 2007). Stakeholders that are confronted with an organizational crisis are likely to search underlying causes for the events they observe (Dean, 2004; Kelley, 1973). More specifically, stakeholders will attribute a certain degree of crisis responsibility to the organization in crisis (Coombs, 2007). The more stakeholders attribute crisis responsibility to the

organization, the more the organizational reputation suffers (Claeys, Cauberghe, & Vyncke, 2010; Coombs & Holladay, 1996). If the government communicates risks to the public, it may be considered less responsible when that risk develops into a crisis. Research in the context of trials shows that when a defendant self-discloses incriminating and potentially harmful information before it is announced by a public prosecutor, guilty verdicts and thus perceptions of responsibility are reduced (Dolnik, Case, & Williams, 2003; Mauet, 2007; Williams, Bourgeois, & Croyle, 1993). We therefore expect that governments communicating risks before they develop into actual crises similarly reduce perceptions of responsibility:

H4. The responsibility attributed to the government for a crisis will be lower when risk communication was presented before the crisis, than when no risk communication was given before the crisis hits.

3. METHOD

3.1. Case, stimuli and procedure

In a single factor experimental between-subjects design, three conditions (risk communication only, risk communication followed by crisis communication, crisis communication only) were manipulated. A control group was added, in which respondents received no information about the risk/crisis, only the questionnaire.

Each participant received a short introduction and was then randomly assigned to one of the three conditions, in which they were exposed to four newspaper articles (See Appendix for the original stimuli, p. 138). Depending on the experimental condition, each participant received an article about the risk and/or crisis and two or three filler articles.

The article containing the risk communication was always presented first. The article containing the crisis communication came last and in the control condition the respondents only received the three filler articles. The second filler article was always followed by some filler questions to put the respondents on the wrong track. After the respondents read all the articles, they were asked to complete a questionnaire. In **Figure 1** a visual representation can be found of the procedure.

The first condition presented a risk communication message but did not offer information on a subsequent crisis (n=31, 24.2%). The second condition presented risk communication which was followed by information about a related crisis that had

occurred (n=39, 30.5%). The third condition did not offer a risk communication message but only described the occurrence of the crisis (n=34, 26.6%). The control group (n=24, 18.8%) filled in the same questionnaire without reading any information about neither the risk nor the crisis, but with some slight adaptations of the questions to make them think about the possible presence of dangerous bacteria on fresh produce (e.g., to measure the behavioral intention to keep on eating fresh produce it was stated: "*When thinking about the potential presence of dangerous bacteria, I intend to eat less fresh produce*").

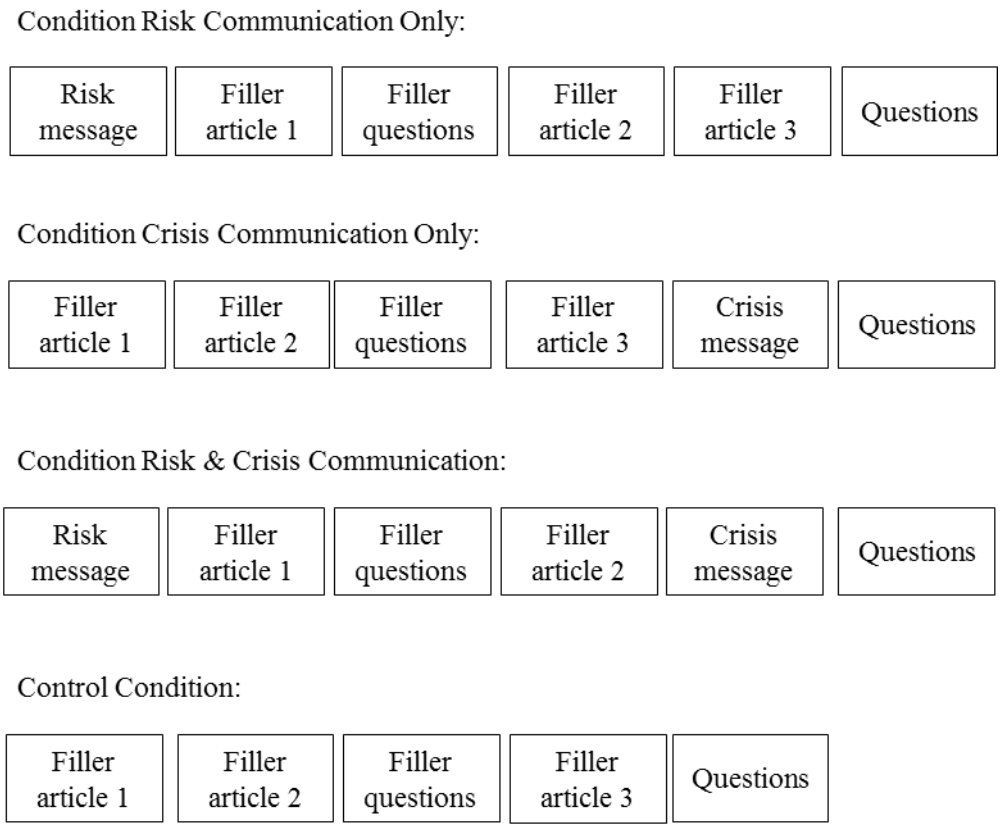

Figure 1 - Overview of different conditions

The risk and crisis scenarios used in the newspaper articles concerned an emerging food safety risk. Micro-organisms and contaminants are identified as possible hazards in fresh produce, which makes fresh produce a growing cause for foodborne illnesses (Jacxsens et al., 2010). Eating contaminated fresh produce can lead to illness, the development of cancer or in the worst case death. Even though some measures can be taken to eliminate the risks (e.g., profoundly rinsing fresh produce), the risk cannot be completely circumvented by consumers because of the absence of an adequate heat

treatment (EFSA, 2011). Consequently, personal control is low and consumers have to rely on the government and authorities to avoid micro-organisms and contaminants on fresh produce. The desired behavioral intention when communicating this risk is that people keep on eating fresh produce, as it is part of a healthy daily diet.

Participants that received a risk communication article read that the Federal Public Service (FPS) of public health, safety of the food chain and environment warned the public about the emerging food safety risks on fresh produce. In addition, the text reassured the public by describing the measures taken by the FPS to try to guarantee food safety. The crisis information article described the occurrence of *Listeria* bacteria on lamb's lettuce in the South of Belgium with many causalities and fatalities, also communicated by the FPS. The same preventive recommendations, as the efforts done by the FPS to guarantee food safety were mentioned in both the risk as crisis communication. Furthermore, both articles ended with the same recommendation by the FPS to continue eating fresh produce as part of a healthy daily diet.

3.2. Participants

A total of 128 respondents filled out the questionnaire, with a mean age of 23 years (*SD*=1.88, range 21-37 years). About 77 % of participants were female (23% male). The sample consisted of undergraduates in social sciences. The first part of the data collection was carried out in October 2012 using a paper and pencil questionnaire. This part included all data but the control condition. A control condition was added to the study in June 2013, using an online survey amongst the same population. Research showed that no significant differences can be found when using different media to fill out a questionnaire (Deutskens, Jong, Ruyter, & Wetzels, 2006; Knapp & Kirk, 2003; Yun & Trumbo, 2000). In the first data collection 104 respondents filled out the questionnaire (76.9% was female, 23.1% male, *M*age=23.12, *SD*=1.96, range 21-37 years). The control condition was filled out by 24 respondents with a mean age of 23.04 (*SD*=1.55, range 21-26 years) and 79.2% was female (20.8% male).

3.3. Measures

The dependent and mediating variables were measured using seven-point semantic scales. To be sure the questionnaire was accurately filled out, a control question was inserted: (*"This is a control question, please indicate 7"*). One person filled out a wrong number and was deleted from the dataset.

Five negative emotions (fear, disappointment, anger, sadness, worry) were measured in order to establish the degree to which participants' experienced *negative feelings,* as suggested by Dickinson and Holmes (2008) (*M*=2.56, *SD*=1.06, α=.859).

Behavioral intention, more specifically the intention to keep on eating fresh produce despite potential risks, was measured using one item: *"After reading the news about the bacteria, I will eat less fresh produce",* which was recoded (*M*=6.23, *SD*=.85) (based on De Wit, Das, & Vet, 2008). In the control group this construct was measured by the following item *"When considering the presence of bacteria, I intend to eat less fresh produce",* which was also recoded.

Trust in the government was measured using the scale by De Jonge et al. (2007), consisting of six items (e.g., *"I have trust in the FPS of public health that they adequately regulate the safety of fresh produce", "The FPS of public health is an open and honest source for information"*) (*M*=4.67, *SD*=.77, α=.821).

The *responsibility of the government* was measured using one item[2]: *"How responsible is the FPS of public health for the dangers caused by bacteria on fresh produce"* (Griffin, Babin, & Darden, 1992) (*M*=4.20, *SD*=1.41).

4. RESULTS

Hypothesis 1 postulates that risk communication induces less negative feelings than not communicating risks at all. To test this hypothesis, an independent samples t-test compared the results of the condition in which participants were exposed to the risk communication message only (i.e., risk communication only) versus the control group who did not receive any risk nor crisis message. The findings showed that negative feelings were significantly lower in the risk communication only condition (*M*=2.23, *SD*=.91) than in the control group (*M*=3.31, *SD*=1.24; *t*(41)=-3.56, *p*=.001), supporting Hypothesis 1.

[2] Measuring concepts using one item is encouraged when the construct is clear and unidimensional (Alexandrov, 2010; Rossiter, 2008).

To test the mediating impact of negative feelings on the effect of risk communication on behavioral intentions, the Preacher and Hayes (2004) Bootstrap test, to estimate indirect effects in simple mediation models, was used. This test is more appropriate than the Sobel test since it produces more robust results for small samples (Zhao, Lynch, & Chen, 2010). In **Table 1** an overview is given of the different coefficients per path. The direct effects of the independent variable (i.e., risk communication only versus control group) on the dependent variable (i.e., intention to keep on eating fresh produce) (b=-.082, p>.05) was no longer significant when 'negative feelings' was entered as a mediator. The Bootstrap analysis indicated a significant (p<.05) indirect effect of the two conditions on intention to keep on eating fresh produce (b=-.411, SE=.155, 95% CI=[-.750, -.148]) through negative feelings. Hence, the concept negative feelings fully mediated the effect of the two conditions on the intention to keep on eating fresh produce. Hypothesis 2 is supported.

Table 1 - Bootstrapping results of indirect effects

	b	SE	t	p	BC Bootstrap 95% CI
Total effect of IV on DV	-.493	.232	-2.125	.038	
IV on M	1.076	.291	3.702	.001	
Direct effects of M on DV	-.382	.097	-3.929	.003	
Direct effect of IV on DV	-.082	.231	-.356	.724	
Indirect effects of IV on DV	-.411	.155		.05	-.750, -.148

IV: Independent Variable (Risk communication only condition = 0 vs. Control condition = 1), DV: Dependent Variable (Intention to keep on eating fresh produce), M: Mediator (Negative feelings), BC: Bias Corrected; 5000 bootstrap samples, CI: Confidence interval

In addition, we examined the importance of risk communication on the public's perceptions of the government once a crisis hits. In order to do so, we compared the condition in which participants only received information regarding a food safety crisis (i.e., crisis communication only) to the condition in which they were also given risk communication prior to the announcement of the crisis (i.e., risk & crisis communication). Hypothesis 3 expects that when a government communicates about a risk before it turns into a crisis, the level of trust in the government is higher than in case the government did not warn the public about the potential risk.

The results showed that trust in the government was significantly higher ($t(71)=-2.39$, $p=.020$) when respondents received risk communication before information on the crisis was offered ($M=4.87$, $SD=.68$) compared to when the crisis communication only was presented ($M=4.47$, $SD=.75$), supporting hypothesis 3.

In addition, risk communication can also affect perceptions of government responsibility. The responsibility attributed to the government was significantly lower ($t(71)=2.52$, $p=.014$) when respondents received risk communication before information on the crisis was offered ($M=3.85$, $SD=1.20$) than when no risk communication was presented ($M=4.56$, $SD=1.21$). Hypothesis 4 is supported.

5. DISCUSSION AND CONCLUSION

The importance of risk communication in informing people about potential hazards is acknowledged by many researchers and applied in many situations (e.g., health risks such as smoking, natural risks such as floods, terrorist attacks, food risks, environmental risks, technological risks such as nuclear risks) (Lofstedt, 2006; Perko et al., 2013; Rogers et al., 2007; Wong & Cappella, 2009). However, sometimes governments remain reluctant to communicating risks out of fear of raising negative feelings such as fright and worry (Sandman, 2006; Sjöberg, 1998). These feelings might be especially induced when the public cannot prevent the risk from happening, such as emerging food risks (Witte, 1992). In order to examine if this reluctance is justifiable, this study examined the impact of communicating food safety risks on the public's feelings and behavior.

The results showed that communicating risks did not increase negative feelings amongst the public, on the contrary, not communicating about the risk led to higher negative feelings. Santos, Covello and McCallum (1996) also found that providing information about a risk does not increase public anxiety. In addition, our findings showed that communicating risks about food safety does not result in a panic reaction amongst the public (i.e., not wanting to eat fresh produce). Quite the reverse, participants that received a risk message that contained reassuring information, had a higher intention to keep on eating fresh produce because they were better informed and reassured, and therefore experienced less negative feelings (Lofstedt, 2006; Palenchar & Heath, 2002; Slovic, 1991). Furthermore, the results stressed the importance of emotional responses in risk communication, showing a mediating effect of negative feelings on the intention to keep on eating fresh produce, which is in line with earlier research (Loewenstein et

al., 2001; Slovic et al., 2004). Therefore, the first findings showed that governments and organizations should not fear to communicating uncontrollable risks, if the risk message contains reassuring information. Without reassuring information, the risk message might induce too high levels of negative feelings, evoking a fear control process as postulated by threat appeal research (Witte, 1992).

This study additionally examined to what degree risk communication protects the public's perceptions of the government when a crisis actually hits. The findings showed that communication about the uncontrollable food risks can inoculate the public against a crisis. Communicating risks before a crisis hits, resulted in a higher degree of trust in the government compared to when no risk communication had been provided before the crisis. Additionally, communication about the food risks led the public to consider the government less responsible for the crisis. These results comply with the Inoculation theory (Easley et al., 1995; McGuire, 1961; Wan & Pfau, 2004; Williams et al., 1993). The results point out that communication about uncontrollable risks is beneficial to the public's perception of the government because it allows an organization to warn an audience about an upcoming crisis (cf. Williams et al., 1993).

6. MANAGERIAL IMPLICATIONS

A number of managerial implications can be drawn based upon the presented results. First of all, the findings from this study illustrate that authorities should not refrain from communicating uncontrollable risks since this does not result in a panic reaction amongst the public.

Second, the results indicated that when uncontrollable risks do evolve into crises, communicating risks protects authorities against detrimental attitude changes (i.e., trust in the government, attributed responsibility) amongst the public due to these negative events. Prior research (Finucane, Alhakami, Slovic, & Johnson, 2000; Lofstedt, 2006; Renn, 2006; Ter Huurne & Gutteling, 2009) has shown that a minimum of trust in governments and organizations is crucial for effective risk communication. Trust in authorities is especially important during crises (e.g., an outbreak) since people need to follow up the guidelines and information provided by the government to ensure their safety.

Third, people have the right to know the risks they face and what is being done or can be done about them (Seeger, 2006). During a crisis it is important that people are informed

about the actions the government takes to protect them (Heath, 2006). A crisis is a very chaotic and demanding event, which can result in misperceptions and rumors (Reynolds, 2006). The involved authorities should attempt to be an effective and reliable (and preferable first) source of information during crises, so the information gap can be filled and journalists cannot question or change their messages based on other information sources (Heath, 2006; Reynolds, 2006).

Finally, trust is fragile, and can easier be destroyed than created (Slovic, 1999). However, the presented results showed that trust in the government increases when risk communication was offered before a crisis hits. Hence, communicating risks can help to increase trust in the government.

7. LIMITATIONS AND FUTURE RESEARCH

A number of limitations to this study offer suggestions for further research. First, participants received the crisis information briefly after they read the risk communication. Further research could examine if a different time span between the risk communication and the actual crisis would lead to the same results. The Inoculation theory proposes that risk communication functions as a vaccine to protect the public opinion about the government against attacks (i.e., the crisis) (McGuire, 1961). The literature specifies that the inoculation effect increases when there is a time lag between offering the "vaccine" and the actual "attack" (Wan & Pfau, 2004). However, prior research found no difference in effect when the inoculation was offered immediately before the attack or three days before (Szybillo & Heslin, 1973). In the same line of reasoning, further research should examine the impact of repetition of the risk message.

Second, even though the risk examined in this experimental study is an actual possibility (Jacxsens et al., 2010), the crisis was fictitious. It may thus be interesting to analyze the current awareness and feelings about potential risks amongst a group of people, and develop a questionnaire that is ready to be distributed when a crisis actually hits. Our results give an indication of the effects, but real-life data could help to support these results. However, such a method would entail a number of practical difficulties. Also the causality between the exposure to the risk communication and the perceptions of the government after the crisis would be hard to make, due to many confounding effects.

Third, the student samples limit the generalizability of our findings. Further research could use a more representative sample of the population in order to generalize these findings. However, research indicates that student samples are widely used and accepted in crisis communication research (Avery, Lariscy, Kim, & Hocke, 2010). Fourth, the general levels of evoked negative feelings were relatively low across the conditions. This aspect might be attributed to the research setting, which might lead to less emotional arousal than in real-life. Nevertheless, the differences of the evoked negative feelings between the conditions show the tendency of a fear control process.

Finally, this study examined risks related to food safety because, 1) food issues are of high personal relevance (Frewer, Howard, Hedderley, & Shepherd, 1997; Lofstedt, 2006), 2) the perceived severity is moderate to high (Dosman, Adamowicz, & Hrudey, 2001), and 3) the awareness about food risks in general is high as well. However, it would be interesting to see what the impact is of other risks that are not related to food, that have a lower perceived relevance, and have a lower involvement. These factors can influence the subjective risk evaluations (Nathan et al., 1992; Renn, 2006; Slovic, 1991; Visschers & Siegrist, 2008). Also, further examination of a variety of risks would allow us to generalize these findings.

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9. APPENDIX: STIMULI

9.1. Risk communication message

Volksgezondheid slaat alarm over gevaarlijke bacteriën op groenten en fruit

Brussel – De Federale Overheidsdienst (FOD) Volksgezondheid meldt dat gevaarlijke bacteriën de voedselveiligheid van groenten en fruit bedreigen door de opwarming van de aarde. Deze bacteriën kunnen overal voorkomen en kunnen uw gezondheid schaden.

De opwarming van de aarde heeft nu ook negatieve gevolgen voor de voedselveiligheid van onze groenten en fruit, zo blijkt uit onderzoek in opdracht van de Federale Overheidsdienst (FOD) Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu.

"Onze verse groenten en fruit kunnen worden besmet met gevaarlijke bacteriën die door de opwarming van de aarde steeds meer voorkomen in België. Deze bacteriën (zoals de *Escherichia* coli 0157:H7, *Salmonella*, *Listeria*,...) kunnen pijnlijke fysieke klachten veroorzaken gaande van lichte buikkrampen, naar bloederige diarree, nierfalen en in extreme gevallen zelfs de dood" zegt woordvoerder Henrik Henauw van FOD Volksgezondheid. "De bacteriën blijven voornamelijk aanwezig op groenten en fruit die we rauw opeten. Wanneer deze gekookt worden is er zo goed als geen kans dat de bacteriën overleven" vervolgt Henauw.

De Federale Overheidsdienst Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu zet volop maatregelen in om de Belgische bevolking maximaal te beschermen. "Dit doen we door beschermingsmaatregelen toe te passen zoals verschillende kwaliteitscontroles van onze groenten en fruit, en strenge inspecties bij de telers en handelaars" duidt Henauw.

Voorzorgsmaatregelen die u zelf kan nemen zijn onder andere: groenten en fruit grondig wassen of schillen, alles fris bewaren, geen gekneusde of beschimmelde groenten en fruit eten, en voor en na het eten uw handen goed wassen.

De Federale Overheidsdienst Volksgezondheid benadrukt dat het heel belangrijk is om dagelijks voldoende groenten en fruit te blijven eten zodat een gezond voedingspatroon behouden blijft. (Mjb)

9.2. Crisis communication message

Tientallen Belgen ziek door Listeria-bacterie op verse veldsla

Brussel – In Henegouwen liggen tientallen mensen in het ziekenhuis, nadat zij besmet raakten met de *Listeria*-bacterie. De infectie gaat gepaard met hevige diarree, braken en buikpijn en kan ernstige schade aan de nieren veroorzaken met zelfs de dood als gevolg. De besmetting is vermoedelijk veroorzaakt door het eten van verse veldsla.

In de provincie Henegouwen zijn bijna 35 patiënten in het ziekenhuis opgenomen en hebben reeds 5 mensen het leven gelaten. De eerste dode viel zaterdag al. Het gaat om een 43-jarige vrouw. Minstens 15 anderen zijn er erg aan toe en liggen op de afdeling intensieve zorgen. Een aantal van hen heeft ernstige schade aan de nieren opgelopen en krijgt een dialysebehandeling. De toestand van minstens twee onder hen is zo kritiek dat ze kunstmatig moeten beademd worden.

De slachtoffers zijn besmet met de *Listeria monocytogenes*-bacterie, vermoedelijk veroorzaakt door veldsla. "Het aantal zware gevallen in een kort tijdsbestek is zeer ongewoon, ook de getroffen leeftijdsgroepen zijn atypisch. Momenteel worden vooral volwassenen getroffen", aldus Marian Jacobs, crisisverantwoordelijke bij de Federale Overheidsdienst (FOD) Volksgezondheid, Veiligheid van de Voedselketen en Leefmilieu.

Laboratoriumonderzoek moet uitwijzen of *Listeria* op de veldsla daadwerkelijk de oorzaak is. Ondertussen voert de overheid strenge kwaliteitscontroles uit bij telers en handelaars van veldsla.

De Federale Overheidsdienst Volksgezondheid raadt in de tussentijd iedereen aan de hygiëne in de keuken goed in de gaten te houden en snijplanken en messen steeds goed schoon te maken, groenten en fruit goed te wassen of schillen, fris te bewaren, en geen gekneusde of beschimmelde groenten en fruit te eten. De enige effectieve manier om de bacteriën te verwijderen is het koken van groenten en fruit. (anp/kve)

9.3. Filler articles

Nieuwe taal ontdekt in noordwest-India: Koro

BRUSSEL - Amerikaanse taalonderzoekers hebben in het noordwesten van India een nieuwe taal ontdekt. De taal Koro wordt door 800 tot 1.200 mensen gesproken.

De ontdekking is gedaan in deelstaat Arunachal Pradesh. In opdracht van National Geographic werd onderzoek gedaan naar de grote diversiteit van talen in de streek. Het Koro verschilt echter opvallend veel van de andere 150 gesproken talen in de deelstaat, die tot de Tibeto-Birmaanse taalfamilie behoren.

Het is niet bekend wanneer de Koro-taal is ontstaan. Verondersteld wordt dat slaven die naar het gebied zijn gehaald, de taal hebben beïnvloed. Om dit vast te stellen moet echter meer onderzoek worden gedaan. In eerste instantie werd gedacht dat het Koro een dialect van de taal Aka was. Maar door het gebruik van totaal verschillende woorden ontdekten de wetenschappers snel dat het een compleet andere taal betreft.

De sprekers van beide talen hebben wel culturele gelijkenissen. Zo dragen zij dezelfde rode gewaden en brouwen ze bier van rijst. Ook zouden veel Koro-sprekers Aka-sprekers trouwen.

Wetenschappers denken dat er nog meer onontdekte talen zijn. Tijdens studies worden de kleinste talen vaak als dialect beschouwd en niet goed bestudeerd.

Wereldwijd worden er 6.909 talen gesproken. Zeker de helft wordt met uitsterven bedreigd. Eerder dit jaar stierf de laatste spreker van een van India's oudste talen, de Bo-taal.

Of het Koro een lang leven is beschoren, wordt betwijfeld. Slechts een klein deel van de kinderen van Koro-sprekers neemt de taal over. Zij prefereren Engels of Hindi.

Om stervende talen te kunnen bewaren, stellen de Amerikanen voor alle kennis en woorden op te slaan. Aangezien het Koro geen schrift kent, wordt dat ingewikkeld. (AP/Belga)

Museum mag gebruik blijven maken van tuin

AMSTERDAM - Het Museum Geelvinck Hinlopen Huis aan de Keizersgracht in Amsterdam mag gebruik blijven maken van de museumtuin. Dat heeft de Raad van State geoordeeld, zo laat het museum weten.

Een buurvrouw van het museum stoorde zich aan de overlast die ze ervaarde van babbelende museumbezoekers in de tuin. Het conflict tussen de buurvrouw en het museum liep zo hoog op dat de Raad van State er aan te pas moest komen. Deze beoordeelde het beroep van de vrouw als ongegrond. Daardoor kan het museum open blijven en kunnen bezoekers blijven genieten van de tuinen van niet alleen Museum Geelvinck, maar ook van de andere grachtenmusea met een keurtuin. Ook zij hebben de zaak met spanning gevolgd. Wanneer de uitspraak negatief zou uitpakken, zouden onder andere Museum Van Loon, het Bijbelsmuseum, Museum Willet-Holyhuysen, de Hermitage Amsterdam en het Tassenmuseum hun tuinen voor bezoekers moeten afsluiten. (Isd)

Deze zomer meer Belgische en Duitse toeristen

AMSTERDAM - Nederland heeft dit jaar meer buitenlandse toeristen ontvangen voor een zomervakantie dan vorig jaar. Er kwamen in de zomer vooral meer Belgen en Duitsers, meldt het Nederlands Bureau voor Toerisme (NBTC).

Het gaat om een lichte stijging ten opzichte van de zomer van vorig jaar. Dat er meer Duitsers en Belgen kwamen, komt volgens het NBTC door de economisch onzekere tijden. 'Dan zoeken mensen hun vakantie dichter bij huis.' Populair waren vooral de kust en Noord-Brabant. Het aantal zomervakanties in eigen land bleef gelijk. Ze kwamen wel laat op gang. 'Het mooie weer van de afgelopen weken zorgde voor een run op lastminutes en was een stimulans om er in de nazomer nog op uit te trekken', constateert het NBTC. 'De campings hebben overal minder vakantiegangers ontvangen en de bungalowparken hebben, ondanks regionale verschillen, een redelijke zomer achter de rug.' De hotelsector laat een lichte groei zien.

De jaarverwachting voor 2012 ziet er ook positief uit wat betreft het inkomend toerisme in Nederland. Dit jaar bezoeken ongeveer 11,7 miljoen buitenlandse toeristen Nederland. Dat is 4 procent meer dan vorig jaar. 'Ondanks de crisis blijven Europeanen internationaal reizen. Ongeveer 80 procent van al het internationaal bezoek komt uit Europa.' (Vc)

CHAPTER 3:

Emotional and cognitive reactions towards emerging food safety risks in Europe

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CHAPTER 3: Emotional and cognitive reactions towards emerging food safety risks in Europe[3]

ABSTRACT

Climate change and globalization may impact the microbiological food safety on fresh produce that is eaten raw (Jacxsens et al., 2010). Hence, food risk communication to inform consumers needs to be carried out. The present study investigated emotional and cognitive reactions of individuals towards a risk message with regard to the emerging food safety risks. The theoretical basis was the Risk-as-feelings perspective (Loewenstein et al., 2001) and the Affect heuristic (Finucane et al., 2000). This research elaborated on whether these reactions towards a risk message vary across some European countries (i.e., Norway, Spain, Serbia and Belgium).

