

A Food Affair – A Study on Interventions to Stimulate Positive Consumption Behavior

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NEDERLANDSTALIGE SAMENVATTING

Sommige delen in de wereld lijden aan ondervoeding en voedseltekorten, terwijl andere getypeerd worden door obesitas en voedselverspilling. Deze evoluties vormen een interessant uitgangspunt voor verschillende disciplines en duiden op een nood om op zoek te gaan naar betekenisvolle interventies. Aan de zijde getypeerd door overschotten heeft een groot deel van het onderzoek zich reeds toegespitst op het identificeren van verschillende factoren die leiden tot ongezonde voedingskeuzes en voedselverspilling. Echter, bovenop het identificeren en analyseren, is het van cruciaal belang om op zoek te gaan naar oplossingen en deze te valideren. In dit proefschrift gaan we het gebruik van antropomorfisme na om de verkoop van misvormde groenten te stimuleren en zo voedselverspilling te reduceren (Hoofdstuk II), verkennen we de voordelen van de ‘small changes approach’ in de strijd tegen obesitas (Hoofdstuk III) en onderzoeken we hoe mindfulness tot gezondere voedingskeuzes kan leiden (Hoofdstuk IV).

In Hoofdstuk II, *Same Same But Different: Using Anthropomorphism in the Battle Against Food Waste*, baseren we ons op evolutionaire invloeden en literatuur rond categorisatie om het potentieel van antropomorfisme na te gaan in de strijd tegen voedselverspilling. In vier studies tonen we aan dat consumenten een verhoogd risico en een inferieure smaak waarnemen bij het zien van misvormde groenten en fruit en dat dit aan de basis ligt voor hun afkeer. Echter, wanneer we antropomorfisme gebruiken (het toekennen van menselijke eigenschappen aan objecten) neem de aankoopintentie voor misvormde groenten en fruit toe. Door het activeren van een positief menselijk schema geraken consumenten in een positieve stemming, dit leidt op zijn beurt tot een verlaagde risicowaarneming en een betere smaakperceptie, waardoor ze meer geneigd zullen zijn het product te kopen. Een bijkomende studie toont dat dit effect het sterkst is bij mensen met een lage bezorgdheid over het milieu (vs. mensen met een hoge bezorgdheid). Naast de bevinding dat het antropomorfiseren van

misvormde producten de intentie om deze producten aan te kopen verhoogt, tonen we bovendien ook aan dat door antropomorfisatie misvormde producten ook sneller gekozen worden. Algemeen tonen de bevindingen in dit hoofdstuk aan dat antropomorfisme een waardevolle interventie kan zijn om de verkoop van misvormde groenten en fruit te bevorderen en de voedselverspillingsberg te verkleinen.

In Hoofdstuk III, *Cross-National Investigation of the Drivers of Obesity: Re-Assessment of Past Findings and Avenues for the Future*, gaan we in een online vragenlijst bij 2167 participanten uit de Verenigde Staten, het Verenigd Koninkrijk, Frankrijk en België cross-nationale verschillen in voedingsattitudes na, alsook de impact van deze attitudes op overgewicht en obesitas. We vergelijken verschillen in interesse voor smaak en gezondheid en kijken in hoeverre respondenten geloven dat ‘ongezond = lekker’ voor de verschillende landen. Belangrijk hierbij is dat we een aanpak hanteren die zich zowel richt op voeding, als op het implementeren van kleine fysieke activiteiten. Bovendien nemen we niet alleen bestaande schalen op voor de constructen die we willen meten, maar kijken we ook naar gedrag aan de hand van keuzetaken. Onze bevindingen tonen aan dat mensen uit Frankrijk het meest belang hechten aan gezond te eten, terwijl mensen uit de Verenigde Staten het meest streven om smakelijk en lekker te eten. Mensen uit België kozen dan weer het hoogst aantal gezonde producten bij de keuzetaak en mensen uit de Verenigde Staten pasten het minst aantal kleine fysieke activiteiten toe in hun dagelijks leven. We tonen verder ook aan dat een grotere interesse in gezond eten en het implementeren van meer kleine fysieke activiteiten, samengaat met een kleinere kans op obesitas, terwijl geloven dat ongezonde voeding lekkerder is dan gezonde voeding leidt tot een grotere kans op obesitas. Onze resultaten geven aan dat het belangrijk is om zowel voeding als fysieke activiteit te onderzoeken, alsook dat het nodig is om regelmatig updates te doen door het veranderend landschap en maatschappelijke evoluties. Bovendien richtten we de aandacht op een mogelijks relevante

strategie voor het stimuleren van positieve veranderingen, namelijk de ‘small changes approach’.

In Hoofdstuk IV, *Mind Your Intuition – How Mindfulness Can Reduce the Unhealthy = Tasty Intuition*, onderzoeken we hoe mindfulness de ‘ongezond = lekker’ intuïtie kan verminderen. Wanneer we informatie moeten verwerken, vertrouwen we vaak op verschillende heuristieken en strategieën om onze cognitieve inspanning te beperken. Een belangrijke strategie bestaat erin dat we voeding van nature dichotoom opdelen in twee categorieën, zijnde goed of slecht voor onze gezondheid. In dit hoofdstuk stellen we dat de mate waarin we dichotoom denken, de ‘ongezond = lekker’ intuïtie zal versterken. Aan de hand van drie studies tonen we aan dat mindfulness (zowel *trait* als *state*) ervoor kan zorgen dat we minder dichotoom denken, dat het geloof in de ‘ongezond = lekker’ intuïtie afgezwakt wordt en dat we vaker een gezondere keuze maken. We vinden dat een hogere *trait* mindfulness gepaard gaat met minder dichotoom denken en een zwakkere ‘ongezond = lekker intuïtie’. Bovendien vinden we dat participanten na een korte mindfulness oefening meer categorieën in een categorisatietask onderscheiden en dat een groter aantal categorieën gepaard gaat met een zwakkere ‘ongezond = lekker intuïtie’. Samen tonen deze bevindingen aan dat mindfulness ervoor kan zorgen dat men minder op suboptimale beslissingstrategieën zal vertrouwen (categorisatie/dichotoom denken en de ‘ongezond = lekker’ intuïtie) en dat mindfulness zo een positieve bijdrage kan leveren bij het maken van beslissingen en keuzes.

SUMMARY IN ENGLISH

Some parts of the world suffer from malnutrition and food insecurity, while other parts are characterized by obesity and food waste. These evolutions pose an interesting starting point for many different research disciplines and instigate a need to find meaningful interventions. On the affluent side, a large body of research has focused on identifying determinants of food choice and waste, however offering solutions beyond analyses is a vital step to take. As such, in this dissertation, we examine the use of anthropomorphism to promote misshapen produce in an attempt to reduce food waste (Chapter II), we explore the benefits of the small changes approach in the fight against obesity (Chapter III) and we investigate mindfulness as a tool to stimulate healthy decision making (Chapter IV).

In Chapter II, *Same Same But Different: Using Anthropomorphism in the Battle Against Food Waste*, we draw from evolutionary influences and categorization literature to study the potential of anthropomorphism in the battle against food waste. Four studies identify increased risk and inferior taste perceptions as the underlying process for consumers' aversion to misshapen produce. However, using anthropomorphism (i.e., attributing human characteristics to nonhuman objects) can increase purchase intentions for misshapen produce. By activating a positive human scheme, consumers experience a positive mood, which leads to decreased risk and increased taste perceptions, resulting in an overall increase in purchase intentions. An additional study shows that this effect is strongest for people who have less (vs. more) concern for the environment. Beyond mere intentions, we also demonstrate a positive impact of anthropomorphizing misshapen produce on product choice. In sum, these findings highlight the use of anthropomorphism as an effective strategy to promote the sale of misshapen fruits and vegetables and as such reduce food waste.

In Chapter III, *Cross-National Investigation of the Drivers of Obesity: Re-Assessment of Past Findings and Avenues for the Future*, we investigate cross-national differences in food attitudes together with their impact on weight status in an online web-based survey with 2167 participants in the United States, the United Kingdom, France and Belgium. We compare between-country differences in health and taste interest and the extent to which respondents subscribe to the unhealthy = tasty intuition. Importantly, we adopt a joint approach focusing on food choice and the incorporation of small physical activities and include measurements based on scales and behavioral choice tasks. Our findings show that, people in France attach most importance to eating healthy, whereas people from the United States strive most to consume tasty and delicious food compared to the other countries. People from Belgium chose the highest amount of healthy options in the food choice task and people from the US incorporated the least amount of small physical activities into their daily lives. We also demonstrate that having a higher interest in healthy eating together with incorporating more small physical activities goes together with a lower chance of being obese, whereas a greater belief that unhealthy food is tastier is associated with a significantly higher chance of obesity. Beyond these results, our findings highlight the need to adopt a joint approach when investigating health behavior and the need for frequent updates, due to changing environments. We also draw attention to a potentially relevant strategy to stimulate positive behavior with the small changes approach.

In Chapter IV, *Mind Your Intuition – How Mindfulness Can Reduce the Unhealthy = Tasty Intuition*, we investigate how mindfulness can reduce the unhealthy = tasty intuition by reducing dichotomous thinking. To limit the amount of cognitive resources needed for information processing, consumers often rely on different heuristics and inferences. One important strategy pertains to consumers' tendency to categorize food-related information according to a good/bad dichotomy of healthy vs. unhealthy. We argue that dichotomous

thinking might strengthen the unhealthy = tasty intuition. Three studies shed light on the impact of trait and state mindfulness on dichotomous thinking and by extension the subscription to the unhealthy = tasty intuition and food choice. Higher trait mindfulness was associated with less dichotomous thinking and a weaker subscription to the unhealthy = tasty intuition. After a brief mindfulness exercise participants distinguished more categories in a categorization task, reducing the extent to which they subscribed to the unhealthy = tasty intuition. Together, these findings demonstrate how mindfulness can reduce the reliance on suboptimal personal strategies (categorization and unhealthy = tasty intuition) and positively impact food choice and decision making.

CHAPTER I:

INTRODUCTION

CHAPTER I: INTRODUCTION

1. Introduction

Food plays a central role in everyday life. It can be a source of pleasure or pain, of health or indulgence, of happiness or sadness, of hunger or obesity. Over the past few decades, scholars from different research disciplines have embarked on a quest to understand why people choose to eat the foods they do (see Symmank et al. 2017 for an overview). This quest is important for many different stakeholders; marketers and businesses are interested in understanding the different factors underlying food consumption to develop more effective advertising campaigns and better products (Chandon & Wansink, 2012; Nestle & Nesheim, 2012), while health professionals, nutritionists and policy makers are interested, so they can develop better targeted interventions (Thaler & Sunstein, 2008).

Besides problems that are related to what is consumed, food problems are to a large extent also related to what is wasted and not consumed. Together with rising body weights and the burden of overweight and obesity (Ng et al., 2014; WHO, 2018), food waste is presenting a growing strain on our natural resources (Gustavsson, Cederberg, Sonesson, Van Otterdijk & Meybeck, 2011) and society as a whole.

To improve dietary health and wellbeing and to develop meaningful interventions, it is crucial to understand why people choose the foods they do (Renner, Sproesser, Strohbach & Schupp, 2012). Many research disciplines have investigated the *why*, *who*, *what*, *when* and *where* of food choice and have proposed different models and theories (Furst et al., 1996; Booth, 1994; Glanz et al., 1992; Mennell et al., 1992; Axelson & Brinberg, 1989; Shepherd, 1989, 1990; Thompson, 1988; Murcott, 1983). However, presenting solutions beyond analyses is an important road to take in light of the current epidemics, obesity and food waste.

Drawing from findings on the food choice process, this dissertation explores concrete interventions to promote positive changes in food consumption behavior. We conceptualize food consumption in the broad sense, encompassing purchase intention (Mai & Hoffmann, 2015), choice (Raghunathan, Naylor & Hoyer, 2006) and eating (Sproesser, Schupp & Renner, 2014), each having important downstream consequences on health (cf. BMI) and sustainability (cf. food waste). Many different elements determine health, such as environmental, socioeconomic, social, behavioral and psychological factors. In this introductory chapter, we will discuss several factors that are important in the food choice process based on the model by Furst et al. (1996) and will point out how they can be influenced through concrete interventions in order to improve overall health and sustainability. In Chapter II we propose how anthropomorphism can be used to stimulate purchases for misshapen produce. In Chapter III we explore how the small changes approach can contribute in the fight against obesity and in Chapter IV we investigate how mindfulness can positively impact food choice.

2. The Food Choice Process

The food choice process (FCP) involves a complex interaction of different factors and motives. One of the earliest works on the factors involved in food choice by Lewin (1943, 1951) theorized that food choice was a complex process involving cultural, sociological and psychological factors that varies within individuals with different strengths among various groups of people for different types of food (Falk, Bisogni & Sobal, 1996). Building on this foundational work, different approaches (e.g. deduction, construction, and the application of existing theoretical models) have been used to conceptualize models of food choice (see Sobal, Bisogni, Devine & Jastran, 2006 for an overview). However, no single theory can fully explain decision making in food behavior (Sobal & Bisogni, 2009). Generally, three major

determinants consistently emerge as operating together to drive food choice; consumers execute food choices based on personal systems including **value negotiations** and **behavioral strategies**, which are shaped by **life course factors**, including the personal roles and the social, cultural and physical environments (Falk et al., 1996; Furst et al., 1996) (see Figure 1). The value negotiation process is very dynamic, while strategies are more routine (Furst et al., 1996). In the next paragraph, I will discuss different important factors underlying food choice for each major determinant; *the lifestyle factor ‘culture’, values and strategies*.

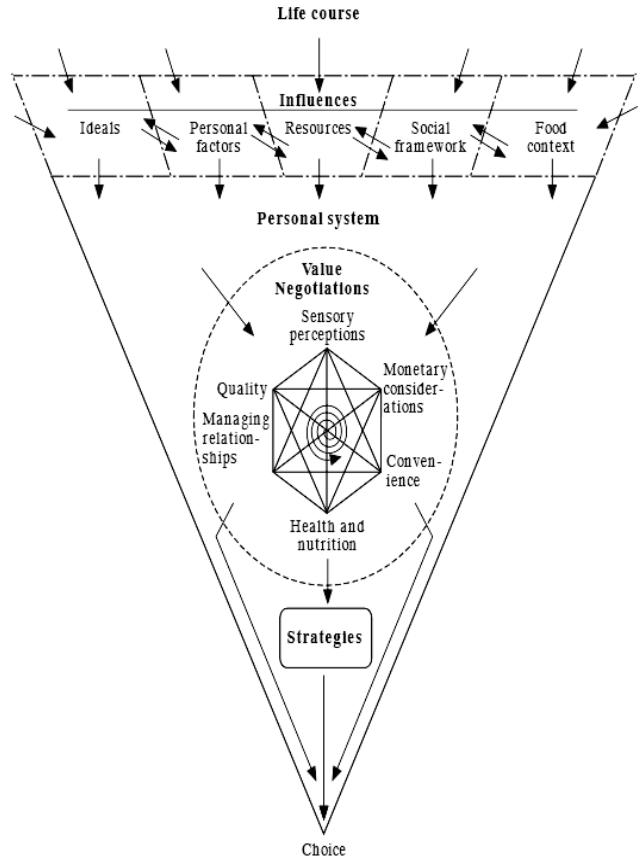


Figure 1. A conceptual model of the components in the food choice process (Furst et al., 1996)

2.1 Culture as an important life course factor

People's attitudes toward food may form according to the impact of their particular historical era and may differ according to the cultural and social settings to which they are exposed to (Furst et al., 1996). Culture has a strong influence on habit formation and can lead to differences in the habitual consumption of certain foods and in traditions of preparation (Lau et al., 1984; Steptoe et al., 1995). Large variations can exist in food choices due to cultural boundaries. Societies that may not seem so strikingly different on some dimensions could harbor large differences in the food domain. For example, Rozin, Remick, and Fischler (2011) demonstrated that American (vs. French) culture emphasizes individualism and abundance, quantity over quality, comforts (things that make life easier) over joys (unique things that make life interesting), and variety of choice over traditional values. The American focus on quantity over quality is in direct opposition to the French focus on moderation and could be an important contributor to the higher prevalence of obesity in the United States compared to France (Laurier et al., 1996).

A person's culture can be considered as a framework within which individual food choice evolves (Pollard, Kirk & Cade, 2001). Researchers continuously expand their existing models to accommodate more complex factors influencing food choice. Evolutions (e.g. increasing sedentary lifestyles) and changes in environments (e.g. the relentless expansion of fast food restaurants) are expected to modify the food choice process and influence the underlying values. Fostered by large between-country differences in obesity prevalence, researchers have noted the importance of culture in food choice and have sought to determine how this might impact weight status. Large multi-country comparisons are methodologically challenging and currently remain underexplored (Perez-Cueto et al., 2010; Pieniak, Perez-Cueto & Verbeke, 2009). Chapter III takes the cultural component into account by

investigating cross-national differences in food attitudes and health behavior and their impact on weight status.

2.2 Value negotiations

Lewin (1943, 1951) identified taste, health, social status and cost as important factors underlying food choice. Based on in-depth interviews, Furst and colleagues (1996) identified ‘values’ as pertaining to *sensory perceptions* (including taste, texture, odor and appearance), *monetary considerations*, *convenience*, *health/nutrition*, *managing social relationships* and *quality*. Following was an extensive period, where researchers attempted different approaches to capture these underlying factors, but a formal set of measures lacked (Bell, Stuart, Radford & Cairney, 1981; Tuorila & Pangborn, 1988; Lau, Kronl & Coleman, 1984; Rappaport, Peters, Huff-Corzine & Downey, 1992). One of the first developments to formally measure the values central to food choice, was initiated by Steptoe, Pollard and Wardle (1995). In the development of the Food Choice Questionnaire (FCQ) they identified nine factors in which *sensory appeal*, *health*, *convenience* and *price* were the most important and *mood*, *natural content*, *weight control*, *familiarity* and *ethical concern* were typically endorsed less strongly (Steptoe et al., 1995).

Consistently, five key values are reported and identified as critical influences on deciding what foods to purchase or consume, being *health*, *taste* or *sensory appeal*, *cost*, *convenience*, and *acceptance by others* (including tradition or familiarity) (Drenowski, 1992; Lau et al., 1984; Rappaport et al., 1992; Glanz, Basil, Malbach, Goldberg, & Snyder, 1998; Connors, Bisogni, Sobal, and Devine 2001). However, changes and evolutions in environmental contexts such as social, political, and economic conditions are expected to shape food choice values (Sobal & Bisogni, 2009). In 2015, 20 years after its development, the FCQ received an update and *safety* (consumption of food will not cause illness) was added

as an additional value (Lyerly & Reeve, 2015). Different food crises (e.g., dioxin, hoof-and-mouth disease) and food scandals (e.g. fipronil eggs contamination) could have rendered consumers more sensitive to take safety issues into consideration.