The results showed that compared to emotional reactions, cognitive reactions had a higher predictive influence on behavioral intentions (i.e., the intention to alert loved ones, rinse fresh produce better, think about how to avert the risk and seek information). Both emotional and cognitive reactions, as well as their predictive impact, significantly differed amongst the countries. Trust in the government, subjective knowledge about the topic, and behavioral intentions differed as well per country. Based on these varying results of the impacts of emotional and cognitive reactions on behavioral intentions that were observed in different countries, it was recommended that risk communication strategies are adapted on a national rather than on a European level.

KEY WORDS

Risk communication; Food safety risks; Cross-cultural communication; Risk-as-feelings; Affect heuristic

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1. INTRODUCTION

Fresh produce is an important part of a healthy, daily diet. However, due to an increase in reported outbreaks of foodborne infectious diseases outbreaks attributed to fresh produce, as well as in rapid alerts and border rejections or recalls of fresh produce, concerns emerge on the safety of fresh produce. Micro-organisms and contaminants are identified as the main food safety issues in fresh produce (Van Boxstael et al., 2012), and fresh produce as a food vehicle is a growing cause of foodborne illnesses (EFSA & ECDC, 2012; EFSA, 2013; Jacxsens et al., 2010; Lynch, Tauxe, & Hedberg, 2009; Sivapalasingam, Friedman, Cohen, & Tauxe, 2004; Tobin, Thomson, & LaBorde, 2012). Climate change and globalization are the two factors that may have impacts on the emergence of these food safety hazards (Jacxsens et al., 2010). Eating contaminated fresh produce can lead in case of biological hazards such as *Salmonella* poisoning to acute diarrhoeal illnesses, more severe diseases or mortality. Chemical contaminants such as mycotoxins or pesticide residues can lead to more chronic diseases such as cancer (Weisenburger, 1993). Washing hands before and after eating, along with thoroughly rinsing fresh produce; peeling and storing it at cool temperature can reduce the risks to a certain extent. However, the risks cannot be completely circumvented by consumers because of the absence of an adequate heat treatment to remove the contaminants and micro-organisms before consuming fresh produce that is eaten raw (EFSA, 2011). Communicating these risks about raw fresh produce to consumers and their inability to prevent the risks could lead to the perception that they are not in control, which could cause feelings of worry and fear related to the consumption of fresh produce (Witte, 1992).

This research investigates the impacts of a general risk message on emotional and cognitive reactions of individuals. Both reactions influence risk perception, as postulated in the Risk-as-feelings perspective (Loewenstein, Weber, Welch, & Hsee, 2001) and the Affect heuristic (Finucane, Alhakami, Slovic, & Johnson, 2000; Slovic, Finucane, Peters, & Macgregor, 2004). On one hand, emotional reactions are used as a simple decision rule to enable a quick response. On the other hand, cognitive reactions are based on rational reasoning in assessing the risk (i.e., the severity of and the susceptibility to the risk) (Loewenstein et al., 2001; Slovic et al., 2004). Both emotional and cognitive reactions will result in the risk perception and behavioral responses to it (Loewenstein et al., 2001; Slovic et al., 2004). This study assesses whether both reactions have the same predictive impacts on the general behavioral intentions (i.e., the intention to alert loved ones, rinse

fresh produce better and think about how to avert the risk) and the intention to seek information.

The role of trust in the government comes to the fore since it has an important, moderating role in situations where consumers cannot control the risk. Many researchers (Pieniak, Verbeke, Scholderer, Brunso, & Olsen, 2007; Renn & Levine, 1991) stressed the importance of trust in the government concerning risk communication, not only as the latter's main objective, but also in achieving its other objectives (e.g., behavioral changes). Research (Visschers & Siegrist, 2008) also showed that subjective knowledge can influence trust, and subjective knowledge is known to be an essential contextual factor to process and react to risk information. Therefore, the impacts of trust in the government and subjective knowledge, and their possible influence on emotional and cognitive reactions, are examined.

Due to the global nature of trade and climate change, the above-mentioned food safety risks might occur worldwide. Therefore, it is necessary to communicate the risks on an international level. Hence, this research also aims to identify possible differences in consumers' reactions to risk communication within Europe. This way, national differences in the reactions across Europe can become clear and can indicate whether risk communication strategies about emerging food safety risks should be implemented on a European or a national level.

2. THEORETICAL FRAMEWORK

2.1. Risk-as-feelings & risk-as-analysis

The Affect heuristic (Finucane et al., 2000; Slovic et al., 2004) and Risk-as-feelings perspective (Loewenstein et al., 2001) postulate that risk perceptions are based on emotional and cognitive evaluations of risk information (Loewenstein et al., 2001; Slovic et al., 2004). Risk perception is not only grounded on what individuals think, but also on what they feel (Das, 2011; Loewenstein et al., 2001; Slovic et al., 2004; Visschers & Siegrist, 2008). Emotional processing of a risk (risk-as-feelings) automatically appears at an unconscious level. Hence, affect works here as a heuristic, a simple decision rule, to allow consumers to make quick decisions (Das, 2011; Loewenstein et al., 2001; Slovic et al., 2004; Visschers & Siegrist, 2008). On the other hand, cognitive processing of a risk (risk-as-analysis) involves logic and reason, and takes more objective features into

account when assessing a risk (i.e., the severity of and susceptibility to the risk) (Das, 2011; Loewenstein et al., 2001; Slovic et al., 2004; Witte, 1992).

Both emotional and cognitive processes are continually interactive and dependent on each other, which has been named as *"the dance of affect and reason"* (Finucane, Peters, & Slovic, 2003). This dance results in a general risk perception and behavioral responses to the risk (Loewenstein et al., 2001). Hence, behavioral responses, that is, intention to seek information (Griffin, Dunwoody, & Neuwirth, 1999; Kahlor, 2010; Kuttschreuter, 2006), and other adaptive behavioral intentions (de Zwart et al., 2009; Loewenstein et al., 2001; Witte, 1992) are determined by emotional and cognitive responses to the risk (Das, 2011; Loewenstein et al., 2001).

Research (Fischhoff, Slovic, Lichtenstein, & Read, 1978; Slovic, Fischhoff, Lichtenstein, & Roe, 1981; Slovic, 1987) did show that public reactions towards risks are affected by two dimensions related to the risk type, namely the perceived control that individuals have over the risk (i.e., dread risk) and the perceived knowledge about the risk (i.e., unknown risk). The first dimension, dread risk, is defined by the extent of perceived lack of control, feelings of dread, perceived catastrophic potential, involuntary exposure to the risk and the inequitable distribution of risks and benefits (Slovic et al., 2004, 1981; Slovic, 1991). The second dimension, unknown risk, is related to the knowledge about the risk or the extent to which a hazard is judged to be unobservable, unknown or new; familiarity with the risk and delay in producing harmful impacts (Peters, Burraston, & Mertz, 2004; Slovic, 1991). Both dimensions influence risk perception (Das, 2011; Fischhoff et al., 1978; Peters & Slovic, 1996), balancing the influence of emotional and cognitive reactions, which leads to more or less reliance on emotions, depending on the risk type (Rogers, Amlôt, Rubin, Wessely, & Krieger, 2007; Slovic, Peters, Finucane, & Macgregor, 2005).

In this paper, we will further examine the impacts of emotional versus cognitive reactions on risk perceptions of the emerging food risks. The emerging food risks are uncontrollable, since consumers cannot circumvent the risk without an adequate heat treatment. When individuals are not able to control the risk (i.e., high dread risk), the impacts of emotional responses are expected to be higher than the impacts of cognitive reactions (Loewenstein et al., 2001; Slovic, 1991).

Furthermore, although the specific emerging risk on fresh produce is not well-known among the public, people do perceive food risks as familiar (i.e., low unknown risk) (Breakwell, 2000; Eurobarometer, 2010). Familiar risks are perceived as less risky

(Reynolds & Seeger, 2005), and therefore less negative feelings such as worry and fear can be expected (Witte, 1992). As Renn (2006, p. 838) stated: *"After all, the known and familiar risk is much less fearful than the unknown and less familiar risk".*

Hence, it is unclear which reaction will have more influence after reading a risk message about the emerging risks on fresh produce. This research investigates the impacts of cognitive and emotional reactions on behavioral intentions in the case of emerging food risks on fresh produce.

2.2. The importance of trust in the government and subjective knowledge in risk perception

Risk perception is a multidimensional construct, which is influenced by complex social, psychological, political and cultural processes (Bickerstaff, 2004; Cope et al., 2010; de Zwart et al., 2009; Kuttschreuter, 2006; Slovic, 1999). Besides emotional and cognitive reactions to the risk, this paper examines the roles of trust in the government and subjective knowledge with respect to risk perceptions. Trust is one of the key principles of effective risk communication (Pornpitakpan, 2004; Siegrist & Cvetkovich, 2000; Visschers & Siegrist, 2008). Particularly, in the case of emerging food safety risks that consumers cannot control, the role of their trust in the government comes to the fore. Other studies (Griffin, Ter Huurne, Boerner, Ortiz, & Dunwoody, 2008; Slovic, 1999; Ter Huurne & Gutteling, 2009; Van Kleef et al., 2007) also showed that a lack of trust in the government can increase emotional reactions and cognitive risk perception.

Subjective knowledge of the risk might influence risk perception as well (Earle, Siegrist, & Gutscher, 2007; Visschers & Siegrist, 2008). Knowledge about the risk is an important antecedent for gathering and processing risk information (Johnson, 2005; Perko, van Gorp, Turcanu, Thijssen, & Carle, 2013; Pieniak et al., 2007). Furthermore, following the Planned Risk Information Seeking Model (PRISM) (Kahlor, 2010), the intention to seek information about a certain risk is based on cognitive risk perceptions, emotional responses and perceived knowledge. Lower perceived knowledge relates to higher information needs and thus a higher intention to seek information related to the risk (Griffin et al., 1999; Johnson, 2005).

2.3. The importance of national differences in risk perception

Research shows that perceptions and attitudes towards risk communication differ worldwide (Pornpitakpan, 2004; Slovic, 1999), and even within Europe (Cope et al., 2010; Hornikx & Hoeken, 2007; Mazzocchi, Lobb, Bruce Traill, & Cavicchi, 2008; Pieniak et al., 2007). It might be that emotional and cognitive reactions towards a risk, trust in the government and subjective knowledge may differ per country (Cope et al., 2010; Hornikx & Hoeken, 2007; Mazzocchi et al., 2008; Pieniak et al., 2007). These differences per country can lead to the fact that the influence of these variables on behavioral intentions will differ as well. Earlier research showed that trust in the government varies per country (Frewer et al., 2011; Sjöberg, 2001).

Cope et al. (2010) addressed the need for more insights into effective risk communication strategies in different national contexts and stated that risk communication should be conducted at a national level, rather than being centralized at a pan-European level. The importance of research on national differences in risk communication strategies was stressed by several authors (Bickerstaff, 2004; Cope et al., 2010; de Zwart et al., 2009; Hoeken & Korzilius, 2003; Slovic, 1999; Weber & Hsee, 2010). Hence, the current study contributes to filling this gap in the existing literature by investigating the differences in emotional and cognitive reactions towards food safety risks amongst Norway, Spain, Serbia and Belgium. Variations in the relationships amongst emotional and cognitive reactions, trust in the government, and subjective knowledge on behavioral intentions across countries are assessed as well.

3. RESEARCH QUESTIONS

The current study poses the following research questions (RQs) with respect to the emerging food safety risks:

RQ 1: Do emotional and cognitive reactions, trust in the government, subjective knowledge and behavioral intentions differ per country?

RQ 2: What are the correlations amongst emotional and cognitive reactions, trust in the government, subjective knowledge and behavioral intentions, and do they differ across countries?

RQ 3: Are emotional and cognitive reactions, trust in the government and subjective knowledge predictors of possible behavioral intentions, and do they differ across countries?

4. METHOD

4.1. Design

To investigate the research questions stated in this study, a quantitative survey was developed to measure emotional and cognitive reactions towards the emerging food safety issues, trust in the government, subjective knowledge, general behavioral intentions and the intention to seek information. To measure these reactions, a risk message was provided about the emerging food safety risks (cf. Appendix, p. 170). The risk message was designed based on insights related to threat appeal research (e.g., the Extended Parallel Processing Model by Witte, 1992). A threat appeal message consists of the threatening part to address both the severity of the threat and the susceptibility to it, and the reassuring part to increase the feeling of efficacy (i.e., what can be done to avoid the risk of contamination). In the case of fresh produce that is eaten raw, the efficacy is low for the consumer, since heating is the only adequate way to circumvent the risk. Therefore, the reassuring part was related to the respective governments' preventive measures in their attempts to guarantee food safety.

Four European countries were selected for a comparison of the results across nations, namely Norway, Spain, Serbia and Belgium. These countries represent the north-south and east-west axis within Europe. All data were collected before the outbreak of the *enterohemorrhagic Escherichia coli* (EHEC) bacteria in Germany in May/June 2011. Furthermore, no recent food related outbreaks were reported in any of the four countries, other than an outbreak of *Yersinia enterocolitica* O:9 infection in March 2011 in Norway, with bagged salad mix indicated as a possible source. During this outbreak, the producer had voluntarily withdrawn the salad bags from the market (Macdonald et al., 2011).

4.2. Procedure and participants

A total of 864 respondents filled out the survey with a mean age of 35.71 (*SD*=12.91, age range=15–78 years); 45.1% were male. In Flanders (the Flemish-speaking part of Belgium), the data were collected in November 2010 using a paper-and-pencil questionnaire at an annual fair. In the three other countries, the data were collected using an online survey in April–May 2011. The online survey was disseminated by local universities to students' and professors' email addresses, on LinkedIn, on online local forums and by local inhabitants using the snowball method, which encouraged respondents to forward the email containing the link to the survey to as many

acquaintances as possible. Research showed that no significant differences can be found when using different media to fill out a questionnaire (Deutskens, Jong, Ruyter, & Wetzels, 2006; Knapp & Kirk, 2003).

In Belgium, a total of 475 respondents participated; to keep the number of respondents fairly equal across the four countries, 230 respondents were randomly selected out of this dataset. In Norway, 229 respondents filled out the survey. Spain had 189 participants. In Serbia, responses of 212 participants were collected. **Table 1** presents an overview of the sample characteristics. There is a significant difference in age amongst the countries ($F(3,861)$, 7.24, $p<.001$). The Scheffe post hoc test revealed that the mean age of the sample in Serbia ($M=32.81$) is significantly lower than in Norway ($M=38.48$). A significant difference in educational levels is also indicated amongst the countries ($\chi^2(12, N= 864) = 237.65$, $p<.001$). No significant difference was found based on gender ($\chi^2(3, N= 864) = 3.88$, $p=.275$). These differences in sample characteristics should be kept in mind when interpreting the results.

Table 1 - Sample characteristics

	Norway		Spain		Serbia		Belgium		Total	
	%	n	%	n	%	n	%	n	%	N
Total	26.5	229	22	190	24.9	215	26.6	230	100	864
Gender										
Male	39.3	90	48.4	92	44.2	95	46.5	107	45.1	384
Female	59.0	135	50.0	95	54.0	116	53.0	122	54.9	468
Mean Age	38.48 (*SD*=12.36)		35.39 (*SD*=8.63)		32.81 (*SD*=9.07)		36.21 (*SD*=17.99)		35.71 (*SD*=12.91)	
Age groups										
< 30	34.9	80	31.6	60	43.3	93	62.1	154	44.2	376
31-45	35.4	81	53.7	102	47.9	103	7.3	18	35.7	304
46-65	25.8	59	13.7	26	7.4	16	20.2	50	17.0	145
65+	2.2	5	.5	1	.0	0	8.5	21	3.1	26
Education										
Primary school or no education	0	0	1.6	3	.5	1	1.7	4	.9	8
Lower secondary school	.4	1	10.6	20	.5	1	13.0	30	6.1	52
Higher secondary school	12.4	28	12.8	24	10.0	21	41.7	96	19.8	169
College (bachelor)	34.7	78	33.5	63	43.8	92	29.6	68	35.3	301
University (master)	41.3	93	41.5	78	27.1	57	12.2	28	30.0	256
Post university	11.1	25	0	0	18.1	38	1.3	3	7.7	66

4.3. Measures

The questionnaire was developed using existing seven-point Likert and semantic scales. Immediately after the respondents read the provided risk message, five negative feelings were measured: fear, anger, sadness, frustration and worry. All measured emotions are negative, based on threat appeal research and the suggestion by Dickinson and Holmes (2008) that fear is not the only emotion that drives an individual's coping response after receiving a threat appeal. The mean value of these negative emotions was calculated and labelled as emotional reactions.

Furthermore, the cognitive perception of the risk was measured using two concepts: perceived severity (Witte, 1992) (e.g., *I see the new germs as a serious threat to the food safety of fresh produce*) and perceived susceptibility (Witte, 1992) (e.g., *It is likely that I will get in touch with fresh produce that contain germs*). Each consisting of three items; the mean value of the six items taken together were labelled as cognitive reactions.

Intention to seek information comprised three items (Kahlor, 2010) (e.g., *I have the intention to seek information about the risks of new germs on fresh produce, due to climate change*). The general behavioral intentions were measured using three items (e.g., *I will alert loved ones; I will rinse my fresh produce better after reading this message; and I will think about how to avert this risk*) (based on De Wit, Das & Vet, 2008).

To measure trust in the government, four items were used (e.g., *I trust that the government and food safety agencies will guarantee the food safety of fresh produce*) (De Jonge, van Trijp, Renes, & Frewer, 2007). Subjective knowledge consisted of four items, based on Kahlor's scale (2010) (e.g., *I know a lot about the risks of new germs on the food safety of fresh produce, due to climate change*).

At the end of the questionnaire, sociodemographic variables were measured. The questionnaire was originally developed in Dutch and was subsequently translated into English in order to be translated into Serbian, Norwegian and Spanish by native speakers.

Table 2 provides an overview of the measured concepts and mean values, standard deviations and Cronbach's alpha. The internal consistency per construct is similar per country, indicating that the measurement instrument was valid across countries after translation (Erkut, Alarcon, Coll, Tropp, & Garcia, 1999).

Table 2 - Overview of the measured concepts, mean values, standard deviations, Cronbach's alpha and significant differences amongst the countries.

	Norway M(SD) Cronbach's α	Spain M(SD) Cronbach's α	Serbia M(SD) Cronbach's α	Belgium M(SD) Cronbach's α	ANOVA outcome	Total M(SD) Cronbach's α
Subjective knowledge	M=3.37 (1.59) .828	M=2.98[A] (1.55) .860	M=2.82 (1.44) .773	M=2.98[A] (1.55) .803	$F(3,861)$, 5.15, p=.002	M=3.04 (1.55) .817
Trust	M=3.80[A] (1.30) .817	M=3.78[A] (1.38) .774	M=3.09 (1.36) .775	M=3.71[A] (1.11) .732	$F(3,861)$, 14.69, p<.001	M=3.60 (1.32) .778
Emotional reactions	M=3.04[A] (1.41) .911	M=3.27[A] (1.32) .873	M=3.86 (1.45) .860	M=2.54 (1.24) .883	$F(3,861)$, 32.43, p<.001	M=3.14 (1.43) .885
Cognitive reactions	M=5.03 (1.02) .826	M=4.64 (1.17) .863	M=5.37 (1.09) .861	M=4.27 (1.22) .871	$F(3,861)$, 38.24, p<.001	M=4.83 (1.20) .867
Behavioral intentions	M=4.38 (1.41) .770	M=4.73 (1.41) .766	M=5.15 (1.47) .806	M=4.01 (1.50) .796	$F(3,861)$, 23.89, p<.001	M=4.56 (1.51) .797
Intention to seek information	M=3.53 (1.41) .858	M=4.06 (1.57) .946	M=4.31 (1.64) .903	M=3.47 (1.63) .918	$F(3,861)$, 14.77, p<.001	M=3.83 (1.60) .905

The same superscript characters ([A]) in the same row means there is no difference between the marked numbers.

5. RESULTS

Since the sample significantly differed amongst the four countries for two sociodemographic measures, that is, age and educational level, the results were controlled for these variables. A MANCOVA analyzing the impact of nationality on the different dependent variables, controlling for age and educational level (as covariates), shows no effects of educational level on any dependent variable (p>.008). As suggested by Huberty and Morris (1989) and Keselman et al. (1998) we used a Bonferroni adjusted alpha level of .008 to control for the statistical type I error. The covariate age does had an effect (using a Bonferroni adjusted alpha level of .008) on behavioral intentions (p=.003) and intention to seek information (p<.001). The older the respondent is, the more likely he or she will change his or her behavior or seek information. However, the effects of nationality on all six dependent variables remained significant (p<.001), after inserting the covariates age and educational level. Hence, the significant effects of nationality are valid.

5.1. Individual reactions towards the risk message and the moderating role of nationality

Emotional reactions towards the risk after reading the risk message were calculated at 3.14 (*SD*=1.43), and cognitive reactions towards the risk message equal 4.83 (*SD*=1.20). Trust in the government had a mean value of 3.60 (*SD*=1.32), which is below the neutral value of 4. The mean value of subjective knowledge for all respondents was 3.04 (*SD*=1.55), which is genuinely low. The behavioral intentions (i.e., the intention to alert loved ones, rinse fresh produce better and think about how to avert this risk) had a mean value of 4.56 (*SD*=1.51), and the mean value for the intention to seek information was 3.83 (*SD*=1.60).

All measured concepts (i.e., emotional and cognitive reactions, trust in the government, subjective knowledge and both behavioral intentions) significantly differed per country, in response to research question 1. Serbia had the highest cognitive reactions towards the risk message, the lowest trust in the government, the lowest subjective knowledge and the highest behavioral intentions, compared to the results in the other countries. Belgium had the lowest emotional and cognitive reactions and the lowest behavioral intentions. **Table 2** gives an overview of the results.

5.2. Correlations between the individual reactions towards the risk message and the moderating role of nationality

The correlation table of the general dataset (cf. **Table 3 A**) clearly reveals that trust in the government was only weakly negatively correlated with emotional reactions (r=-.180). Emotional reactions were positively correlated with both behavioral intentions and cognitive reactions. The latter was also correlated with behavioral intentions in general and the intention to seek information. These findings show that the main variables do correlate, as asked in research question 2, and the strongest correlation could be found between cognitive reactions and general behavioral intentions (r=.516).

Regarding the correlations per country (cf. **Table 3-B–E**), some differences can be noted. Norway is the only country with weak correlations between trust in the government and subjective knowledge, and between subjective knowledge and intention to seek information. Furthermore, the correlation of emotional reactions with behavioral intentions is much stronger than those in the other three countries. The correlation between emotional reactions and trust in the government is strongest in Norway and Spain; in Serbia, there is no correlation. Hence, the found correlations are not always the same in each country (cf. RQ 2).

Table 3 - Correlations amongst the individual reactions towards the risk message for the general dataset (A) and per country (B, C, D, E).

A. Correlation matrix (TOTAL)

	Subjective knowledge	Trust	Emotional reactions	Cognitive reactions	Behavioral intentions	Intention to seek info
Subjective knowledge	-					
Trust	.092**	-				
Emotional reactions	-.068	-.180**	-			
Cognitive reactions	-.035	-.050	.359**	-		
Behavioral intentions	-.055	-.043	.396**	.516**	-	
Intention to seek information	.007	-.024	.318**	.389**	.612**	-

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

B. Correlation matrix (NORWAY)

	Subjective knowledge	Trust	Emotional reactions	Cognitive reactions	Behavioral intentions	Intention to seek info
Subjective knowledge	-					
Trust	.157*	-				
Emotional reactions	-.020	-.253**	-			
Cognitive reactions	.163*	.034	.271**	-		
Behavioral intentions	.016	-.098	.441**	.467**	-	
Intention to seek information	.131*	-.028	.423**	.463**	.645**	-

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

C. Correlation matrix (SPAIN)

	Subjective knowledge	Trust	Emotional reactions	Cognitive reactions	Behavioral intentions	Intention to seek info
Subjective knowledge	-					
Trust	.113	-				
Emotional reactions	-.031	-.222**	-			
Cognitive reactions	.030	.016	.280**	-		
Behavioral intentions	-.002	.029	.242**	.486**	-	
Intention to seek information	.031	-.006	.198**	.358**	.502**	-

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

D. Correlation matrix (SERBIA)

	Subjective knowledge	Trust	Emotional reactions	Cognitive reactions	Behavioral intentions	Intention to seek info
Subjective knowledge	-					
Trust	.118	-				
Emotional reactions	-.122	.073	-			
Cognitive reactions	-.064	.018	.297**	-		
Behavioral intentions	-.066	.097	.288**	.579**	-	
Intention to seek information	-.078	.112	.246**	.451**	.594**	-

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

E. Correlation matrix (BELGIUM)

	Subjective knowledge	Trust	Emotional reactions	Cognitive reactions	Behavioral intentions	Intention to seek info
Subjective knowledge	-					
Trust	-.112	-				
Emotional reactions	-.048	-.136*	-			
Cognitive reactions	-.224**	-.062	.355**	-		
Behavioral intentions	-.088	-.001	.367**	.442**	-	
Intention to seek information	.024	-.033	.238**	.268**	.610**	-

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

5.3. Predictive impacts of emotional and cognitive reactions on behavioral intentions and differences per country

It is evident from the correlation tables (cf. **Table 3-A–E**) that neither trust in the government nor subjective knowledge correlated with behavioral intentions. Therefore, it was decided that only emotional and cognitive reactions would be used in the regression model on behavioral intentions. However, the impacts of trust and knowledge on emotional and cognitive reactions have been considered, which are discussed later.

To find out the predictive value of emotional and cognitive reactions on the general behavioral intentions and intention to seek information, different stepwise linear regressions were carried out (see **Table 4**). Due to the moderate correlations among the emotional and cognitive reactions, the possibility of multicollinearity was checked. The tolerance values were all above .872, suggesting that multicollinearity was not a problem (Farrar & Glauber, 1967).

Significant models emerged on general behavioral intentions (p<.001) and intention to seek information (p<.001). The model on behavioral intentions explained 31.0% of the total variance in the general dataset (Adjusted R^2= .310) and the model on the intention to seek information explained 18.6% of the total variance in the general dataset (Adjusted R^2= .186). These models clearly indicate that the impacts of cognitive reactions are higher than those of emotional reactions on general behavioral intentions and intention to seek information.

The stepwise linear regression models for each separate country emerged as significant as well on general behavioral intentions (all countries: p<.001) and intention to seek information (all countries: p<.001).

The impacts of cognitive reactions on both behavioral intentions were higher in three of the four countries. However, in Norway, the standardized beta coefficients were similar for both emotional reactions as cognitive reactions. Furthermore, emotional reactions were not a significant predictor of the general behavioral intentions and intention to seek information in Serbia. Additionally, the explained variance differed per country. The highest explained variance could be found for general behavioral intentions, but it ranges from 38% in Serbia to 22.7% in Belgium.

Table 4 - Overview of linear regression, using the enter model, on intention to seek information and behavioral intentions.