During food choice events, the different values are weighed and accommodated with varying degrees of conscious reflection (Furst et al., 1996). Research has shown that individual differences depending on age, gender, race, lifestyle, socioeconomic status, cultural background, and education affect the importance attached to different values (Dammann & Smith, 2009; Glanz et al., 1998; Lindeman & Sirelius, 2001; Pilgrim, 1957; Prescott, Young, O'Neill, Yau & Stevens, 2002). Yet, for the majority of people, *taste* or *sensory appeal* emerges as the most important driver of food choice (Rozin & Zellner, 1985; Stafleu, de Graaf, van Staveren & Schroots, 1991; Tepper & Trail, 1998).

The importance attached to different values has important downstream consequences. Fats are often responsible for the texture and aroma of many foods, therefore decisions guided by taste may motivate the choice for high fat products (Drenowski, 1992), negatively impacting nutrition and health (Drewnowski & Fulgoni, 2008; Malik et al., 2010). Moreover, the importance attached to sensory appeal likely stimulates consumers to select the best-looking food products (in store and at home) and to discard deviating products, thereby negatively impacting sustainability (de Hooge et al., 2017). In Chapter II the importance attached to safety and taste as underlying values, is used to explore an intervention that can positively influence both in order to stimulate sustainable behavior.

2.3 Strategies

Despite the importance of different factors underlying food choice, most decisions do not result from cognitive elaboration, but from quick responding (Tversky & Kahneman, 1974). Over time, people develop strategies, personal systems for making food choices and these

strategies in turn become heuristics that guide many recurring food choices and become routine (Furst et al., 1996). As a consequence most decisions about food are relatively automatic and a lot of them result in mindless consumption (Wansink, 2007).

A study by Connors and colleagues (2001) sought to expand the understanding of the personal food systems that people develop. They identified three main processes: (i) categorizing foods; (ii) prioritizing conflicting values; and (iii) balancing prioritizations.

A first strategy pertains to consumers' tendency to categorize food on different values and multiple dimensions. People use categories based on the major values of taste, cost, convenience, and healthfulness of foods (Connors et al., 2001). Specifically, categorizing food related information according to a good/bad dichotomy of healthy vs. unhealthy can lead consumers to draw incorrect assumptions about a food's healthfulness (Oakes & Slotterback, 2001) and to underestimate the caloric content of a meal (Rozin, Ashmore & Markwith, 1996), thereby impeding their ability to maintain a healthy weight. Moreover, categorization based on the value of taste itself can have detrimental effects for weight management, since foods that are combinations of sugar and fat are universally preferred (Connors et al, 2001; Drewnowski, 1987).

A second strategy pertains to prioritizing conflicting values. Values often present a conflict in food choice contexts, when satisfying one value would prevent meeting another. The most common trade off people make is taste vs. health or health vs. convenience. The unhealthy = tasty intuition describes how consumers inherently assume that health and taste are inversely related (Ragunathan et al., 2006). Often, choices guided by this belief will have negative consequences for weight management (Mai & Hoffmann, 2015). Chapter III provides direct evidence of the negative impact of the unhealthy = tasty intuition on weight status. Chapter IV explores the use of mindfulness to overcome the use of suboptimal strategies related to categorization and the unhealthy = tasty intuition.

Third, the balancing strategy involves mixing healthy foods with unhealthy foods, especially when values conflict. When one value dominated in a food choice context, this often influences which value will dominate in the next situation (Connors et al., 2001). For example, some people balance "healthy foods" with "unhealthy foods" in a meal, during a day or throughout a week (Connors et al., 2001). Ultimately, this strategy might result in suboptimal decision biases, such as the averaging bias where consumers underestimate the caloric content of a meal consisting of a healthy and an unhealthy option (Chernev & Gal, 2010)

Mood is also an important factor in personal strategies (Pham, Cohen, Pracejus & Hughes, 2001). On the one hand a person can consult how he or she would feel about a certain decision or choice, on the other hand affective states can directly influence a person's choice. There is a substantive amount of research conducted on how emotions, mood or affect influence information processing (Bless, Mackie & Schwarz, 1992; Bodenhausen, Kramer & Süsser, 1994; Schwarz & Bless, 1991). Generally, a person's current affective state can inform him or her about the goodness or badness of a person, object, situation or environment. If a person feels good, he or she may attribute the positive feeling to the situation and evaluate it more favorably; people in positive moods accordingly evaluate new products more favorably than those in negative moods (Gorn, Goldberg & Basu, 1993; Schwarz 1990). It is thought that a positive mood increases heuristic processing, whereas a negative mood increases systematic processing (Armitage, Conner & Norman, 1999). Research found that mood can have a significant impact on food choice. People in a positive mood will prefer healthy foods, whereas people in a negative mood will prefer indulgent foods (Gardner, Wansink, Kim & Park, 2014). Chapter II explores an intervention to positively impact mood and presents empirical findings on how this can result in more favorable evaluations.

A great deal of behavioral research has focused on accumulating evidence of individual's decision biases, however this information can also be used to improve decisions and stimulate positive behavior (Ratner et al, 2008; Thaler & Sunstein).

3. Positively influencing the food consumption process

In the previous paragraph we discussed several important factors underlying food choice related to culture, values and strategies and pointed out how these might have negative downstream consequences. Next, we will discuss how these insights can be used to stimulate positive behavioral changes. To this end, we focus on two important domains; obesity/weight management and food waste, and propose relevant interventions that can be applied.

3.1 Stimulating healthy weights

The continued rise in obesity rates suggests that current programs and initiatives designed to combat obesity have not been successful (Hill, 2009). Personal strategies and values are deeply embedded in an individual, and therefore difficult to change. Reports indicate that taking baby steps – not giant leaps – is the best way to get lasting results for weight management (Lutes et al., 2012). One related approach involves promoting small changes in diet and physical activity to prevent further weight gain and adopting these changes as the new default option. Even a modest increase in energy expenditure or decrease in energy intake of 100 kcal/day could be sufficient to eliminate most of the weight gain in the general population (Hill, Wyatt and Peters, 2003). Actions, such as substituting sugared beverages for noncaloric sweeteners or walking 2000 steps extra a day could be sufficient (Hill, Wyatt, & Peters, 2012). In this respect, an approach focused on small changes, offers a potentially relevant solution and will be further investigated in Chapter III.

Most strategies dominating decisions about food happen automatic, intuitively and outside our awareness, therefore changing them is difficult (Dijksterhuis, Smith, Van Baaren, & Wigboldus, 2005). Some interventions might even aggravate the problem or create new suboptimal strategies (e.g. 'if it is healthy, I can eat more', Provencher, Polivy & Herman, 2009). Therefore, an intervention that brings attention and awareness in the form of mindfulness could offer a relevant tool to reduce the reliance on suboptimal strategies and I will elaborate on this in Chapter IV. More specifically we explore how mindfulness can reduce the unhealthy = tasty intuition.

3.2 Stimulating sustainability

Besides obesity, food waste is presenting a major threat to our society, with large environmental, economic and social consequences. A large proportion of the food that is wasted is due to cosmetic standards employed by retailers (Stuart, 2009). The visual appearance is the first sensory impression triggering consumers' inferences about product characteristics (Grunert, Bredahl & Brunsø 2004). Often foods that look appealing are considered tasty, whereas food that does not look appealing is considered untasty (Connors et al. 2001). These inferences stem from the evolutionary belief of 'what is beautiful is good' (Dion, Berscheid, & Walster, 1972) or rather in this case 'what is ugly is bad'. Similarly, for objects, it is assumed that a more attractive design is also superior (Chaiken & Maheswaran, 1994). By proactively using the appearance of a product to give consumers a certain impression about the product value (Creusen & Schoormans 2005), consumer product choice can be influenced. A potential strategy is thus to make products more appealing by influencing their appearance, thereby reducing their chance to be discarded. Additionally, the appearance of a product can influence the category it is attributed to. Building on the importance consumers attach to different values, their tendency to categorize products,

interventions that are able to positively impact these values and strategies, are of great interest. One potential approach will be further discussed in Chapter II.

4. Dissertation outline

There has been a long and growing history of research investigating the factors underlying food choice (Furst et al 1996; Connors et al; 2001; Sobal et al. 2009). Building on the available information, in this dissertation we explore concrete interventions to stimulate positive behavioral changes. In doing so, the current dissertation adds to the growing movement of Transformative Consumer Research (TCR, see Mick, 2006). TCR has the objective to increase consumers' and societal well-being rather than aiming to increase economic profit. As such, in this dissertation we investigate mindfulness as a tool to empower consumers when making decisions about food, together with the use of anthropomorphism aimed at reducing food waste. We also explore a relatively new intervention, the small changes approach, and its possibilities in the fight against obesity. In what follows, we provide an overview of the topics that will be discussed in the subsequent chapters of this dissertation.

In Chapter II, *Same Same But Different: Using Anthropomorphism in the Battle Against Food Waste*, we demonstrate how anthropomorphism can be applied to point-of-purchase displays of misshapen fruits and vegetables to prompt purchases and reduce food waste. Four studies identify increased risk perceptions and inferior taste perceptions as important underlying values for consumers' rejection of misshapen produce. However, using anthropomorphism (i.e., attributing human characteristics to nonhuman objects) can increase purchase intentions for misshapen produce. By activating a (positive) human scheme, positive emotions are elicited, in turn these emotions positively influence other quality attributes (lower perceived risk and higher taste), leading to an increase in purchase intentions. We

extend categorization literature by demonstrating that applying anthropomorphism to a misshapen product, makes the product more readily accepted. More specifically, the interplay of resolving the incongruency and activation of a positive human scheme lead to more favorable evaluations than when anthropomorphism is absent.

In Chapter III, *Cross-National Investigation of the Drivers of Obesity: Re-Assessment of Past Findings and Avenues for the Future*, we reinvestigate previously established cross-national differences in food attitudes together with their impact on weight status in an online web-based survey with 2167 participants in the United States, the United Kingdom, France and Belgium. We find that, contrary to previous findings, people in France attach most importance to eating healthy, whereas people from the US strive most to eating tasty and delicious food compared to the other countries. We also demonstrate that having a higher interest in healthy eating together with incorporating more small physical activities goes together with a lower chance of being obese, whereas a greater belief that unhealthy food is tastier increases the chance of obesity. Moreover, we extend cross-national research on health by highlighting the need to include behavioral measures next to the use of validated scales and to adopt a joint approach focused on both physical activity and food attitudes.

In Chapter IV, *Mind Your Intuition – How Mindfulness Can Reduce the Unhealthy = Tasty Intuition*, we investigate how mindfulness can reduce the unhealthy = tasty intuition by reducing dichotomous thinking. An important strategy pertains to consumers' tendency to categorize food-related information according to a good/bad dichotomy of healthy vs. unhealthy. Four studies shed light on the impact of trait and state mindfulness on dichotomous thinking and by extension the subscription to the unhealthy = tasty intuition and food choice. Higher trait mindfulness was associated with less dichotomous thinking and a weaker subscription to the unhealthy = tasty intuition. After a brief mindfulness exercise participants distinguished more categories in a categorization task, reducing the extent to which they

subscribe to the unhealthy = tasty intuition. Together, these findings demonstrate how mindfulness can reduce the reliance on personal strategies and positively impact food choice and decision making. We extend research on mindfulness by not only taking into account the global component encompassing different elements, but by zooming in on one specific element; a state of acceptance.

Table 1 represents a general overview of the experimental research conducted in Chapters II, III and IV and how this research fits with elements from the food choice process (as in Figure 1) developed by Furst et al. 1996.

Table 1. General overview of the research

Chapter	Main factors under investigation	Domain	Intervention to promote positive behavior	Dependent variable
II. Same Same But Different: Using Anthropomorphism in the Battle Against Food Waste	<u>Values</u> - Taste - Safety / risk <u>Strategy</u> - Categorization - Mood as information	Food waste	Anthropomorphism	Purchase intention Choice
III. Cross-National Investigation of the Drivers of Obesity: Re-Assessment of Past Findings and Avenues for the Future	<u>Culture</u> <u>Values:</u> - Taste - Health <u>Strategy:</u> - Unhealthy = tasty Intuition	Obesity and weight management	Small changes approach	Choice Weight status
IV . Mind Your Intuition – How Mindfulness Can Reduce the Unhealthy = Tasty Intuition	<u>Strategy</u> - Categorization - Unhealthy = Tasty Intuition	Obesity and weight management	Mindfulness	Choice

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CHAPTER II:
SAME SAME BUT DIFFERENT:
USING ANTHROPOMORPHISM
IN THE BATTLE AGAINST FOOD WASTE

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WASTE

Food waste is a major threat to global sustainability. Much of it is caused by the aesthetic requirements imposed by retailers, which assume that consumers are not interested in buying misshapen fruits and vegetables (unless accompanied by significant price discounts). This article proposes an alternative, more effective way to market such produce. Four studies identify inferior taste perceptions and increased risk perceptions as important drivers of consumers' aversion to misshapen produce. It also shows that the use of anthropomorphism (i.e., attributing human characteristics to nonhuman objects) can increase purchase intentions for misshapen produce because it positively influences consumers' moods, which leads to less perceived risk, and more positive taste perceptions. In addition, this study includes environmental concern as a moderator and captures actual behaviors in a grocery shopping context. The results outline an approach with a potentially more effective use of government dollars—currently being spent on public campaigns to reduce customer-level food waste—in the effort to curb waste throughout the entire food chain.

1. Introduction

Approximately 30%–50% of edible produce never reaches supermarket shelves, at a total annual cost of US\$400 billion, such that food waste represents a dire threat to global sustainability (Gustavsson et al., 2011; Naughton, 2015). In response, policy makers have sought solutions, such as when the European Commission designated 2014 the “Year Against Food Waste” or the UN included “halving world food waste by 2030” among its 2015 global development goals (UN, 2015). Despite relaxed EU rules regarding the sale of misshapen fruits and vegetables, farmers still complain that they regularly must discard produce that does not meet “aesthetic requirements” (Swinford, 2013); an estimated 25% of fruit and vegetables get discarded because they fail to meet retailers’ exacting standards for their physical appearance (FAO, 2013; Kummu et al., 2012).

Such causes of food waste occur downstream in the supply chain, as is more common for high income countries (cf. low income countries, where the emphasis is on reducing food waste upstream; Göbel et al., 2015). In developed nations, retailers have the ability to reduce the losses at the production and distribution levels, if they would agree to purchase imperfect fruits and vegetables (Aschemann-Witzel, de Hooge & Normann, 2016). Consumers also could contribute to the effort by learning to gauge produce on features other than a perfect appearance at the point of purchase (POP). This shift would alter the current situation, in which retailers throw away imperfect items, in the belief that consumers always demand perfect produce (Block et al., 2016; Stuart, 2009).

Noting the importance of reducing food waste, a surge of research focuses on determinants of and solutions to household food waste (Melbye, Onozaka & Hanse, 2016; Porpino, Wansink & Parente, 2016; Stancu, Haugaard & Lähteenmäki, 2016; Visschers, Wickli & Siegrist, 2016). Less research pertains to ways to reduce food waste through the intersection of distribution and POP

levels. Insights into consumers' willingness to purchase abnormally shaped products are scarce, though some studies indicate a negative correlation between the shape of fresh produce and purchase intentions (e.g., Loebnitz & Grunert, 2014, 2015), without specifying the drivers of this negative effect. The few studies that investigate consumers' preferences for imperfect produce are exploratory (de Hooge et al., 2017; Loebnitz & Grunert, 2014, 2015; Loebnitz, Schuitema & Grunert, 2015), without proposing specific interventions retailers might undertake to spur purchases. Therefore, with this study we seek clearer insights into the principal reasons consumers may be reluctant to buy misshapen produce. Building on this insight, we then investigate anthropomorphization of misshapen produce as a potential intervention to increase consumers' intentions to purchase.

In our effort to identify dominant drivers of reduced purchase intentions, we integrate schema and evolution theory. Abnormally shaped food represents a deviation from consumers' schema of a particular product category and is therefore incongruent with their current product category knowledge. For low involvement purchases, for which consumers seek to minimize their effort (Hoyer, 1984), they are spontaneously attracted to products with a typical appearance, because typical members of a category can be classified more quickly and accurately than non-typical members, which saves them time and effort (Creusen & Schoormans, 2005; Loken & Ward, 1990). In addition, products with a typical appearance may signal that they are a safe option (Campbell & Goodstein, 2001). Furthermore, humans have evolved to judge the appearance of other objects to determine whether they should adopt approach or avoidance behavior, and incongruency with existing schema can automatically evoke risk perceptions (Campbell & Goodstein, 2001). Accordingly, White et al. (2016) argue that people reject abnormal foods because their evolutionary instinct prompts them to avoid objects that might pose health or safety

threats (Lyerly & Reeve, 2015). Such an automatic perception of risk in response to misshapen produce might affect consumers' quality expectations and reduce their purchase intentions. Because taste is the main determinant of food choice (Mai & Hoffmann, 2015), we expect this latter element to be the main driver of reduced purchase intentions.

In that case, retailers need interventions that can reduce risk perceptions. Most interventions rely on offering sizeable discounts, yet such economic incentives could even aggravate the problem, by signaling poor quality (Grewal et al., 1998). But other options are available. For example, the French retailer Intermarché launched an “Inglorious Fruits and Vegetables” campaign to promote the sale of unattractive produce (Intermarché, 2017), and an Asda campaign highlighted boxes of imperfect fruits and vegetables to normalize their purchase and consumption (Butler, 2016). Yet even these initiatives may not be sufficient to reduce risk perceptions, because their emphasis on abnormal shapes still prompts consumers to see (and process) the incongruity first.

Therefore, we propose that anthropomorphizing misshapen produce might be more effective, as a way to reduce incongruity effects. That is, evolutionary processes have required humans to judge immediately whether another entity can be trusted (Plutchik, 1980). In particular, knowledge about human agents is readily accessible, because this knowledge is acquired early in human development and is deeply embedded (Epley, Waytz & Cacioppo, 2007). Therefore, adding positive humanlike elements to a misshapen produce in POP stimuli might activate a human schema, rather than the (incongruent) produce schema. If the stimuli highlight positive elements (e.g., smiling face), the activated human schema should elicit positive emotions that signal safety (rather than risk) and thus produce more favorable product evaluations and purchase intentions (De Bondt, Van Kerckhove & Geuens, 2018). Moreover, these anthropomorphized images might

exert stronger positive impacts on consumers with less (cf. more) environmental concern, because people with more environmental concern likely are already positively predisposed to purchasing misshapen produce (cf. Loebnitz & Grunert, 2015).

Despite the progress that has been made to date, consumers, stakeholders and policy makers still struggle to find relevant solutions to food waste. There is a clear need for studies exploring the consequences of existing policies or providing novel insights. In this respect, a “positive psychological, physical, emotional and social-relationship with food at both individual and societal levels” should be aimed for, as discussed by the food well-being (FWB) paradigm (Block et al., 2011, p. 6). Our intervention can contribute to food marketing research and practice by encouraging healthy consumption at the individual level and reducing waste at a societal level. We test our predictions in four studies. In the first study, we verify that abnormal products suffer from inferior evaluations, and we identify risk perceptions specifically as a precursor of taste perceptions that leads to lower purchase intentions. We test the proposed intervention in three studies using different products, and in two of them, we also investigate boundary effects related to environmental concern.

2. Conceptual Background

2.1 Physical Appearance and Product Expectations

The appearance of a product is central to consumer product evaluations and choices. In the interpersonal domain, evolutionary psychology research demonstrates that consumers use appearance as an important input that activates the belief “that the beautiful is good and the ugly is evil” (Synnott, 1989, p. 611). Similarly, consumers assume that more attractive designs are superior for objects (Chaiken & Maheswaran, 1994). Trudel and Argo (2013) demonstrate that when an object is distorted (made to look like garbage), consumers are more apt to throw it away

than to recycle it. The physical appearance of food also activates product beliefs, which determine consumers' food choices. For example, Steenkamp and Van Trijp (1996) identify a positive relationship between the attractiveness of meat offerings and quality expectations, and Loebnitz and Grunert (2015) find that consumers are more likely to purchase normally shaped, rather than abnormally shaped, fruits and vegetables. Although Loebnitz, Schuitema, and Grunert (2015) find a significant effect of food shape abnormality on consumers' purchase intentions, it arises only when the food deviates extremely from the norm. In a similar finding, de Hooze and colleagues (2017) argue that consumer responses depend on the type of deviation: They more readily accept slight deviations in shape than in color. Thus, it is clear that consumers are less inclined to buy abnormally (vs. normally) shaped products, but the reason is less evident.

According to categorization theory, to make sense of the various products in the marketplace, consumers assign them to different classes (Loken & Ward, 1990). To categorize a product, they evaluate it in terms of its perceived similarity and dissimilarity to prototypical products in that category (Bless & Schwarz, 2010; Veryzer & Hutchinson, 1998). Congruent products signal safety; deviations from the norm appear more risky (Campbell & Goodstein, 2001). White et al. (2016) posit that rejections of abnormal food products also stem from an evolutionary instinct, in that people seek to protect themselves from objects that might pose a threat to their health or safety, as might be signaled by their abnormal appearance. Therefore, abnormally shaped produce may increase risk perceptions, through both evolutionary influences and categorization efforts.

Product appearance also can inform quality perceptions (Creusen & Schoormans, 2005). Products that appear normal or typical of a category signal higher quality than abnormal or atypical ones (Häubl & Elrod, 1999; Loebnitz et al., 2015). Trudel and Argo (2013) note that the

more a product's size or form differs from prototypical members of a category, the less useful it appears. Similar products also evoke reference point assimilation effects (positive relation); atypical products suffer from contrast effects (negative relation) (Bless & Schwarz, 2010), which tend to be negative. In some cases, an appearance that deviates slightly from the norm can prompt positive outcomes, because the moderate incongruity effect it produces leads consumers to increase their cognitive processing (Lee & Schumann, 2004) and seek to resolve the incongruity, which can be more satisfying than a congruent experience (Meyers-Levy & Tybout, 1989). However, if consumers are not motivated to solve the incongruity, possess too much product knowledge (Peracchio & Tybout, 1996), or perceive high risk (Campbell & Goodstein, 2001), even moderate incongruity is problematic, and consumers prefer a typical appearance. In a food purchase context, with consumers who generally are experienced with the purchases but also perceive high risk, consumers likely prefer the norm (congruity) and may regard deviations as suboptimal, with negative impacts on their quality judgments. For food products in particular, quality pertains mainly to taste (Mai & Hoffman, 2015), so perceived taste, as a manifestation of quality perceptions, may drive intentions to purchase abnormally shaped fruits and vegetables.

The purchase risk is high in this setting because food safety is an important attribute, especially when uncertainty is high (Oglethorpe & Monroe, 1987). Abnormally shaped produce deviates from the norm and thus prompts risk perceptions, which also influence other quality perceptions. Because taste is the most important driver of food choice, this attribute likely also represents the most important determinant of purchase intentions. Formally,

H₁: Abnormally shaped products evoke (a) increased risk perceptions and (b) inferior taste perceptions compared with normally shaped products, which (c) result in lower purchase intentions.

2.2 Anthropomorphism as an Intervention

Anthropomorphism involves “attributing humanlike properties, characteristics, or mental states to non-human agents and objects” (Epley et al., 2007, p. 865). When a non-human agent is anthropomorphized, knowledge about human agents serves as a source for interpreting and evaluating that agent (Epley et al. 2007). Among the different forms of anthropomorphism, we research the addition of humanlike facial features or expressions to an object. From an evolutionary perspective, emotional expressions offer reliable indicators of inner emotional states (Frijda, 1986) and prepare an entity for issuing specific behavioral responses, by indicating whether the other being is prepared to attack or cooperate (Plutchik, 1980). For an anthropomorphized object, people use information provided by physical similarities to human traits to infer underlying characteristics (Landwehr, McGill & Hermann, 2011) and spontaneously decode facial expressions that they recognize. These decoded emotions then influence people’s own emotional states, resulting in approach or avoidance behaviors (Landwehr et al. 2011). For example, if consumers see a smile in the grill of a car, they tend to make more favorable evaluations of the vehicle than if they recognize a frown (Aggarwal & McGill, 2007; Landwehr et al., 2011).

When an abnormally shaped food product is anthropomorphized, it thus should prompt the activation of knowledge about the human schema. Epley et al. (2007) claim that knowledge about human agents becomes more readily accessible than knowledge about the anthropomorphized non-human agent, because such knowledge is acquired very early in human development, so it is more deeply embedded. This readily accessible information influences judgments of the product (Bless & Schwarz 2010), such that anthropomorphism might help consumers accept norm deviations. Instead of activating contrasting information about the fruit and vegetable product

category, they activate information about the human schema. Furthermore, Kim and McGill (2011) argue that anthropomorphism can influence risk perceptions. A positive affective reaction to a product, because it evokes a (positive) human schema, might create a sort of halo that alters processing of other attribute information (e.g., risk, taste) (Hoegg, Alba, & Dahl 2010; Nisbett & Wilson, 1977). In particular, affective mood states can reduce or increase perceptions of risk (Johnson & Tversky, 1983), because people who need to evaluate unknown risks often turn to their current feelings as salient input. When evaluating situations, their positive mood offers information that even might replace objective evaluations of a target (Schwarz, 1990). If a person feels good, he or she may attribute the positive feeling to the situation and evaluate it more favorably; people in positive moods accordingly evaluate new products more favorably than those in negative moods (Gorn, Goldberg & Basu, 1993; Schwarz, 1990). If positive feelings provide a means to overcome risk perceptions, by providing additional, positive information, they might result in more positive evaluations of the target product. That is, anthropomorphizing misshapen produce may prompt consumers' positive mood, related to their activation of a human schema. This positive mood then decreases perceived risk. Because consumers' product perceptions (including taste perceptions) then might improve, it should enhance purchase intentions. We detail this framework in Figure 1.

H₂: Anthropomorphism of misshapen fruits and vegetables positively influences consumers' moods, which leads to (a) less perceived risk, (b) more positive taste perceptions, and (c) higher purchase intentions (cf. no anthropomorphism).

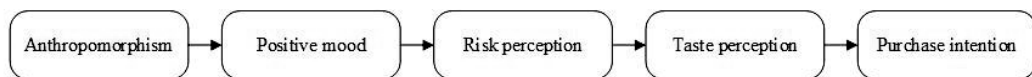


Figure 1. Conceptual Model of the Effects of Anthropomorphism

2.3 Environmental Concern

Consumer decision making about misshapen produce also may be influenced by environmental concerns. Zimmer, Stafford, and Stafford (1994) define environmental concern as a general concept that refers to feelings about different environmental issues; it precedes environmentally friendly behaviors. Some consumers integrate environmental concern into their daily lives, so it likely informs their food waste behaviors, through various trade-offs and goal conflicts, including health/safety versus sustainability (Kriflik & Yeatman, 2005), spending versus saving money, or convenience versus environmentally friendly behaviors. A stronger environmental concern influences judgments of these trade-offs (Aschemann-Witzel et al., 2015), such that when consumers have more favorable attitudes toward the environment, they should be more willing to make personal sacrifices and engage in environmentally friendly consumption.

For this study, we predict that environmental concern has a positive influence on purchase intentions toward misshapen fruits and vegetables, whereas low purchase intentions should be more common among consumers who express little environmental concern. Loebnitz and Grunert (2015) identify a significant interaction of food shape abnormality with pro-environmental self-identities, such that people with high environmental concern indicate higher purchase intentions for misshapen food products than those with low environmental concern, though only for extremely abnormally shaped food products. Because people who express high environmental concern already incorporate sustainability in their daily decisions, they likely are familiar with the issues surrounding food waste and may be more willing to accept food shape abnormalities already, without intervention. Thus, when it comes to using anthropomorphism to make misshapen produce more appealing, there may be less room for improvement among consumers who exhibit high (vs. low) environmental concern.

H₃: The positive effect of anthropomorphism on purchase intentions toward misshapen fruits and vegetables is stronger for people with low rather than high environmental concern.

Different elements thus might shape consumer expectations and purchase intentions toward misshapen fruits and vegetables. Our goal is to identify ways that retailers and food producers can overcome unprompted negative perceptions among consumers and thereby lead them to adopt more sustainable consumption patterns. We take a two-step approach. First, in Study 1 we seek to identify the process that lowers consumers' purchase intentions for misshapen produce and thus address the research gap regarding the different drivers of rejections of abnormally shaped food. Second, we investigate the effects of promoting misshapen produce through anthropomorphism in three studies. Study 2 provides initial evidence that consumers can be persuaded to buy abnormally shaped, anthropomorphized fruits and vegetables; Study 3 replicates this finding for another product and introduces environmental concern as a boundary condition. In Study 4, we capture actual behavior in an experimental grocery store.

3. Study 1

Prior research has identified reduced purchase intentions for misshapen produce but without specifying the underlying product associations. We predict that risk and taste perceptions result from the information provided by the shape of the produce, such that they drive consumers' lower purchase intentions for abnormally shaped produce. We also examine health and convenience perceptions as potential drivers, in an effort to determine *why* consumers are reluctant to buy misshapen fruits and vegetables without monetary incentives.

3.1 Design

The 2×2 study design includes shape (normal, abnormal) and product (bell pepper, apple) as between-subject factors. We include two products to avoid idiosyncrasies. In the abnormal conditions, pictures of naturally occurring shape abnormalities appeared on a white background. Similar pictures of normally shaped products represented the normal conditions. The four pictures were equal in product size, pixel quality, and colors (see Appendix A).

3.2 Procedure and Measures

We randomly assigned 140 U.S. participants, obtained from Amazon Mechanical Turk ($M_{\text{age}} = 36.44$ years, $SD = 11.99$ years; 51% female) to one of the four conditions. After seeing the picture of a normal or abnormal apple or bell pepper, the participants indicated their purchase intentions on three items: “I would consider buying this product,” “I would like to try this product,” and “I would not be inclined to buy this product,” on seven-point Likert scales (1 = “completely disagree” to 7 = “completely agree”; Cronbach’s $\alpha = .87$). Next, we measured health and taste perceptions with four items on seven-point semantic differential scales (“unhealthy–healthy,” “low in nutritional value–high in nutritional value,” $r = .76$; “untasty–tasty,” “unappealing–appealing,” $r = .78$). We also measured risk perceptions (“risk-free–risky”), convenience (“large effort to prepare–small effort to prepare”), and normality (“abnormal–normal”) on seven-point semantic differential scales, presented in random order. The survey ended by gathering socio-demographic variables.

3.3 Results and Discussion

No interaction effects between product and shape emerged (for health, taste, convenience, risk or purchase intention all p 's > .30), so we aggregated the results into two conditions: normal ($n = 64$) and abnormal ($n = 76$). Shape remained as the only relevant between-subjects factor.

Main Effects. We confirm that abnormal products were viewed as less normal than the normal ones ($M_{\text{normal}} = 6.25$, $SD = 1.05$; $M_{\text{abnormal}} = 3.14$, $SD = 2.12$, $t(113.97) = 11.25$; $p < .001$). In addition, purchase intentions are lower in the abnormal condition than in the normal condition ($M_{\text{normal}} = 5.10$, $SD = 1.59$; $M_{\text{abnormal}} = 3.67$, $SD = 1.84$; $t(138) = 4.88$; $p < .001$). Respondents also perceived the abnormal (vs. normal) products as less tasty ($M_{\text{normal}} = 5.88$, $SD = 1.28$; $M_{\text{abnormal}} = 3.93$, $SD = 1.73$; $t(135.89) = 7.61$; $p < .001$), less healthy ($M_{\text{normal}} = 6.23$, $SD = 1.13$; $M_{\text{abnormal}} = 5.18$, $SD = 1.45$; $t(137.27) = 4.78$; $p < .001$), more risky ($M_{\text{normal}} = 1.97$, $SD = 1.40$; $M_{\text{abnormal}} = 3.36$, $SD = 2.03$; $t(133.16) = -4.76$; $p < .001$), and less convenient ($M_{\text{normal}} = 6.00$, $SD = 1.37$; $M_{\text{abnormal}} = 4.55$, $SD = 1.82$; $t(136.33) = 5.36$; $p < .001$). That is, the abnormal shape resulted in increased risk perceptions and decreased taste, health, and convenience perceptions, as detailed in Table 1.

Table 1. Product Evaluation Means

Product Characteristics	Apple			Bell Pepper		
	<i>Normal (n = 32)</i>	<i>Abnormal (n = 38)</i>	<i>t-test</i>	<i>Normal (n = 32)</i>	<i>Abnormal (n = 38)</i>	<i>t-test</i>
Normality	6.41 (.84)	2.42 (1.80)	t(54.25) = 12.20; $p < .001$	6.09 (1.23)	3.87 (2.18)	t(59.92) = 5.12; $p < .001$
Health	6.36 (1.15)	5.28 (1.40)	t(68) = 2.17; $p = .001$	6.09 (1.10)	5.09 (1.50)	t(66.96) = 3.20; $p = .002$
Taste	5.88 (1.31)	3.86 (1.53)	t(68) = 5.86; $p < .001$	5.88 (1.27)	4.01 (1.93)	t(64.54) = 4.84; $p < .001$
Risk	1.66 (1.00)	3.13 (1.76)	t(60.38) = -4.20; $p < .001$	2.28 (1.67)	3.58 (2.27)	t(66.85) = -2.75; $p = .008$
Convenience	6.34 (1.29)	4.66 (1.95)	t(64.54) = 4.33; $p < .001$	5.66 (1.38)	4.45 (1.70)	t(68) = 3.22; $p = .002$
Purchase intention	4.97 (1.74)	3.32 (1.66)	t(68) = 4.04; $p < .001$	5.23 (1.45)	4.00 (1.96)	t(66.90) = 2.99; $p = .004$

With a stepwise regression, we examine the impact of the different product evaluations (health, taste, risk, and convenience) on purchase intentions. Taste perception emerged as the only significant predictor ($B = .78$; $F(1,138) = 208.12$; $p < .001$); it accounted for 60% (adjusted R^2) of the variance in purchase intentions. In line with our expectation, this makes taste perception the most important driver.

Mediation Analysis. We also test the underlying effects, for which we predicted that abnormalities in shape increase risk and decrease taste perceptions, which lead to lower purchase intentions, using serial mediation (Model 6, Preacher & Hayes, 2013). With bias-corrected bootstrapping, we generate 95% confidence intervals around the indirect effects of taste and risk perceptions, as well as indirect effects through both mediators in serial order; mediation exists if

the confidence interval excludes 0 (Hayes, 2013). The serial mediation analysis (5000 bootstrap samples, bias-corrected confidence intervals) reveals a significant indirect effect for taste perceptions ($ab = -1.13$, $SE = .25$; 95% lower level confidence interval [LLCI] = -1.69, 95% upper level confidence interval [ULCI] = -.67) but not for risk perceptions ($ab = -.01$, $SE = .09$; 95% LLCI = -.19, 95% ULCI = .19). The serial indirect effect is significant ($ab = -.46$, $SE = .15$; 95% LLCI = -.80, 95% ULCI = -.22). These findings indicate that shape abnormalities increase risk perceptions, which decrease taste perceptions, which then lower respondents' purchase intentions.

Overall, the data from Study 1 offer evidence that abnormal shapes of fruit and vegetables lead to inferior product evaluations, by decreasing convenience, taste, and health perceptions and increasing risk perceptions (H_{1a} and H_{1b}). By increasing risk perceptions, the shape abnormalities also lead to lower taste perceptions, reducing purchase intentions (H_{1c}). To counteract this process and promote the sale of misshapen fruits and vegetables, interventions need to improve product evaluations.

4. Study 2

Building on the Study 1 findings, we explore an intervention with the potential to trigger positive emotions that might evoke more favorable evaluations and increase purchase intentions. By adding positive, visual, humanlike characteristics to an object, it is possible to make the object more likeable and elicit positive feelings that might be strong enough to overwrite the “ugly is bad” belief and create a positive halo around the product. For abnormally shaped products, we expect this positive feeling to trigger approach behavior and decrease risk perceptions. The enhanced expectations of safety also might improve taste perceptions and ultimately lead to higher purchase intentions (H_2). For normal products, no such positive effect is likely, because they do not suffer from high risk perceptions or low taste perceptions initially.

4.1 Design

Study 2 uses a 2 (shape: normal vs. abnormal) $\times$ 2 (intervention: control vs. anthropomorphism) between-subjects design, in which we randomly assigned participants to one of four conditions. The dependent variables were mood, taste and risk perceptions, and purchase intentions.

4.2 Procedure and Measures

A total of 160 respondents ($M_{\text{age}} = 32.31$ years, $SD = 15.04$, range 18–74 years; 70% female) from a consumer panel of a large Western European university completed an online questionnaire, in return for a chance to win a gift certificate for an online store. As a cover story, we indicated that a new retailer, known for its extensive assortment of fruits and vegetables, was coming to town. To gain a better understanding of the local market, it wanted to pretest some advertisements, so each respondent would evaluate one advertisement. Depending on the assigned condition, respondents reviewed a normally or abnormally shaped tomato that was either anthropomorphized or not. We created four advertisements for this study, with the help of Adobe Photoshop: a normal tomato; a normal, anthropomorphized tomato (i.e., with eyes, mouth, and arms); an abnormally shaped tomato; and an abnormal, anthropomorphized tomato (same eyes, mouth, and arms). The ads were similar in size, pixel quality, and design, with a logo at the bottom and a slogan on top. The simple, basic anthropomorphization helps exclude the potential influence of other factors and mimics a friendly face, to ensure that it would activate positive emotions. In an online pretest, 70 U.S. members of Amazon Mechanical Turk ($M_{\text{age}} = 37.00$ years, $SD = 12.27$; 54% male) confirmed that the anthropomorphized pictures seemed more humanlike than those in the control condition (two items on seven-point Likert scales with 1 = “completely disagree” and 7 = “completely agree”: “It is suggested that the product is a person” and “It is as if the product comes

alive”; $r = .81$). They did not indicate any significant difference between the normal and abnormal tomatoes in the control conditions though ($p > .6$), so the abnormal tomato was not perceived as more “human” before being anthropomorphized (Appendix A).