	Intention to seek information			Behavioral intentions (3 items)		
	B	SE B	Beta	B	SE B	Beta
Norway						
Emotional reactions	.326	.060	.328**	.344	.058	.351**
Cognitive reactions	.500	.084	.355**	.488	.083	.350**
R^2		.289			.304	
Spain						
Emotional reactions	.153	.089	.129	.152	.073	.146*
Cognitive reactions	.430	.102	.314**	.513	.084	.431**
R^2		.128			.231	
Serbia						
Emotional reactions	.119	.076	.105	.120	.064	.115
Cognitive reactions	.737	.103	.480**	.802	.086	.578**
R^2		.263			.380	
Belgium						
Emotional reactions	.206	.093	.156*	.282	.079	.232**
Cognitive reactions	.280	.094	.209*	.434	.081	.350**
R^2		.082			.227	
Total						
Emotional reactions	.229	.039	.206**	.260	.034	.248**
Cognitive reactions	.429	.047	.315**	.536	.041	.421**
R^2		.186			.310	

**=p<.001, *=p<.005

Consequently, in response to research question 3, the predictors of behavioral intentions and intention to seek information are emotional and cognitive reactions, the latter having stronger impacts. Furthermore, the regressions on behavioral intentions and intention to seek information per country showed that not every concept contributes in the same way to the predicting value of the dependent variables in each country.

Based on the theoretical overview and the correlations matrix (cf. **Table 3**-A–E, p. 156), the effects of trust in the government and subjective knowledge on emotional and cognitive reactions have been assessed in two stepwise linear regressions. The results showed that a significant model emerged on emotional reactions (p<.001, R^2=.033), with trust being the only significant predictor (Beta=-.175, p<.001). The tolerance values

were .994, hence multicollinearity is no problem (Farrar & Glauber, 1967). No significant model was found on cognitive reactions (p=.168, R^2=.002).

The linear regression models on emotional reactions per country indicated that in Norway (p<.001, R^2=.055) and Spain (p=.015, R^2=.038) significant models emerged, in which trust in the government was the only significant predictor (Beta Norway=-.254, p<.001; Beta Spain=-.223, p=.004). On cognitive reactions, the linear regression models showed that only in Belgium a significant model emerged (p=.001, R^2=.049), in which subjective knowledge was the only significant predictor (Beta=-.234, p<.001).

6. DISCUSSION AND CONCLUSION

This study assessed the importance of individual's emotional and cognitive reactions (after reading a risk message about food safety) in behavioral intentions and information seeking behavior. Since consumers have little or no personal control to avoid the emerging food risks, the influence of their trust in the government was evaluated as well, together with subjective knowledge. The latter is known to be an important contextual factor to process and react to risk information. Furthermore, the differences amongst Norwegian, Spanish, Serbian and Belgian respondents concerning emotional and cognitive reactions, trust in the government and subjective knowledge, and the influences on behavioral intentions and information seeking intentions were investigated.

The results showed that both emotional and cognitive reactions were correlated, which demonstrates the *"dance of affect and reason"* (Finucane et al., 2003; Slovic et al., 2004). Furthermore, emotional and cognitive reactions were correlated with both behavioral intentions, which follows the Risk-as-feelings perspective by Loewenstein et al. (2001) and the Affect heuristic (Finucane et al., 2000; Slovic et al., 2004). The predictive values of emotional and cognitive reactions on behavioral intentions also emerged. The findings indicated that cognitive reactions have stronger impacts than emotional reactions on behavioral intentions and information seeking behavior. Previous studies showed that the balance between emotional and cognitive reactions can be influenced by different factors such as familiarity and controllability, which are dependent according to the type of risk (Rogers et al., 2007; Slovic et al., 2005). Our study adds to these findings by showing that cognitive factors may be particularly crucial for food-related risks. This result could be explained by the perceived familiarity of food risks, leading to more impact of cognitive reactions.

Different researchers (Siegrist & Cvetkovich, 2000; Visschers & Siegrist, 2008; Wachinger, Renn, Begg, & Kuhlicke, 2012) suggested that trust had a substantial impact on risk perception, especially when the knowledge about the risk is low. However, this study revealed a weak correlation between trust in the government and subjective knowledge. Similarly, no correlations between trust in the government and both behavioral intentions could be found, nor between subjective knowledge and both behavioral intentions.

The regression model on emotional reactions revealed that trust in the government is the only significant predictor. This finding supports the fact that trust is an important basis for effective risk communication, because emotional reactions influence behavioral intentions (Renn & Levine, 1991). The impact of subjective knowledge is less clear, since it hardly showed any correlation with the other variables. It might be because its influence is especially notable on information processing (systematic or heuristic), which was not measured in this study, and merits further research.

The differences in reactions towards the same message about the emerging food safety risks per country can possibly (partially) be explained by the management of the food chain safety. Although food safety rules and criteria are harmonized at the European Union (EU) levels, it is up to each member state to organize and implement its own monitoring and surveillance system, inspections and audits to verify compliance with EU regulations and also to develop its own communication programme about food safety for consumers. Spain and Belgium are part of the EU; Norway is an associated member state, whereas Serbia is a candidate for membership and in the process of aligning with EU food safety regulations. Therefore, each European country involved in this study exercises sovereignty to upgrade its own food safety management system and communication strategy. The latter may be reflected in consumers' knowledge of and attitudes towards food safety issues.

To conclude, the results showed that both emotional and cognitive reactions play an essential role in risk communication. Cognitive reactions had stronger predictive impacts than emotional reactions on behavioral intentions and intention to seek information. Furthermore, the explained variance of behavioral intentions and intention to seek information by emotional and cognitive reactions differed as well across countries, demonstrating that other factors influence the behavioral intentions to a greater or lesser extent. Additionally, these cognitive and emotional reactions were differently influenced by antecedents such as trust in the government and subjective knowledge.

Risk communication strategies should therefore be adapted nationally. Cognitive reactions are influenced by the severity and susceptibility aspects of the message. The knowledge that the perceived severity and perceived susceptibility are affected by many other factors such as personal experience (Terpstra, Lindell, & Gutteling, 2009), along with trust in the government and risk management (Griffin et al., 2008; Slovic, 1999; Ter Huurne & Gutteling, 2009; Van Kleef et al., 2007), which also differ per country, points to the necessity of nationally adapted risk messages.

7. LIMITATIONS AND FURTHER RESEARCH

This research has some limitations. Data collection happened in four countries; so during this phase, it was not possible to assess all media coverage and public attention about the emerging food safety risks in each country. This situation means that a news topic might have influenced some of the reactions. Furthermore, the use of a single generic risk message influences the generalizability of the results. Future research is necessary to identify the exact specifications for an effective risk message, customized per country. Moreover, this research was an exploratory study to look for differences amongst the four countries. Upcoming research could evaluate the cultural and/or national dimensions influencing these differences, in order to pinpoint the underlying reasons for the encountered differences. Since the online survey was distributed before the EHEC outbreak in Germany in May/June 2011, it would be interesting if further research could find out the effects of this outbreak on emotional and cognitive reactions, trust in the government, subjective knowledge and behavioral intentions. The impact of the depth of information processing could be a valuable concept to consider in future research when assessing the impact of subjective knowledge, and the effects of the risk message in general. This strategy can also counter the possible drawback that the importance of cognitive reactions is only found because of the research setting, where people do have the time to read the risk message, and need to elaborate on the content due to the questionnaire. Moreover, since some reactions could not be explained by the theoretical framework, it is crucial to seek for other influencing factors of behavioral intentions.

The mere fact that this research has been conducted in different countries raises some limitations; one limitation is the possible bias in the extremity of responses, which can vary per country (Hoeken & Korzilius, 2003). The fact that the samples are not representative of each country's residents is another restriction. The results need to be interpreted with care and cannot be generalized to every population in each country.

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9. APPENDIX: RISK MESSAGE

Research has shown that climate change can evoke new threats with regard to food safety of fresh produce (fresh fruit and vegetables). Due to climate change (increase in temperature, changing amount of precipitation), new and/or other germs (e.g., bacteria, virus, etc.) and contaminants (e.g., toxins, pesticides, etc.) can be found on fresh produce. Germs and contaminants can have an impact on public health.

The government has in collaboration with food safety agencies and the food industry the responsibility to provide safe and healthy food to the consumers. Therefore, scientific research is carried out into the development and the characteristics of these germs, to efficiently prevent and/or suppress it. This way, the government wants to guarantee safe fresh produce.

Possible solutions are the adaptation of the present production systems and/or of the packaging technologies, or the development and the use of new kinds of pesticides.

The long term effects of climate change on the germs are not yet mapped. Therefore, the potential impact of the germs and pesticides on public health is insecure. Further research has to bring more clarity.

CHAPTER 4:

How to communicate emerging food risks? The impact of vividness, framing of spatial distance, and message sidedness on message credibility

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CHAPTER 4: How to communicate emerging food risks? The impact of vividness, the framing of spatial distance, and message sidedness on message credibility[4]

ABSTRACT

This study investigated the effectiveness of risk messages in terms of evoking message credibility by examining three different communication strategies, that is, vividness of the message, spatial distance in the message, and sidedness of the message. Using a 2 (main argument vivid vs. main argument not vivid) X 2 (spatially near vs. spatially distant) X 2 (one-sided vs. two-sided) between subjects factorial design, eight leaflets were developed and shown to 390 participants. The results showed that when the main argument is vivid and the risk is presented spatially near, the message credibility was significantly higher when the message is one-sided versus two-sided. However, when the main argument of the risk is vivid and the risk is presented spatially distant, then the message credibility was significantly higher for a two-sided message than for a one-sided message. These results have important managerial implications for professionals involved with international risk communication.

KEY WORDS

Risk communication; Vividness effect; Message sidedness; Psychological distance; Message credibility

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1. INTRODUCTION

Risk communication about emerging food safety risks becomes increasingly important due to the occurrence of different food outbreaks such as the EHEC outbreak in Germany in May/June 2011, which increases the public concern. *"Risk communication is the interactive exchange of information and opinions concerning risk and risk-related factors among risk assessors, risk managers, consumers and other interested parties"* (FAO/WHO, 1998). The importance of risk communication has been acknowledged by many researchers, risk managers, health communicators, government officials, as a way to be open and transparent, and to inform and reassure the public about potential hazards (Renn & Levine, 1991; Van Kleef et al., 2007).

Food risks are not the only emerging risks in society; nuclear risks, climate change, natural hazards, terrorist attacks, health risks, are only a few of the examples which merits risk communication. Hence, the public receives a continuously stream of information to learn and to affect attitudes and behaviors.

Message credibility is an important component through which the public assesses the probability that the message argument is accurate and valid (Petty & Cacioppo, 1984; Renn & Levine, 1991; Wathen & Burkell, 2002). As Bickerstaff (2004, p. 836) states: "*if the credibility is being challenged, it is reasonable to expect that the message will be ignored or set alongside the many other messages.*" Message credibility can be described as *"the perception of the message being credible, clear, understandable and likely"*. It is an essential variable in risk communication as it is an important prerequisite to message acceptance (Gürhan-Canli & Maheswaran, 2000; Mackenzie & Lutz, 1989; Renn & Levine, 1991).

The objective of this study is to investigate how a risk message should be designed to obtain the highest message credibility. Knowing that many (uncontrollable) factors influence message acceptance (e.g., gender, age, prior knowledge, involvement), it is important to increase the messages' effectiveness by optimizing those factors that communicators can control when disseminating a message.

Different communication strategies (i.e., vividness of the message, psychological distance to the risk message, and message sidedness) have shown to influence message credibility when communicating risks (Chandran & Menon, 2004; Chang, 2013; Eisend, 2006; Verbeke et al., 2008). The vividness of the message and the psychological distance to the risk message influences the perceived concreteness of the risk, which can influence the

message credibility (Chandran & Menon, 2004; Chang, 2013; Wathen & Burkell, 2002). Furthermore, the psychological distance and the message sidedness have shown to influence the way information is processed, which can influence message credibility (Chandran & Menon, 2004; Ford & Smith, 1991; Petty & Cacioppo, 1984). To our knowledge, the intertwined effects of these different communication strategies have not been investigated yet.

In this study, pictures will be used besides text, to vividly present the information. Only when the main argument is presented vividly, a vividness effect occurs (Guadagno, Rhoads, & Sagarin, 2011). The latter leads to more attention, more persuasiveness, and more credibility of the message (Block & Keller, 1997; Chang, 2013; Guadagno et al., 2011; Wathen & Burkell, 2002). Since a picture is superior in attracting and capturing attention (Pieters & Wedel, 2004), it is important that it induces a vividness effect, which can result in more attention to the risk message. The impact of the text on message credibility can in turn be influenced by the two other communication strategies, which are the framing of the psychological distance and message sidedness.

Furthermore, this study will investigate how an uncontrollable risk can be communicated, that is, the emerging risks of micro-organisms and contaminants on fresh produce (raw fruits and vegetables) that cannot be circumvented by the consumers and can happen worldwide (EFSA, 2011; Jacxsens et al., 2010). The feeling of uncontrollability could lead to feelings of disbelief, denial and perceived manipulation. This can in turn lead to less credibility of the source and the message, which eventually results in message rejection (Witte & Allen, 2000; Witte, 1992). Knowing that message credibility plays an important role to obtain message acceptance (Renn & Levine, 1991), credible messages become even more important when communicating uncontrollable risks.

Hence, this study will investigate which combination of the communication strategies results in the highest message credibility. Based on the interaction of these communication strategies more insights on risk message effectiveness can be provided.

2. THEORETICAL FRAMEWORK

2.1. The importance of message credibility when communicating risks

Credibility is a multifaceted and complex construct, in which both the source as the message can be perceived credible (Renn & Levine, 1991; Wathen & Burkell, 2002). Source credibility, based on characteristics such as expertise and trustworthiness, has been extensively researched in risk communication and is seen as a key issue in risk communication (McComas & Trumbo, 2001; Peters, Covello, & McCallum, 1997; Pornpitakpan, 2004). However, research showed that the evaluation of the message has a greater impact on the overall assessment of credibility than the evaluation about the source (Austin & Dong, 1994). Hence, in this research the focus will be on message credibility since it is a prerequisite to message acceptance leading to the desired behavioral intentions, an increase in awareness, and/or attitude changes (Beltramini, 1988; Bickerstaff, 2004; Mackenzie & Lutz, 1989; Renn & Levine, 1991; Slater & Rouner, 1996; Verbeke et al., 2008; Wathen & Burkell, 2002). This research will investigate how message credibility may be influenced by different communication strategies: namely vividness, psychological spatial distance and sidedness of the message.

2.2. Communication strategies

In what follows, a general overview will be presented of the different communication strategies that will be used in this study, and their influence on message credibility.

2.2.1 Vividness

"*Information may be described as vivid, that is, as likely to attract and hold our attention and to excite the imagination to the extent that it is emotionally interesting, concrete, and imagery-provoking, and proximate in a sensory, temporal, or spatial way.*" (Nisbett & Ross, 1980, p. 49). There are different ways to outline a vivid element in a message, such as, colorful language, colors, graphics, animations, pictures and concrete information (Beltramini, 1988; Block & Keller, 1997; Collins, Taylor, Wood, & Thompson, 1988; Keller & Lehmann, 2008). Vividly presented information can trigger the vividness effect. This effect results in more attention to the message, more persuasiveness, and an increase in message credibility (Block & Keller, 1997; Chang, 2013; Fortin & Dholakia, 2005; Guadagno et al., 2011; Perko, van Gorp, Turcanu, Thijssen, & Carle, 2013; Sherer & Rogers, 1984; Wathen & Burkell, 2002).

However, some authors questioned the existence of the vividness effect because many studies failed to support the vividness effect hypothesis on persuasiveness and on the judgment of decisions (for an overview see Taylor & Thompson, 1982). A possible explanation for the lack of supportive results is that only the presentation of the information and not the information itself is vivid (McGill & Anand, 1989; Taylor & Thompson, 1982). This hypothesis was tested by Guadagno et al. (2011) and they concluded that the vividness effect only occurs if the central argument is vividly presented, not the background information of the message. Following this reasoning when communicating risks, it would mean that the risk (i.e., the central argument) itself should be made vivid before a vividness effect can occur.

To investigate this premise, the study will manipulate the level of concreteness of the used pictures included in the risk message. A picture is used because it influences the concreteness of a risk message, thereby increasing the perceived message credibility (Chang, 2013; Wathen & Burkell, 2002). Moreover, past studies showed that pictures make it easier to imagine information as opposed to words (Babin & Burns, 1997; Chang, 2013; Keller & Block, 1997). In case of the emerging food risks, the risk (i.e., bacteria on fruit) might be difficult to imagine. Therefore a picture can be useful to increase the ease of imagination, which can elicit a vividness effect resulting in increased message credibility. This study assesses the impact on message credibility when the main argument (i.e., the bacteria on fruit) is made vivid compared to when the main argument is not vividly presented.

2.2.2 Spatial distance

Research indicated that the spatial distance between an individual and the place where the risk occurs, influences people's reactions to the message (Liberman & Trope, 2008). This premise is based on the Construal Level Theory (CLT) (Liberman & Trope, 2008; Trope, Liberman, & Wakslak, 2007; Trope & Liberman, 2010). The CLT is a framework that links psychological distance and abstraction of processing, and states that people make different psychological associations and mental representations depending of the perceived psychological distances. By differentiating the psychological distance into a distant or near event, the level of construals, and thus the type of processing, will vary. This influences people's reactions towards the risk and the message credibility. According to the CLT, near events are represented and evaluated at a lower level construal, defined as more concrete, specific and detailed. Distant events are represented

and evaluated at a higher level construal, which are more abstract, decontextualized and general (Bonner & Newell, 2008; Liberman & Trope, 2008; Nussbaum, Trope, & Liberman, 2003; Trope et al., 2007).

Different types of psychological distances can be distinguished, that is, temporal, spatial, hypothetical and social distances. These four types of psychological distances influence the representations and evaluations of the situation in the same way (Chandran & Menon, 2004; Liberman & Trope, 2008; Stephan, Liberman, & Trope, 2011; Trope et al., 2007).

Chandran and Menon (2004) extended the CLT to risk communication, looking at the effects of message cues related to the CLT on judgments of health risk. By manipulating the temporal frame (i.e., day vs. year frame), the impact on risk perception and message effectiveness was assessed. Their results showed that the risk was construed more proximal and concrete in a day frame than in a year frame, leading to, amongst others, a higher perceived credibility of the risk communication (Chandran & Menon, 2004). In line with their study, we will examine the impact of spatial distance in risk communication. This study will assess how the emerging food safety risks should be framed to obtain the most credible message, that is, by addressing it as a nearby or as a worldwide risk.

2.2.3 Message sidedness

When communicating risks related to food, both the benefits (i.e., the amount of vitamins) and the risks (i.e., the possible presence of dangerous bacteria) of eating fresh produce can be presented. This communication strategy differs for more commonly used communication messages in which one-side (the negative aspect) of the risk if provided. Two-sided messages acknowledge opposing views, or address the pros and cons, which can be more effective than presenting only one side of the topic (Crowley & Hoyer, 1994; Ein-Gar, Shiv, & Tormala, 2012; Eisend, 2006, 2007, 2013; Rucker, Petty, & Briñol, 2008). The effectiveness of two-sided messages has been shown in different domains such as advertising research (for an overview see the meta-analysis by Eisend, 2006) and health and risk communication research (Cornelis, Cauberghe, & De Pelsmacker, 2013a, 2013b; Ford & Smith, 1991; Keller & Lehmann, 2008; Verbeke et al., 2008).

The idea of two-sided messages is that by giving both sides of the issue, the message appears more balanced and informative which results in positive attitudes, favorable

reactions as it increases the credibility of the message and the communicator (Crowley & Hoyer, 1994; Rucker et al., 2008; Verbeke et al., 2008). The increase of credibility is based on the attribution theory (Jones & Davis, 1965), since messages and communicators are perceived as more honest if both sides of an issue are offered (Crowley & Hoyer, 1994; Eisend, 2006). Furthermore, by giving balanced risk information, two-sided messages give the public the possibility to make informed decisions (Verbeke et al., 2008). The latter is in line with the fact that the processing of two-sided messages in general requires more cognitive commitment that leads to more systematic elaboration of the information in comparison to one-sided messages (Ford & Smith, 1991; Petty & Cacioppo, 1984).

Based on the attribution theory, it could be expected that two-sided messages lead to more message credibility than one-sided messages. This study will assess what the impact is of one-sided (mentioning only the risk) messages and two-sided risk messages (mentioning the risk and the benefit), in combination with the two other communication strategies on message credibility.

3. HYPOTHESES DEVELOPMENT

In the case of emerging food risks the desired behavioral intentions are the intentions to increase awareness of the risk and to increase the intention to apply precautionary measures such as profoundly rinsing fresh produce. Message credibility is an important condition in order to obtain message acceptance resulting in desired behavioral intentions (Wathen & Burkell, 2002; Witte, 1992). We expect:

H1: Message credibility is positively correlated with the desired behavioral intentions.

A risk message often entails both text and a picture. The latter is superior in attracting and capturing attention when it is presented together with text (Pieters & Wedel, 2004). Hence, it is important that the picture results in a high message credibility, to capture the individuals' attention to shift to the textual information. Based on the vividness effect and the conditions in which it occurs, the message only draws more attention and is only perceived as more credible when the main argument is vividly presented (Chang, 2013; Guadagno et al., 2011; Wathen & Burkell, 2002). Therefore, we expect:

H2: When the main argument has been made vivid, message credibility is higher than when a general picture has been used.

When the main argument of the message is not vividly presented, we expect individuals to pay less attention to the text, leading to less or no impact of the communication strategies used in the text. Since we are investigating the communication strategies which can lead to the highest levels of message credibility, we will focus on these conditions in which the vividness effect is likely to appear, namely when a picture is used in which the risk is vividly presented.

Hence, looking at the interaction of the condition in which the main argument has been made vivid, with the manipulation of spatial distance and message sidedness, we expect the following. If the risk is presented as spatially distant (i.e., occurrence worldwide), a more abstract evaluation of the situation will take place (Trope et al., 2007). Hence, when individuals are triggered to process the message in a more general and abstract way due to the spatial distance, they might perceive that the one-sided message lacks information, because people know that fruit is also healthy (Eurobarometer, 2006). In addition, two-sided messages, compared to one-sided messages, are more likely to be processed in a systematic way (Ford & Smith, 1991; Petty & Cacioppo, 1984). So, when the positive information is added to the risk (i.e., a two-sided message), it will increase message credibility because the information appears balanced when it is processed in an abstract and systematic manner. We expect for a risk message in which the vividness effect is triggered the following:

H3a: When the risk is framed as spatially distant, message credibility will be higher for a two-sided versus a one-sided message.

However, since a spatially near event triggers a more concrete processing type (Trope et al., 2007), a one-sided message will be more in line with this mindset than a two-sided message. Hence, reading the one-sided message with a spatially near occurrence (and the bacteria on fruit as main argument is vividly presented), makes the information appear congruent and consistent at first, concrete, and peripheral glance. On the other hand, the spatially near event induces a concrete type of processing, and the two-sided message is more likely to stimulate systematic processing (Ford & Smith, 1991; Petty & Cacioppo, 1984). This reasoning could mean that the two-sided information might be perceived contradictory at the concrete level, and could therefore lead to less credibility.

Hence, we expect for a risk message in which the vividness effect is triggered the following:

H3b: When the risk is framed as nearby, message credibility will be higher for a one-sided than for a two-sided message.

4. METHOD

4.1. Design and stimuli

Using a 2 (main argument vivid vs. main argument not vivid) X 2 (spatially near vs. spatially distant) X 2 (one-sided vs. two-sided) between subjects factorial design, this study investigates the impact of the communication strategies on message credibility. The risk message informs people about the emerging food risks on fresh produce due to climate change and globalization. Fresh produce can contain micro-organisms and contaminants, which makes fresh produce a growing cause for foodborne illnesses (Jacxsens et al., 2010). Furthermore, consumers can hardly circumvent the risk from happening in case of fresh produce eaten raw, because of the absence of an adequate heat treatment (EFSA, 2011).

Eight different leaflets were designed and each leaflet contained the same information about recommended actions that consumers can take (e.g., washing hands before and after handling fresh produce, rinse fresh produce profoundly, keep fresh produce cool) and actions that the government is taking (such as quality controls and more inspections of fresh produce suppliers).

When the main argument was vividly presented, a picture of the bacteria on grapes was shown. When the main argument was not made vivid, a picture of only grapes was shown. The vividness manipulation can be found in Appendix (p. 194). The spatial distance was manipulated by using *"Flanders*" (which is the northern region of Belgium) for the near occurrence, and "*worldwide*" for the distant occurrence. Finally, the one-sided message contained only the risk (i.e., *"Fruit can contain [occurrence] dangerous bacteria*") and the two-sided message stated: *"Fruit is bursting with vitamins but can contain [occurrence] dangerous bacteria*". The two-sided message started with the information of the benefit of the issue, followed by the risk information, as suggested by Eisend (2006). The use of both textual information as pictures is advised to have the best influence on individual's perception (Boer, Ter Huurne, & Taal, 2006).

4.2. Procedure

The data was collected in November 2011, at an annual fair in Ghent (a city of the Flemish part of Belgium), using a paper and pencil survey. A total of 390 respondents were randomly assigned to read one of the eight different leaflets about emerging food safety risks on fruit, and afterwards they filled out a questionnaire. The mean age was 38.54 (*SD*= 14.47) (minimum age 17 years – maximum 85 years). Of the respondents 46.1 % was male, and 53.9% was female.

4.3. Measures

The concepts were measured using existing semantic scales and differential scales on a seven-point Likert scale. Perceived credibility of the message was measures using five items based on the credibility scale by Gürhan-Canli and Maheswaran (2000), (e.g., *The message to me is: Not at all believable / highly believable; Not at all probable / absolutely probable; Not at all clear/ very clear; Not at all credible / very credible; Not at all trustworthy / completely trustworthy*) (*M*=5.60, SD= 1.17, α=.896).

The behavioral intentions were measured using four items (e.g., *'I will alert loved ones' (M=3.75, SD=1.84), 'I will rinse my fresh produce better after reading this message' (M=4.82, SD=1.81), 'I will apply the precautionary measures' (M=4.70, SD=1.76), 'I will think about how to avert this risk' (M=4.49, SD=1.59*) (based on De Wit, Das, & Vet, 2008) (*M*=4.46, *SD*=1.45; α=.855).

To measure vividness as a manipulation check, three items were used (Keller & Block, 1997) (e.g., "*The content of the leaflet was not vivid – very vivid, not easy to imagine – easy to imagine, not concrete – concrete'*) (*M*=4.96, *SD*=1.33, α=.855).

5. RESULTS

5.1. Manipulation check

A manipulation check was conducted to test if the perceived vividness differed between the two conditions as intended. Using an independent samples t-test, the results showed that the message in which the main argument was vividly presented, was perceived more vivid (*M*=5.12, *SD*=1.72) than the message in which the main argument was not vividly presented (*M*=4.80, *SD*=1.36) (*t*=2.391, df=377; *p*=.017).

The other conditions (i.e., spatial distance and message sidedness) do not need a manipulation check, since both manipulations are clearly nearby or distant and one- or two-sided.

5.2. Hypotheses testing

To test the correlation between message credibility and behavioral intentions, a bivariate Pearson correlation was executed. The result showed a moderate positive correlation (r=.312, p<.001) which supports Hypothesis 1.

An independent samples t-test was carried out to investigate the impact of the vividness of the message's main argument on message credibility. The results pointed out that the perceived credibility was significantly higher when the main argument was vividly presented (bacteria on grapes) (M=5.76, SD=1.10) than when the risk was not vividly presented (grapes only) (M=5.44, SD=1.22) (t=2.632, df=363.90; p=.009), which is in line with hypothesis 2.

Hypothesis 3a and 3b were tested by performing a univariate ANOVA analysis, using the three different manipulations as independent variables. A significant third-order interaction effect was found on message credibility (F(1,372)=9.501,p=.002), as can be seen in **Figure 1** and **Figure 2**.

When analyzing the interaction effect more closely, simple effect showed that when the main argument was vividly presented (the bacteria on grapes) and the risk was spatially distant (occurrence worldwide), the message credibility was significantly higher for a two-sided message (M=5.92, SD=.76) than for a one-sided message (M=5.50, SD=1.17) (t=2.044, df=71.94, p=.045). These results support Hypothesis 3a.

However, when the main argument was vividly presented (the bacteria on grapes) and the risk could occur spatially near (in Flanders), message credibility was significantly higher for a one-sided message (M=6.09, SD=.76) than for a two-sided message (M=5.45, SD=1.50) (t=-2.563, df=61.55, p=.013), which is in line with Hypothesis 3b. Hypothesis 3a and 3b are supported.

As expected, no differences in message credibility were found according to spatial distance and message sidedness when the main argument was not made vivid (showing only the grapes).

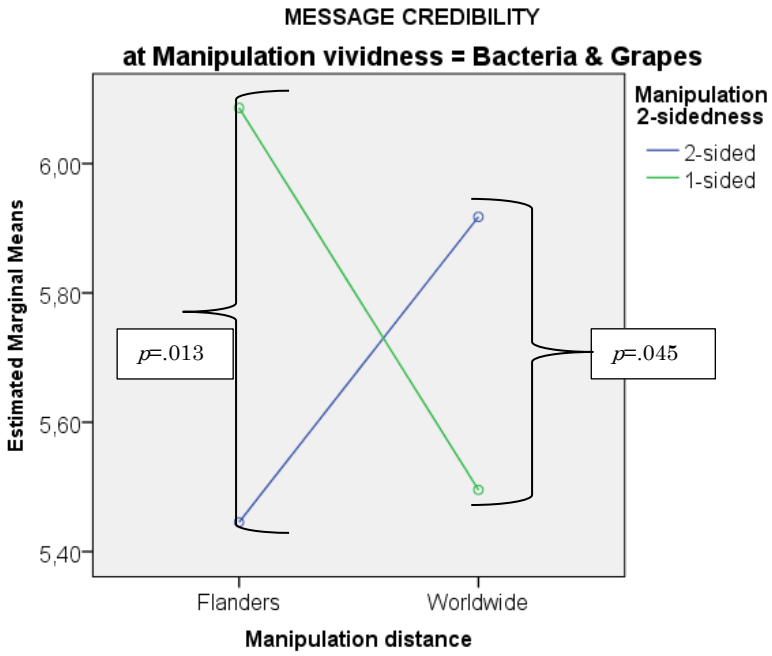

Figure 1 - Third order interaction effect of vividness (MAIN ARGUMENT VIVID), psychological distance and message sidedness on message credibility

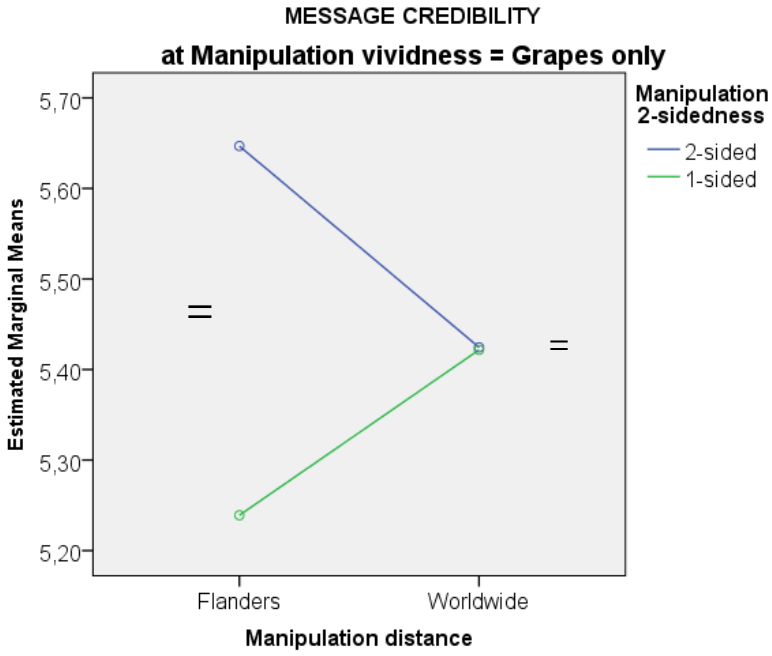

Figure 2 - Third order interaction effect of vividness (MAIN ARGUMENT NOT VIVID), psychological distance and message sidedness on message credibility

6. DISCUSSION AND CONCLUSION

The objective of this study was to investigate how a risk message should be designed to increase message credibility in order to increase message acceptance. By using different communication strategies (i.e., vividness, framing of the spatial distance and message sidedness) the intertwined effects of these strategies was assessed to obtain the best results with respect to message credibility.

The results can be summarized as follows. Message credibility was positively correlated with the desired behavioral intentions, in line with earlier studies (Wathen & Burkell, 2002; Witte, 1992). Furthermore, the message credibility was higher when the main argument was made vivid than when a general picture was used. This shows the importance of a vivid main argument in order to induce a vividness effect, as shown in other studies (Guadagno et al., 2011). Furthermore, this research showed that only when the main argument was made vivid, the impact on message credibility of the two other communication strategies came to the fore, demonstrating the importance of the vividness effect to capture the individuals' attention to shift to the textual information.

Moreover, the following was demonstrated when the vividness effect occurred: a spatially distant risk and a two-sided message led to higher message credibility than a one-sided message. On the other hand, a spatially near risk and a one-sided message led to higher message credibility than when a two-sided message was used.

To conclude, knowing that one-sided message (containing only risk information) can lead to a decrease of eating fruit (Verbeke et al., 2008), it can be advised to use two-sided messages when communicating the emerging safety risks on fresh produce. This two-sided message should be used when the main argument is made vivid in combination with a spatially distant event to obtain the highest message credibility. This credibility positively correlates with behavioral intentions.

It is important to bear in mind that credibility can also be increased when the (health) risks are frequently communicated by different and trusted sources (Wills, Storcksdieck Genannt Bonsmann, Kolka, & Grunert, 2012). Hence, in order to communicate the emerging food risks, it is important to frequently communicate the risks.

7. LIMITATIONS AND FURTHER RESEARCH

This research was exploratory, and future research is needed to identify other influencing factors as well. The vividness effect for example is known to be influenced by involvement (Chang, 2013; Keller & Lehmann, 2008), self-efficacy (Block & Keller, 1997), prior attitude about the topic (Block & Keller, 1997; Taylor & Thompson, 1982), emotional responses (Böhm & Pfister, 2005; O'Neill & Nicholson-Cole, 2009; Witte, 1992), and source credibility (Block & Keller, 1997; Taylor & Thompson, 1982). The effectiveness and processing of two-sided messages is also influenced by involvement (Eisend, 2013), prior attitude, knowledge (Crowley & Hoyer, 1994; Eisend, 2006), and perceived novelty (Eisend, 2006). Hence, it is important to take these moderating variables into account in future research on risk communication.

Additionally, to verify these results and the reasoning behind it, it would be interesting to measure the type of processing (i.e., abstract or concrete), and the depth of processing (i.e., systematic or peripheral) in future research. Future research could also measure the perceived concreteness of the risk, since both the vividness of the message and the psychological distance to the risk message influences this. Its impact on message credibility can give more insights on the results.

The message credibility on a seven-point scale was relatively high in every condition, which shows that all stimuli would lead to a good outcome, however, knowing that many different (uncontrollable) factors influence message acceptance it is important to work out these factors which one can control the best way as possible.

Finally, although the occurrence of the risk message stated *"worldwide*", and the emerging food risks can occur worldwide, it does not automatically mean that the same risk message can be applied worldwide. Research (De Vocht, Cauberghe, Uyttendaele, & Sas, 2014) showed that using the same message within Europe leads to different reactions towards the message.

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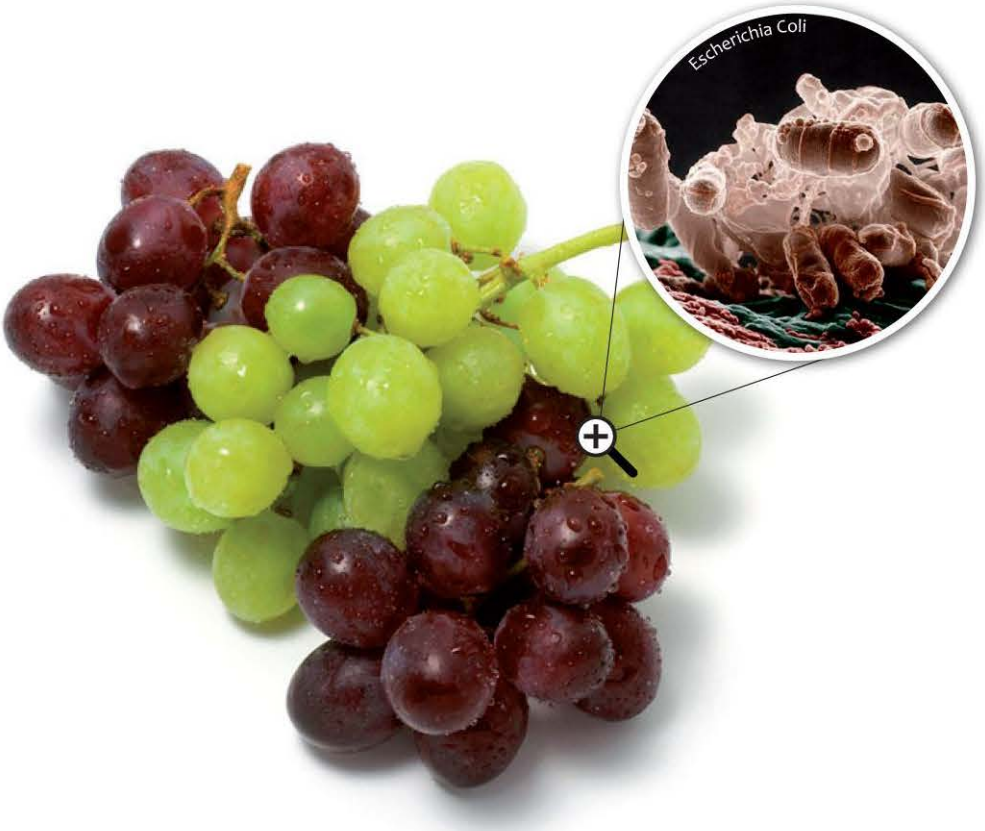
9. APPENDIX: STIMULI

Risk message with the main argument vividly presented, framed spatially near and two-sided:

Fruit zit boordevol vitaminen, maar kan in Vlaanderen gevaarlijke bacteriën bevatten



De overheid doet zijn uiterste best om de voedselveiligheid van fruit te garanderen. Deze beschermingsmaatregelen zijn onder meer verschillende kwaliteits-controles van fruit en inspecties bij telers en handelaars .
Voorzorgsmaatregelen die u zelf kan nemen tegen de bacteriën zijn: fruit goed wassen of schillen, fris bewaren, geen gekneusd of beschimmeld fruit eten, en voor en na het eten uw handen wassen.
Het blijft belangrijk om dagelijks voldoende fruit te eten om een gezond voedingspatroon na te streven.

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Risk message with the main argument not vividly presented, framed spatially distant and one-sided:

Fruit kan wereldwijd gevaarlijke bacteriën bevatten

De overheid doet zijn uiterste best om de voedselveiligheid van fruit te garanderen. Deze beschermingsmaatregelen zijn onder meer verschillende kwaliteits-controles van fruit en inspecties bij telers en handelaars .
Voorzorgsmaatregelen die u zelf kan nemen tegen de bacteriën zijn: fruit goed wassen of schillen, fris bewaren, geen gekneusd of beschimmeld fruit eten, en voor en na het eten uw handen wassen.
Het blijft belangrijk om dagelijks voldoende fruit te eten om een gezond voedingspatroon na te streven.

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CHAPTER 5:

Communicating uncontrollable risks: The impact of the presentation order of threatening and reassuring information

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CHAPTER 5: Communicating uncontrollable risks: The impact of the presentation order of threatening and reassuring information[5]

ABSTRACT

Some risks cannot be circumvented by individuals and for these risks there is a low self-efficacy. In this context, the study examined the impact of the presentation order of the threatening and reassuring part of a risk message in combination with explicitly mentioning versus not mentioning the individuals' low self-efficacy on behavioral intentions (intention to alert loved ones, intention to seek information). The reassuring part in this study consisted of the actions the government is taking to prevent the emerging risks from happening. 192 respondents participated in the 2 (presentation order threat-reassurance versus reassurance-threat) x 2 (low self-efficacy not mentioned versus explicitly mentioned) between-subjects factorial design. The significant interaction effects showed that the information seeking behavior and intention to alert loved ones about the risk were higher when the reassuring part preceded the threat, and when the low self-efficacy was not mentioned. In addition, when the threat preceded the reassuring part, the highest intention to seek information was found when the low self-efficacy was explicitly mentioned. Furthermore, it was demonstrated that the interaction effect on both dependent variables was fully mediated by negative feelings after reading the presented message.

KEY WORDS

Risk communication; EPPM, Information seeking behavior; Presentation order

[5] Chapter 5 is submitted as: "De Vocht, M., Cauberghe, C., Faseur, T., Uyttendaele, M. & Sas, B. (submitted). Communicating Uncontrollable Risks: The Impact of Presentation Order of Threatening and Reassuring Information. *Submitted to Journal of Risk Research."*

Chapter 5 was also presented at the conference of International Association for Media and Communication Research (IAMCR). *How much threat should be relieved? The impact of an implicit or explicit low self-efficacy on food risk perception in a context of climate change and globalization*. 13th – 17th of July, 2011, Istanbul, Turkey.

1. INTRODUCTION

"Risk communication is the interactive exchange of information and opinions concerning risk and risk-related factors among risk assessors, risk managers, consumers and other interested parties" (FAO/WHO, 1998). It can be used to increase awareness about potential risks, and to motivate people to adapt preventive behaviors to prevent the risk from happening. A useful model to explain the impact of risk communication is the Extended Parallel Processing Model (EPPM) (Witte, 1992). The EPPM states that effective risk messages entail a threat appeal to elicit a perceived threat that draws the attention to the message by causing negative feelings such as fear and uncertainty. These negative emotions drive the individual to process the subsequent reassuring appeal (the recommended behavior) in which a solution is offered to reduce the negative impact of the risk and increase a feeling of personal control (i.e., perceived self-efficacy). However, people cannot prevent all risks from happening. For example, for emerging risks on fresh produce eaten raw, terrorist attacks, hurricanes, volcano outbreaks, floods, etc., individuals have little or no control to prevent the risks from occurring. For some of these risks like floods or hurricanes, one tries to elicit the perceived efficacy by increasing the feeling of preparedness when the risk would occur by giving self-protective behaviors (Kievik & Gutteling, 2011; Sellnow, Sellnow, Lane, & Littlefield, 2011; Terpstra, Lindell, & Gutteling, 2009). However, other risks like terrorist attacks, nuclear explosions, or food risks on fresh produce eaten raw, consumers cannot prevent from happening, nor can they prepare themselves in case the risks occur. This aspect implies that when the evoked fear and uncertainty are too high and people cannot reduce it, it will lead to a fear control process, leading to message rejection (Witte, 1992).

When communicating risks in which neither adaptive nor self-protective behaviors can be communicated, the objective of the risk message is to increase the awareness about the risks. This way people can become aware of the risks. This awareness can avoid unwanted reactions during a crisis period such as panic, fear or worry which keeps them from maintaining their behavior. This premise can be explained by the Inoculation theory (McGuire, 1961), analogous with a flu vaccine, stating that when individuals are inoculated against a possible crisis (i.e., increasing awareness), they will be able to cope with the crisis. If people are aware about possible risks, the negative feelings can be lower when a crisis occurs, leading to less panic reactions, following the Inoculation theory (McGuire, 1961).

Hence, when the awareness increases it shows that the message was accepted; activating the respondents to seek information and to alert loved ones. When consumers communicate about the risk and search for more information, the awareness of the emerging risks will increase as well. The question arises if and how message acceptance can be obtained in cases where the reassuring part cannot emphasize any recommendations of adaptive or self-protective behaviors to increase the feeling of control, but can only stress the governmental efforts taken to prevent and control the risks from happening. It is unclear in this context whether the reassuring part containing the information of the governments' efforts, will be reassuring enough, to avoid a fear control process. Therefore, the influence of the presentation order of the threatening part and reassuring part on message acceptance will be examined in this study.

Furthermore, research showed that when an authority communicates a risk before a crisis occurs, it will lead to positive implications for the reputation and the credibility of the authority if the information is honest and complete (Claeys & Cauberghe, 2012; Williams, Bourgeois, & Croyle, 1993). The information about these risks is only complete when the low self-efficacy is mentioned. So, this research will investigate the impact of explicitly versus not mentioning the low self-efficacy in the risk message on message acceptance.

To summarize, the current study will investigate the impact of different risk messages concerning emerging food risks on fresh produce that people cannot prevent from happening on message acceptance (i.e., intention to alert loved ones and intention to seek information). More specifically, both the persuasive impact of the presentation order of the threatening versus the reassuring part of the message will be investigated, as the impact of whether or not the low self-efficacy is mentioned. Finally, the influence of the emotion fear (and by extension negative feelings) on message acceptance will be assessed.

2. THEORETICAL FRAMEWORK

2.1. The Extended Parallel Processing Model

Threat appeals are *"persuasive messages designed to scare people by describing the terrible things that will happen to them if they do not do what the message recommends"* (Witte, 1992, p. 329). Among the different threat appeal models, the EPPM (Witte, 1992, 1998) is the most recent and integrated one to explain consumers' reactions to health risk messages. According to the EPPM, threat appeals can trigger a process by which individuals appraise two components of the message: the *perceived threat* of the risk (i.e., the threat appeal) and the *perceived efficacy* (i.e., reassuring appeal) to overcome the risk (Witte, 1992). The *threat appraisal* consists of the perceived susceptibility and the perceived severity. When the threat is not perceived as relevant or severe, individuals will not be motivated to process the message in depth, leading to no response to the threat appeal. When the threat is perceived as severe, feelings of fear and uncertainty are elicited and people will feel an urge to reduce these negative feelings. Therefore, they will further process the message and evaluate the feeling of personal control, that is, the efficacy of the recommended behavior. The efficacy comprises self-efficacy and response efficacy. Response efficacy is the belief individuals have that the recommended behavior will prevent the risk from happening. The self-efficacy refers to the individuals' belief in their ability to act as the recommended behavior suggests (Witte, 1992). Only when both threat and efficacy are perceived as high, a danger control process is initiated resulting in message acceptance, leading to adaptive behavior (Witte, 1992, 1998). When the threat appraisal is high, but the efficacy appraisal is low, a fear control process is initiated. This process leads to message rejection because the elicited feelings of fear are too high and cannot be reduced leading to counter argumentation and negation of the message. Research showed that fear is not the only emotion experienced when an individual is exposed to a threat message (Dickinson & Holmes, 2008; Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996; Witte & Allen, 2000). Other negative feelings such as worry, anger, frustration etc. can be aroused as well when reading a risk message.

Following the EPPM (Witte, 1992), when a risk message is given about a risk that one cannot prevent from happening (i.e., a low self-efficacy) in combination with a high perceived threat, it might lead to a fear control process. Therefore, we will examine the impact of the presentation order of the threatening and reassuring part on perceived threat. Furthermore, the impact of explicitly mentioning or not mentioning the fact that

individuals cannot circumvent the risk, on self-efficacy will be assessed as well. Later, we will formulate the hypotheses related to the interaction effect of these message components on message acceptance (intention to seek information and intention to alert loved ones).

2.2. The impact of presentation order on perceived threat

Different studies questioned the conventional presentation order of the threat followed by efficacy information (Hall, Bishop, & Marteau, 2006; Keller, 1999; Prentice-Dunn, Floyd, & Flournoy, 2001). It is possible that starting the message with the reassuring part about the efforts from the government to prevent the risk from happening, can help the individuals to cope with the subsequent threat. Therefore, we will investigate if the conventional presentation order or the reversed order is the most beneficial when communicating the emerging risks that individuals cannot prevent from happening.

Relevant for the present study are the mechanisms of *the primacy and recency effects*, two types of order effects identified by researchers in risk communication, marketing and psychology (Asch, 1952; Buda & Zhang, 2000; Chiou, Wan, & Lee, 2008; Ein-Gar, Shiv, & Tormala, 2012; Hogarth & Einhorn, 1992; Petty, Tormala, Hawkins, & Wegener, 2001). A primacy effect occurs when a message consists of two differing parts, and the judgment (impression) is formed using the first presented information. The recency effect occurs when the last presented information generates a stronger effect than earlier presented information. Impression formation research showed that low motivation to process is linked with primacy effects and high motivation to process information is associated with recency effects (Ein-Gar et al., 2012; Kruglanski & Freund, 1983; Petty et al., 2001). The reasoning behind this premise is that it asks more motivation to withhold judgment until all information has been processed (Ein-gar et al., 2012). For the case investigated in this paper (i.e., the emerging food risks) we expect the motivation to process this information to be high because food risks have a high personal relevance since food is an important part of daily life (Frewer, Howard, Hedderley, & Shepherd, 1997; Lofstedt, 2006). Due to the high personal relevance, there could be a systematic processing of the information (Frewer et al., 1997; Johnson, 2005; Loroz, 2007). Hence, based on impression formation research, a recency effect can be expected in this case.

In addition, the *belief adjustment model* by Hogarth and Einhorn (1992) predicts a recency effect when a message contains mixed information (e.g., positive vs. negative;

threatening vs. reassuring) and when a decision needs to be made immediately upon receiving the information. This model posits that a general, sequential anchoring-and-adjustment process is initiated when a belief is formed, thus that succeeding information will adjust the primary opinion, that is, the anchor (Buda & Zhang, 2000; Hogarth & Einhorn, 1992). This aspect can be seen as the recency effect.

Based on impression formation research and the belief-adjustment model, a recency effect is expected when presenting the risk message. Therefore, the perceived threat is expected to be highest when the threat is presented after (versus before) the reassuring part. The following hypothesis can be formulated:

H1: The perceived threat of the respondents will be higher when the reassuring part precedes the threat than when the threat precedes the reassuring part.

2.3. The impact of presenting the low self-efficacy to prevent the risk

Mostly, research focuses on risks in which the perceived efficacy can be increased by recommending preventive or self-protective behaviors (Kievik & Gutteling, 2011; Sellnow et al., 2011; Terpstra et al., 2009). However, in risk situations where individuals cannot prevent the risk from happening like emerging risks on fresh produce eaten raw, terrorist attacks, nuclear explosions, etc. there is a low self-efficacy, leading to a low feeling of personal control to prevent the risk (Witte, 1992). A low self-efficacy in combination with a severe perceived threat could lead to the fear control process, leading to message rejection. The EPPM (Witte, 1992, 1998) states that the preventive or self-protective behaviors need to be explicitly mentioned to be able to obtain a high perceived self-efficacy which can trigger a danger control process leading to message acceptance.

The question arises how people will react to a risk message in which it is clearly stated that they cannot prevent the risk from happening. Adding this information is ethically correct to do, but may also lead to unwanted reactions such as panic, worry etc.

The EPPM (Witte, 1992, 1998) states that an explicit recommendation to prevent the risk leads to a high perceived self-efficacy. Hence, we expect that when the message explicitly states that individuals cannot circumvent the risk, it will lead to a low perceived self-efficacy. The second hypothesis is as follows:

H2: When the low self-efficacy is not mentioned, the perceived efficacy will be higher than when the low self-efficacy is explicitly mentioned.

2.4. The interaction effect of presentation order and presenting the low self-efficacy

The interaction effect of the presentation order of the threat and the reassuring information, with the explicitly mentioning or not mentioning of the low self-efficacy to prevent the risk, will be investigated on the intention to seek information and the behavioral intention to alert loved ones. These behaviors support the possible increase in awareness of the risks.

Different models have investigated the influencing determinants of information seeking behavior, with Risk Information Seeking and Processing (RISP) (Griffin, Dunwoody, & Neuwirth, 1999), Framework for Risk Information and Seeking (FRIS) (Ter Huurne, 2008), and Planned Risk Information Seeking Model (PRISM) (Kahlor, 2010) as the most recent and complete models. These researches have shown that information seeking can be seen as a self-protective behavior that can close a knowledge gap, reduce the uncertainty and lead to a perception of control (Griffin et al., 2008, 1999; Kievik & Gutteling, 2011; Thompson, 1981). Furthermore, a strong relationship with "perceived behavioral control" and information seeking and processing intention has been found (Griffin et al., 1999; Kahlor, 2007, 2010; Palenchar & Heath, 2002). So, when people perceive a threat, they will try to reduce the negative feelings by eliciting a feeling of personal control. In situations in which people have or perceive little or no control of the occurrence of the risk (i.e., low self-efficacy), they might try to substitute this lack of control by seeking more information (i.e., perceived information seeking control) (Kahlor, 2010; Stevens, 2010). Besides information seeking, the behavioral intention to alert loved ones can be perceived as a way for consumers to share their information need with others as a potential information resource (Yoon & Nilan, 1999), and can therefore be seen as a perceived behavioral control.

The risk messages with a low self-efficacy might elicit a similar reaction. When a threat is perceived and the perceived self-efficacy is low, more information can be sought and loved ones can be informed to regain a feeling of control. Hence, the mere act of information seeking and alerting loved ones could regain a feeling of personal control, which leads to an increase in awareness about the risk. However, this effect might depend on the presentation order of the reassuring and threatening information, and on the mentioning or not mentioning the low self-efficacy. Both factors might influence the perceived threat and perceived self-efficacy.

Presentation order: threat-reassurance

When the threat is followed (versus preceded) by the reassuring part of the message, the perceived threat is expected to be lower due to the recency effect (cf. H1). When the low self-efficacy is not explicitly mentioned a higher perceived efficacy is plausible (cf. H2). The combination of a lower perceived threat and a higher perceived efficacy, can lead to lower behavioral intentions based on the EPPM. Because of the reassuring information at the end of the message, and because the individuals are not consciously made aware of the lack of personal control, no high negative feelings are elicited. This implies no motivation to search for information about the hazard, nor an intention to alert loved ones.

When the threat is followed by the reassuring information about the governments' actions, the perceived threat will be lower due to recency effect (cf. H1). Explicitly mentioning the low self-efficacy will lead to lower perceived efficacy (cf. H2). In this condition, a moderate level of threat is experienced, eliciting negative feelings, but no perception of personal control. Because the message is not too threatening and does end reassuring, the perceived information seeking control is expected to be initiated in order to reduce the negative feelings and the lack of control, leading to a high intention to seek information and to alert loved ones. This leads to the following hypothesis:

H3a: When the threat precedes the reassuring part of the message, explicitly mentioning the low self-efficacy will lead to a higher intention to seek information and a higher intention to alert loved ones than not mentioning the low self-efficacy.

Presentation order: reassurance-threat

The presentation order reassurance-threat will imply a higher threat (eliciting negative feelings) due to the recency effect (cf. H1). When the low self-efficacy is not mentioned the perceived self-efficacy will be higher (cf. H2). The combination of a high threat with a high perceived self-efficacy can lead to a danger control process to reduce the negative feelings, and therefore higher intentions to seek information and intention to alert loved ones emerge.