After exposure to the ad, respondents indicated their intention to purchase the product (three items, seven-point Likert scales with 1 = “completely disagree” and 7 = “completely agree”; Cronbach’s $\alpha = .84$). Next, they expressed their beliefs about different, randomly presented product characteristics, such as normality, health, taste, and risk perceptions, on seven-point semantic differential scales (as in Study 1). As a measure of their emotional state, respondents indicated how the ad made them feel (eight items, seven-point semantic differential scales: “unhappy–happy,” “unpleasant–pleasant,” “not surprised–surprised,” “not interested–interested,” “not amused–amused,” “not bored–bored,” “not disgusted–disgusted,” “not irritated–irritated”). We reversed the scores for negative emotions so that a higher score indicates a more positive mood (Cronbach’s $\alpha = .93$). Finally, the survey gathered socio-demographic variables.

4.3 Results and Discussion

Main Effects. The abnormal products were perceived as less normal ($M_{\text{normal}} = 5.57$, $SD = 1.44$; $M_{\text{abnormal}} = 4.01$, $SD = 1.79$, $t(146.06) = 6.02$; $p < .001$) but not less healthy ($p > .7$). Next, we checked the impact of the different images with three two-way analyses of variance (ANOVA), with shape and intervention as the independent variables and participants’ mood, risk perceptions, and taste perceptions as dependent variables (Table 2).

Table 2. Positive Mood and Risk and Taste Perception Means

	Normal				Abnormal			
	Control		Anthropomorphism		Control		Anthropomorphism	
	M	SD	M	SD	M	SD	M	SD
Positive mood	4.05	(1.18)	4.57	(1.45)	3.62	(1.10)	4.48	(1.17)
Risk	1.79	(1.08)	2.15	(1.12)	3.03	(1.72)	2.27	(1.29)
Taste	4.91	(1.36)	5.14	(1.49)	3.63	(1.50)	4.56	(1.54)

The significant main effect of shape on risk ($F(1,156) = 10.67, p = .001$) and taste ($F(1,156) = 15.90, p < .001$) perceptions confirms the previously identified negative impact of misshapen (vs. normal) produce on these variables. However, shape does not significantly affect mood. In addition, the significant main effect of anthropomorphism on mood ($F(1,156) = 12.53, p = .001$) and taste perceptions ($F(1,156) = 6.27, p = .013$) indicates that it enhances these dependent variables but not risk perceptions ($F(1,156) = .93, p = .34$). We also find a significant interaction effect of shape with anthropomorphism on risk perceptions ($F(1,156) = 7.28; p = .008$) (see Table 3). That is, as we expected, anthropomorphizing an abnormal product decreases risk perceptions, whereas risk perceptions are not affected when a normal product is anthropomorphized. These results offer a first indication in support of our proposed underlying model.

Table 3. Effects of Shape and Intervention on Participants' Positive Mood and Taste and Risk Perceptions

	Positive Mood		Risk		Taste	
	F(1,156)	p-Value	F(1,156)	p-Value	F(1,156)	p-Value
Shape	1.74	.19	10.67	.001	15.90	<.001
Intervention	12.53	.001	.93	.34	6.27	.013
Shape × Intervention	1.20	.38	7.28	.008	2.29	.13

Mediation Analysis. To determine whether our findings also translate into a positive effect on purchase intentions, we conducted two serial mediation analyses. Specifically, we test whether

anthropomorphizing an abnormally shaped product positively affects mood, which leads to approach behavior by lowering risk perceptions and increasing taste perceptions, so that it ultimately results in higher purchase intentions, as well as whether this mediation disappears for normally shaped, anthropomorphized products. To test the path from the intervention (control vs. anthropomorphism) $\rightarrow$ mood $\rightarrow$ risk perceptions $\rightarrow$ taste perceptions $\rightarrow$ purchase intentions, we use a multiple mediator model with serial mediation and bootstrapping (5,000 samples; Hayes 2013, model 6). The serial indirect effect of anthropomorphism through all three mediators (mood, then risk perception, then taste perception) reveals significant paths, from anthropomorphism to mood ($B = .86, p = .001$), from mood to risk perceptions ($B = -.44, p = .003$), from risk perceptions to taste perceptions ($B = -.28, p = .005$), and from taste perceptions to purchase intentions ($B = .40, p < .001$). This full model of serial indirect effects is significant (95% confidence interval [.01, .14]). In addition, when we include all three mediators in the model, the direct effect of anthropomorphism on purchase intentions is no longer significant ($p = .1$).

For the normally shaped produce condition, we conducted the same serial mediation with bias-corrected bootstrapping to generate the 95% confidence interval around the indirect effect through mood, risk perceptions, and taste perceptions as serial mediators. The analysis (5000 bootstrap samples, bias-corrected confidence intervals) reveals no significant indirect effect ($ab = .001, SE = .005; 95\% LLCI = -.008, 95\% ULCI = .011$).

Therefore, anthropomorphism has mood-enhancing properties that can make abnormal products seem less risky, increase taste perceptions, and induce higher purchase intentions. This process also illustrates why this proposed intervention works particularly to the benefit of abnormally shaped fruit and vegetables: They are perceived as more risky and less tasty than their normal counterparts.

5. Study 3

With Study 3, we seek to uncover the moderating role of environmental concern, to test our prediction that applying anthropomorphism to an abnormally shaped product will have a stronger influence on the purchase intentions of consumers who express low (vs. high) concern for the environment. Consumers prioritize different interests when making purchase decisions, such that some consumers' purchase intentions might already reflect their environmentally conscious motives, but other consumers' intentions primarily stem from price or taste perceptions. Prior research already has established that consumers with higher environmental concern express higher purchase intentions for abnormally shaped food (Loebnitz & Grunert, 2015). Because they have more room for improvement, people with low environmental concern should be more subject to the influence of anthropomorphized, abnormally shaped fruits and vegetables, whereas we do not expect to find differences in their purchase intentions for normal fruits and vegetables (H_3), regardless of anthropomorphism.

5.1 Design

The 154 respondents ($M_{\text{age}} = 31.68$ years, $SD = 14.14$; 77% women) from a consumer panel of a large Western European university completed an online questionnaire in return for a chance to win a gift certificate for an online store. This study uses a 2 (shape: normal vs. abnormal) $\times$ 2 (intervention: control vs. anthropomorphism) between-subjects design, and we assigned participants randomly to one of the four conditions.

5.2 Procedure and Measures

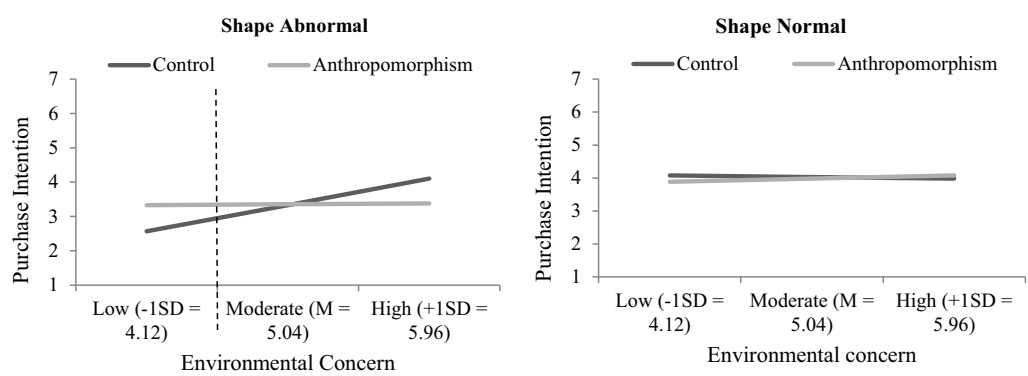
The procedure was the same as that for Study 2, but the images featured a normally or abnormally shaped cucumber, which was either anthropomorphized or not. The online pretest with 70 U.S. members of Amazon Mechanical Turk ($M_{\text{age}} = 35.91$, $SD = 11.77$; 56% female) confirmed that the anthropomorphized pictures appeared more humanlike than the normal ones (as in Study 2), but there was no significant difference between the normal and abnormal cucumbers in the control condition ($p > .8$). After respondents in the main study indicated their intentions to purchase the advertised product and their beliefs about product characteristics (normality, taste, and risk, as in Studies 1 and 2), they completed a scale adapted from Alcock (2012) to measure environmental concern, with five items on seven-point Likert scales (1 = “completely disagree” and 7 = “completely agree”; e.g., “It takes too much time and effort to do things that are environmentally friendly” and “The environment is a low priority for me compared with a lot of other things in my life”; Cronbach’s $\alpha = .70$).

5.3 Results and Conclusion

The respondents regard the abnormal products as less normal than the normal ones ($M_{\text{normal}} = 5.79$, $SD = 1.14$; $M_{\text{abnormal}} = 3.29$, $SD = 1.77$, $t(127.72) = 10.39$; $p < .001$). Next, we examined whether the interaction between anthropomorphism and environmental concern is moderated by shape. Not all our variables are categorical, so we used a procedure recommended by Preacher and Hayes (2013, Model 3). The analysis (5,000 bootstraps; 95% bias-corrected confidence intervals) revealed a significant three-way interaction: The combined effect of anthropomorphism and environmental concern is moderated by shape ($B = -.96$, $SE = .48$, $p = .047$), such that their

interaction is significant when product shape is abnormal ($B = -.80$, $SE = .35$, $p = .024$) but not when it is normal ($p > .6$). For an abnormally shaped product, the effect of anthropomorphism on purchase intentions is moderated by environmental concern. That is, with low environmental concern (-1SD), anthropomorphism has a positive effect on purchase intentions ($B = .76$, $SE = .40$, $p = .06$), but with high environmental concern (M or +1SD), this effect disappears, and anthropomorphism has a non-significant effect on purchase intentions (both $p > .1$). For normally shaped products, the effect of anthropomorphism on purchase intentions is not moderated by environmental concern (Figure 2).

Figure 2. Interaction of Anthropomorphism and Environmental Concern on Purchase Intentions for Normal and Abnormal Products



Note: Vertical dashed line indicates the Johnson-Neyman region of significance (left side is significant)

Our data thus suggest that anthropomorphizing misshapen fruits and vegetables can have positive effects on purchase intentions. This process also is influenced by consumer environmental concern; consumers who are less concerned about the environment are more likely to exhibit this effect, in line with H₃.

6. Study 4

With Study 4 we investigate whether our previous findings translate into actual behavior. Thus, we test whether displaying a poster with an anthropomorphized misshapen product in a grocery shopping context increases choice of misshapen products, relative to a poster of a normal product or one without anthropomorphization. As an extension, we also consider the potential impact on consumers' willingness to pay. In the absence of monetary incentives, do consumers still anticipate lower value and express reduced willingness to pay for abnormally shaped products?

6.1 Design

The study uses a 2 (shape: normal vs. abnormal) $\times$ 2 (intervention: control vs. anthropomorphism) between-subjects design, plus a control condition with no poster. The small experimental grocery store featured seven products (tomato, carrot, eggplant, cucumber, potato, zucchini, and onion). In addition, four posters were developed for this study (Appendix A). For each product (except onions), variations of normal and abnormal shapes, were presented together in small plastic containers (see Appendix B). The proportion of normal and abnormal products was approximately equal in each container.

6.2 Procedure and Measures

In total, 143 participants ($M_{\text{age}} = 23.26$ years, $SD = 7.35$ years; 57% female) took part in this experimental lab study, in return for course credit or a small monetary fee. The study took place in the consumer lab and meeting room maintained by the marketing department of a Western European university. Participants were randomly assigned to one of five conditions. To keep their purchase motives constant, we gave all participants the same scenario, which described a plan to invite four friends over on a cold winter evening and make soup, which was easy to make and required mostly vegetables as ingredients. After reading the scenario and completing some control

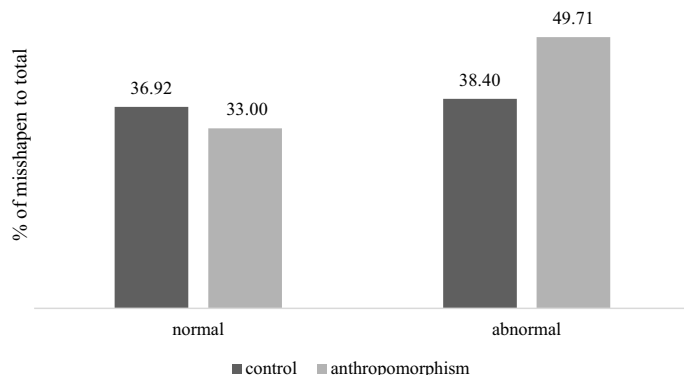
questions (e.g., “For how many friends do you need to make soup?”), participants visited the experimental grocery store individually to select vegetables for their soup. The experimental store was set up in an adjacent room, with a large table covered in wooden stands that held the containers with the vegetables. Once they entered this room, participants received shopping baskets and could walk around to choose vegetables. The abnormal products clearly deviated in shape; we obtained them from retailers selling them under an ugly fruits and vegetables campaign. In the control condition, no posters were present, but in the treatment conditions, three posters in the room showed a normal or abnormal carrot, either anthropomorphized or not; they appeared around the room and were clearly visible to all participants. We rotated the different conditions/posters every two hours over a period of five days. After making their selections, the participants handed their baskets to a research assistant, seated near the exit, who recorded which products they selected and asked how much they would be willing to pay for them. After the participant left the room, the research assistant placed the products back in the bins. Each participant returned to the first room and completed the rest of the questionnaire. We used four 10-point slider scales to measure store perceptions (attractiveness, freshness, quality of the products, and cleanliness), as well as an open-ended question asking how the participant would make the soup and which ingredients she or he would add, to maintain the cover story. Finally, we measured environmental concern (as in Study 3) and socio-demographic variables.

6.3 Results and Discussion

To ensure no other influential variables could be driving our effects, we compared the store perceptions using a one-way ANOVA. As intended, the five study conditions did not differ in the extent to which the store was perceived as attractive ($F(4,138) = 1.31$; $p = .27$), fresh ($F(4,138) =$

1.52; $p = .20$), clean ($F(4,138) = 2.20$; $p = .07$; no significant post hoc differences), or offering quality produce ($F(4,138) = 1.26$; $p = .29$). In a two-way ANOVA, we included shape and anthropomorphism as fixed factors and the percentage of misshapen vegetables as the dependent variable. These results reveal a significant main effect of shape ($F(1,106) = 7.43$, $p < .01$) but not for anthropomorphism ($F(1,106) = 1.23$, $p = .27$), as well as their significant interaction ($F(1,106) = 5.21$, $p < .05$) (Figure 3).

Figure 3. Percentage of Misshapen Among Total Vegetables Chosen



The simple effects tests indicate a significant difference in the percentage of misshapen vegetables chosen in the presence of the abnormal anthropomorphized (vs. non-anthropomorphized) posters ($M_{\text{anthro}} = 49.71\%$, $SD = 17.38\%$; $M_{\text{control}} = 38.40\%$, $SD = 16.72\%$; $F(1,106) = 6.30$, $p < .05$), whereas the anthropomorphized (vs. non-anthropomorphized) posters of the normally shaped carrot did not produce any difference ($M_{\text{anthro}} = 33.00\%$, $SD = 18.04\%$; $M_{\text{control}} = 36.92\%$, $SD = 17.50\%$; $F(1,106) = .63$; $p = .43$). Compared with the condition without posters, participants chose significantly more misshapen vegetables if they saw posters of an

anthropomorphized, misshapen carrot ($M_{\text{abnormal+anthro}} = 49.71\%$, $SD = 17.38\%$; $M_{\text{no poster}} = 31.69\%$, $SD = 17.78\%$; $t(63) = -4.13$; $p < .001$) (Table 1). Thus, anthropomorphizing misshapen products in an ad appears to increase choices of those vegetables, even in the presence of normal products. However, marketing an abnormal product without anthropomorphism or presenting a normal product (with or without anthropomorphism) does not enhance choices of misshapen products.

Next, to exclude the possibility that the presence of a poster featuring a carrot increases the choice of carrots overall, which might drive our effect, we determine that no significant difference emerges for the percentage of carrots chosen across the five conditions. We also find no significant differences across conditions in the average willingness to pay. Although participants chose more misshapen vegetables in the anthropomorphized, abnormal condition, it did not influence the price they were willing to pay (see Table 4).

Table 4. Study 4 Results

	No Poster	Abnormal	Abnormal + Anthropomorphism	Normal	Normal + Anthropomorphism	
Percentage of misshapen vegetables	31.69 ^a (17.78)	38.41 ^{a*} (16.72)	49.71 ^{b*} (17.38)	36.92 ^a (17.50)	33.00 ^a (18.49)	F(4,138) = 5.19; $p < .001$
Percentage of carrots ^c	27.70 (16.37)	26.91 (23.15)	31.17 (15.76)	25.60 (20.47)	26.23 (16.98)	F(4,138) = .41; $p = .80$
Average willingness to pay (€)	.52 (.30)	.62 (.34)	.54 (.27)	.60 (.22)	.50 (.22)	F(4,138) = .89; $p = .48$

^{a,b} Means with the same superscripts do not differ significantly ($p > .10$). Means with different superscripts differ significantly ($p \leq .05$).

^c No significant differences for other product categories, except potato.

* Significance level of $.05 < p < .10$

Finally, we consider whether the positive effect of anthropomorphism in the abnormal condition is moderated by environmental concern. The model is significant ($F(3,56) = 2.86$; $p <$

.05), but the interaction term is not ($B = -4.63$, $SE = 4.47$, $t(56) = -1.04$, $p = .30$). The low sample size (60 participants) of the abnormal condition might be responsible for the failure to detect such an effect. We therefore ran a spotlight analysis to decompose the interaction term at different levels of environmental concern (Hayes 2013). The intervention exerts a significant effect when environmental concern is low ($-1SD$, $B = 16.70$, $SE = 6.29$, $t(56) = 2.65$, $p < .01$) to moderate (at 4.79 , $B = 11.81$, $SE = 4.51$, $t(56) = 2.62$, $p < .05$). In contrast, the effect of anthropomorphism of an abnormal product on choice is not significant among participants with high environmental concern ($+1SD$, $B = 6.94$, $SE = 6.72$, $t(56) = 1.03$, $p = .31$). That is, anthropomorphism has a more positive influence on the choice of misshapen vegetables among consumers with low environmental concern, in line with our prediction.

7. General Discussion

To ensure global capacities to feed people sustainably (FAO, 2013; World Food Program (WFP) 2017), more effective uses of food resources are required. Retailers can have far-reaching, powerful influences in terms of reducing waste, both upstream in the supply chain and downstream among consumers. Our empirical studies, by establishing that consumers' taste and risk perceptions lead them to reject abnormally shaped food, lead us to recommend anthropomorphism as an effective intervention.

With Study 1 we demonstrate that shape abnormalities lead to inferior product evaluations, in the form of higher perceived risk and lower, taste, health, and convenience perceptions. As we hypothesized, lower purchase intentions for abnormally shaped products appear to stem from increased risk perceptions, which translate into lower taste perceptions. In Study 2, we show that anthropomorphism used with a misshapen product can enhance people's positive moods, which

decreases their risk and increases their taste perceptions, evoking positive effects on purchase intentions. Study 3 highlights environmental concern as a moderator of this effect; when environmental concern is low, the beneficial effect of anthropomorphism on purchase intentions is more pronounced than when environmental concern is high. Our findings thus indicate that using anthropomorphism in the battle against food waste can make an otherwise uninterested consumer group easier to reach and convince. Finally, in Study 4, we show that our intervention applies to not just intentions but also actual choices, such that we help bridge the intention–behavior gap.

7.1 Theoretical Implications

Previous research indicates that abnormally (vs. normally) shaped products reduce purchase intentions; we determine why. Increased risk perceptions, which negatively affect consumers' taste perceptions, represent the primary driver of reduced purchase inclinations.

This research also expands understanding of how consumers respond to food promotions that rely on creative techniques, usually reserved for hedonic or tempting foods, to encourage consumption of healthy products (Bublitz & Peracchio, 2015). Most marketing of healthy products highlights the nutritious nature of the product or the health benefits of consuming it, to encourage consumers to make healthier decisions; such information tends to be more cognitive in nature. But for unhealthy or hedonic products, the goal instead is to initiate a purchase, often by triggering an affective response related to pleasure, fun, or the sensory experience of a product. We provide novel evidence that consumers also respond positively to the use of creative, affective advertising appeals for healthy food products.

The value of the intervention we propose also stems from its ability to enhance purchases of misshapen fruits and vegetables specifically. That is, anthropomorphism benefits misshapen

fruits and vegetables but not normal fruits and vegetables. Our findings provide preliminary evidence that by eliciting a positive mood, anthropomorphism can lead to more favorable product evaluations and increased purchase intentions. We identify risk as key reason that people reject misshapen produce, so the influence of anthropomorphism is greater for misshapen fruits and vegetables than for normal fruits and vegetables.

Finally, we demonstrate that the positive effect of anthropomorphizing a misshapen product transfers to other products in the category too. For example, in Study 4, the poster displayed a carrot; however, the participants increased their overall choices of misshapen vegetables, not just of carrots.

7.2 Consumer, Public Policy, and Managerial Implications

Reducing food losses is an important means to increase food availability and reduce economic losses. Approximately one-third (~\$1 trillion) of the world's food is lost or wasted every year, and reversing this trend could preserve enough food to feed 2 billion people—more than twice the number of undernourished people across the globe (World Food Program USA, 2017). Even if products that do not meet cosmetic standards are simply downgraded (e.g., for animal consumption or processing), rather than disposed of, this step still represents a loss in economic terms. To help retailers join the battle against food waste, we propose a novel strategy that does not rely on price reductions or unit promotions; an added benefit thus is that it does not trigger overpurchases or subsequent waste (Waste and Resources Action Program, 2012), nor does it signal inferior quality to consumers. In contrast, price reductions or volume promotions may prompt consumers to buy larger packages than they can consume, so eventually they throw away the food too (Koivuporo et al., 2012).

Our findings also contribute to discussions of FWB, because consumers' relationships with food can shift to contribute to societal well-being (Bublitz et al., 2013, Block et al., 2011). With our holistic approach, we identify an intervention that benefits people (who are more inclined to consume healthy products, without triggering their overpurchases) and society as a whole (by decreasing food waste).

In practice, some supermarkets and organizations already assign human characteristics to abnormally shaped fruits and vegetables in advertising campaigns, but scientific evidence on the effectiveness of this approach has been lacking. We provide retailers with evidence in support of this intervention, which creates an opportunity that benefits consumers, by encouraging them to consume healthy snack options, as well as farmers, growers, and commercial entities, which can profit from selling more produce. In contrast, current strategies that aim to reduce food waste suffer various issues. For example, price reductions may have the unintended effects of not only harming consumers' quality perceptions but also creating price pressures across the category. A shopper choosing between somewhat misshapen carrots at a low price and aesthetically pleasing, high priced carrots might switch easily to the cheaper option and substitute for normal purchases. For a grower that has invested heavily in infrastructure and processes to produce carrots that meet very high aesthetic standards set by supermarkets, only to find the market has shifted to a preference for "ugly," cheaper alternatives (Mortimer, 2015), price-based interventions may be detrimental. The overall objective thus should be to find markets for both normal and misshapen produce.

Instead of keeping customers away from imperfect produce and imposing unrealistic standards, supermarkets should gradually introduce misshapen produce into their assortments and invest in advertising to promote these items. Such steps would help shoppers become familiar with

misshapen produce and include them in their consideration sets. Incidental exposure to advertising, even when consumers do not pay full attention to it, increases the likelihood that an advertised product will enter a consideration set (Shapiro, MacInnis & Heckler, 1997). In line with our finding that taste is an important driver, we also recommend tasting booths that allow consumers to experience unfamiliar foods, which could be an effective, complementary strategy to increase consumers' acceptance of misshapen fruits and vegetables (Tuorila et al., 1998).

7.3 Limitations and Further Research

First, we tested our intervention with a limited amount of food products. Continued experiments should test other fruits and vegetables to determine if our findings generalize. In particular, we note that EU rules for appearance have been removed for 26 products (e.g., carrot, cucumber, onion, eggplant) but remain in place for 10 products (e.g., apple, tomato, strawberry, bell pepper) (European Commission, 2008). Thus, it might be advisable to start with the first group; the second group can only be sold with specific labeling, which ultimately could require a different approach.

Second, in Study 4, we attempted to capture behavior, but we did not require actual purchases. These respondents knew they were being observed, so they might have behaved in a socially desirable manner. However, they were unaware of the study hypotheses; each respondent only saw one type of poster, so our finding of a greater impact of just one of the four posters (anthropomorphized, abnormal carrot) suggests confidence in our results. Nevertheless, as a follow-up, it might be interesting to test the proposed intervention in practice and assess actual shopping behavior in a supermarket. Intentions are good predictors of behavior, but a large intention-behavior gap persists, especially with regard to sustainable consumption (Vermeir & Verbeke, 2006). For food products, price, quality, convenience, and brand familiarity remain the

most important decision criteria (Carrigan & Attalla, 2001). Testing our proposed intervention in a supermarket and alternating the posters could enhance external validity. Additional experiments also might examine the effects of a familiar brand that promotes an abnormally shaped product.

Third, some concerns might be raised regarding the generalizability of our results to other sample populations or cultures. In the United States for example, consumers are more accustomed to purchasing aesthetically perfect produce, but in southern Europe (Spain, Portugal), imperfect produce is encountered far more often. In addition, recent food crises could leave consumers more concerned about food quality and safety issues (e.g., dioxin, hoof-and-mouth disease).

In turn, investigating the impact of informing consumers about the disadvantages of food waste and increasing their environmental concern might prove novel insights as well. Loebnitz and Grunert (2014) find that participants with high objective knowledge indicate lower risk perceptions and higher taste, health, and quality expectations with regard to food shape abnormalities, compared with participants with low objective knowledge, so educating and informing consumers might have positive influences. Changing consumer behavior represents an effective strategy for fostering sustainable change (Heller & Keoleian, 2003), but to do so, food retailers first must make misshapen produce available to them, who in turn need to be motivated to buy it (Stern, 2000).

To conclude, we highlight that “ugly food” programs can be a win-win proposition for everyone in the supply chain; growers, retailers, and consumers. Our empirical findings point to a potentially more effective use of government dollars—currently being spent on public campaigns to reduce customer-level food waste—in the effort to curb waste throughout the entire food chain.

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9. Appendices

9.1 Appendix A. Stimuli

Study 1



Study 2



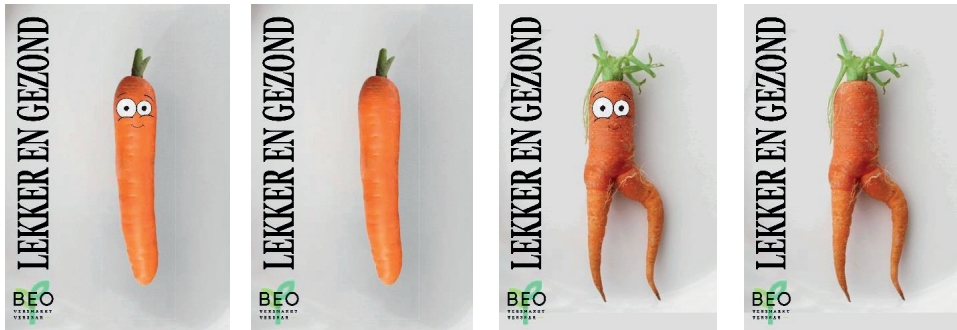
Translation: “a tomato a day will make you smile” – Sligro, soon in your neighborhood

Study 3



Translation: “a cucumber a day will make you smile” – Sligro, soon in your neighborhood

Study 4



Translation: “tasty and healthy”

9.2 Appendix B. Study 4 Store



CHAPTER III:
CROSS-NATIONAL INVESTIGATION
OF THE DRIVERS OF OBESITY:
RE-ASSESSMENT OF PAST FINDINGS
AND AVENUES FOR THE FUTURE

CHAPTER III: CROSS-NATIONAL INVESTIGATION OF THE DRIVERS OF OBESITY: RE-ASSESSMENT OF PAST FINDINGS AND AVENUES FOR THE FUTURE

In this paper we question whether prior cross-national differences in food attitudes still exist and if so, to what extent. Due to societal evolutions such as sedentarism and globalization, international variations in food attitudes may not be as pronounced as currently believed. A cross-sectional web-based survey was carried out in the United States, the United Kingdom, France and Belgium. A total of 2167 respondents (52% women; mean age = 39.0 years, SD = 11.4) participated. To successfully combat obesity, a joint approach focusing on food choice and physical activity is required; therefore we included behavioral measures by means of choice tasks for these two important drivers. Further, the extent to which respondents subscribe to the unhealthy = tasty intuition, together with health and taste interest were investigated. Socio-demographic information and self-reported heights and weights were also incorporated. Logistic regressions were fitted with weight status as the dependent variable and the attitudinal and behavioral measures as independent variables. Our findings indicate that having a higher interest in healthy eating decreases the chance of being overweight (odds = 0.88) and believing that unhealthy food is tasty significantly increases the chance of being obese by 1.18 times. Overall, we find that food attitudes have largely converged across the countries we investigated.

This chapter is based on the published article: Cooremans, K., Geuens, M., & Pandelaere, M. (2017). Cross-national investigation of the drivers of obesity: Re-assessment of past findings and avenues for the future. *Appetite*, 114, 360-367, doi.org/10.1016/j.appet.2017.04.010

1. Introduction

Over the past decades, obesity has evolved from a predominantly Anglo-American problem to a worldwide recognized epidemic (James, 2008). Based on recent figures 33% of adults in the United States are overweight (BMI between 25 and 30) and 36% (BMI above 30) are obese. Europe is rapidly catching up with 36% of adult population being overweight and 17% being obese (OECD, 2013).

Being overweight or obese is caused by an energy imbalance between calories consumed and calories expended (WHO, 2014). Reducing energy intake and/or increasing energy expenditure can help to restore the balance. With respect to the former, several researchers assume that consumers' attitudes towards food (e.g., the liking of fast food) (Dave, An, Jeffrey, & Ahluwalia, 2009) and the importance given to different characteristics of food (e.g., health and taste) (Zandstra, De Graaf, & Van Staveren, 2001) have largely contributed to the worldwide prevalence of obesity. Food attitudes are anchored on a cultural heritage, which varies across countries. Americans, for example, have a utilitarian view on food where they tend to focus on high quantity and value for money (Stearns, 2002). They experience food mostly as a health stressor and therefore do not have a positive relationship with food; it is more a source of worry than a source of pleasure (Fischler & Masson, 2008). The French, in contrast, are claimed to have an experiential view where they consider food as a source of pleasure and worry the least about its impact on health (Rozin, Fischler, Imada, Sarubin & Wrezniewski, 1999).

Further, in the US, where obesity and the consumption of unhealthy food used to be most pronounced, many consumers are found to associate unhealthy food with a good taste and healthy food with a poor taste (Raghunathan, Naylor &, Hoyer, 2006). In France, on the other hand, where

a lower prevalence of obesity can be found, the belief that healthy food is tasty is more common (Werle, Trendel, & Ardito, 2013).

The French Paradox illustrates the remarkable relationship of the French with food; although consuming a highly palatable diet containing more fat than other diets, they exhibit lower levels of obesity and heart diseases (Rozin, 2005). Part of this can be attributed to portion size, with the French consuming smaller portions compared to Americans (Rozin, Kabnick, Pete, Fischler, & Shields, 2003). Consequently, in the past, France has often been put forward as a nutritional role model (Ferrières, 2004 and Guiliano, 2004). However, over the past 10 years, France has witnessed an alarming rise in obesity rates by more than 40% (OECD, 2013). Even though the proportion of overweight people to the total population is still rather low in France, their relative position to other countries has severely deteriorated between 2000 and 2010 (OECD, 2013). The increasing availability and success of fast food and prepared foods together with the loss of “common food culture” seem to be causing this recent change (Steinberger, 2009).

From this overview, two important observations can be made. First, previous findings are no longer in line with current trends and observations. Because of societal evolutions such as globalization, urbanization and modernization, we question whether prior cross-national differences in food attitudes still exist or whether the importance of national background may currently be exacerbated. The rapid spread of global supermarket chains (Hawkes, 2008) and fast food restaurants, together with the rising availability of prepared convenience foods, are only some of the factors that are changing the nutrition environment and thereby challenging traditional consumption patterns. We propose that the impact of cultural backgrounds in how people choose their food is becoming less pronounced and that food attitudes might be converging.

Second, there is a lack of research combining food attitudes with measures for physical activity; given the fact that obesity results from an energy imbalance, a joint approach focusing on both aspects is necessary to tackle the obesity epidemic. Indeed to our second observation, while a number of studies have focused on international differences in food attitudes and consumption patterns, less attention has been directed to physical activity (Fox & Hillsdon, 2007). Current actions that are used to attack the ongoing rise in obesity rates are mostly aimed to reduce the gap between dietary recommendations and actual food consumption. However these actions, such as front-of-pack nutrition labeling (Feunekes, Gortemaker, Willems, Lion, & Van den Kommer, 2008), mass-media campaigns (Beaudoin, Fernandez, Wall, & Farley, 2007), and taxes on sugar-sweetened beverages (Lin, Smith, Lee, & Hall, 2011), have failed to reverse this trend (Roberto, Swinburn, Hawkes, Huang, Costa, et al., 2015).

Maintaining both a healthy diet and adequate levels of physical activity are necessary when striving for a healthy weight. In the US, reports have suggested that most adults trying to lose weight are not combining a calorie-reduced diet with sufficient physical activity or with the necessary lifestyle changes (Kruger, Galuska, Serdula, & Jones, 2004). With only 26% of the population being able to meet the current minimum (30min/day) activity guidelines (Hill, 2009), there is ample room left for improvement. However, advocating increased intensive physical activity or relying on extensive self-regulation might also fail to reverse the rising obesity trend. Recent reports indicate that taking baby steps – not giant leaps – is the best way to get lasting results (Lutes et al., 2012). Strategies, such as a small changes approach, where people incorporate small lifestyle changes to prevent weight gain should be further explored in the obesity debate (Hill, Wyatt, & Peters, 2012).

Moreover, the launch of recent interventions for lifestyle changes, such as “Bouger 30 minutes par jour, c’est facile” (*Moving 30 minutes per day, it’s easy*) by the French government or “Step it up”, a call to action by the US Surgeon General, confirm there is a growing emphasis on easily applicable physical activities, such as walking. Several studies have taken into account the extent to which people engage in moderate-vigorous physical activities, but research on how people from different countries incorporate small physical activities is still at its infancy (Dong, Block, & Mandel, 2004 and Gordon-Larsen, McMurray, & Popkin, 1999). The advantage of investigating small physical activities compared to traditional structured exercises is that the approach is transferable across socially, culturally and economically diverse populations (Lutes et al., 2008).

In light of these two observations, (1) that current obesity trends and observations are no longer in line with previous findings, and (2) the lack of research combining physical activity and food consumption, the purpose of this study is threefold. First, this study aims to evaluate current national differences and equalities in health and taste attitudes to food consumption. Second, next to food attitudes, we also investigate national differences in food choice behavior and the incorporation of small physical activities. Measuring how people incorporate both drivers is necessary in order to draw meaningful conclusions about the determinants affecting weight status as studies that take into account only one of both drivers can provide biased results. Third, we explore in four countries (United States, United Kingdom, France and Belgium) how these attitudinal and behavioral factors are associated with overweight and obesity.

Establishing the link between nationality, food attitudes and weight status is not always straightforward and to our knowledge not many studies have taken all three factors into account. Pieniak, Pérez-Cueto, & Verbeke (2009) analyzed cultural differences in consumers’ interest in healthy eating and its association with being overweight or obese in three European countries.

However, no significant association could be found between interest in healthy eating and the likelihood of being overweight or obese. Another study, by Pérez-Cueto et al. (2010) investigated the association between Food-Related Lifestyles and obesity in five European countries. Overall, a stronger interest in health was associated with ‘not being obese’.

Prior studies investigating cross-national differences in food attitudes have often either focused on individual countries in Europe or on the US without making a direct comparison between nations or have made use of different sources of data. This study aims to compare both regions more adequately by using the same sampling method and the same questions. Apart from using validated scales, this study also contained behavioral measures by means of choice tasks. Incorporating behavioral measures allowed testing whether drivers of differences in weight status may not be limited to food attitudes, but also (and to what extent) a result of behavioral characteristics.

2. Material & Methods

2.1 Data Collection

To capture sufficient cultural variation, a cross-national web-based survey was carried out in four countries with differing levels of obesity prevalence: the United States (US), the United Kingdom (UK), France (FR) and Belgium (BE) where respectively 34.3%, 27.3%, 22.0% and 21.5% of the adult population has a BMI ≥ 30 (WHO, 2014). Furthermore, the countries we targeted are intended to depict a fairly representative picture of important national differences in the struggle against obesity; the US, known to suffer severely from the obesity epidemic, and which has been the subject of many previous research proving a well-studied benchmark; the UK, the leading country in Europe regarding obesity rates; France, formerly appraised for its favorable relationship with food, but now increasingly suffering from the obesity epidemic; and Belgium, a country with

similar views on food as France, though less pronounced. Quota samples on gender (male, female) and age categories (20-29, 30-39, 40-49 & 50-59) were applied. Total sample size was 2167 respondents (52% women, 48% men; $M_{age} = 39.0$, $SD = 11.4$). Table 1 shows the sample characteristics.

Table 1. Demographic characteristics of the sample.

	US (n = 650)		UK (n = 530)		France (n = 511)		Belgium ^a (n = 476)	
	%	N	%	N	%	N	%	N
Gender								
Male	51.7	336	45.7	242	41.9	214	52.1	248
Female	48.3	314	54.3	288	58.1	297	47.9	228
Age								
20-29	20.9	136	22.1	117	34.8	178	27.3	130
30-39	22.0	143	27.0	143	32.1	164	18.9	90
40-49	30.2	196	27.0	143	25.8	132	28.2	134
50-59	26.9	175	24.0	127	7.2	37	25.6	122
Education								
(less than) High School	40.0	260	42.8	227	35.2	181	50.6	241
2-4 year College Degree	50.0	325	40.2	213	39.5	202	26.3	125
Master's degree or higher	6.6	43	10.9	58	17.8	91	15.5	74
Other	3.4	22	6.0	32	7.4	38	7.6	36
Income								
Below average	45.7	297	38.5	204	30.5	156	32.4	154
Average	40.9	266	42.1	223	54.0	276	53.6	255
Above average	13.4	87	19.4	103	15.5	79	14.1	67
Living Area								
Urban	29.2	190	33.8	179	45.0	230	31.9	152
Suburban	45.8	298	47.4	251	20.2	103	32.4	154
Rural	24.9	162	18.9	100	34.8	178	35.7	170

^a 90.1% of the respondents are Flemish speaking citizens and 9.9% are French speaking. The two groups did not show a significant difference on any of the variables of interest.