When the low self-efficacy is explicitly mentioned, and the threat follows the reassuring part, the threat will be perceived as high (cf. H1) and the self-efficacy will be perceived as low (cf. H2). This means that the impact of the reassuring part will be minimized due to the subsequent threat (i.e., recency effect) and due to the low personal control because

of the explicit low self-efficacy. People might get overwhelmed by the threat, eliciting very high negative feelings which leads to message rejection (i.e., fear control) and low behavioral intentions. Because of the fact that the negative feelings are too high, the perceived information seeking control process cannot be initiated.

The following hypothesis can be distilled:

H3b: When the reassuring part of the message precedes the threat, not mentioning the low self-efficacy will lead to a higher intention to seek information and a higher intention to alert loved ones than the explicit formulation of the low self-efficacy.

Mediating effect of negative feelings

Based on the previous, it becomes clear that negative feelings play an important role when receiving a risk message. Following the EPPM (Witte, 1992), the perceived threat will increase negative feelings. When the threat is perceived as high, and when the feeling of personal control is too low, the EPPM states that one will go into fear control which means one will perceive too much fear and uncertainty leading to message rejection. Therefore, the following is hypothesized:

H4: Negative feelings fully mediate the interaction effect between the presentation order (Reassurance-Threat vs. Threat-Reassurance) and mentioning the low self-efficacy (not vs. explicitly) on the intention to seek information and the intention to alert loved ones.

In **Figure 1**, the conceptual model is presented.

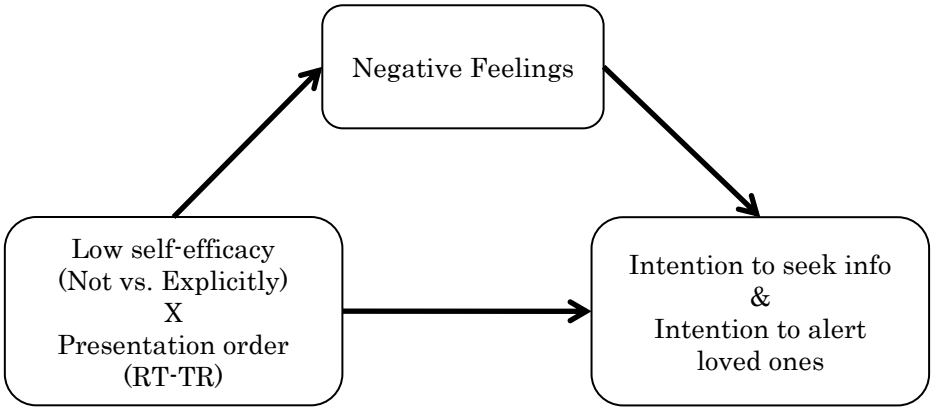

Figure 1 - Conceptual model

3. METHOD

3.1. Case, design and stimuli

To test the hypotheses, different risk messages are created concerning an emerging food safety risk. Micro-organisms and contaminants are identified as possible hazards in fresh produce, which makes fresh produce a growing cause for foodborne illnesses (Jacxsens et al., 2010). The consequences of eating contaminated fresh produce can lead to illness, the development of cancer or in the worst case death. Profoundly rinsing fresh produce, washing hands before and after eating, peeling fresh produce, and storing fresh produce at a cool temperature can to some extent eliminate the risk. However, the risk cannot be completely circumvented by the consumer because of the absence of an adequate heat treatment (EFSA, 2011). This means that the personal control to prevent the risk (i.e., self-efficacy) by individuals is low. The preventive measures to avoid micro-organisms and contaminants on fresh produce can only be fulfilled by the government and authorities. The government can try to reassure individuals by stating that they are doing all they can to control the fresh produce supply chain.

In an experimental 2 x 2 between-subjects factorial design, the presentation order of the threat message and the reassuring message about the governments' efforts (Reassurance-Threat vs. Threat-Reassurance) and the formulation of the low self-efficacy (not mentioned vs. explicitly mentioned) are manipulated in four newspaper articles (See Appendix for the original stimuli, p. 220). The reassuring part of the message focused on the government actions, stating that the government is in control of potential new bacteria by performing more quality controls of fresh produce from farm to fork, and by carrying out regular inspections of growers and dealers. The threatening part of the message was manipulated by focusing on the perceived severity of the threat, arguing that new bacteria are contaminating fresh produce and that these contaminants could have severe consequences for public health. The explicit low self-efficacy reported the lack of control for individuals to prevent the occurrence of the new bacteria on fresh produce, while in the other condition the low self-efficacy was not mentioned. Every newspaper article ended with the same recommendation from the government to continue eating fresh produce as part of a healthy daily diet.

3.2. Pretest

A pretest was conducted to check the manipulation of the threat and the reassuring part communicated by the government (N=77) using a between subject factorial design. Half of the respondents read the reassuring part of the article and half of the respondents read the threatening part of the article. Each part was followed by two questions to measure the perceived threat and perceived reassurance of the message: *"Do you perceive a threat in this text?"* and "*Do you perceive a reassurance in this text?"*. A seven-point Likert scale, ranging from *"totally disagree"* to *"totally agree"* was used. The results showed that the threatening part was perceived as more threatening (M=5.76; SD=1.26) than reassuring (M=1.62; SD=0.70) (t=-4.562, df=52; p<.001) and the reassuring part was perceived as more reassuring (M=5.74; SD=1.37) than threatening (M=4.00; SD=1.41) (t=-14.16, df=63; p<.001).

3.3. Procedure and participants

The respondents were recruited on a yearly Flemish Horticulture and Agriculture fair in Belgium, in January 2011. The data were thus collected before the EHEC and the *Listeria* outbreak that occurred in the last six months of 2011. When people agreed to participate in this study, they filled out the questionnaire while seated in the expo stand. After a short introduction of the study, the respondents were randomly assigned to one of the four conditions. Next, they were exposed to the risk message and subsequently they filled out the questionnaire. A convenience sample of 192 respondents completed the questionnaire. The mean age of the respondents was 39.27 years (SD=17.03, range=14-81 years) and 53.1% of the respondents was male. Stressing the importance of the novelty of the risk, the respondents who stated they had already heard about this food safety risk (24.5%; n=47) were left out. Analyses were performed on the remaining 145 respondents.

3.4. Measures

The main study's questionnaire was developed based on existing seven-point Likert and semantic differential scales. Five negative emotions were measured, namely *anger, sadness, fear, frustration* and *worry*, by asking the respondents to indicate, on a seven-point Likert scale, how they felt after reading the article. After summation of the mean values, the emotions were conceptualized into *negative feelings* (M=2.10, SD=1.16, α=.867).

To measure self-efficacy, two items were used which were adapted from Witte's (1992) scale (*"I can avoid the risks caused by the new bacteria"* and *"If I rinse my fresh produce profoundly, I can avoid coming in contact with the new bacteria"*) (*M*=4.14, *SD*=1.79, *r*=.341, *p*<.001).

Perceived risk was measured using two items of Witte's (1992) scale ("*I perceive the new bacteria as a severe risk"* and "*It is possible that I get in contact with contaminated fresh produce*") (*M*=3.79, *SD*=1.41; r=.353, *p*<.001).

To measure the behavioral intention to alert loved ones, one item of De Wit, Das and Vet's (2008) scale was used ("*I will alert my loved ones about this risk*") (*M*=2.96, *SD*=1.83).

The intention to seek information was measured using one item (Kahlor, 2010) ("*I plan to seek information about this risks"*) (*M*=3.29, *SD*=1.82). Some concepts are a one-item construct which has been encouraged by several researchers (Alexandrov, 2010; Rossiter, 2008).

4. RESULTS

4.1. Main effects

To analyze the impact of the presentation order on the dependent variable perceived threat, an independent samples t-test was conducted. The results showed that the perceived threat was higher ($t(141)=1.92$, $p=.056$) when the reassuring part was followed by the threatening part (*M*=4.01, *SD*=1.40) than when the threatening part preceded the reassuring part (*M*=3.56, *SD*=1.39). Although the results are marginally significant the results are in line with hypothesis 1.

Furthermore, the perceived self-efficacy was significantly higher ($t(141)=1.98$, $p=.05$) when the low self-efficacy was not mentioned (*M*=4.12, *SD*=1.35) than when it was mentioned (*M*=3.65, *SD*=1.47). Hypothesis 2 is supported.

4.2. Interaction effect on intention to seek information and behavioral intentions

A MANOVA was conducted with the presentation order of threat-reassurance and the individuals' low self-efficacy not mentioned versus explicitly mentioned as the independent variables. The dependent variables were the intention to seek information and the intention to alert loved ones about the risk. The results indicated interaction

effects on both dependent variables: intention to seek information (F(1,141)=5.50, p=.020) (See **Figure 2**) and intention to alert loved ones (F(1,141), 5.61, p= .019) (See **Figure 3**).

Simple effects showed that when the threat preceded the reassuring part, not mentioning the information about the low self-efficacy led to a marginally significant lower intention to seek information than when the low self-efficacy was mentioned ($M_{\_NOT\_mentioned}$=2.94, SD=1.74; $M_{\_SE\_explicitly}$=3.69, SD=1.95; t(67)=-1.67, p=.099). The effect for the intention to alert loved ones showed a similar trend, however not significant ($M_{\_NOT\_mentioned}$=2.59, SD=1.83; $M_{\_SE\_explicitly}$=3.25, SD=1.84; t(68)=-1.51, p=.136). These results are in line with Hypothesis 3a.

When the reassuring part preceded the threat, not mentioning the information about the low self-efficacy led to a (marginally) significantly higher intention to seek information ($M_{\_NOT\_mentioned}$=3.65, SD=1.93; $M_{\_explicitly\_mentioned}$=2.89, SD=1.52; t(68.283)=1.87, p=.066) and intention to alert loved ones ($M_{\_NOT\_mentioned}$=3.44, SD=1.92, $M_{\_explicitly\_mentioned}$=2.54, SD=1.64; t(71)=2.16, p=.034). These results mainly support Hypothesis 3b.

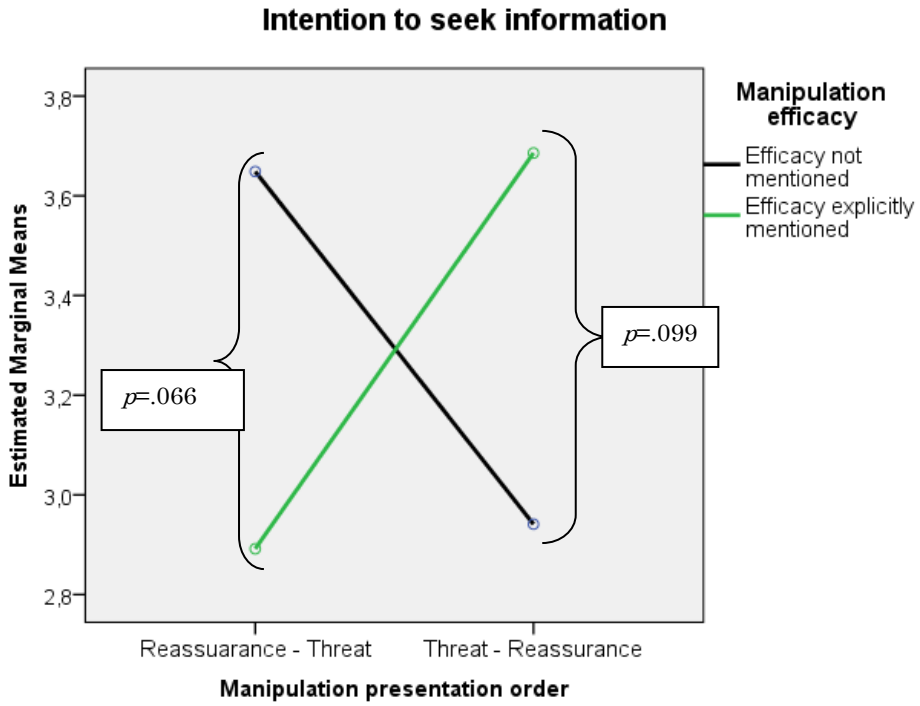

Figure 2 - Interaction effect on intention to seek information (p=.014)

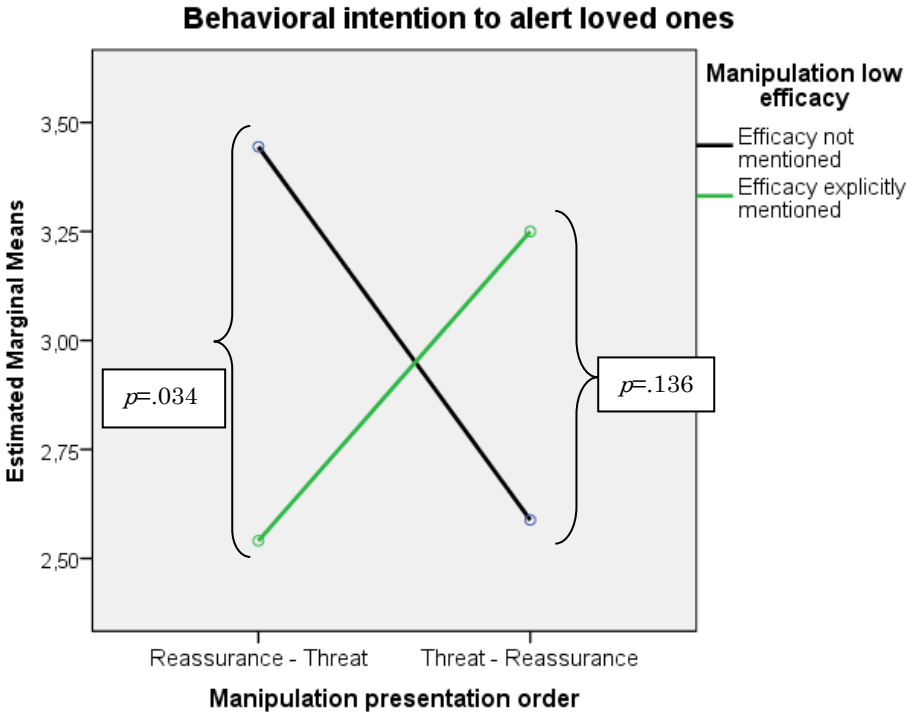

Figure 3 - Interaction effect on intention to alert loved ones (p=.011)

4.3. Mediating effects of negative feelings

To test the mediating effect of negative feelings, the Preacher and Hayes (2004) Bootstrap test to estimate indirect effects in simple mediation models, was used. This test produces more robust results for small samples than the Sobel test (Zhao, Lynch, & Chen, 2010). In **Table 1** an overview is given of the different coefficients per path. The direct effects of the independent variable (i.e., the interaction effect of presentation order and mentioning low self-efficacy not vs. explicitly) on the dependent variables intention to seek information (b=-.043, p>.1) and intention to alert loved ones (b=-.107, p>.1) were no longer significant when the concept "negative feelings" was entered as a mediator. The Bootstrap analysis indicated a significant (p=.05) indirect effect of the interaction effect on intention to seek information (b=.114, 95% CI=[.009 to .259]) through negative feelings. For intention to alert loved ones, the Bootstrap analysis also indicated a significant indirect effect of the interaction effect (b=.100, 95% CI=[.002 to .242]) through negative feelings. Hence, negative feelings fully mediate the interaction effect of presentation order of threat and reassurance and the explicit versus no formulation of low self-efficacy, on the intention to seek information and on the intention to alert loved ones. Hypothesis 4 is supported.

Table 1 - Bootstrapping results of indirect effects

	b	SE	t	p	BC Bootstrap 95% CI
Total effect of IV on DV					
DV (Intention to alert loved ones)	-.015	.150	-.102	.919	
DV (Intention to seek information)	.068	.148	.457	.648	
IV on M	.230	.094	2.439	.016	
Direct effects of M on DV					
DV (Intention to alert loved ones)	.400	.140	2.864	.005	
DV (Intention to seek information)	.482	.136	3.558	.001	
Direct effect of IV on DV					
DV (Intention to alert loved ones)	-.107	.149	-.719	.473	
DV (Intention to seek information)	-.043	.145	-.300	.765	
Indirect effects of IV on DV					
DV Intention to alert loved ones	.100	.063		.05	.002, .242
DV Intention to seek information	.114	.065		.05	.009, .259

IV: Independent Variable (Presentation order X Self-efficacy explicitly or not), DV: Dependent Variable, M: Mediator (Negative feelings),
BC: Bias Corrected; 5000 bootstrap samples, CI: Confidence interval

5. DISCUSSION AND CONCLUSION

The effects of health risks messages on preventive adaptive behavior are frequently described using the EPPM (Witte, 1992). However, there are risks such as food safety risks on fresh produce that cannot be circumvented by individuals, so no preventive adaptive behaviors can be given. Following the EPPM, this would lead to message rejection because the negative feelings which have been elicited by the threatening information cannot be reduced by a feeling of personal control. Therefore, the reassuring part of the message can only contain the preventive actions that the government and authorities are taking. The objective of communication about risks which one cannot circumvent, is to increase the awareness of the risk, which can be translated in behavioral intentions to seek information and the behavioral intention to alert loved ones. An increase in awareness can help to avoid unwanted (extreme) reactions during a crisis. The study investigated how message acceptance (increased awareness of the risk) can be obtained when the reassuring part of the message cannot provide self-protective or adaptive behaviors to increase the feeling of personal control. Instead, the reassuring part consists of preventive measures taken by government and authorities. Furthermore, the impact of explicitly stating in the risk message that there is a low self-efficacy or not explicitly mentioning the low self-efficacy, has been investigated as well.

The results showed that the perceived threat is higher when the reassuring part preceded the threat, which supports the idea that a recency effect occurs when reading a risk message because of the high motivation to process the message and withhold judgment until all information is processed (Ein-Gar et al., 2012) and that the succeeding information adjusts the primary opinion (Hogarth & Einhorn, 1992). Furthermore, when the low self-efficacy was not mentioned, a higher perceived self-efficacy was found. This aspect follows the EPPM which states that one needs to mention explicitly preventive behavior to elicit the feeling of self-efficacy, and the opposite is valid when it is explicitly mentioned that one cannot circumvent the risk from happening. Significant interaction effects of the presentation order (Threat-Reassurance vs. Reassurance-Threat) and low self-efficacy (not vs. explicitly) on intention to seek information and intention to alert loved ones were found. The interaction effects on intention to seek information and on behavioral intention to alert loved ones were fully mediated by negative feelings. When the message started with the threat followed by the reassuring part, no results at a .05 value were found. However, a trend was visible ($p<.1$) that the intention to seek information and the intention to alert loved ones were lower when the low self-efficacy was not mentioned than when it was explicitly mentioned because of the argumentation of personal information seeking control. When the low self-efficacy was not mentioned, a lower intention to seek information has been found than when it was explicitly mentioned. This argumentation is not applicable on the intention to alert loved ones, demonstrating that the feeling of information seeking control can only be elicited by the actual act to seek information, not by sharing the information.

When the threat followed the reassuring part, and the low self-efficacy was explicitly mentioned, the behavioral intentions were lower than when the self-efficacy was not mentioned. The reasoning behind this might be that the respondents perceived a low personal control (self-efficacy) and were left overwhelmed by the threat (as suggested by Prentice-Dunn et al., 2001). The overwhelming effect of the perceived threat elicits high negative feelings, leading to fear control and message rejection.

The results showed that when the conventional presentation order was used in which a threat was followed by reassuring information, the intention to seek information was higher when the low self-efficacy was explicitly mentioned than when self-efficacy was not mentioned. No significant difference was found for the behavioral intention to alert loved ones. When the reassuring part was presented first, the highest behavioral intentions (both intention to seek information as intention to alert loved ones) were found when the low self-efficacy was not explicitly mentioned. This means that both

presentation orders have the same impact on behavioral intentions, the one (i.e., threat-reassurance) being more effective when the low self-efficacy was mentioned, the other (i.e., reassurance-threat) being more effective when the low self-efficacy was not mentioned. However, research showed that communicating a risk before a crisis occurs, increases the reputation and the credibility of the authority if the information is honest and complete (Claeys & Cauberghe, 2012; Williams et al., 1993), so it is important to communicate the low self-efficacy. Furthermore, the feeling of personal information seeking control could be elicited when the low self-efficacy was explicitly mentioned. Hence, it is concluded that to communicate emerging risks that cannot be circumvented by individuals, the conventional presentation order (threat followed by reassuring information) with the explicit mentioning of the low self-efficacy, resulted in the best outcome in terms of information seeking and alerting loved ones.

6. LIMITATIONS AND FURTHER RESEARCH

The current study has some limitations which can offer suggestions for further research. A drawback of the given study is the fact that some results were only significant at the p=.1 level. Furthermore, in this research, we only used newspaper articles as a medium. It is interesting to investigate possible differences of impact when using different media (e.g., television campaigns, radio messages, web messages, etc.), since it has been proven to influence the impact on credibility and message acceptance (Kiousis, 2001; Wathen & Burkell, 2002). Furthermore, not every concept of perceived information seeking control (Kahlor, 2010) has been measured in this research (e.g., the perceived need for information, nor the perceived information sufficiency). Future research can investigate whether the high intention to seek information can be supported by the impact of the need for information and the information sufficiency. Besides, it would be interesting to see which mechanism influences the intention to alert loved ones, knowing that it could not be explained in this study by the perceived behavioral control. Also, the depth of processing needs to be investigated as well and can be measured using Trumbo and McComas' scale (2003), to clarify whether the presentation order effects can be attributed to the recency effects only or if other factors are influencing the threat appraisal as well. As shown in earlier research, other factors can be: involvement (Cauberghe, De Pelsmacker, Janssens, & Dens, 2009); motivation to process the information (Cacioppo, Petty, Kao, & Rodriguez, 1986), and prior knowledge about the risk (Renn & Levine, 1991).

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8. APPENDIX: STIMULI

8.1. Reassurance – Threat, Efficacy not mentioned

Overheid heeft nieuwe bacteriën onder controle

Brussel - De overheid deelde gisteren mee dat de voedselveiligheid van verse groenten en fruit gegarandeerd is. "Door verschillende controle-mechanismen en nieuwe technologieën kunnen geen besmette groenten en fruit tot bij de consument komen", zo verzekerde de woordvoerder van het Ministerie van Volksgezondheid.

De verschillende controlemechanismen en de nieuwe technologieën worden door de overheid volop ingezet om de voedselkwaliteit en –veiligheid te garanderen. Zo zal de overheid het aantal steekproeven op geïmporteerde groenten en fruit opdrijven, en zullen ook meer analyses uitgevoerd worden op producten voor ze naar de supermarkten worden gebracht. Daarnaast zorgen nieuwe technologieën zoals hoogtechnologische screeningen van groenten en fruit om bacteriën te kunnen opsporen, nieuwe verpakkingstechnieken en nieuwe productie- en verwerkingsprocessen ook voor een garantie van de voedselveiligheid.

Er is namelijk een kans dat door de opwarming van de aarde groenten en fruit besmet worden met nieuwe bacteriën die eerder niet voorkwamen in België. Bovendien zorgt de toenemende globalisering voor een grotere kans op het invoeren van groenten en fruit met bacteriën waar de Belgische bevolking niet resistent voor is. De nieuwe bacteriën kunnen ernstige gevolgen hebben voor de gezondheid van de mens. Deze gevolgen kunnen ieder van ons, jong en oud, overkomen en variëren van een voedselvergiftiging tot de ontwikkeling van kanker.

Het Ministerie van Volksgezondheid wijst er echter op dat we voldoende groenten en fruit moeten blijven eten omdat deze een belangrijk onderdeel zijn van een evenwichtig voedingspatroon. (mdv)

8.2. Reassurance – Threat, Efficacy mentioned

Overheid heeft nieuwe bacteriën onder controle

Brussel - De overheid deelde gisteren mee dat de voedselveiligheid van verse groenten en fruit gegarandeerd is. "Door verschillende controlemechanismen en nieuwe technologieën kunnen geen besmette groenten en fruit tot bij de consument komen", zo verzekerde de woordvoerder van het Ministerie van Volksgezondheid. De consument zelf zou deze nieuwe bacteriën niet kunnen bestrijden.

De verschillende controlemechanismen en de nieuwe technologieën worden door de overheid volop ingezet om de voedselkwaliteit en –veiligheid te garanderen. Zo zal de overheid het aantal steekproeven op geïmporteerde groenten en fruit opdrijven, en zullen ook meer analyses uitgevoerd worden op producten voor ze naar de supermarkten worden gebracht. Daarnaast zorgen nieuwe technologieën zoals hoogtechnologische screeningen van groenten en fruit om bacteriën te kunnen opsporen, nieuwe verpakkingstechnieken en nieuwe productie- en verwerkingsprocessen ook voor een garantie van de voedselveiligheid.

Zo blijft de consument gespaard van bacteriën die ze zelf niet zouden kunnen bestrijden, zelfs niet door de groenten te koken, te schillen of te wassen.

Door de opwarming van de aarde is er namelijk een kans dat groenten en fruit besmet worden met nieuwe bacteriën die eerder niet voorkwamen in België. Bovendien zorgt de toenemende globalisering voor een grotere kans op het invoeren van groenten en fruit met bacteriën waar de Belgische bevolking niet resistent voor is. De nieuwe bacteriën kunnen ernstige gevolgen hebben voor de gezondheid van de mens. Deze gevolgen kunnen ieder van ons, jong en oud, overkomen en variëren van een voedselvergiftiging tot de ontwikkeling van kanker.

Het Ministerie van Volksgezondheid wijst er echter op dat we voldoende groenten en fruit moeten blijven eten omdat deze een belangrijk onderdeel zijn van een evenwichtig voedingspatroon. (mdv)

8.3. Threat – Reassurance, Efficacy not mentioned

Nieuwe bacteriën besmetten groenten en fruit

Brussel – Door de opwarming van de aarde en de globalisering komen nieuwe bacteriën voor op groenten en fruit. "Deze bacteriën kunnen ernstige gevolgen hebben voor de gezondheid van de mens, en het kan ieder van ons overkomen." meldt de woordvoerder van het Ministerie van Volksgezondheid.

De opwarming van de aarde heeft nu ook gevolgen voor de voedselveiligheid van groenten en fruit. Door de klimaatsverandering worden groenten en fruit besmet met nieuwe bacteriën die eerder niet voorkwamen in België. Bovendien zorgt de toenemende globalisering voor een grotere kans op het invoeren van groenten en fruit met bacteriën waar de Belgische bevolking niet resistent voor is. De nieuwe bacteriën kunnen ernstige gevolgen hebben voor de gezondheid van de mens. Deze gevolgen kunnen ieder van ons, jong en oud, overkomen en variëren van een voedselvergiftiging tot de ontwikkeling van kanker.

De overheid deelde gisteren mee dat de voedselveiligheid gegarandeerd is**.** Door verschillende controlemechanismen en nieuwe technologieën kunnen geen besmette groenten en fruit tot bij de consument komen. Zo zal de overheid het aantal steekproeven op geïmporteerde groenten en fruit opdrijven, en zullen ook meer analyses uitgevoerd worden op producten voor ze naar de supermarkten worden gebracht. Daarnaast zorgen nieuwe technologieën zoals hoogtechnologische screeningen van groenten en fruit om bacteriën te kunnen opsporen, nieuwe verpakkingstechnieken en nieuwe productie- en verwerkings-processen ook voor een garantie van de voedselveiligheid. Hierdoor blijft de voedselveiligheid en –kwaliteit van groenten en fruit gegarandeerd.

Het Ministerie van Volksgezondheid wijst op het feit dat we voldoende groenten en fruit moeten blijven eten omdat deze een belangrijk onderdeel zijn van een evenwichtig voedingspatroon. (mdv)

8.4. Threat – Reassurance, Efficacy mentioned

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De opwarming van de aarde heeft nu ook gevolgen voor de voedselveiligheid van groenten en fruit. Door de klimaatsverandering worden groenten en fruit besmet met nieuwe bacteriën die eerder niet voorkwamen in België. Bovendien zorgt de toenemende globalisering voor een grotere kans op het invoeren van groenten en fruit met bacteriën waar de Belgische bevolking niet resistent voor is. De nieuwe bacteriën kunnen ernstige gevolgen hebben voor de gezondheid van de mens. Deze gevolgen kunnen ieder van ons, jong en oud, overkomen en variëren van een voedselvergiftiging tot de ontwikkeling van kanker.

"De consument kan deze nieuwe bacteriën niet bestrijden, zelfs niet door de groenten te koken, te schillen of te wassen", meldt de woordvoerder van het Ministerie van Volksgezondheid.

De overheid deelde gisteren mee dat de voedselveiligheid gegarandeerd is**.** Door verschillende controlemechanismen en nieuwe technologieën kunnen geen besmette groenten en fruit tot bij de consument komen. Zo zal de overheid het aantal steekproeven op geïmporteerde groenten en fruit opdrijven, en zullen ook meer analyses uitgevoerd worden op producten voor ze naar de supermarkten worden gebracht. Daarnaast zorgen nieuwe technologieën zoals hoogtechnologische screeningen van groenten en fruit om bacteriën te kunnen opsporen, nieuwe verpakkingstechnieken en nieuwe productie- en verwerkings-processen ook voor een garantie van de voedselveiligheid. Hierdoor blijft de voedselveiligheid en –kwaliteit van groenten en fruit gegarandeerd.

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CHAPTER 6:

Analyzing consumers' reactions to news coverage of the 2011 *Escherichia coli* O104:H4 outbreak, using the Extended Parallel Processing Model

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CHAPTER 6: Analyzing consumers' reactions to news coverage of the 2011 *Escherichia coli* O104:H4 outbreak, using the Extended Parallel Processing Model [6]

ABSTRACT

This article described and analyzed Flemish consumers' real-life reactions after reading online newspaper articles related to the *enterohemorrhagic Escherichia coli* (EHEC) O104:H4 outbreak associated with fresh produce in May and June 2011 in Germany. Using the Extended Parallel Processing Model (EPPM), this study explored the impact of Flemish (Belgian) online news coverage on consumers' perception of the risk induced by the EHEC outbreak and their behavioral intentions as consumers of fresh produce. After the consumers read a newspaper article related to the outbreak, the EPPM concepts were measured combined with behavioral intentions. The consumers' reactions were measured by inserting a link to an online survey below every online newspaper article on the EHEC outbreak that appeared in two substantial Flemish newspapers. Looking at the perceived values of the EPPM concepts, the perceived severity and the perceived susceptibility of the risk were, as expected, high. However, the consumers thought they could prevent the risk from happening, which stresses the importance of increasing consumers' knowledge of emerging food safety risks. Furthermore, analyses showed the moderating role of government trust and its influence on the way consumers perceived the risk, how worried they were, and their behavioral intentions.

KEY WORDS

Risk communication; EHEC outbreak; Food risks; Extended parallel processing model

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1. INTRODUCTION

The outbreak in May–June 2011 of *enterohemorrhagic Escherichia coli* (EHEC) O104:H4 was reported as one of the most severe foodborne outbreaks in Europe and the first outbreak on this scale caused by fresh produce in the European Union. The EHEC outbreak was mainly situated in Germany but affected citizens of other European countries (and some US citizens) who travelled to Germany. In total, 15 European countries in addition to Germany reported cases of EHEC infection. The outbreak resulted in the loss of 50 lives and 857 cases of Haemolytic Uraemic Syndrome (HUS), which leads to acute kidney failure (WHO, 2011).

Even though this EHEC outbreak in Germany was a rare incident caused by an atypical VTEC seropathotype (*E. coli* strain O104:H4), fresh produce as a food vehicle is a growing cause of foodborne illnesses (EFSA & ECDC, 2012; EFSA, 2013; Jacxsens et al., 2010; Lynch, Tauxe, & Hedberg, 2009; Sivapalasingam, Friedman, Cohen, & Tauxe, 2004; Tobin, Thomson, & LaBorde, 2012). In addition, the increasing international trade of fresh produce puts pressure on governing food safety. Global sourcing of fresh produce (including imported from low-cost countries with other climate conditions), other production practices, and lack of knowledge of hygiene and control measures, may lead to the introduction of food safety hazards in European food products (Florkowski, 2008; Klontz, Klontz, Mody, & Hoekstra, 2010). At present, the EU is the largest importer and exporter of fresh produce in the world (Dorling, Newman, & Barford, 2008).

Eating contaminated fresh produce can lead in the case of biological hazards to acute diarrheal illness or in the worst case death, as exemplified in the EHEC outbreak. Thoroughly rinsing fresh produce, washing hands before and after eating, peeling fresh produce, respect hygiene and good kitchen practices to avoid cross-contamination and storing fresh produce at a cool temperature can to some extent reduce the risk. However, it cannot be completely circumvented by consumers because of the absence of an adequate heat treatment before consuming fresh produce eaten raw and sold or served as “ready-to-eat” (EFSA, 2011). Therefore, consumers largely rely on the fresh produce supply chain actors (from farm to retail/catering) to provide safe food. This can be done by implementing appropriate preventive measures, control measures, and testing programs and on competent authorities to regulate, control, and monitor the safety of the food chain. This aspect stresses the role of government trust when communicating a risk to consumers.

Communicating these risks about raw fresh produce to consumers is necessary since an emerging food risk, developing into a crisis, similar to the EHEC outbreak, can have immediate direct economic costs due to a decrease in sales, import ban, food recalls, etc. (Calvin, 2007; Wentholt, Fischer, Rowe, Marvin, & Frewer, 2010). However, indirect economic costs such as loss of trust in the product or in the government can also occur (Pennings, Wansink, & Meulenberg, 2002; Wentholt et al., 2010). Communicating about emerging food safety hazards could avert these economic consequences. Fresh produce is generally perceived as healthy by consumers (Eurobarometer, 2006, 2010) and therefore it is not easy to communicate risks related to fresh produce.

A useful model for communicating risks is the Extended Parallel Processing Model (EPPM) (Witte, 1992). The EPPM states that risk messages need to contain a threat appeal and a reassuring appeal. The threat appeal wants to increase the perceived severity and the perceived susceptibility of the risk. The reassuring appeal elicits the perceived self- and response efficacy to obtain message acceptance. This acceptance leads in turn to behavioral intentions (Witte, 1992, 1998). Response efficacy is the belief one has in the recommended behavior that it will prevent the threat. Perceived self-efficacy is the (feeling of) personal control to prevent the risk from happening (Witte, 1992, 1998). In the case of fresh produce eaten raw, the actual efficacy is low. Consumers have only a limited impact on the microbial food safety of the fresh produce they consume due to the lack of an inactivation step for pathogens. Avoiding and cooking fresh produce are two ways to circumvent the risk. However, both interventions may not be applicable or accepted by consumers and/or cannot be maintained long term.

The objective of the present study is to examine the perceived value of various EPPM concepts (i.e., perceived severity, perceived susceptibility, perceived efficacy, negative feelings) and trust in the government of Flanders (the Flemish part of Belgium) regarding food safety. This objective will be obtained by using real-life data from consumers collected after they read online newspaper articles about the EHEC outbreak in Germany. The moderating influence of government trust on the EPPM concepts and behavioral intentions regarding consuming produce was also investigated. Furthermore, differences in reactions based on gender and age are assessed, since both sociodemographic variables have been shown to influence reactions towards a risk message (Dosman, Adamowicz, & Hrudey, 2001; Eurobarometer, 2006, 2010; Frewer, 2000; Keller & Lehmann, 2008; Sundblad, Biel, & Garling, 2007; Tobin et al., 2012).

2. THEORETICAL FRAMEWORK

2.1. The Extended Parallel Processing Model

The EPPM (Witte, 1992) explains people's reactions to risk messages and states that when an individual receives a risk message it can trigger a process in which two components are appraised. The *threat appraisal* consists of the appraisal of the perceived susceptibility and the perceived severity (Witte, 1992, 1998). Belief about the seriousness of the threat (e.g., *"eating fresh produce contaminated with EHEC can lead to death"*) is the *severity of the threat*. The *perceived susceptibility* is the belief that the risk could affect you (e.g., *"I eat fresh produce every day, so I can be exposed to this risk"*). When the threat is perceived as severe, feelings of fear or negative feelings are elicited, and people feel an urge to reduce the negative feeling. Therefore, they further process the message and evaluate the efficacy of the recommended response (Witte, 1992, 1998). The perceived efficacy comprises response efficacy and self-efficacy (Witte, 1992, 1998). *Response efficacy* is the belief consumers have that the recommended behavior will effectively prevent the risk from happening (e.g., "*I believe that the actions necessary to prevent the risk from occurring will prevent the risk from happening*") (Witte, 1992, 1998). *Self-efficacy*, on the other hand, questions if consumers believe that they have the ability to act as the recommended behavior suggests (e.g., *"I believe I can perform the actions necessary to prevent the risk from occurring"*).

When both appraisals are perceived as high, a danger control process is initiated resulting in message acceptance, which most likely leads to adaptive behavior (Witte, 1992, 1998). Research (Dickinson & Holmes, 2008; Witte & Allen, 2000) shows that fear is not the only emotion experienced when an individual is exposed to a threat message; other negative feelings such as worry and anger, can be aroused as well after reading a risk message, which will be called negative feelings in this paper.

In case of the emerging risks on fresh produce, the actions that can prevent the risk from happening (i.e., response efficacy) are those that the fresh produce supply chain actors (from farm to retail/catering) and competent authorities at the regional or national level undertake to provide safe food. These actions consist of intensified inspections and surveillance programs to monitor and detect the source of contamination and eliminate the contaminated product from the market, more stringent adherence and attention to "best practices" and hygiene in agricultural production, processing, trade, and distribution of food (Baert et al., 2012). Consumers can also take action to limit food safety risks by appropriately storing and handling fresh produce at home. However,

because of the absence of an adequate heat treatment or other pathogen reduction steps, the risks cannot be completely circumvented (EFSA, 2011). This aspect implies that self-efficacy will be low because consumers cannot believe in the possibility to avoid eating contaminated fresh produce and fully control the food safety hazard. Following the EPPM (Witte, 1992, 1998), when the perceived efficacy is lower than the perceived threat, an individual's negative feelings are intensified, resulting in "fear control" process and message avoidance.

Nevertheless, consumers could be unaware of the impossibility of preventing the risk from occurring (as they could believe that they can control the threat by avoiding consuming raw produce, growing their own or buying local food, thoroughly washing the produce, etc.), which could lead to a higher perceived efficacy than the actual self-efficacy. Still, the role of risk communication is to make consumers aware of the emerging food safety risks, and inform consumers about the impossibility of circumventing the safety risks of fresh produce. This leads to the fact that even though the perceived self-efficacy could be high in this specific EHEC crisis (due to a lack of knowledge), the role of trust will come to the fore since the government (and food safety agencies) can undertake actions to provide safe food (e.g., increased monitoring to detect the presence of new food hazards, etc.). The belief consumers have in the competence of authority and government actions relies on the consumers' trust in these bodies.

Earlier research highlighted that trust is a key principle of effective communication regarding risks and food risks in general (Breakwell, 2000; Lofstedt, 2006; Pornpitakpan, 2004; Slovic, 1999; Twyman, Harvey, & Harries, 2008; Wentholt et al., 2010), and especially in cases where consumers cannot control the risk: technology-related risks such as the millennium bug (Gutteling & Kuttschreuter, 2002), risks related to industrial chemicals (Ter Huurne & Gutteling, 2009), and risks of flooding (Kievik & Gutteling, 2011; Terpstra, Lindell, & Gutteling, 2009). As Ter Huurne and Gutteling (2009, p. 810) pointed out: *"Generating or maintaining trust, then, often becomes a primary goal of risk communication".*

Therefore, in this study the moderating role of trust was assessed on the perceived concepts of the EPPM (i.e., severity, susceptibility, efficacy, and negative feelings regarding the EHEC outbreak) and on behavioral intentions.

2.2. The E. coli O104:H4 outbreak in May and June 2011 associated with fresh produce

In the beginning of May 2011, increased incidences of HUS and bloody diarrhea were reported in northern Germany. The outbreak peaked on May 22 (Appel et al., 2012). The German authorities warned German consumers against eating tomatoes, lettuce, and cucumbers that were believed to be responsible for the outbreak. On May 26, Spanish cucumbers were identified as the source because pathogenic *E. coli* serotypes had been found (Appel et al., 2012). That day the first casualty outside Germany was reported as well. From that day on, media attention increased, and the overall sales of fresh produce, in particular of lettuce, tomatoes, and cucumbers, significantly declined in Europe. On June 1, German authorities announced that none of the *E. coli*–positive Spanish cucumbers showed the serotype O104:H4. On June 10, fresh sprouts produced by a German farmer were identified as the suspected food vehicle. Eighteen days later (June 30), fenugreek seeds appeared as a potential source and were removed from the market. On July 5, the EFSA identified fenugreek seeds imported into Germany from Egypt as the most likely source of the outbreak. July 4 was the latest onset date of illness attributed to the outbreak. Twenty-five days later, the outbreak was officially declared over by German authorities.

3. METHOD

3.1. Participants and procedure

For this research, the first reactions of consumers to news coverage of the EHEC outbreak in Flanders, Belgium, were collected. In Belgium, no diarrheal or HUS-related cases occurred during the outbreak. When media coverage of the EHEC outbreak began in May 2011, a link to an online survey was inserted below every online newspaper article on this topic on two online Flemish newspapers' websites.

Research showed that, except for word of mouth, the internet is the most used source of food safety information (Lee, Niode, Simonne, & Bruhn, 2012). Hence, analyzing consumers' reactions to online newspaper articles can provide insights into reactions to the EHEC crisis since newspapers are frequently used to obtain information on food safety. Also, most research on risk communication is measured in a research setting, using hypothetical risk messages about emerging issues. Although these studies are valuable, collecting real-life data during a crisis in a neighboring country with

uncertainty about the food type and many casualties involved, provided an opportunity to gain insights into consumers' first real-life reactions.

In total, reactions to 17 articles that focused on the EHEC outbreak were collected, within a time span of nine days, from May 23, 2011, until May 31, 2011. This period was just after the outbreak peaked (May 22) when fresh produce (lettuce, tomatoes, and cucumbers) was identified as the suspected food vehicle, and before fenugreek seeds were identified as the source (Appel et al., 2012). Media attention increased throughout Europe. From 19 articles that appeared in the two online newspapers during the reported period, 17 articles were used to collect consumers' reactions.

When the various articles were examined in detail, the content was clearly diverse. Some articles contained every aspect of the EPPM, namely severity (i.e., the consequences of the EHEC bacteria were stated clearly, such as, HUS, death), susceptibility (i.e., where the EHEC outbreak took place and/or who it affected, such as, Germany, Scandinavia, elderly, women), response efficacy accomplished by the authorities (i.e., scientific research, more screening and control measures). Other articles contained only one EPPM concept. Some articles had a more reassuring tone, others were framed as more threatening. Due to the varying tones of the articles, we merged the reactions of the 17 articles, and did not examine the responses to individual articles.

A total of 6312 respondents filled out the questionnaire, 47.6% were male, and 52.4% were female. The average age was 40.70 years (SD=13.72), with a minimum age of 13 years and a maximum age of 88 years. Based on the Internet Protocol (IP) addresses and the sociodemographic data, no multiple responses were given by a single respondent.

3.2. Measures

The online questionnaire was developed using adaptions of existing seven-point Likert scales, with one referring to *"totally disagree*" or *"not at all",* four *"neutral",* and seven *"totally agree"* or *"very much"*. Every concept was measured using one item, instead of using the complete scale consisting of multiple items. This has been encouraged by several researchers (Alexandrov, 2010; Rossiter, 2008) and was necessary to prevent dropout in this unique real-life data collection.

First, the respondents indicated which online newspaper they had read *(De Morgen* or *Het Laatste Nieuws)*, and they were asked to specify which article they had read. Next, five negative emotions were measured, namely *anger, sadness, fear, frustration and*

worry by asking the consumers to indicate, on a seven-point Likert scale, how they felt after reading the article. After summation of the mean values, the emotions were conceptualized into *negative feelings* (α=.847) as suggested by Dickinson and Holmes (2008).

The EPPM concepts were measured using an adaptation of Witte's model (1992). *Perceived severity* was measured using the item *"I see EHEC bacteria as a risk to the safety of fresh produce"* and *perceived susceptibility* with *"It is possible that I have come in contact with fresh produce that contains EHEC bacteria." Self-efficacy* was measured using *"I can avoid eating fresh produce contaminated by the EHEC bacteria". Response efficacy* was not measured, since consumers could not circumvent the risk due to the EHEC outbreak; therefore, they could not believe in the recommended preventing behavior.

Trust in the government was measured based on De Jonge et al.'s scale (2007) using one item, *"I trust the government that safety of fresh produce will be guaranteed"* .

De Wit et al.'s scale (2008) was used to measure *behavioral intentions*. More precisely, the following aspects were measured: the intention to keep on eating fresh produce, the intention to rinse fresh produce better, and the intention to alert loved ones about the potential risks of fresh produce due to the EHEC outbreak.

4. RESULTS

Table 1 and Table 2 show the results of the measured concepts. **Table 1** provides an overview of the mean values and the gender differences. **Table 2** distinguishes differences per age group. Looking at the perceived values of the EPPM concepts, the *perceived severity* (*M*=5.40) and the *perceived susceptibility of the risk (M*=4.64) were above the neutral value of four as measured on a seven-point Likert scale, which is relatively high. For *perceived severity*, gender differences were observed. *Severity* was perceived lower by men than by women (M_{men}=5.26 versus M_{women}=5.53). Severity and susceptibility increased with age, with perceived susceptibility the lowest in the youngest age category (Table 2).

Perceived self-efficacy was also above the neutral value of four (*M*=4.25) (Table 1). This feeling of efficacy was higher for men than for women (M_{men}=4.26 versus M_{women}=4.07) (Table 1). Furthermore, the older the respondent, the more self-efficacy he or she perceived (Table 2).

The concept "Negative feelings" was measured by using anger (M=3.07, SD=1.86), sadness (M=3.07, SD=1.78), fear (M=3.47, SD=1.84), frustration (M=3.08, SD=1.84), and worry (M=4.72, SD=1.73). In general, the mean value for negative feelings was 3.45 (SD=1.42) which is rather low. As observed in Table 1, men had lower negative feelings than women (M_{men}=3.29 versus M_{women}=3.60). When the four age categories were compared regarding negative feelings, it increased with age. However, this increase was not significantly different between the two youngest age groups and the two oldest age groups (Table 2).

A mean value of 3.86, which is just below the middle value, was found for government trust. No differences between men and women were found for trust (Table 1). Young adults (25–35 years) and adults (35–54 years) had the lowest value for government trust and significantly differed with all age groups (Table 2).

The intention to rinse fresh produce better (M=5.72) and the intention to alert loved ones (M=5.46) were clearly expressed by the respondents. Both intentions were higher for women than for men (M_{women}=6.03 versus M_{men}=5.39 and M_{women}=5.66 versus M_{men}=5.23) (Table 1). All four age categories differed; the older the respondent, the higher his or her behavioral intentions to rinse fresh produce better and to alert loved ones (Table 2). The mean value for the intention to keep on eating fresh produce was 4.72 and was significantly higher for women than men (M_{women}=4.63 versus M_{men}=4.81) (Table 1). No age differences were found regarding the intention to keep on eating fresh produce (Table 2).

Table 1 - Mean values in general, and mean values and differences between men and women for the measured EPPM concepts, trust and behavioral intentions.

	Total (N=6312)		**Women** (N=3305)		**Men** (N=3007)		**Difference between gender**
	M	SD	M	SD	M	SD	
Perceived Severity	5.40	(1.61)	5.53	(1.52)	5.26	(1.70)	t=-6.50, df=6049.80, p<.001
Perceived Susceptibility	4.64	(1.31)	4.66[A]	(1.29)	4.61[A]	(1.34)	t=-1.65, df=6150.73, p=.100
Perceived Efficacy	4.16	(1.70)	4.07	(1.68)	4.26	(1.72)	t=4.42, df=6273, p<.001
Negative Feelings	3.45	(1.42)	3.60	(1.39)	3.29	(1.43)	t=-8.26, df=5856.88, p<.001
Trust	3.86	(1.75)	3.87[A]	(1.66)	3.86[A]	(1.71)	t=-.090, df=6067.63, p=.928
Intention to rinse better	5.72	(1.50)	6.03	(1.31)	5.39	(1.62)	t=-16.98, df=5774.28, p<.001
Intention to alert loved ones	5.46	(1.58)	5.66	(1.47)	5.23	(1.67)	t=-10.83, df=6012.52, p<.001
Intention to keep on eating fresh produce	4.72	(1.97)	4.63	(1.98)	4.81	(1.95)	t=-3.49, df=6270.57, p<.001

The same superscript characters ([A]) in the same row mean that there is no difference for gender. All other values differ at p<.001 level. Equal variance was expected only for perceived efficacy; all other concepts had a Levene test p<.001, so no equal variance is assumed. M= Mean value, SD= Standard Deviation. Values used: 1= totally disagree, 2= disagree a lot, 3= disagree, 4= neutral, 5=agree, 6, agree a lot, 7= totally agree.

Table 2 - Mean values per age category for the measured EPPM concepts, trust and behavioral intentions.

	< 25 years (N=819)		25-35 years (N=1695)		36-54 years (N=2574)		> 55 years (N=1144)		ANOVA outcome
	M	SD	M	SD	M	SD	M	SD	
Perceived Severity	5.24[A]	(1.62)	5.36[A]	(1.52)	5.38[A]	(1.65)	5.60	(1.65)	$F(3,6228)=8.80$, $p<.001$
Perceived Susceptibility	4.44	(1.31)	4.69[A]	(1.25)	4.67[A]	(1.28)	4.64[A]	(1.45)	$F(3,6175)=7.79$, $p<.001$
Perceived Efficacy	4.10[A]	(1.61)	4.03[A]	(1.63)	4.20	(1.71)	4.32	(1.84)	$F(3,6192)=7.32$ $p<.001$
Negative Feelings	3.25[A]	(1.37)	3.37[A]	(1.35)	3.51[B]	(1.42)	3.59[B]	(1.52)	$F(3,5870)=11.71$, $p<.001$
Trust	4.08[A]	(1.52)	3.68	(1.54)	3.84	(1.55)	3.95[A]	(1.70)	$F(3,6225)=21.06$, $p<.001$
Intention to rinse better	5.24	(1.61)	5.58	(1.52)	5.80	(1.44)	6.10	(1.42)	$F(3,6214)=61.40$, $p<.001$
Intention to alert loved ones	4.98	(1.64)	5.24	(1.58)	5.54	(1.55)	5.91	(1.44)	$F(3,6228)=70.98$, $p<.001$
Intention to keep on eating fresh produce	4.76[A]	(1.94)	4.68[A]	(1.91)	4.71[A]	(1.97)	4.76[A]	(2.07)	$F(3,6228)=.548$, $p=.650$

Means with the same superscript characters ([A, B]) in the same row do not differ from one another according to the post hoc test Dunett's C. Dunnett's C was used because unequal variance is assumed (Levene's tests $p<.001$). M= Mean value, SD= Standard Deviation. Values used: 1= totally disagree, 2= disagree a lot, 3= disagree, 4= neutral, 5=agree, 6, agree a lot, 7= totally agree.

In the case of emerging food safety risks, government trust was expected to have a moderating role. Therefore, the present study also looked into the moderating impact of government trust on the perceived EPPM concepts. First, the main effect of trust on the intention to keep on eating fresh produce was analyzed. This is the most important behavioral intention because during an outbreak consumers need to continue eating fresh produce that is not linked to the outbreak or when the outbreak in one country does not influence food safety in another (neighboring) country. For example, during the EHEC outbreak, lettuce, tomatoes, and cucumbers sales decreased throughout Europe. However, this decrease was based on a panic reaction, not rational arguments. The analysis of the main effect of trust was followed by analyzing interaction effects of trust and the various EPPM concepts on the intention to keep on eating fresh produce. Respondents were divided into two groups based on the median split for trust and every EPPM concept: perceived severity, perceived susceptibility, perceived self-efficacy, and negative feelings.

A main effect of trust on the behavioral intention to keep on eating fresh produce was found. Respondents with high government trust had a higher intention to keep on eating fresh produce (M=5.08, SD=1.85) than respondents with low trust (M=4.43, SD=2.01) (t=13.15, df=6090.29, p<.001). Furthermore, an interaction effect was found for perceived severity and trust on the intention to keep on eating fresh produce (F(1,4290)=5.025, p=.025), as shown in **Figure 1a**. An interaction effect appeared for perceived susceptibility and trust on behavioral intention to keep on eating fresh produce (F(1,4338)=4.455, p=.035) (**Figure 1b**). The highest intention to keep on eating fresh produce emerged when the perceived susceptibility and severity were high and trust was low. The highest intention to keep on eating fresh produce was found with low susceptibility and severity and when trust was high. However, when the threat was perceived to be high (which was the case for emerging food risks as shown by the mean values for severity and susceptibility), high trust in the government led to a higher intention to keep on eating fresh produce than when the government trust was low. Hence, high trust in the government can reassure consumers and make them continue to eat fresh produce.

In **Figure 1c,** an interaction effect for trust and self-efficacy on the intention to keep on eating fresh produce is shown (F(1,6268)=10.883, p=.001). The lowest behavioral intention to keep on eating fresh produce was found when perceived self-efficacy and trust were low. The highest intention to keep on eating fresh produce emerged when

perceived self-efficacy and trust were high. However, when self-efficacy was low, the highest intention to keep on eating fresh produce appeared when trust was high.

No significant interaction effect of trust and negative feelings was found on the intention to keep on eating fresh produce (F(1,5937)=2.612, p=.106) (**Figure 1d**). However, a main effect emerged for trust on negative feelings, which is visualized in Figure 1d. Respondents with high trust had lower negative feelings (M=3.20, SD=1.37) than respondents who had low government trust (M=3.64, SD=1.42) (t=12.05, df=5935, p<.001).