Comparing the sample characteristics to the WHO global database on Body Mass Index confirms that the sample is representative and satisfactory for the proposed objectives (Table 2). Only for France, people who are overweight or obese are significantly underrepresented in the sample. To address this slight deviation from representativeness, all analyses involving weight status were repeated with weight-adjusted means. Since there was no impact on the results, they were not included in this paper.

Table 2. Prevalence of overweight and obesity, comparison with WHO data

	Present study		WHO data adults 2014		p-values	
	Age 20-60		Age 18+			
	Overweight (%) BMI $\geq$ 25	Obese (%) BMI $\geq$ 30	Overweight ^a (%) BMI $\geq$ 25	Obese ^b (%) BMI $\geq$ 30	Overweight	Obese
US	61.3	32.8	67.9	34.3	.40	.79
UK	58.3	26.6	63.1	27.3	.53	.89
France	36.6	12.9	59.2	22.0	.001	.01
Belgium	51.7	16.0	58.7	21.5	.33	.17

^a <http://apps.who.int/gho/data/node.main.A897A?lang=en>

^b <http://apps.who.int/gho/data/node.main.A900A?lang=en>

2.2 Measures

A web-based survey was distributed in four countries with the help of Qualtrics panels. The survey was originally constructed in English and was translated to Dutch and French by fluent bilinguals. The survey measured healthy choice behavior and food attitudes, and ended with socio-demographic information and self-reported height and weight.

First, to measure respondents' health behavior, they had to fill out two choice tasks in which they were confronted with 20 pairs of a relative healthy and unhealthy food item, and with five situations that can present themselves in daily life, but that vary in level of activity. The pairs

are used as an indication of food choice behavior and the situations serve as an indication for the extent to which people incorporate small physical activities. Examples of food choices are: salad vs. pizza, healthy bagel vs. hamburger, granola bar vs. brownie, muesli vs. fruit loops, etc. The choice of pairs was in line with items used in previous research. Examples of the situations are: 'You arrive at your office building and your desk is on the 3rd floor. Most of the times you: take the stairs vs. take the elevator.' or 'When you have to go somewhere by car you: park your car in the spot that's closest to the entrance/exit vs. deliberately park your car further away, because some extra exercise never hurts.' This method is based on practical examples from the small changes approach, on how people can incorporate small physical activities into their daily life. For each pair and each situation there was a relatively healthy option and a relatively unhealthy one. The two resulting scores indicate that a person demonstrates healthier food choices and/or engages in more physical activity in daily life. The order of the different pairs and situations was randomized and counterbalanced.

Next, to assess the importance consumers attach to health and taste aspects of food and to compare with previous findings, we used two subscales from the Health and Taste Attitude Scale (HTAS) (Roininen, Lähteenmäki, & Tuorila, 1999). For Health, the eight item General Health Interest subscale was used, and for Taste, the six item Pleasure subscale was included (7-point Likert scales, 1=totally disagree; 7=totally agree). To assess differences in food associations, respondents explicitly indicated to what extent they believe that health and taste are inversely related (Unhealthy=Tasty Intuition; UTI) by means of two items on a 7-point Likert scale (i.e., "Things that are good for me rarely taste good", "There is no way to make food healthier without sacrificing taste") (Raghunathan et al., 2006).

The survey ended with socio-demographic questions and self-reported height and weight. Body Mass Index (in kg/m^2) was calculated as weight (in lbs) divided by the squared height (in in^2) times 703 for the United States and the United Kingdom, and as weight (in kg) divided by the squared height (in m^2) for France and Belgium. BMI was categorized into four weight status categories, according to the standard classification by the World Health Organization, i.e., underweight (BMI<18.5), normal weight (BMI between 18.5 and 24.9), overweight (BMI between 25.0 and 29.9), and obesity (BMI $\geq$ 30.0).

2.3 Data Analyses

A confirmatory factor analysis was performed using the maximum likelihood procedure in AMOS 22 both on the pooled sample and by country. Since the chi-square statistic is sensitive to sample size, commonly used fit indices that are less affected were used like Root Mean Square Error of approximation (RMSEA), Bentler's Comparative Fit Index (CFI) and the Tucker Lewis Index (TLI). The following cut-off values suggest good model fit: less than 0.05 for RMSEA and near 0.95 for CFI and TLI (Hu & Bentler, 1999). Next, multi-group confirmatory factor analysis (MGCFA) was used in AMOS 22 to test for cross-national measurement invariance (Steenkamp & Baumgartner, 1998). Further analyses have been performed using the statistical software SPSS 21. Comparisons of means have been conducted through one-way ANOVA. To account for differences in group size, Gabriel and Games Howell post-hoc tests have been applied to assess which group means significantly differ from each other. In line with the third objective, ordered logistic regressions were fitted to explore associations between the different weight status categories and health behavior, food attitudes and socio-demographic characteristics.

3. Results

3.1 Confirmatory Factor Analysis

To test how well the measured items represent the intended constructs, a confirmatory factor analysis (CFA) was performed. The 16-item model with 8 items for health, 6 for taste and 2 for unhealthy=tasty intuition did not show an acceptable fit (Table 3). The scales that were used to measure health and taste interest are originally comprised of positive and reverse worded items, a common practice in consumer research. In cross-national research, on the other hand, positive and reverse worded items can be interpreted differently and can confound the above lying constructs (Wong, Rindfleisch, & Burroughs, 2003). An exploratory factory analysis (EFA), taking factor loadings >0.60 on the focal factor and $<.35$ for cross loadings as criteria (Aaker, 1997, Geuens et al., 2009 and Nunnally, 1978), resulted in a nine-item, three-factor solution. As all reversed items had high cross loadings, none of them were used for the final scales. Standardized factor loadings and composite reliabilities are presented in Table 4. Repeating the CFA indicated good fit for this model. This model was retained for further analyses.

Table 3. Fit Indices from CFA on the pooled sample and by country

	χ^2	d.f.	Cmin/df	RMSEA	CFI	TLI	CAIC
16 items - 3 factor model	2344.11	101	23.21	.10	.79	.75	2647.95
9 items - 3 factor model	166.63	24	6.94	.051	.98	.96	348.93
9 items - 3 factor model US	71.43	24	2.98	.055	.98	.97	228.47
9 items - 3 factor model UK	61.89	24	2.58	.055	.98	.96	214.62
9 items - 3 factor model FR	64.77	24	2.70	.058	.96	.93	216.73
9 items - 3 factor model BE	81.72	24	3.40	.071	.95	.93	232.19

Note. For all models: $p < 0.001$.

Table 4. Factor loadings and composite reliability estimates of the items and constructs

Constructs and items	
Health	(0.82)
1. I am very particular about the healthiness of food I eat	0.78
2. It is important for me that my diet is low in fat	0.65
3. I always follow a healthy and balanced diet	0.76
4. It is important for me that my daily diet contains a lot of vitamins and minerals	0.75
Taste	(0.69)
1. When I eat, I concentrate on enjoying the taste of food	0.63
2. It is important for me to eat delicious food on weekdays as well as weekends.	0.69
3. An essential part of my weekend is eating delicious food.	0.64
UTI	(0.79)
1. Things that are good for me rarely taste good	0.86
2. There is no way to make food healthier without sacrificing taste	0.75

3.2 Measurement invariance

The data were collected in four different Euro-American countries, raising some concern regarding the measurement equivalence across the collected information. To assess measurement invariance, nested models were applied to the sample data where greater restrictions were placed on each successive model by constraining an additional set of parameters to equality across countries. Model 1 or the configural model is the least restrictive of the models and reflects equivalence in factor structure only (i.e., the only constraint is that a three-factor solution should fit for all countries). Model 2 assumes metric invariance and places equivalence on factor loadings (i.e., the factor loading for any given item is assumed to be identical across all countries). Model 3 assumes scalar invariance and constrains intercepts to equality in addition to factor loadings (i.e.,

besides identical factor loadings for any given item, the intercepts must be equal as well). In order for making meaningful comparisons of means across countries, scalar invariance of the items is required (Meredith, 1993). As recognized by Steenkamp and Baumgartner (1998) few scales achieve full cross-cultural scalar invariance. Consequently, they recommend that researchers conduct tests of partial metric and scalar invariance by examining which factor loadings and intercepts are invariant and relaxing the constraints on non-invariant loadings and intercepts as a means of improving model fit. At least two item loadings and intercepts per factor are required to be invariant for partial scalar invariance.

We tested the hierarchical models and report the results of the multi-group analyses in Table 5. Constraining factor loadings and imposing metric invariance improved the model fit compared to the configural model, but when constraining item intercepts to assess scalar invariance, model fit decreased. As proposed by Steenkamp and Baumgartner (1998), we tested for partial scalar invariance and gradually relaxed the constraints on three item intercepts. To determine the level of between-group invariance of CFA models absolute changes in the goodness-of-fit indexes are used as an indication instead of the chi-square likelihood ratio test, which is overly sensitive to sample size. More specifically, ΔCFI has proven to be a robust statistic for testing between-group invariance of CFA models. Cheung and Rensvold (2002) suggest that a value of $\Delta CFI < .02$ and $\Delta RMSEA < .01$ are indications that the null hypothesis of invariance should not be rejected. In the partial scalar model ΔCFI was close to the maximum of .02 and $\Delta RMSEA$ was well within the boundary of .01, providing support for partial scalar invariance.

Table 5. Nested model comparisons

Invariance type	χ^2	d.f.	Cmin/df	TLI	CFI	Δ CFI	RMSEA	Δ RMSEA
Configural	279.81	96	2.92	.953	.969		.030	
Metric	311.82	114	2.74	.957	.966	-.003	.028	.002
Scalar partial ^a	440.31	132	3.34	.942	.947	-.019	.033	.003
Scalar	677.73	141	4.81	.906	.908	-.058	.042	.012

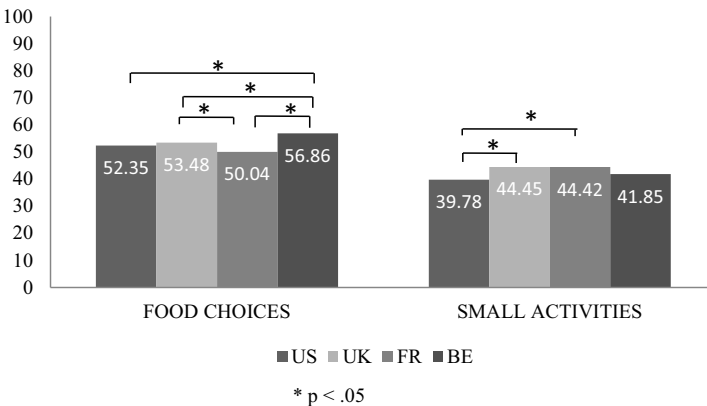
^a H1, H2 and P3 intercepts relaxed

3.3 Country effects

To test for international differences in food choice behavior, the implementation of small physical activities, general health interest, taste interest and UTI, ANOVAs were conducted.

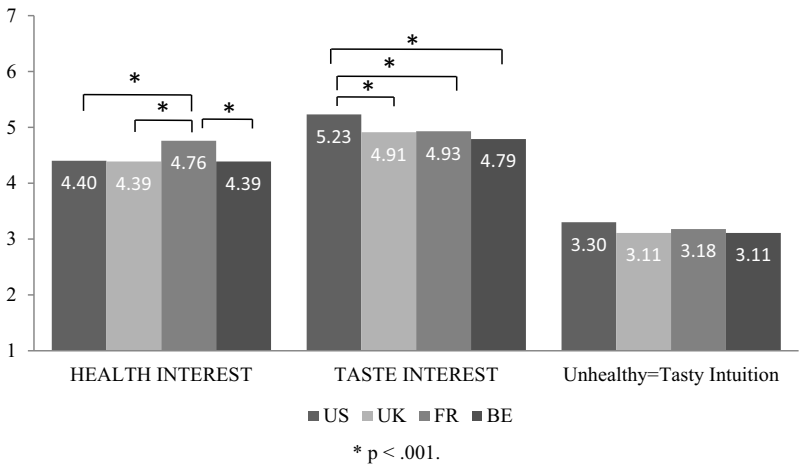
With respect to the health-related choice tasks, for ease of interpretation we converted these scores to percentages. Results indicate that there is a significant country effect in the food choice task ($F(3,2163) = 10.70, p < .001$). The Belgians chose the highest amount of healthy options in the food choice task. People from the UK chose more healthy food options than people from FR. No significant difference between the US and FR ($p = .15$). In the small physical activities task ($F(3,2163) = 4.17, p = .01$), people from the US incorporate fewer small physical activities into their daily life compared to people from the UK ($p = .02$) and FR ($p = .02$) (Fig. 1).

Fig. 1. Percentage of healthy choices in the choice task for food pairs and small physical activities.



Regarding between-country differences in health interest, taste interest and UTI, the data reveal that French respondents score higher on health interest compared to respondents from the US, the UK, and BE (all p 's < .001) (overall $F(3,2163) = 12.23$, $p < .001$). The French thus attach the most importance to following a healthy diet. The US respondents score higher on importance attached to taste, compared to the UK, FR and BE (all p 's < .001) (overall $F(3,2163) = 8.56$, $p < .001$). No significant between-country differences were found for the extent to which people believe that health and taste are inversely related (i.e. unhealthy=tasty intuition) ($F(3,2163) = 2.29$, $p = .08$). In other words, unhealthy food is not considered significantly tastier in one country compared to another. Overall, the scores for the countries we investigated are below the mean, indicating that only a weak unhealthy=tasty intuition was observed (see Fig. 2).

Fig. 2. Mean values of interest in health, taste and UTI



3.4 Logistic regressions

In line with the third objective, where we investigate the association between the aforementioned parameters and weight status, we present the results from a logistic regression on the pooled sample in Table 6. Each year of age adds 1.04 to the likelihood of being overweight or obese. Women have .60 times less chance of being overweight than men do ($p < .001$). Compared to the US, people from FR have .68 times less chance of being overweight ($p = .01$). The chance of being obese is lower in FR and BE compared to the US. Alarming, the chance of being overweight and obese is equally high in the UK and the US ($p = .43$ and $p = .29$ respectively). Having a higher interest in healthy eating decreases the chance of being obese by 0.88 ($p = .03$). Believing that unhealthy food is tasty increases the chance of being obese by 1.18 ($p < .001$). Contrary to expectations, choosing more healthy food options is associated with higher chances of being overweight by 1.09 ($p = .02$), which could indicate the presence of reverse causality (i.e. being obese increases interest in healthier food intake). We do find that incorporating more small physical activities can be associated with a lower chance of being obese by .79 ($p < .001$). With regards to public health, overweight does not present a serious health risk factor, but obesity does. The most important findings here are thus that having a higher health interest and incorporating more small physical activities goes together with lower chances of obesity, whereas a greater belief that a food's healthiness and tastiness are inversely related is associated with a higher chance of being obese.

Table 6. Odds ratios for obesity and overweight

	OVERWEIGHT^a			OBESE^b		
	Exp(B)	Wald	p-value	Exp(B)	Wald	p-value
Age (years)	1.04	58.21	<.001	1.04	54.41	<.001
Gender male (reference)	1.00			1.00		
Gender female	0.63	18.09	<.001	1.24	3.19	.074
Country						
US (reference)	1.00			1.00		
UK	1.13	0.62	.430	0.85	1.13	.288
FR	0.68	6.31	.013	0.33	40.43	<.001
BE	0.98	0.03	.875	0.41	28.40	<.001
Health interest	0.93	1.66	.198	0.88	4.49	.034
Taste interest	0.98	0.15	.698	0.97	0.28	.598
Unhealthy=tasty food association	1.07	3.05	.081	1.18	14.47	<.001
Health score food pairs	1.09	5.20	.023	1.03	0.71	.401
Health score situations	0.93	2.64	.104	0.79	21.49	<.001

Nagelkerke $R^2 = 0.158$ ^a includes respondents with BMI between 25 and 30^b includes respondents with BMI ≥ 30

Note: An investigation of the impact of the different factors on BMI (after log transformation) as a continuous variable indicated no effect for gender, and similar effects as those in the obese category.

4. Discussion & Conclusion

While obesity adversely affects society, very little is known about the different factors driving this worldwide problem. Over the past years, several interventions, campaigns, laws, etc. have been executed, but information on how people are currently behaving and taking all this into consideration is scarce. This is one of few studies comparing food attitudes between different countries in Europe and the US, in which also weight status is taken into account. By using the same sampling method and the same questions, the data we obtained are comparable across the different countries. A first objective of this paper was to reassess earlier findings on food attitudes in four different countries. Findings revealed that people in France attach most importance to eating healthy, whereas people from the US strive most to eating tasty and delicious food compared to the other countries. This is not in line with previous findings that the French are

mostly focused on pleasure and that the Americans are mostly known for associating food with health and least with pleasure (Rozin, et al., 1999). It is possible, however, that the French might derive more pleasure from eating healthy food, as they attach great importance to balance, variety and freshness (Fischler & Masson, 2008). Although significant, the differences we found were very small from an absolute perspective. Furthermore, while past research reported large differences in the extent to which US and French consumers believe that health and taste are inversely related, our measurement did not confirm this (Raghunathan, Naylor, & Hoyer, 2006 and Werle, Trendel, & Ardito, 2013). For the four countries we investigated, we found that people from the US attach most importance to eating tasty and delicious food (something generally associated with unhealthy foods), whereas the French are most concerned with eating healthy food. Therefore, even though we were unable to capture the previously established American – French distinction in unhealthy = tasty intuition, it is possible that our measure of the unhealthy=tasty intuition is too coarse to detect between-country differences. Based on our data, it is not clear whether there is a difference in unhealthy = tasty intuition present between the four countries, but that our UTI measure could not detect or not. We conclude that, in line with expectations, food attitudes are converging across the countries we investigated.

As a second objective, we investigated food choice behavior and the incorporation of small changes in physical activity. When investigating healthy behavior, people from Belgium made more healthy food choices than the other countries. France made the most indulgent food choices from the countries we investigated, which is in line with previous evidence that the French do not deny themselves certain types of food (Rozin et al., 2003). For the implementation of elements from the small changes approach, France and Belgium take the lead in number of active choices. Although Belgians have an equal health interest as in the US and the UK, they demonstrate more

health-consistent behavior in the choice tasks. This could indicate that these healthy choices are more integrated in their daily life than in the other countries. Even though there are still substantial differences in the prevalence of obesity across the different countries, the cross-national differences on the measures in this study were small.