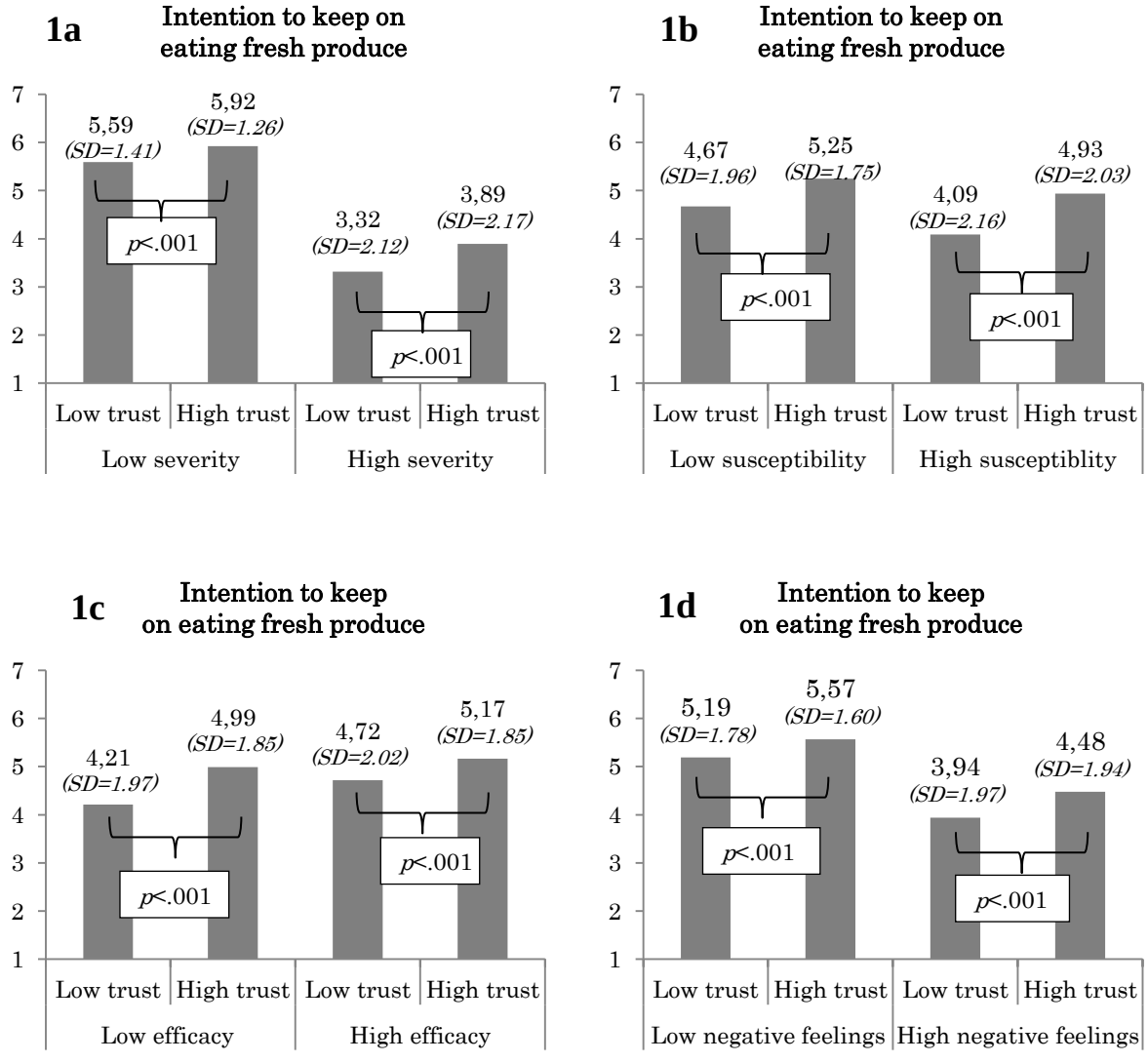

Figure 1 - Interaction effect of perceived severity (1a), perceived susceptibility (1b), perceived efficacy (1c), negative affect (1d), and trust on intention to keep on eating fresh produce

5. DISCUSSION AND CONCLUSION

Since the food risk communication field is expanding, as well as policy attention on emerging food risks (Wentholt et al., 2010), insight into consumers' reactions to food safety risk communication is important when developing a risk communication strategy and preparing future crisis communication. The empirical findings showed that the perceived severity and the perceived susceptibility of the EHEC risk on fresh produce with consumers in Flanders were relatively high. The perceived self-efficacy was high as well. Consumers could have been unaware of the limited possibilities they had to prevent the risk from occurring in the case of fresh produce eaten raw. Individuals might think that they can fully prevent the risk from happening by rinsing fresh produce more thoroughly, for example. However, storing and handling fresh produce appropriately at home helps reduce the number of pathogens, but for fresh produce contaminated earlier in the food chain, a residual risk may remain. The high perceived self-efficacy stresses the important role of risk communication to increase awareness and knowledge of emerging food risks.

The average value for negative feelings was the lowest of all measured concepts, which is in line with the EPPM. This is in line because the perceived threat and the perceived efficacy were high. This means that the respondents do perceive a threat but feel efficacious enough to prevent the risk from happening. Therefore, they go into "danger control" instead of "fear control", which leads to fewer negative feelings and higher behavioral intentions such as rinsing fresh produce better and alerting loved ones.

The values for negative feelings and the behavioral intentions to rinse fresh produce and to alert loved ones after reading the news on the EHEC outbreak were higher for women and older respondents. The differences based on gender are similar to previous research on risk perception (De Jonge et al., 2007; Eurobarometer, 2006, 2010; Frewer, 2000). A possible explanation for the gender differences might be that women do most of the cooking and have a caretaking role in the household (Breen & Cooke, 2005; Brines, 1994; Cooke, 2004). This premise could lead to higher perceived risk, higher negative feelings, and higher behavioral intentions.

The differences based on age, are ambiguous in literature. Some literature suggests that young people perceive lower risks than older people (Hamilton, 1985), other literature suggests the opposite (Dosman et al., 2001; Keller & Lehmann, 2008; Tobin et al., 2012). Our results show that older people do perceive higher risks and experience more negative feelings than younger people. A possible explanation could be that younger

people have less experience with the impact of possible risks, and therefore perceive them as lower (Dosman et al., 2001). Another possibility might be that young people are more familiar with these risks leading to lower perceptions (Dosman et al., 2001).

The results showed that the behavioral intention to rinse fresh produce better and the intention to alert loved ones were high, which is in line with the Eurobarometer results (2006, 2010). Furthermore, in the current study there was no clear behavioral intention to stop eating fresh produce for both men and women. During the EHEC outbreak, no clinical cases of *E. coli* O104:H4 were identified in Belgium and no indications that any fresh produce sent to the market in Belgium was contaminated with EHEC in general or the *E. coli* O104:H4 outbreak strain in particular. Therefore, there was no need to avoid eating fresh produce in Belgium, so the Belgian government did not warn against eating different types of fresh produce such as lettuce, tomatoes, or cucumbers during the outbreak, in contrast to the German government (Appel et al., 2012). A high intention to keep on eating fresh produce is a positive outcome bearing in mind the increase in economic losses if people stop eating fresh produce. Risk communication could help to avoid the indirect and direct economic losses of a foodborne outbreak crisis by raising awareness about and knowledge of emerging food risks. A high awareness of potential food safety risks entails that people perceive a lower risk because it is not novel anymore (De Pelsmacker, Cauberghe, & Dens, 2011), avoiding a scare, which will lead to a higher intention to keep on eating fresh produce that is not related to the outbreak.

In risk communication about food safety hazards that cannot be completely circumvented by consumers when communicating about fresh produce eaten raw, trust plays a vital role. The results showed that the level of government trust was beneath the neutral middle value four with the youngest and oldest age groups having the highest level of trust. Furthermore, a moderating role for government trust was found. This role can be seen in the significant interaction effects between government trust and every EPPM concept measured, besides negative feelings, on the behavioral intention to keep on eating fresh produce. No significant interaction effect appeared for trust and negative feelings on the intention to keep on eating fresh produce. However, when trust was low, higher negative feelings were found than when trust was high.

These results are in line with previous research on risk communication (Groothuis & Miller, 1997; McComas & Trumbo, 2001; Siegrist, Gutscher, & Earle, 2005; Slovic, 1999; Ter Huurne & Gutteling, 2009), and stress the important, moderating role of trust.

When trust was high, it mitigated the way the message was being perceived, leading to better message acceptance and the resulting behavioral intentions.

6. MANAGERIAL IMPLICATIONS

From these results, managerial implications can be drawn. Since consumers cannot completely avoid these fresh produce risks, increasing knowledge of emerging food safety hazards is important. To increase this knowledge, communication should explain in an honest, understandable, and accessible way the emerging hazard (the threat), what the government and food safety authorities are doing to provide safe food (the relief), and what consumers can do (e.g., keep on eating fresh produces, rinse thoroughly) and cannot do (e.g., they cannot completely circumvent the risk when fresh produce is eaten raw). However, increasing knowledge of consumers' inability to circumvent the risk could lead to the perception that they are not in control (i.e., low self-efficacy) which could lead to more feelings of worry and fear (Witte, 1992; 1998). Nevertheless, due to ethical reasons and the right-to-know about emerging hazards, risk communication should take place, but the role of trust comes to the fore since it has an important, moderating role in cases where consumers cannot control the risk. Hence, the primary objectives of future risk communication about emerging food safety issues need to be increasing knowledge, and building and maintaining trust.

Other implications that are related to this study, but are not based on the results of our study, will be discussed in what follows. Trust is fragile. Once it is lost, it cannot easily be rebuilt (Slovic, 1999). Openness, transparency, competency, and efficiency are important components of communication for building and maintaining trust (Frewer, Howard, Hedderley, & Shepherd, 1996; Lofstedt, 2006; Renn & Levine, 1991). During a foodborne outbreak, there is a lot of uncertainty, because the source cannot be found immediately (e.g., in the EHEC outbreak it took almost two months before the fenugreek seeds were identified as the source) and false accusations can spread (e.g., Spanish cucumbers as a potential source). These factors decrease trust, because constantly changing, sometimes contradicting, messages are being disseminated. However, when communication is transparent and open, uncertainty can be communicated, which is better than not communicating. Not communicating leads to more doubts and people believe any other (not credible) information source they find. As Kahlor's (2010) Planned Risk Information Seeking Model shows, people who cannot prevent a risk from happening counteract by seeking information. Furthermore, people do not always trust

news media coverage, but a motivation for following the (distrusted) news is to fulfill the need for cognition (Vasterman, 2005). Therefore, consumers must find an independent source of information that gives more clarification and insights. Breakwell (2000) stated that an information source that is believed to be expert, unbiased, and not sensationalizing will be trusted the most. Research shows that respondents get confused when there are many different sources, and they need to have one information point providing easily accessible information (Baan, Gutteling, & Terpstra, 2009; Gutteling, Baan, Kievik, & Stone, 2010; Ter Huurne & Gutteling, 2008).

7. LIMITATIONS AND FUTURE RESEARCH

The unique situation of collecting data during a real-life crisis has limitations. Various contextual factors cannot be ruled out. Moreover, whether respondents heard more via other broad media channels (e.g., television, radio) or personal communication with family, friends, colleagues, etc. is unclear. Another limitation is in the methodology. By inserting a link below every online newspaper article self-selection of the respondents was induced. Only persons who read one of the EHEC articles, noticed the link, and voluntarily wanted to participate, clicked on the link to fill out the survey. The fact that response efficacy was not measured is an additional limitation. Since respondents can only to a limited extent prevent the risk of foodborne infection regarding consumption of raw fresh produce, no response efficacy was measured because no recommended behavior could be inserted in the item to measure response efficacy, as developed by Witte (1992). However, looking at the results for self-efficacy, respondents believed they could prevent the risk from happening. It would have been interesting to gain insights into the behaviors of which respondents thought they could prevent the risk from happening. In future research, existing beliefs in different behaviors could be investigated with various communication strategies necessary to counter these misperceptions. Future research could also investigate in more detail the vital and moderating role of trust in risk communication, especially in cases where consumers cannot prevent the risk from happening (e.g., industrial risks, natural disasters as flooding, hurricanes).

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CHAPTER 7:

Conclusions, contributions, and further research

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1. INTRODUCTION

In this dissertation research was conducted to investigate how food risks on fresh produce, which cannot be controlled by the consumers, can be effectively communicated. The objective of these communication efforts is increasing the awareness about the possible risks and preparing the individuals for potential crises. Some protective behaviors can be taken by the consumers such as thoroughly rinsing and keeping the fresh produce at a cool temperature to decrease the possibility of contamination at home. However, when the fresh produce was contaminated earlier in the food chain, the risks cannot be completely circumvented by these behaviors.

Risk communication is grounded in the general right-to-know about hazards and risks (Nathan, Heath, & Douglas, 1992; Renn & Levine, 1991; Reynolds & Seeger, 2005). As Renn (2006) points out: *"We can deal with dangers better when we are well aware of them and when we can prepare ourselves for them*" (Renn, 2006, p. 837). Especially when communicating risks in which neither adaptive nor self-protective behaviors can be communicated, the objective of the risk message is to increase the awareness about the risks. This way people can become aware of the risks, which can avoid unwanted reactions during a crisis period such as panic, fear or worry which keeps them from maintaining their behavior (i.e., keep on eating fresh produce). However, if risk communication efforts are not balanced enough, consisting of both threatening and reassuring information, it could induce too much negative feelings, leading to panic reactions and even message rejection (Witte, 1992). This premise can explain the reluctance of governments to communicate risks out of fear to raise a panic.

In this dissertation the desired behavioral intentions are, besides to maintain their current behavior to eat fresh produce, the intention to seek for more information about the risk, alert loved ones and think about how to avert the risk. When consumers communicate and think about the risk, and search for more information, the awareness of the emerging risks can increase as well.

In **Figure 1** the theoretical overview can be found again, in which the different research question and chapters are indicated. In what follows we will recapitulate our findings and describe the theoretical contributions. Afterwards, we will have a look into the

managerial implications of these findings. This chapter will end with addressing limitations and future research in the field of (food) risk communication.

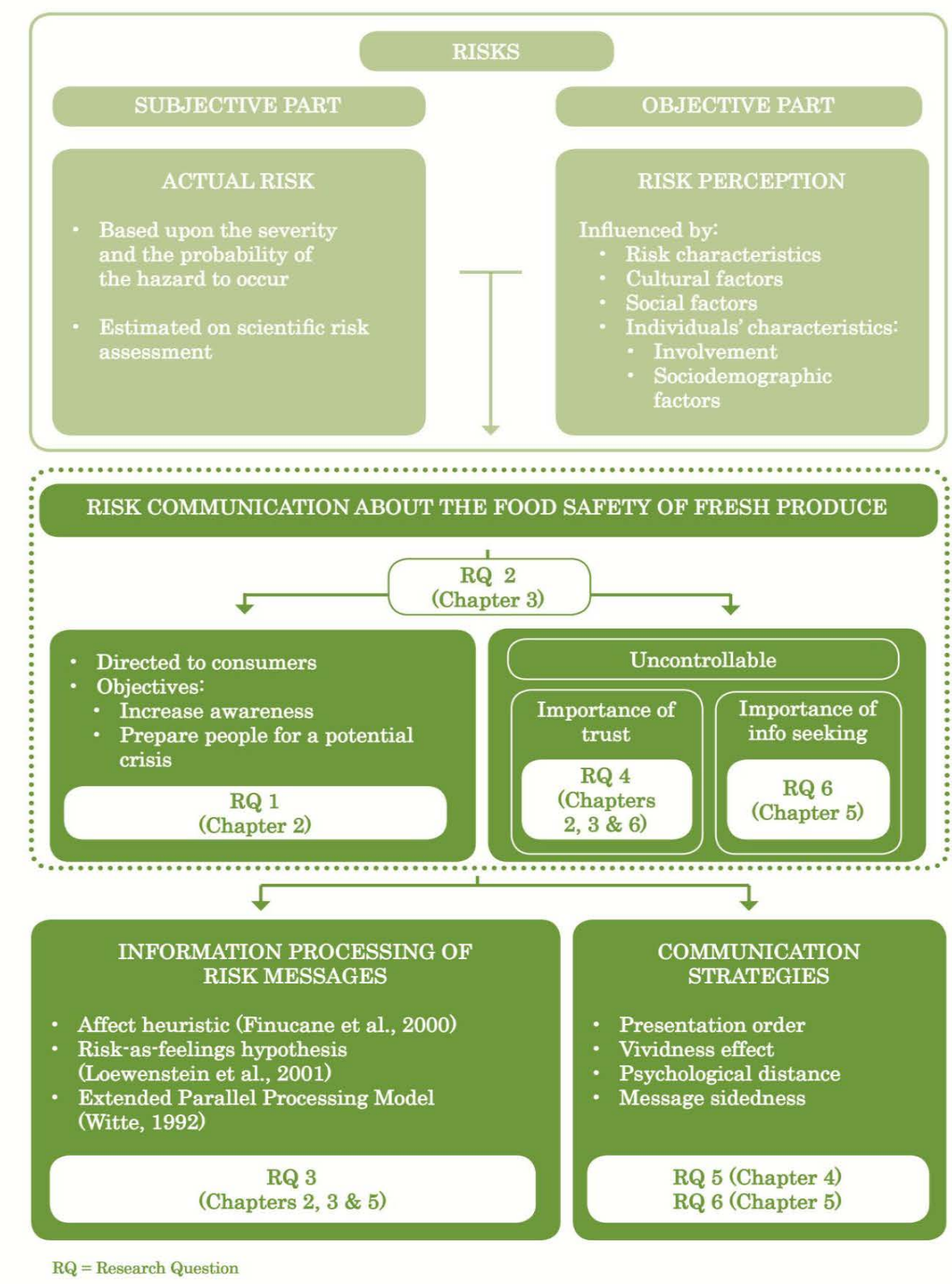

Figure 1 - The different research questions (and chapters) situated in the theoretical overview

2. RECAPITULATION AND THEORETICAL CONTRIBUTIONS

2.1. The importance of risk communication

In ***chapter 2*** we investigated whether the governments' reluctance towards communicating risks out of fear to raise negative feelings (Sandman, 2006; Sjöberg, 1998), is justifiable or not. It became apparent that the effect of risk communication on the desired behavioral intention (i.e., to keep on eating fresh produce) is fully mediated by negative feelings, showing that more negative feelings led to less intentions to keep on eating fresh produce. Furthermore, communicating risks does not evoke more negative feelings when risks are being communicated than when no risks are communicated, on the contrary. The study in chapter 2 stressed the importance of communicating risks, even when it is followed by a crisis situation. The attributed responsibility towards the government is lower, and trust in the government is higher, when risk communication preceded the crisis situation than when no risk communication was provided before the crisis hits. Hence, the effectiveness of food risk communication in terms of awareness and crisis preparedness, as questioned in ***research question 1***, is clearly shown in chapter 2.

This positive impact of risk communication can be attributed to the Inoculation theory (McGuire, 1961). The results showed that the "vaccine" (i.e., the risk message), works against the possible "attack" (i.e., a crisis), leading to a higher ability to cope with the crisis, resulting in less negative feelings and therefore less maladaptive behaviors (Witte, 1992). Our results also confirm that risk communication operates in the same manner as an organizational self-disclosure (Arpan & Roskos-Ewoldsen, 2005; Claeys & Cauberghe, 2012) and thus positively affects trust in the government through inoculation.

The effectiveness of risk communication in terms of behavioral intentions to increase the awareness of the risk and to seek information (cf., ***chapter 3*** and ***chapter 5***), and the ability to increase message credibility (***chapter 4***) has been demonstrated in this dissertation as well. Furthermore, communicating all the information, including the low self-efficacy, does not necessarily lead to panic reactions, as shown in ***chapter 5***.

2.2. The importance of national adaptation of the risk message

Chapter 3 assessed whether a standardized risk message about food safety risks can be used across Europe, by using four different countries (i.e., Norway, Spain, Serbia and Belgium) that represent the North-South and East-West axis. We considered these four countries to be a good benchmark to investigate whether reactions differed across Europe. The results showed that the emotional and cognitive reactions towards the risk message differed per country. Furthermore, trust in the government, subjective knowledge about the topic, and behavioral intentions differed per country. The correlations between all variables differed as well per country. Additionally, the cognitive and emotional reactions are differently influenced by antecedents such as trust in the government and subjective knowledge. In response to ***research question 2***, it can be concluded that a risk message should be nationally adapted since it elicits different reactions among individuals of different countries.

2.3. The importance of emotional and cognitive reactions on the effectiveness of risk communication

As described earlier in this dissertation, the importance of emotional reactions is acknowledged in both the Extended Parallel Processing Model (Witte, 1992), the Risk-as-feelings perspective (Loewenstein, Weber, Hsee, & Welch, 2001) as in the Affect heuristic (Slovic, Finucane, Peters, & Macgregor, 2004). These frameworks have in common that they recognize the direct effect of negative feelings on risk judgments and behavioral intentions. However, the Affect heuristic does emphasize the role of affect more than the role of negative feelings and the Risk-as-feelings perspective makes a difference between the anticipated and anticipatory feelings. At the beginning of its development, the EPPM only recognized the indirect influence of the feeling of fear on the desired behavioral intentions. Though, further research on the EPPM showed that other negative feelings besides fear have an influence in a threat appeal. Other studies on the EPPM also found that negative feelings can directly influence the response towards the message and the behavioral intentions.

In this dissertation we used the insights of the Affect heuristic because of its reliance on the dual processing theory which demonstrates that there exist two independent but interrelated systems when assessing a risk. The insights of the Risk-as-feelings hypothesis were used because of its reliance on the anticipatory feelings interacting with cognitive evaluations on behavior, which is closely related to the EPPM. However, the

EPPM's insights were also used because of the attributed importance of perceived efficacy in order to obtain message acceptance. The impact on the presentation order as described by the EPPM, starting the risk message with the threat, followed by the reassuring information, is another reason EPPM has been used. In this dissertation we decided to use different negative feelings (i.e., emotional reactions) and we looked at the cognitive reactions as the cognitive risk perception (i.e., the severity and the susceptibility).

As posited in ***Research question 3a***, a mediating effect of negative feelings was expected. In ***chapter 2***, it was demonstrated that negative feelings fully mediated the effect of risk communication on behavioral intentions. In ***chapter 5***, a mediating effect of negative feelings was found on the impact of the interaction effect of the different presentation styles on the desired behavioral intentions (i.e., the intention to alert loved ones and the intention to seek information). The presentation styles were both the presentation order and the explicitly mentioning or not mentioning of the low self-efficacy.

The mediating impact of negative feelings was expected on the one hand because of its proven importance of negative feelings in earlier research. Following the EPPM, it is shown that negative emotions can directly influence maladaptive behaviors and message rejection, and can both indirectly as directly influence the desired behavioral intentions (Cauberghe, De Pelsmacker, Janssens, & Dens, 2009; Witte & Allen, 2000; Witte, 1992). On the other hand, prior research illustrates that negative feelings can guide risk perceptions, judgments and behavior (Finucane, Alhakami, Slovic, & Johnson, 2000; Griffin, Dunwoody, & Neuwirth, 1999; Loewenstein et al., 2001; McComas, 2006; Sandman, 2006; Slovic et al., 2004; Witte, 1992).

This dissertation also found that emotional reactions correlated with cognitive reactions, giving prove to the *"the dance of affect and reason"* (Finucane, Peters, & Slovic, 2003), as questioned in ***Research question 3b***. However, the correlations were only moderately high, which is in line with the review study by Sheeran et al. (2013).

Because of the type of risk discussed in this dissertation (i.e., emerging uncontrollable food risks), it was not clear whether the emotional or the cognitive reactions would have the strongest impact on the behavioral intentions (Rogers, Amlôt, Rubin, Wessely, & Krieger, 2007; Slovic, Peters, Finucane, & Macgregor, 2005), which was investigated in ***chapter 3***. Based on the psychometric paradigm, it has been shown that risks that score high on the dimension "dread", will result into more emotional reactions (Loewenstein et

al., 2001; Slovic, 1991). The emerging food risks are uncontrollable, leading to high feelings of dread. On the other hand, the subjective knowledge about the emerging food risks is low because it is a new and emerging risk (as has been shown in ***chapter 3***). However, in general, the idea of food risks is perceived as familiar (Breakwell, 2000; Eurobarometer, 2010), which can decrease the impact of emotional reactions (Reynolds & Seeger, 2005). Finally, the communicated risks involve both a natural risk (micro-organisms) and unnatural risk (pesticides residues), leading to more familiarity and less familiarity respectively. It was assessed whether the cognitive or the emotional reactions would be the most important. Our results showed that in the case of emerging food risks the cognitive risk perception (i.e., susceptibility and severity of the risk) had the largest predictive impact on both the intention to seek information as on the general behavioral intentions (i.e., the intention to alert loved ones, to rinse fresh produce and to think about how to avert the risk). These results suggest that when food risk messages are assessed, there is less reliance on emotional reactions than on cognitive reactions, which answers ***Research question 3b***. These results are in line with the overview of experimental studies on risk appraisals by Sheeran et al. (2013) that showed that emotions make a small but important contribution to the prediction of behavioral intentions and actual behavior.

Hence, to answer ***Research question 3***, the importance of emotional reactions was showed in ***chapter 2 and 5*** because of the mediating impact of negative feelings. Furthermore, as discussed in ***chapter 3***, both emotional and cognitive reactions have a predictive impact on behavioral intentions; however, the cognitive reactions have the largest impact.

2.4. The importance of trust in the government

The importance of trust in the government has been stressed, especially in risk situations in which the consumers cannot circumvent the risk from happening and need to rely on the precautionary actions the government and responsible authorities take to try to control the risk (Frewer, 2004; Siegrist, Cvetkovich, & Roth, 2000; Ter Huurne & Gutteling, 2009; Yeung & Morris, 2006). In ***chapter 2***, it was shown that by communicating openly and honestly about the risk and providing reassuring information about the government's actions to safeguard food safety, it leads to more perceived trust in the government and less attributed responsibility of the government when a crisis

actually hits. Furthermore, negative correlations between trust and negative feelings were found in ***chapter 3***.

Although it was shown in earlier research (Kennedy, Delaney, Hudson, McGloin, & Wall, 2010; Viklund, 2003) that trust is a significant predictor of the cognitive risk perception, our results could not support this. We did find a predictive impact of trust on emotional reactions in ***chapter 3***. This result is in line with earlier research (Kuttschreuter, 2006; Rogers et al., 2007) that found that emotional reactions are influenced by trust. Hence, these results answer ***Research question 4***, questioning the predictive impact of trust.

It should be noted that the causal relationship between trust in the government and both emotional and cognitive reactions is not clear because other studies did state that emotional and cognitive reactions can influence trust (Frewer, Scholderer, & Bredahl, 2003; Slovic, 1999; Visschers & Siegrist, 2008). We decided to investigate and to assume that trust influences emotional and cognitive reactions, based on Kuttschreuter's research (2006) that investigated the causal relationship of trust on emotional reactions about food safety issues. Another reason we opted for this relationship is because trust in the government has been shown to mitigate cognitive reactions and behavioral intentions, as demonstrated in ***chapter 6***. This chapter investigated the moderating role of trust in the government and the EPPM concepts on the intention to keep on eating fresh produce. When people had more trust in the government it was shown that the intention to keep on eating fresh produce was higher whether or not the perceived severity, susceptibility and efficacy were perceived as low or high. However, this effect on the behavioral intention was not significant when negative feelings interacted with trust on the government. Nevertheless, a main effect of trust in the government on negative feelings was found. These results provide an answer on ***Research question 4*** about the moderating impact of trust in the government.

2.5. The importance of different communication strategies on message credibility

Message credibility was assessed because it has been shown to increase message acceptance leading to the desired behavioral intentions, an increase in awareness, and/or attitude changes (Beltramini, 1988; Bickerstaff, 2004; Mackenzie & Lutz, 1989; Renn & Levine, 1991; Slater & Rouner, 1996; Verbeke et al., 2008; Wathen & Burkell, 2002). The study showed that a correlation exists between message credibility and behavioral intentions. This result stresses the importance of message credibility and its influence on

message acceptance, which in turn can result in behavioral intentions (Beltramini, 1988; Bickerstaff, 2004; Mackenzie & Lutz, 1989; Renn & Levine, 1991; Slater & Rouner, 1996; Verbeke et al., 2008; Wathen & Burkell, 2002; Witte, 1992).

Chapter 4 assessed the impact of a combination of communication strategies which all proved their importance in past studies when communicating risks, (i.e., vividness, spatial distance and message sidedness of the message), on message credibility. A main effect of vividness on message credibility has been found, showing that more credibility was perceived when the information and the main argument were vividly presented.

A vividness effect was only expected when the main argument was vividly presented, and the results did not show any impact of spatial distance and message sidedness when the main argument was not made vivid, as stated by Guadagno et al. (2011). Therefore, we only looked into the differences of the impact of spatial distance and message sidedness in the condition when the main argument was vividly presented that leads to a vividness effect. The results, as described in ***chapter 4***, showed that the message credibility was the highest when the vivid information was combined with a risk that was spatially near presented in combination with a one-sided (i.e., risk only) message or, when the information was spatially distant presented and two-sided (i.e., presenting the risk and the benefit). These results answer ***Research question 5***.

Furthermore, different studies showed that two-sided messages almost always result in better outcomes, however, bearing in mind the moderating role of involvement (Cornelis, Cauberghe, & De Pelsmacker, 2013; Eisend, 2006, 2013), prior attitude, prior knowledge (Crowley & Hoyer, 1994; Eisend, 2006), and perceived novelty (Eisend, 2006). Our findings add to this that the psychological distance towards a risk and the vividness of the message can also influence the impact of the effectiveness of message two-sidedness.

2.6. The importance of communicating low self-efficacy and the presentation order

The study in ***chapter 5*** elaborated on the impact of the low self-efficacy (referring to the fact that individuals have less control over the occurrence of the risk) when communicating the emerging food risks on message acceptance, using the EPPM (Witte, 1992). The study investigated how message acceptance (i.e., intention to seek information and to alert loved ones) can be obtained when the reassuring part of the message cannot provide self-protective or adaptive behaviors to increase the feelings of personal control. Though, the reassuring part consists of preventive measures that

government and authorities are taken to try to guarantee food safety. It was investigated whether the impact of the conventional presentation order as described by threat appeal research (i.e., threat followed by reassuring information) or the reversed order (i.e., reassuring information followed by the threat) would be more efficient. This was assessed because this kind of reassuring information might not be reassuring enough to cope with the first presented threat. By presenting reassuring information first, one could become "prepared" to cope with the subsequent threat, leading to message acceptance. Furthermore, the impact of explicitly stating in the risk message that there is a low self-efficacy or not explicitly mentioning the low self-efficacy on message acceptance has been investigated.

The results in ***chapter 5*** showed that the information seeking behavior and intention to alert loved ones about the risk are higher when the reassuring part preceded the threat, and when the low self-efficacy was not mentioned. When the threat preceded the reassuring part (in line with the EPPM), the highest intention to seek information can be found when the low self-efficacy was explicitly mentioned. These results showed that if the low self-efficacy is explicitly mentioned, in line with the right-to-know function (Renn & Levine, 1991), it can still lead to message acceptance. These results answer ***Research Question 6.***

Following the EPPM, it was expected that a low self-efficacy would lead to fear control processes, resulting in message rejection. Furthermore, meta-analyses on threat appeal research (Peters, Ruiter, & Kok, 2013; Sheeran, Harris, & Epton, 2013; Witte & Allen, 2000) stated that the largest effects on outcomes of risk messages containing threats can be found when it encompasses information that increases the perceived efficacy. Our study adds to this that information about the governments' actions to prevent the risk from happening is also perceived as reassuring enough, initiating a danger control process and in turn message acceptance.

This study also demonstrated that a recency effect takes place when risks are being communicated; meaning that the last presented information has a stronger influence on the judgment of the risk message than the first presented part. Recency effects are normally expected when the motivation to process the information is high, which was expected when communicating food risks (Frewer, Howard, Hedderley, & Shepherd, 1997; Johnson, 2005; Loroz, 2007). The results in ***chapter 5*** support this; because of the high motivation to process, judgments are withhold until all information is processed

(Ein-Gar, Shiv, & Tormala, 2012) and succeeding information adjusts the primary opinion (Hogarth & Einhorn, 1992).

In ***chapter 5,*** the importance of information seeking as a self-protective behavior to close the knowledge gap, to reduce uncertainty and to lead to a perception of control was also assessed (Griffin et al., 2008, 1999; Kievik & Gutteling, 2011; Thompson, 1981). When people have or perceive little or no control over the occurrence of the risk (i.e., low self-efficacy), they might try to substitute this lack of control by seeking more information (i.e., perceived information seeking control) (Kahlor, 2010; Stevens, 2010). It was expected that people who became aware of the lack of controllability (i.e., explicitly mentioning the low self-efficacy) after receiving the threatening information, would have higher intentions to seek information. Not only information seeking behavior was assessed, but also the intention to alert loved ones. The latter might be seen by consumers as a way to share an information need with others who can be seen as a potential information source (Yoon & Nilan, 1999). Therefore, the mere act of sharing and communicating about the risk might be seen as a perceived behavioral control.

A trend was identified in ***chapter 5*** that supported the argumentation of personal information seeking control. When the threat preceded the reassuring part of the message and the low self-efficacy was explicitly mentioned a higher intention to seek information was found. When the low self-efficacy was not mentioned, a lower intention to seek information became visible. This argumentation was not applicable on the intention to alert loved ones, demonstrating that the feeling of information seeking control can only be elicited by the actual act to seek information, not by sharing the information.

In ***chapter 6,*** in which the real life reactions to the news coverage on the EHEC outbreak were discussed, a low value of negative feelings was found. Following the EPPM (Witte, 1992), this result can be explained because of the low perceived risk and the high perceived self-efficacy. Hence, people did think that they could avert the risk from happening. This outcome stresses the role of risk communication to increase awareness and knowledge of emerging food risks.

3. MANAGERIAL IMPLICATIONS

In what follows, we will formulate some managerial implications based on the studies discussed in this dissertation. Afterwards, some general guidelines will be discussed based on the literature review.

3.1. Communicate risk information in an open and honest way

People want transparency and openness, not only because it is their right to be informed about possible risks, but also because they can make more informed decisions and reduce uncertainties (Lofstedt, 2006; Palenchar & Heath, 2002; Reynolds & Seeger, 2005; Sellnow & Sellnow, 2010; Williams & Bolanle, 1998). Based on the results of chapter 2, it can be stated that risk communication has a positive impact on the perceptions of the consumers towards the risk, but also towards the government, whether or not followed by a crisis situation. Communicating all the information does not necessarily lead to panic reactions as shown in chapter 5, in which the desired behavioral intentions could be obtained even when the information about the low self-efficacy is explicitly presented.

When communicating the information in an open and honest way, practitioners should not hesitate to use vividly presented information. This approach can help to have the message being picked up out of the amount of messages that people receive on a daily basis. The use of pictures helps to attract the information and increase credibility, as has been shown in chapter 4. However, other ways to vividly present information such as videos, narratives, colors, graphics, etc. can also result in more attention to and persuasiveness of the message (Block & Keller, 1997; Chang, 2013; De Wit, Das, & Vet, 2008; Fortin & Dholakia, 2005; Guadagno et al., 2011).

When a vividness effect occurs because the main argument has been vividly presented as well, it is advised to use a balanced, two-sided message. As has been shown in the literature overview, two-sided messages lead in most contexts to better outcomes than one-sided messages. In chapter 4, this effect was moderated by the psychological distance towards the risk (i.e., spatial distance to risk). When the message is formulated as a risk with a nearby occurrence, the risk message should be formulated one-sided to obtain the best results. When the risk message is formulated as a distant occurrence, using two-sided messages leads to the best outcome. This, together with the impact of the vividness effect, should be kept in mind when developing a risk message.

Communicating in an open and transparent way can also contribute to the development and maintenance of trust in the government or other information sources (Lofstedt,

2006). Trust plays an important, moderating role in cases where consumers cannot control the risk (Kievik & Gutteling, 2011; Terpstra, Lindell, & Gutteling, 2009), and its importance and mitigating role has been shown in chapter 2, chapter 3 and chapter 6.

Trust is fragile. Once it is lost, it cannot be easily rebuilt (Slovic, 1999). Openness, transparency, competency, and efficiency are important components of communication for building and maintaining trust (Frewer, Howard, Hedderley, & Shepherd, 1996; Lofstedt, 2006; Renn & Levine, 1991; Rogers et al., 2007). In order to increase and/or maintain trust, it is important that all different groups involved (i.e., scientists, consumers, policy makers) are pursuing the same goal, or at least identify overlaps of interest on local, concrete issues wherever possible (Poortinga & Pidgeon, 2003; Rogers et al., 2007).

3.2. Adapt the risk messages

Based on the results of chapter 3, it can be concluded that risk messages are best to be adapted on a national level, due to different local perceptions and attitudes. The best way should be that each country develops its own messages and tests these on a group of people before distributing it. However, risk messages about the global and emerging risks are mostly sent from a global level, for example from the World Health Organization (WHO). Then it is advisable to test these messages first to be sure that no different wordings, understandings or undesired effects can arise.

In this PhD, only limited attention is given to segmentation and target audiences because of the fact that the risk messages regarding the emerging food risks needed to be communicated to all consumers, that is, it is an issue that concerns all of us. As shown in chapter 6, many differences could be found based on gender and age differences, which were in line with previous research on risk perception and communication (Eurobarometer, 2006, 2010; Frewer, 2000; Jacob, Mathiasen, & Powell, 2010; McGloin, Delaney, Hudson, & Wall, 2009; Slovic, 1999; Tobin, Thomson, & LaBorde, 2012; Van Dijk, Fischer, & Frewer, 2010).

It is very important to have a clear view of the target audience and their concerns when a specific population needs to be addressed. This can be done via focus groups, or by looking in general reports such as the Eurobarometer. If more insights about the concerns and arguments are gained, effective communication efforts can be developed in

which these concerns and possible counterarguments could be addressed, which can increase the chance of message acceptance.

3.3. Inform the public

The results of chapter 6 showed the need to provide more information about the emerging food risks, since people did think that they could circumvent the risk from happening.

In the beginning of risk communication, experts thought that lay people needed to be educated in order to know and understand the risks, and this way no panic reactions would emerge. As shown in the overview of the psychometric paradigm, the situation is not as rational and simple, and the importance of emotional reactions on risk perceptions and risk communication cannot be left aside (Loewenstein et al., 2001; Slovic et al., 2004; Witte, 1992). However, research showed that risks are perceived lower when they are perceived as familiar, known, etc. (Covello & Sandman, 2001; Slovic, 1991). Furthermore, subjective knowledge, that is, the perceived feeling of having sufficient knowledge about the risk, can decrease the dramatic responses by consumers if they become aware of food risks via the media (Jin & Han, 2014). Hence, people should be made aware about the risks through communicating messages. However, these risk messages cannot be solely seen as a transfer of the scientific knowledge towards the public. It should involve the information that people want to know, which is not the same as the specific scientific risk information. This aspect has been illustrated in the qualitative research by Renn (2006) that showed that worried people during a food outbreak do not spontaneously ask "*How high is the risk and what health effects can be expected?"*, but they primarily asked *"What can I do and what can I eat without being in danger?"*. Secondarily they asked for proof of faith *"Who can I trust?"* (Renn, 2006).

This is in line with threat appeal research (Witte, 1992), stating that a risk message should contain the threat (i.e., the emerging food risks) and the reassuring information (i.e., what the consumers themselves can do and/or what the government does to circumvent the risk from happening). The research of Kellens et al. (2012) should also be kept in mind. It demonstrated that people might perceive an information need, but did not have the intention to seek information, because they expected that governments should actively communicate about the risks.

It is important to recognize that one can never provide all the information in one message. Scientists who performed a risk assessment would prefer to elaborate on every detail to be sure that the information is scientifically accurate. However, lay people can never understand and pick up every detail, and a risk message is no scientific publication. As concluded by Hansen (2003, p. 118): *"At the very least, risk communicators must be willing to tailor, and in some cases cut, information to discourage confusion".* Therefore it is important that the information of a risk message is accurate but does not contain too many details which are not understandable to lay people. Van Kleef et al. (2007) conclude that it is important to target risk communication to the actual needs and concerns of consumers to avoid an information overload. If a risk message is developed it should be tested on a small sample to be sure that the message is clear and understandable for everyone.

It is also important to bear in mind that people do not always systematically process information, but if they do, they want to find all the information they are looking for (Renn & Levine, 1991). Therefore, as stated by Renn and Levine (1991, p. 195): *"an effective risk communication program must contain a sufficient amount of peripheral cues to initiate interest in the message, but also enough "rational" argumentation to satisfy the audience with central interest in the subject".*

3.4. General guidelines

3.4.1. Communicate uncertainty

In this dissertation, we did not focus on uncertainty. However, it is one of the core elements of the risk communication field as a whole (Lofstedt, 2006). Since risk assessments are based on estimates of risks, it becomes clear that there is never 100% certainty about an outcome (Nathan et al., 1992). Individuals can cope with uncertainty (Lofstedt, 2006), but to manage this uncertainty they need confidence in the competence of the organization or authority to manage the risk and its potential consequences (Rogers et al., 2007), which brings the importance of trust back to the fore.

It is always important to acknowledge the uncertainty when a crisis occurs. It is better to say *"I don't know"*, than to provide false or incorrect information that can lead to a decreased trust and to credibility problems (Frewer, 2004; Lofstedt, 2006; Rogers et al., 2007).

3.4.2. Use the media

People mostly rely on interpersonal channels of communication to assess their personal health risk (McComas, 2006). Nevertheless, it was shown that mass media (i.e., first print media, followed by TV and/or radio) was chosen most often as the primary source of risk information (Dosman, Adamowicz, & Hrudey, 2001; Houghton et al., 2008; McComas, 2006; Rogers et al., 2007). The media can be seen as a way to transfer information between the sources and the general public (Frewer & Miles, 2003).

The media mostly amplifies the risk, which is then picked up by others such as pressure groups, resulting in more amplification of the risk (Lofstedt, 2006). Especially food risks are seen as very "newsworthy" due to the high personal relevance (Houghton et al., 2008). One way to circumvent the social amplification of the risk by the media is via the development of risk guidelines for journalists which help the journalists to ask better questions, limiting unnecessary media amplification (Lofstedt, 2006). Furthermore, it should be noted that people do not always trust news media coverage, but they look at and follow the (distrusted) news to fulfill their need for cognition (Vasterman, 2005). Hence, consumers are aware that media coverage sometimes exaggerates, or that it does not always provide balanced information. It remains therefore very important that people know where they can find more, trusted, accurate and objective information. Another suggestion to add in the guidelines to journalists is to provide a link to the governments' or responsible authorities' websites that contains the information about the risk or crisis. This of course, is only relevant if accessible, understandable, and updated information can be found on these websites.

3.4.3. Use the existing handbook and guides

There exist many handbooks and guidelines on risk communication that provide practical insights, checklists, and theoretical frameworks to help to develop effective risk communication. However, each situation is unique, and as Lofstedt (2006) states: *"there is not one set of risk communication criteria that everyone can buy into"*. Hence, each situation asks for some adaptations. Nevertheless, the existing handbooks and guidelines can provide a valuable help to hold onto when developing risk communication strategies and efforts.

The paper by Smillie and Blissett (2010) describes a model for developing risk communication strategies based on three stages: 1) Risk Appraisal, 2) Situational

Analysis, 3) Source analysis. Other interesting guidelines applied on food risks is the publication by Lofstedt (2010) and the book *"Effective risk communication: a message centered approach"* (Sellnow, Ulmer, Seeger, & Littlefield, 2009).

More hands on information about food risk communication can be found in the EFSA risk communication guidelines – *"When Food Is Cooking Up a Storm – Proven Recipes for Risk Communications"* (EFSA, 2012). The publication, a joint initiative with national food safety agencies, and is designed to meet a recognized need for a practical guidance on communicating risk.

On the webpages of the World Health Organization, an amount of helpful information is available. The most recent and complete risk communication toolkit is *"Communication for Behavioural Impact (COMBI). A Toolkit for behavioural and Social Communication in outbreak response"* (WHO, 2012b). It contains a 7-step approach, with the corresponding tools, checklists and templates for designing behavioral and communication interventions for the development of outbreak response measures. This toolkit should be used in conjunction with the COMBI toolkit (WHO, 2012a). Another report *"Best practices for communicating with the public during an outbreak"* focuses on crisis communication during an outbreak, discussing the specific characteristics of an outbreak and describing the five best practices for communication during an outbreak (WHO, 2005b). Finally, *"Effective Media Communications during Public Health Emergencies"* is a WHO Handbook, a field guide and a wall chart, to help officials to communicate effectively through the media during emergencies (WHO, 2005a).

4. LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This dissertation contains some limitations, which will be discussed in what follows. Afterwards, future research paths will be presented.

4.1. Limitations

The first limitation considers methodological issues. In this dissertation not all concepts were measured in the same way. For example, sometimes different behavioral intentions were merged into one concept, based on a Varimax Factor Analysis. In further research more attention should go to the behavioral intentions separately to apply precautionary measures, because these are the only small things consumers can do to reduce (however not circumvent or control) the risk from happening.

Furthermore, some concepts were measured using one item instead of all items. Although this tendency to use one item has been suggested by other researchers (Alexandrov, 2010; Rossiter, 2008), it would be interesting to investigate whether the same results can be found when all items are used.

Additionally, in this dissertation we used experimental research settings and survey research, and we mainly focused on interaction effects and mediating or moderating effects of different factors. Experimental research is valuable to show the causality between constructs. However, using Structural Equation Modeling (SEM) can provide more insights on the impact of different variables, as has been done earlier on food safety risks (Kuttschreuter, 2006).

The second limitation is based on the difference between affect and feelings. As mentioned earlier, the Affect heuristic mainly focuses on the importance of affect on risk judgments, the EPPM and Risk-as-feelings hypothesis focus more on the importance of anticipatory emotions, induced after reading the risk message. It would be interesting to investigate in further research the interaction effect of both affect (measured before the stimulus is presented) and feelings, their interaction with the cognitive evaluations, and their predictive impact on behavioral intentions.

In chapter 3, the predictive impact of cognitive and emotional reactions on behavioral intentions was assessed. *Further research* should investigate which other factors influence the behavioral intention since only a small amount of variance is explained. Chapter 3 also aimed to investigate whether the same risk message can be used across Europe. Four different countries that represent the North-South and East-West axis, were used, and can be seen as a good benchmark to investigate whether reactions differed across Europe. Of course, this study was an exploratory research, and further research should investigate whether these difference appear in the whole of Europe and even in the world. Further research can also elaborate and investigate why these differences occurred based on the different contexts of these countries.

A *third limitation* can be found in chapter 6, in which we merged the reactions towards all different newspaper articles because it was impossible to exclude all the contextual factors. The EHEC outbreak was a very large outbreak, which has been covered by many different media. Therefore, it would have been impossible to prove that because of one article the perceived severity for example, was high. Various contextual factors cannot be ruled out. Moreover, whether respondents heard more via other broad media channels

(e.g., television, radio) or personal communication with family, friends, colleagues**,** etc., is unclear.

The *fourth limitation* refers to the fact that many assumptions and explanations are based on the systematic or heuristic processing, and more specifically on the experiential, emotional system and the cognitive system. However, the depth of processing of the message by individuals was not measured. Further research should elaborate on the importance of depth and type of processing knowing that this influences the Risk-as-feelings perspective, Affect heuristic, message sidedness, the influence of credibility, subjective knowledge and recency effects**.** This strategy can also counter the possible drawback that the importance of cognitive reactions is only found because of the research setting, where people do have the time to read the risk message, and elaborate on the content due to the context. Moreover, since some reactions could not be explained by the used theoretical frameworks, it is crucial to seek for other influencing factors of behavioral intentions.

It has been shown that biases can influence people's ability to process information from probabilistic information, and therefore influencing risk perception (Renn, 1998). For example the optimistic bias (also known as unrealistic or comparative optimism) occurs when people think that a risk applies more to others than to them, and they judge themselves to be "invulnerable". Representativeness is a bias that states that *"unique events experienced in person or associated with properties of an event are preferred over information on probabilities or relative frequencies when people make predictions or inferences about probabilities"* (Renn, 1998, p. 54). The numerosity heuristic suggests that people respond more favorable to the appearance of more information (e.g., the number of arguments). *The ratio bias* can be seen as a subjective probability and is attributed to a tendency to focus on the frequency of the numerator (i.e., 20) instead of the overall proportion, the denominator (i.e., 100) (Bonner & Newell, 2008; Slovic et al., 2005). The *disconfirmation bias* states that people will only process and select the information that is in line with their prior beliefs and will leave the other information unattended (Eagly & Himmelfarb, 1978; Lord, Ross, & Lepper, 1979). These biases have not been included in this dissertation which is the *fifth limitation*.

A *final limitation* is that this dissertation did not look into the long term effect of the risk messages, and into communicating the same risk messages via different channels to the same individuals. Disseminating a risk message only once has no sustainable effect. Communicating frequently via different channels can increase the chance that the

message will be picked up out of the clutter of information consumers receive on a daily basis. Furthermore, it is shown that credibility can be increased when the (health) risks are frequently communicated by different and trusted sources (Wills, Storcksdieck Genannt Bonsmann, Kolka, & Grunert, 2012).

4.2. Future research paths

Besides the improvement of further research based on the abovementioned limitations, there are some interesting future research paths which will be discussed in the following.

4.2.1. Moderating variables

Subjective knowledge is an important factor, since a lack of knowledge leads to more reliance on trust in the government and can influence risk perception (Covello & Sandman, 2001; Frewer, 2004; Siegrist et al., 2000; Siegrist, Gutscher, & Earle, 2005; Ter Huurne & Gutteling, 2009; Visschers & Siegrist, 2008; Yeung & Morris, 2006). Furthermore, the perceived knowledge can influence the intention to seek information, which is a way to increase the awareness of the risk. When people perceive they do not have enough knowledge, it will induce negative feelings and feelings of uncertainty, which one will try to circumvent by information seeking to fill this information void (Griffin et al., 1999; Johnson, 2005). The importance of subjective knowledge and of risk information seeking models when communicating uncontrollable food risks, merits further research.

Another moderating variable that has been shown to influence risk communication is the *prior attitude towards the issue*. Research found for example that when communicating risks and benefits about familiar foods, the prior attitude played an important role in determining the perceived risk and perceived benefit (Fischer & Frewer, 2009). This can be closely linked to the disconfirmation bias. Prior attitude can also impact the effectiveness of two-sided messages. If prior attitudes are negative or neutral, two-sided messages are seen as more effective. When there is a positive prior attitude, the two-sided messages increase counterarguments, which can increase resistance towards the message, and even the tendency to ignore the message because the negative information is not in line with their prior attitudes (i.e., a disconfirmation bias) (Eisend, 2006; Lord et al., 1979; Verbeke et al., 2008). It would be interesting to take up prior attitude in future research.

Involvement is an important moderating variable in the field of risk communication. As discussed earlier (See 2.4.1. Involvement, p. 56), it can be seen as one of the objectives of risk communication and it plays an important role in risk communication. Research (Cornelis et al., 2013; Ein-Gar et al., 2012; Eisend, 2007, 2013; Keller & Lehmann, 2008; Rucker, Petty, & Briñol, 2008) also showed that two-sided messages are more effective when the public is involved, "*Because a more involved audience is more likely to know that there are opposing arguments to the recommended behavior, one -sided messages have been found to work better than two- sided messages with less involved audiences, and vice versa"* (Keller & Lehman, 2008, p. 119). It would be interesting to look at the moderating effect of involvement, in combination with the moderating effect of spatial distance, when communicating risks.

4.2.2. Other communication strategies

We only selected four communication strategies (i.e., vividness, spatial distance, message sidedness and presentation order) in this dissertation, but of course more strategies exist. The effectiveness of those other communication strategies could be examined as well to communicate (food) risks. For example, the use of gain and loss frames, based on the Prospect theory by Tversky and Kahneman (1974) could be an interesting communication strategy. Gain frames are messages which are positively framed, showing that if an individual undertakes healthful or preventive behavior, (s)he will gain benefits. Loss frames are negatively framed and describes what would happen if one does not undertake the healthful or preventive behavior, addressing that (s)he will lose benefits. It is suggested that gain frames should be used when communicating a preventive behavior (e.g., condom use), and loss-framed message would be more effective when communicating an illness detecting behavior (e.g., breast screening) (Garcia-Retamero & Cokely, 2013; Keller & Lehmann, 2008; Loroz, 2007; Quick & Bates, 2010).

Another example is the way probability information is presented. This can also influence the way information is looked at, as shown by the ratio bias (Bonner & Newell, 2008; Covello & Sandman, 2001; Denes-Raj & Epstein, 1994; Kirkpatrick & Epstein, 1992; Slovic et al., 2005).

Other research, based on the Self-affirmation theory, showed that if people are being affirmed in their existing values, it will lead to a better attitude towards the message, avoid defensive processing and increases the promoted adaptive behavior (Van

Koningsbruggen, Das, & Roskos-Ewoldsen, 2009; Van Koningsbruggen & Das, 2009). The influence of a positive mood has also been shown to affect the reactions towards a risk message (Das & Fennis, 2008).

4.2.3. Segmentation of the target audience

In this dissertation we only investigated the impact of risk messages to "the consumer". We did show some differences based on nationality, gender and age. However, as indicated in earlier research, segmentations based on the perceived risk and efficacy (Rimal & Real, 2003), or on efficacy and trust (Ter Huurne & Gutteling, 2009) can provide interesting insights into how people of different clusters will respond differently to the same risk message. Since the investigated case in this dissertation cannot provide high feelings of efficacy, it would be an interesting subject for future research to investigate the possible segmentation based on perceived risk and trust. Another possible segmentation base could be related to the Construal Level Theory that uses the Behavioral Identification Form (BIF) to measure the type of processing (i.e., abstract or concrete), which can be looked at as a personality trait. Furthermore, it might be interesting to investigate the impact on risk messages based on people's worldview as shown in the Cultural Theory of Risk Perception.

4.2.4. Lifestyle food risk communication

In this dissertation only the impact of risk messages about the emerging food risks has been investigated. It would be interesting to investigate in further research whether the reported findings can also be applied on lifestyle food risks such as obesity. These risks do not elicit a high risk perception, because the consequences are not immediately apparent (McGloin et al., 2009), are perceived as controllable (Verbeke, Frewer, Scholderer, & De Brabander, 2007), and perceived as voluntary (Covello & Sandman, 2001). Another reason these risks do not elicit a high risk perception is because the unconscious, affective system (once crucial for survival by signaling that something does not feel right), will not be triggered for lifestyle risks because they just do not feel risky (Das, 2011). Furthermore, an optimistic bias is more likely to occur when it considers a lifestyle risk (Das, 2011; Verbeke et al., 2007). Future research could look into different communication strategies to induce risk perception when communicating lifestyle risks.

4.2.5. Social media and risk communication

The final future research path that will be discussed is the impact of social media on risk communication. Social media has the benefit that it can provide more easily an overview of the topics people are concerned about. For example, following hashtags on Twitter and Facebook can help to follow concerns and opinions of the consumers. The disadvantage of social media is that it will increase the social amplification of a risk not only in magnitude but also in speed, which provides huge challenges for communication practitioners. On the other hand, the speed with one can communicate thanks to social media, can also be seen as an advantage because people can be rapidly informed.

The main feature of social media is interactivity. This term implicates that there is an increased user engagement with media content, a more independent relation to different media sources, individualized media use and greater user choice (Lister, Dovey, Giddings, Kelly, & Grant, 2009). Hence, social media can help and increase the participation and involvement of the consumers in risk management. Involvement and participation is an important condition in risk assessment and risk decision making to make the decision making process more democratic, and to enhance trust (Frewer, 2000; Houghton et al., 2008; Renn, 2006; Van Kleef et al., 2007). However, because of this interactivity, a new style of communication should emerge, being more rapid and to the point, and in continuous interaction with the consumers. This provides new challenges in risk communication, and guidelines should be updated to help risk communicators to deal with the social media.

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