Finally, we explored how the foregoing attitudinal and behavioral factors relate to weight status. Given the extent of the obesity epidemic and the growing public awareness, more people have acknowledged that eating healthy is important. The increased chance of being overweight as a result of a higher score on the food pair choice task, could suggest that many people try to implement healthier choices. However, due to how precious taste still is, eating healthy may often not be a spontaneous choice. It is possible that when consumers make healthy food choices, this could result in suboptimal choices afterwards such as taking the elevator instead of the stairs, because they feel they have already done their healthy bit (Khan & Dhar, 2006). Another possibility is that, while people might be starting to change their habits, the time lag between action and result makes it difficult for us to already observe its positive effect. Believing that unhealthy food is tasty remains an important predictor of the chance of being obese, therefore research should continue focusing on ways to alter this perception. Incorporating more small physical activities into your daily life together with having a higher health interest could reduce the chance of being obese. While our results are correlational and thus preclude causal inferences, they are nevertheless consistent with this idea. For future cross-national research investigating differences in food attitudes, next to measuring explicit beliefs and interests, it might prove beneficial to incorporate behavioral measures. Furthermore, in battling the obesity epidemic, besides investigating food choices, more research on how people incorporate small lifestyle changes is called for. While large changes must occur to sustain individual weight loss, small

changes could help to prevent gradual excess weight gain. Preventing excessive weight gain still remains easier than treating obesity and once people have started making small changes, they may be more likely to continue making additional changes, so that ultimately over time these small changes can add up to a big lifestyle change. In addition, for people who are already obese or overweight, it may be simpler to start making small, gradual changes to the behavior.

A first limitation of this research is that height and weight were self-reported. Most of the times BMI is underestimated, because people overestimate their height and underestimate their weight. Previous research has shown that self-reported height and weight are significantly correlated with actual measures of height and weight, but with an eventual underestimation of actual BMI (Pérez-Cueto & Verbeke, 2009). Second, the unhealthy=tasty intuition was measured explicitly, but what people say and how they behave does not always correspond. Measuring the unhealthy=tasty intuition implicitly might paint a more nuanced picture. Further, in cross-sectional research, no causal inferences can be drawn. Future research should adopt experimental and causal designs to further investigate the impact of small physical activities or food attitudes on weight status as well as adopting a longitudinal approach. Finally, no information on other lifestyle factors was included (such as alcohol consumption, sport activities or level of sedentary lifestyle), nor differences in portion size or actual food consumption were taken into consideration.

4.1 Implications

The relentless expansion of the processed food industry is no longer the sole problem of the US, other food cultures are severely suffering as well. The French diet, previously broadcasted as the ideal way of eating, is becoming more a marketing message, than a true fact. With France being McDonald's most profitable market outside of the US and the closing of traditional brasseries and

cafés, a turn of tide seemed inevitable (Wile, 2014). Differences in cultural interests to food are not as pronounced as they used to be and policy makers should take this into consideration when developing and promoting health strategies. They should be aware of the changing landscape and target accordingly.

This research adds to the ongoing debate about the drivers behind obesity. Does body mass increase due to physical inactivity or is it a consequence of excess dietary intake (Blair, Archer, & Hand, 2013, Luke & Cooper, 2013 and Swinburn, 2013). To combat obesity, the present study suggests that increasing the implementation of small physical activities has a greater impact than changing food choices. This conclusion should be interpreted with caution as the present study did neither take portion size or actual consumption into account on the food choice side, nor actual amounts of exercising on the physical activity side. Most research on physical activity has been primarily restricted to leisure-time sports or moderate-vigorous activities and results indicate that only few people meet the minimum guidelines. Due to its low threshold and accessibility, encouraging small changes to get sufficient exercise in daily life could accelerate the progress in reversing the obesity trend. Most government campaigns against obesity still focus on food, with less attention being directed to promote physical activity in this battle, but our research suggests that governments should rethink this strategy. Further, by focusing on healthy food choices, in the case of failure, a ‘what the hell effect’ could occur. People struggling to follow a healthy diet, could be even worse off in the end as an initial self-control failure could lead them to further overeat (Baumeister & Tierney, 2011). Continuously exerting willpower leads to depletion and eventually possibly overeating. In contrast, the positive effects of stimulating exercise and implementing small changes may be more likely to enhance one’s mood, stimulate further exercising and positively expand to other life domains as well (Berger, 2004).

Furthermore, we want to highlight the importance of restructuring living environments to encourage more physical activity and discourage sedentary or unhealthy behavior. In France, for example, the government recently launched a program where they promote simple physical activity by encouraging people to complete three 10-minute walking episodes per day. They want to facilitate this by installing street sign indications of walking times for pedestrians (e.g. “city center – 15 minutes”). Other initiatives such as walking meetings are being scheduled more and more. Stimulating employees to be more active and offer the facilities to do so is a win-win situation for companies; it provides a competitive edge and can decrease costs for health-care and absenteeism (Migliore & Merz, 2002). Gaining information on the incorporation of small lifestyle changes is still at an early stage, but could be a promising avenue for future research.

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CHAPTER IV:
MIND YOUR INTUITION –
HOW MINDFULNESS CAN DECREASE
THE UNHEALTHY = TASTY INTUITION

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INTUITION

To limit the amount of cognitive resources, consumers often make use of different heuristics and inferences in the marketplace. One important inference pertains to consumers' tendency to categorize food-related information according to a good/bad dichotomy of healthy vs. unhealthy. The present research examined the relation between mindfulness, dichotomous thinking and the unhealthy = tasty intuition. Four studies shed light on the impact of trait and state mindfulness on dichotomous thinking and by extension the subscription to the unhealthy = tasty intuition and food choice. Higher trait mindfulness was associated with less dichotomous thinking and a weaker unhealthy = tasty intuition, resulting in a healthy choice more often. After a brief mindfulness exercise participants distinguished more categories in a categorization task, reducing the extent to which they subscribe to the unhealthy = tasty intuition. Together, these findings explore a potential cognitive route underlying the positive effects of mindfulness on food choice and decision making.

1. Introduction

According to recent figures, more than half of the adult population is carrying extra and unwanted pounds. In 2016, 39% of adults were considered overweight and 13% obese (WHO, 2018). Governments and policy makers are attempting to stimulate people to reduce energy intake and/or increase energy expenditure. However, an imperative contributor to weight management lies in the observation that people are not always aware of the daily decisions they make about food or the factors influencing their decisions, rendering it hard for them to be changed (Wansink, 2007). As Köster (2009, p.70) described “past behavior, habit and hedonic appreciation are usually better predictors of actual food choice behavior than psychological constructs like attitudes and intentions.” He argues that much decision making occurs at a non-conscious level and that this realization should lead to a rethinking of the methods used in sensory and consumer research.

Specifically, to limit the amount of cognitive resources needed for information processing, consumers often rely on different heuristics and inferences (Roering, Boush, & Shipp, 1986). In this respect, two inferences seem particularly relevant for challenging healthy food decisions: (1) consumers’ tendency to categorize food-related information according to a good/bad dichotomy of healthy vs. unhealthy (i.e. dichotomous thinking), and (2) consumers’ lay belief that health and taste are inversely related, the so called unhealthy = tasty intuition (UTI) (Raghunathan, Naylor & Hoyer, 2006; Mai & Hoffman, 2015). These inferences, together with the reliance on taste as a main driver of food choice (Glanz, Basil, Maibach, Goldberg & Snyder, 1998), can lead consumers to draw incorrect assumptions about a food’s healthfulness (Oakes & Slotterback, 2001), can lead them to underestimate the caloric content of a meal (Rozin, Ashmore & Markwith, 1996), and can increase the preference for unhealthy foods (Raghunathan et al., 2006), thereby impeding their ability to maintain a healthy weight.

In this research, we argue that one inference might be fostering the other, specifically we put forward that a stronger tendency to categorize food-related information according to a good/bad dichotomy of healthy vs. unhealthy may reinforce consumers' belief that health and taste are inversely related. Dichotomous thinking reflects a type of cognitive inflexibility that has been associated with problematic eating behavior and increased attractiveness of forbidden foods (Mann & Ward, 2001). Increased attractiveness of bad, unhealthy and forbidden foods likely results in more intense taste perceptions of these foods. Because the unhealthy = tasty intuition can lead to unhealthy food choices, it is interesting for researchers, policy makers and marketers alike to learn how the determinants of the conflict between health and taste could be reduced, and to identify the variables that can attenuate its negative consequences. In an attempt to offset the automatic processes of categorization and the unhealthy = tasty intuition, we will investigate the role of mindfulness.

Because mindfulness permits direct contact with events as they occur, without the overlay of categorical and habitual thought, consciousness takes on a clarity that permits more flexible, more objectively informed psychological and behavioral responses (Brown, Ryan & Creswell, 2007). By paying attention to the information at hand, mindfulness can minimize the automatic and inattentive reactions around food. Through this process, mindfulness can help to discontinue emotional and cognitive reactions that have become automatic and spontaneous and often have detrimental effects in a consumption environment.

The use of mindfulness-based interventions to combat mindless eating has gained increased attention. In the Western world, mindfulness originated in a clinical setting, where it was used as an intervention for different treatments (see Baer 2015 for an overview). It has also been applied as a lengthy, multicomponent intervention for people dealing with problematic eating

behavior (see Katterman, Kleinman, Hood, Nackers, & Corsica, 2014 for an overview). More recently, researchers have started to investigate the beneficial effects of brief mindfulness exercises on eating behavior (Van de Veer, Van Herpen & Van Trijp, 2015; Jordan, Wang, Donatoni & Meier 2014; Marchiori & Papies, 2014; Arch et al., 2016). The common research design departs from the impact of trait or state mindfulness on food intake, measured by the total amount of calories consumed from one or several presented snack offers. Consequently, most studies are aimed at revealing the beneficial effects of mindfulness during food consumption, but less is known about the ways in which mindfulness strategies bring about their effects (Hölzel et al., 2011; Sedlmeier et al., 2012) or how mindfulness can influence decision making (Karelaia & Reb, 2015). Prior research shows that – when presented with a specific food item – respondents are better able to regulate their *food intake* in a mindful (vs control) condition (e.g. Van de Veer et al., 2015). But, what would happen when respondents have to make *decisions* about food from an array of products, as is typically the case, for example, during grocery shopping or when selecting a dish in a restaurant? In view of the relevance of this question – consumers’ eating behavior is largely determined by these decisions – it is surprising that not much is known yet on *how* mindfulness can influence such *decision making*. To help fill this gap, the aim of the current research is threefold. First, to get a better understanding of *how* mindfulness can influence decision-making, we investigate to what extent mindfulness can decrease the reliance on cognitive inferences. Second, instead of focusing on the quantity of food intake as the outcome variable, we seek to investigate the impact of mindfulness on food *choice*. Third, moving away from the clinical context and longer-term, multicomponent interventions that are usually applied, we also aim to investigate the effectiveness of a short, easy to administer mindfulness exercise in a non-clinical, (non-student) population.

Despite the fact that research on mindfulness has been exponentially growing the past few years, research on how mindfulness can influence decision making is still in its nascent phase (Karelaia & Reb, 2015). Finding ways to empower consumers with meaningful tools is important in the ongoing battle against obesity. To develop more effective interventions and improve our understanding, we shed light on *how* mindfulness can influence *decision making* and *choice*.

2. Conceptual background

To make sense of the complex world we live in and limit the use of cognitive resources, our brain is equipped with predetermined mental schemas to quickly organize information and make decisions, often automatically (Köster 2009; Rangel 2013; Yang et al. 2012). In the marketplace, consumers often make use of different heuristics; they use familiar brand names, packaging cues or anticipated pleasure of consuming the product to aid them in driving their decision. Advertisers and corporations capitalize on these psychological processes to strengthen automaticity in consumer behavior.

2.1 Dichotomous Thinking and the Unhealthy = Tasty Intuition

One important factor hampering healthy food decision making is the belief that unhealthy foods are tastier than more healthful options (Raghunathan et al., 2006). This belief, together with taste as the most important determinant of food choice (Glanz et al., 1998), leads many consumers to choose for unhealthy foods instead of healthy foods. Individual differences exist in the extent to which people subscribe to the unhealthy = tasty intuition. Previous research found that health consciousness (Mai & Hoffmann, 2015), dieting tendency (Irmak, Vallen & Robinson, 2011), and consumer motivation to process nutrition information (Howlett, Burton, Bates & Huggins, 2009)

might be attenuating the extent to which people subscribe to the intuitive belief that the unhealthier the food, the tastier it is. In turn, the unhealthy = tasty intuition might even negatively impact weight (Cooremans, Geuens & Pandelaere, 2017; Mai & Hoffmann, 2015). Because the unhealthy = tasty intuition also operates at an implicit level, it is difficult to offset its implications for food decision making. We argue that an important factor that might be fostering the unhealthy = tasty intuition pertains to consumers' tendency to categorize food-related information according to a good/bad dichotomy of healthy vs. unhealthy (Rozin et al., 1996).

When viewing food products, consumers tend to use overly simplistic generalizations and categorize products as extremely good or bad for health. Thus, some foods are considered wholesome, others unhealthy, and very few are judged to be moderate in health value (Oakes, 2003; Oakes & Slotterback, 2001a, 2001b). This tendency to classify products into dichotomous categories of "good" and "bad," often leads to inferences related to foods' nutritional value (Rozin et al., 1996). Such inferences in turn might lead to a misguided belief about the relationship between a food's healthiness and its impact on weight gain, ultimately resulting in overconsumption (Oakes & Slotterback, 2001b). For example, individuals believe that snacks that tend to be seen as reputable or "good" in terms of health (e.g., raisins or cottage cheese) promote less weight gain than disreputable or "bad" snacks (e.g., potato chips or ice cream), even when they are provided with objective nutrition information that both items contain the same number of calories (Oakes, 2005b). Other evidence suggests that merely altering the name of a food item can influence evaluations of the food healthfulness depending on the "good" or "bad" category that the product name implies (Irmak et al., 2011). Foods perceived as "healthy" are often underestimated in caloric content, whereas "unhealthy" food choices tend to be overestimated (Carels, Harper, & Konrad, 2006; Carels, Konrad, & Harper, 2007). Accordingly, these types of generalizations and

inferences lead to wrongful estimations and could have a suboptimal impact on decision making and weight management (see Provencher & Jacob 2006 for an overview).

The tendency to categorize foods as either good or bad for health likely stems a dichotomous thinking style. Dichotomous thinking can be defined as the tendency to think in terms of binary oppositions such as “good or bad,” “black or white,” “healthy or unhealthy” (Oshio, 2009). This type of thinking can be applied under different conditions, such as when assessing one’s diet as either “on” or “off”, when judging one’s weight status as either “acceptable” or “unacceptable” or when evaluating foods as either “good” or “bad” (Dove, Byrne & Bruce, 2009; Heatherton & Baumeister, 1991; Lingswiler, Crowther & Stephens, 1989). Even though this thinking style might be useful for quick comprehension and decision making, binary thinking about one’s diet and weight status reflects a type of cognitive inflexibility that has been associated with binge eating, restraint eating and a rigid response to dietary transgressions, which in turn impedes people’s ability to maintain a healthy weight (Fairburn, Cooper & Shafran, 2003; Lingswiler et al., 1989; Tiggemann, 2000; Palascha, van Kleef & van Trijp, 2015).

Dichotomous thinking has also been linked to negative outcomes regarding eating disorders and weight regain among obese individuals (Byrne, Cooper & Fairburn, 2004). It has been suggested that an ‘all-or- nothing’ approach to eating and weight control behaviours might make individuals sensitive to frequent lapses in dietary restraint, leading to binge eating or overeating and a failure to lose weight (Fairburn et al., 2003; Polivy & Herman, 1985). Extreme forms of dichotomous thinking have mostly been explored within the area of obesity and/or eating disorders research (Alberts et al., 2012; Byrne, Cooper & Fairburn, 2003, 2004; Dove et al., 2009; Lethbridge, Watson, Egan, Street & Nathan, 2011; Lingswiler et al., 1989). However, as witnessed by the tendency to judge foods as either good or bad, there is evidence that the general population

applies this thinking style as well (Oakes, 2005a, 2005b; Oakes & Slotterback, 2005; Rozin et al., 1996; Tiggemann, 2000).

Beyond leading to over simplistic generalizations, research found that dichotomous thinking also increases the attractiveness of forbidden food (Mann & Ward, 2001). Forbidden foods are mostly high palatable foods that should be eaten with restraint (e.g. chocolate). A central quality dimension of food pertains to taste; therefore increased attractiveness might result in higher taste perceptions of unhealthy or forbidden food. Chronic attention to forbidden food categories combined with a rigid thinking style, will likely strengthen the association that unhealthy foods are perceived to be tastier than more healthful options (Raghunathan et al., 2006). Put differently, the extent to which consumers subscribe to the unhealthy = tasty intuition might be strengthened by their level of dichotomous thinking. A stronger (more extreme) tendency to categorize foods as good or bad, healthy or unhealthy will likely result in a stronger belief that unhealthy foods are tastier.

H1: Dichotomous thinking and the unhealthy = tasty intuition are positively related / People who think more dichotomously will have a higher subscription to the unhealthy = tasty intuition.

2.2 Mindfulness

To target these automatic processes and stimulate people to adopt a healthier choice pattern, we investigate the role of mindfulness. Mindfulness has been described and conceptualized in different ways by a vast amount of researchers, going from a unidimensional construct (Brown & Ryan, 2003) to a five-factor construct (mith, Hopkins, Krietemeyer & Toney, 2006). A two-factor structure has been proposed as the middle ground and has been supported by a number of studies

(Blacker, Herbert, Forman, & Kounios, 2012; Brown, West, Loverich & Biegel, 2011; Myers et al., 2012;). The most frequently cited definition for mindfulness was offered by Jon Kabat-Zinn (1994), who defines mindfulness as “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” (p. 8). Broadly conceptualized and in line with the two-factor structure, mindfulness is comprised of two distinct factors: “(a) enhanced awareness of the full range of present experience, and (b) an attitude of nonjudgmental acceptance of that experience” (Herbert & Cardaciotto, 2005, p. 198).

Mindfulness has been conceptualized as a *state* practiced in mindfulness meditation (e.g., Lau et al., 2006) and as a *trait*, in terms of one’s predisposition to be mindful in daily life (e.g., Baer et al., 2006). Without intervention, trait mindfulness is rather stable over time. However, through practice or mindfulness-based interventions, trait mindfulness can be increased (Kabat-Zinn, 1990). Mindfulness originated in a clinical setting where it found a widespread application for people suffering from anxiety, stress, depression, emotional instability, post-traumatic stress disorder and chronic pain reduction and eating disorders (Hofmann, Sawyer, Witt & Oh, 2010; Ivanovski and Malhi 2007; Rosenzweig et al. 2010, Bays 2009; Tapper et al. 2009).

Apart from treating clinical and psychological conditions, mindfulness-based interventions are being increasingly applied to deal with eating-related problems and weight management. A major determinant of food and weight related problems is mindlessness, so bringing attention and awareness to food intake provides an effective strategy to deal with this. Mindful eating can reduce the attractiveness of unhealthy food for people suffering from binge eating (Kristeller, Wolever & Sheets, 2011) and has been associated with lower BMI (Moor, Scott & McIntosh, 2013). Mindful eating is also associated with smaller serving sizes of energy-dense foods in daily life (Beshara, Hutchinson & Wilson, 2013). Studies have also shown that, due to decreased stress,

mindful individuals are more likely to engage in and maintain healthy behaviors (Roberts & Danoff-Burg, 2010; Ulmer, Stetson & Salmon, 2010). Higher dispositional mindfulness can also affect eating behavior by encouraging attitudinal preferences for healthier foods (Jordan et al., 2014).

More recently, research on mindfulness has evolved from being studied as a lengthy multi-component intervention to being the subject of brief exercises and found its way to non-clinical populations. Several researchers have established the positive effects of brief mindfulness exercises on food consumption; after a brief exercise consumers are better able to compensate for prior food intake (Van de Veer et al., 2015), consume fewer calories from healthy (Jordan et al., 2014) and unhealthy foods (Marchiori & Papies, 2014; Arch et al. 2016) and experience more enjoyment from eating (Arch et al., 2016). Researchers have varied (1) the consumption setting (from a free eating period to multiple tasting tests), (2) the snacks presented (healthy, unhealthy or mixed) and (3) the different factors taken into account (hunger, mood). However, the main focus pertained to eating, whereas the phase that precedes eating, more specifically the decision-making and choice phase, has received scarce attention. This is unfortunate as it might be an important phase to target for improving overall health.

Literature suggests that the receptive nature of mindfulness reframes observations so that they are clearer and less biased (e.g., Brown et al., 2007; Shapiro, Carlson, Astin & Freedman, 2006). Most individuals operate in a conceptual mode of processing. This involves that when viewing a stimulus, a basic human tendency pertains to appraise the object as 'good', 'bad' or 'neutral' (usually in reference to the self). This evaluation is often conditioned by past experiences or cognitive schemas in memory and results in imposing concepts, labels, and judgments on everything that is encountered, often automatically (Bargh & Chartrand, 1999). This tendency is

also witnessed when people classify products into dichotomous categories of 'good' and 'bad' for health, or when they intuitively believe that unhealthy food is tastier than healthy food. A mindful mode of processing on the other hand involves a receptive state of mind, wherein attention is kept to a bare registering of the facts observed and to "be present" to reality as it is rather than to react to it or habitually process it through pre-existing schemas (Brown et al., 2007). By allowing the situation for what is, mindfulness involves less reliance on preconceived ideas, beliefs and biases and more on paying attention to all available information (Bishop, 2002). Mindfulness is also characterized by de-automatization, which helps in discontinuing emotional and cognitive reactions that have become automatic and spontaneous (Kang et al. 2013). In the marketplace, mindfulness may serve as an effective antidote to automatic and reactive behaviors related to consumerism (Rosenberg 2004). By enhancing one's awareness of cognitive-behavioral processes underlying consumption that have become relatively automatic, mindfulness might be able to reduce spontaneous categorizing of food as "good" or "bad" or question the belief that health and taste are inversely related.

H₂: Mindfulness and dichotomous thinking are negatively related / Higher mindfulness will lead to less dichotomous thinking.

Putting the foregoing together (H₁ and H₂), we hypothesize that mindful consumers will be less likely to automatically categorize food-related information according to a good/bad dichotomy of healthy vs. unhealthy, which in turn will reduce their subscription to the unhealthy = tasty intuition.

H₃: Mindfulness reduces dichotomous thinking, which in turn reduces the subscription to the unhealthy = tasty intuition

The evidence that mindfulness has beneficial effects on factors influencing weight management is growing. However, relatively little empirical work has shed light on how mindfulness affects the cognitive processes underlying these mechanisms that improve eating behavior and how they may impact choice. Cognitive rigidity in food decision making is contributing to the obesity epidemic in different ways. On the one hand, dichotomous thinking leads to simplistic generalizations that might result in suboptimal choices. On the other hand, it might foster the unhealthy = tasty intuition. Preliminary evidence in a sample of 24 women with problematic eating behavior ($M_{BMI} = 32.7$) indeed suggests that mindfulness and dichotomous thinking might be related. Results showed that an eight-week mindfulness intervention can decrease food cravings, dichotomous thinking, body image concern, emotional eating and external eating (Alberts et al., 2012). However, the relation between mindfulness and dichotomous thinking has not yet been investigated in a general population though. Moreover, according to Tapper (2017), only one study investigated the effects of mindfulness on food choice. Papies, Pronk, Keesman and Barsalou (2015) showed that a mindfulness manipulation reduces the effect of motivational state (hunger) on food choice in a cafeteria setting. Compared to those in the no training condition, participants in the mindfulness condition were less likely to select an unhealthy snack item and more likely to select a salad.

In four studies we shed light on how mindfulness can influence decision making and lead to healthier food choices. Study 1 explores the association between dispositional (*trait*) mindfulness, dichotomous thinking and the unhealthy = tasty intuition. Study 2 includes a more downstream measure of the unhealthy = tasty intuition and demonstrates the effects on snack choice. In Study 3 we exclude the possibility that mindful people are more cognitive decision makers or more health conscious. In Study 4 we induce acceptance-based situational (*state*)

mindfulness to investigate whether participants in the mindfulness condition rely less on the good/bad dichotomy of healthy/unhealthy by distinguishing more differences between food items (more categories) and whether this decreases their subscription to the unhealthy = tasty intuition.

3. Study 1

The purpose of Study 1 was to examine the association between mindfulness, dichotomous thinking and the unhealthy = tasty intuition. While previous research has investigated the impact of an eight-week mindfulness intervention on dichotomous thinking among a sample of women with disordered eating behavior, we want to extend this relation by including a potential manifestation of dichotomous thinking (cf. the unhealthy = tasty intuition) and by investigating the impact of dispositional mindfulness among a more general population sample.

3.1 Sample and Measures

One hundred U.S. members of Amazon Mechanical Turk ($M_{\text{age}} = 42.76$, $SD = 11.15$; 50% male; $M_{\text{BMI}} = 26.50$, $SD = 6.26$) took part in an online survey.

Participants completed several scales presented in the order as described below, to assess the relation between the different constructs (see Appendix C for a full overview of the items that were used). Dispositional (trait) mindfulness was measured using the KIMS (Baer et al., 2004) and the MAAS (Brown and Ryan, 2003), which were presented in a counterbalanced order.

Mindfulness Attention Awareness Scale (MAAS) The MAAS is a 15-item dispositional measure of mindfulness that primarily assesses the extent to which a person is on “automatic pilot” in his/her daily life. Sample items include “I find it difficult to stay focused on what’s happening in the present,” and “I find myself pre-occupied with the future or the past.”

Participants responded to each item on a 1 (almost never) to 6 (almost always) Likert-scale. We reversed and summed the items so that higher totals indicate higher mindfulness (Cronbach's $\alpha = .93$).

Kentucky Inventory Mindfulness Scale (KIMS) The KIMS is a 39-item scale composed of four subscales assessing observing (e.g., "When I'm walking, I deliberately notice the sensations of my body moving"; 12 items), describing (e.g., "I can easily put my beliefs, opinions, and expectations into words"; 8 items), acting with awareness (e.g., "When I'm doing something, I'm only focused on what I'm doing, nothing else"; 10 items) and accepting without judgment (e.g., "I tend to evaluate whether my perceptions are right or wrong", 9 items). All items were measured on seven-point Likert scales with 1 = never / almost never true to 7 = almost always / always true (Cronbach's $\alpha = .89$).

Dichotomous Thinking and Eating Disorder Scale (DTEDS) The DTEDS includes two subscales assessing dichotomous thinking i) generally, and ii) in relation to eating and weight. A global score is calculated as the average of all items. The DTEDS has good test-retest reliability and internal consistency and is suitable for use with samples of clinical and non-clinical individuals (Byrne Allen, Dove, Watt, & Nathan, 2008). Dichotomous thinking was measured by means of 11 items on 6-point Likert from 1 (strongly disagree) to 6 (strongly agree) (e.g., "I think of food as either "good" or "bad"", "I think of things as either "black" or "white"; Cronbach's $\alpha = .89$).

Unhealthy = tasty intuition (UTI) The UTI was measured using three items ("Things that are good for me rarely taste good", "There is no way to make food healthier without sacrificing taste" and "Healthy food is usually less tasty"; Cronbach's $\alpha = .92$) on seven-point Likert scales (with 1 = strongly disagree to 7 = strongly agree) (Mai & Hoffmann, 2015).

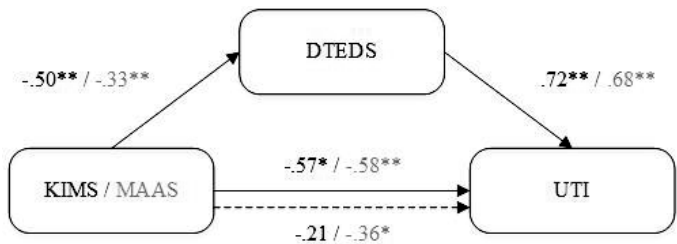
The survey ended with asking participants' height and weight, so that their BMI could be calculated, together with their age and gender.

3.2 Results

First, we investigated the relation between mindfulness and UTI and found a significant effect of mindfulness on UTI ($B = -.57$, $p = .026$, 95% LLCI = -1.08, ULCI = -.07 for KIMS and $B = -.58$, $p = .002$, 95% LLCI = -.95, ULCI = -.21 for MAAS). For a summary of participant data (mean, SD and range) of the variables in the study see Appendix A.

Next, to investigate whether dichotomous thinking mediates the effect of mindfulness on the unhealthy = tasty intuition, a simple mediation analysis (Model 4, 5,000 bootstraps; 95% bias-corrected confidence interval; Preacher & Hayes, 2004) was run. The model confirmed that higher trait mindfulness reduces dichotomous thinking, and in turn leads to a weaker subscription to the unhealthy = tasty intuition ($ab = -.30$, 95% CI = -.51 to -.15 for KIMS and $ab = -.22$, 95% CI = -.49 to -.05 for MAAS) (see Figure 1). By adding dichotomous thinking (DTEDS) to the model, the significant direct effect of KIMS on UTI disappears, indicating a full mediation through dichotomous thinking. For MAAS, we only observe a partial mediation through dichotomous thinking (DTEDS). Consistently the KIMS and the MAAS are highly correlated ($r = .65$, $p < .001$). In addition, we also ran the model for both DTEDS subscales separately of which the results can be found in Appendix B.

Fig. 1. The effect of trait mindfulness on subscription to unhealthy = tasty through dichotomous thinking.



Note: The dashed horizontal line represents the direct effect of mindfulness on UTI when controlling for DTEDS. The full horizontal line represents the total effect of mindfulness on UTI.
 ** : $p < .01$, * : $p < .05$

Studying the relation between the different subscales of the KIMS and DTEDS and UTI, we find that the accepting without judgment subscale is mainly driving the effect ($r = -.47$, $p < .001$ and $r = -.22$, $p = .026$ respectively), whereas the observing, describing and acting with awareness subscales are only weakly related to DTEDS (r 's $< .15$) and UTI (r 's $< .18$).

We also found (marginally) significant positive correlations between BMI and DTEDS ($r = .20$, $p = .046$) and between BMI and UTI ($r = .18$, $p = .077$). This is consistent with the finding that dichotomous thinking and the unhealthy = tasty intuition can systematically negatively impact weight (Byrne et al. 2004; Cooremans et al., 2017; Mai & Hoffmann 2015).

3.3 Discussion

Study 1 confirms the relation between trait mindfulness and dichotomous thinking in a general population and extends this relation to the unhealthy = tasty intuition. Our finding that the relation holds with both mindfulness scales (MAAS and KIMS) demonstrates the robustness of this model. Additionally, we identify the subscription to the unhealthy = tasty intuition as an expression of

cognitive rigidity and an important contributor to the obesity epidemic and acceptance without judgment as the most important element to target.

4. Study 2

In Study 2 we aim to replicate the results from Study 1 and seek external validity by including a choice between a healthy and an unhealthy snack option as a more downstream measure of the unhealthy = tasty intuition. With taste being the most important driver of food choice (Glanz et al., 1998) we expect that people, who strongly believe that unhealthy food is tasty, will be more likely to choose an unhealthy snack option.

4.1 Sample and Measures

96 participants ($M_{\text{age}} = 23.66$, $SD = 7.35$; 68% female; $M_{\text{BMI}} = 21.84$) from a large Western University took part in a lab study in return for course credit. Participants were seated in individual cubicles and filled out an online survey.

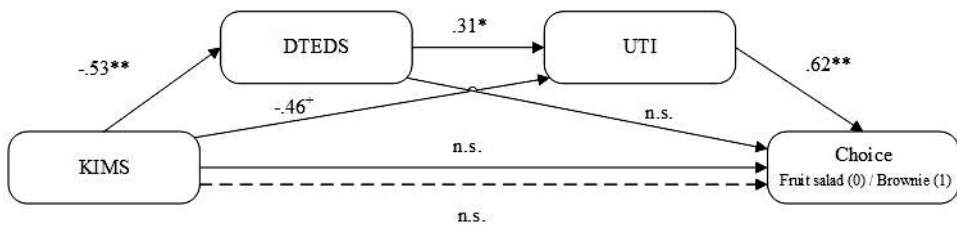
First, dispositional trait mindfulness was assessed using the KIMS. Next, participants filled out the DTEDS and the UTI scales (same as in Study 1). The survey ended with a choice participants had to make between a fruit salad and a brownie. Participants' age, gender, height and weight were also recorded.

4.2 Results

We tested the proposed underlying model that higher trait mindfulness leads to less dichotomous thinking and a lower subscription to the unhealthy = tasty intuition, resulting in a healthier choice more often, by means of a serial mediation analysis (Model 6, Preacher & Hayes, 2008). We used bias-corrected bootstrapping to generate 95% confidence intervals around the indirect effects of

dichotomous thinking and the unhealthy = tasty intuition, as well as the indirect effect through both mediators in a serial order, where mediation occurs if the confidence interval excludes zero (Hayes 2013). The serial mediation analysis (5.000 bootstrap samples) revealed no significant indirect effect for KIMS → DTEDS → choice ($ab = .15$, $SE = .19$; 95% LLCI = $-.18$, 95% ULCI = $.61$) or for KIMS → UTI → choice ($ab = -.29$, $SE = .21$; 95% LLCI = $-.84$, 95% ULCI = $.004$). Importantly, the serial indirect effect through dichotomous thinking and the unhealthy = tasty subscription shows that the path from KIMS to DTEDS is significant ($B = -.53$, $p = .002$), as is the path from DTEDS to UTI ($B = .31$, $p = .037$) and from UTI to choice ($B = .62$; $p = .006$). This full path of serial indirect effects is significant with a 95% confidence interval between $-.35$ and $-.01$. (see Figure 2). In sum, higher trait mindfulness, decreases dichotomous thinking and leads to a lower subscription to the unhealthy = tasty intuition, which increases the chance of choosing a healthy snack option. For a summary of participant data (mean, SD and range) of the variables in the study see Appendix A. In addition, we also ran the model for both DTEDS subscales separately of which the results can be found in Appendix B.

Fig. 2: The effect of trait mindfulness on snack choice through dichotomous thinking and the unhealthy = tasty intuition.



Note: The dashed line represents the direct effect of KIMS on choice when controlling for DTEDS & UTI. **: $p < .01$, *: $p < .05$, +: $p < .10$

Studying the different subscales of the KIMS and DTEDS and UTI, we find that the accepting without judgment subscale is mainly driving the effect ($r = -.48, p = .01$ and $r = -.28, p = .01$ respectively), whereas the observing and describing subscales are only weakly related to DTEDS (r 's $> -.17$) and UTI (r 's $< .09$). However, in this study acting with awareness was also quite strongly related to UTI ($r = -.32; p = .01$), but not to DTEDS ($r = -.17$).

4.3 Discussion

In Study 2, we replicated and extended the findings from Study 1. We replicate the basic model that higher trait mindfulness decreases dichotomous thinking and leads to a lower subscription to the unhealthy = tasty intuition. We further extend the model with a choice between a healthy and an unhealthy snack option and demonstrate that the subscription to the unhealthy = tasty intuition is indeed a significant predictor of choice. By including a snack choice, we believe that our findings strengthen the external validity of the link between mindfulness, dichotomous thinking and the unhealthy = tasty intuition shown in Study 1. In addition, looking at the different subscales, next to accepting without judgment, acting with awareness also emerged as an important component.

5. Study 3

With Study 3, we want to exclude the possibility that consumers high in trait mindfulness, differ in other important aspects underlying food choice (e.g. very health conscious or more cognitive thinkers) and that this might be driving their healthy choice. Particularly health consciousness can shape the role of UTI on decision making (Mai & Hoffman, 2015).

5.1 Sample and Measures

151 participants from a large Western European university ($M_{\text{age}} = 20.80$, $SD = 1.40$; 62% female, $M_{\text{BMI}} = 21.59$) were invited to the lab in return for course credit. They were seated in individual cubicles and completed an online survey.

Step toe, Pollard, and Wardle's (1995) Food Choice Questionnaire (FCQ) was used to measure several motives underlying daily food choice and their relative importance. The FCQ consists of nine factors: *health*, *mood*, *convenience*, *sensory appeal*, *natural content*, *price*, *weight control*, *familiarity* and *ethical concern*. Its instructions are to evaluate 36 statements starting with "It is important to me that the food I eat on a typical day. . ." on a 6-point Likert scale ranging from "not at all important (1)" to "very important (6)". The items refer to food characteristics that might be taken into account when choosing what to eat (e.g. "is nutritious", "looks nice", "is not expensive", "cheers me up").

Next, the MAAS was administered (see Study 1). With the FCQ already being an extensive scale composing 39 items, in this study we opted for the more concise MAAS to limit response bias and avoid the survey to become tedious. Moreover, Study 1 demonstrated the same substantive finding for both the KIMS and the MAAS.

To exclude that mindful individuals might be more cognitive thinkers, we asked the participants whether they would prefer a fruit salad or a brownie as a potential token of our appreciation for their participation. After they made their choice, we asked them whether they made this decision on a primarily cognitive or affective basis by means of five items on 7-point bipolar scales (e.g. my thoughts - my feelings, my willpower - my desire, my prudent self - my impulsive self, the rational side of me - the emotional side of me, and my head - my heart) (Shiv and Fedorikhin 1999). The survey ended with socio-demographics age, gender, height and weight.

5.2 Results

We compared the associations between the different factors of the FCQ and the MAAS. We also compared the correlations between decision basis (cognitive – affective) and the MAAS (see Table 1). The only factor that significantly correlated with trait mindfulness is mood. People with higher trait mindfulness, find it less important that food has mood-enhancing properties (e.g., makes me feel good, helps me relax ...). No relation between MAAS and health or decision basis was found. Put differently, higher dispositional mindfulness is not related to more cognitive decision making or increased health consciousness. Weight control was the only factor significantly related to decision basis; with more attention to weight control being associated with more cognitive (vs. affective) decision making.

Table 1. Means, standard deviations, correlations and internal consistencies of trait mindfulness, the factors underlying food choice and decision basis.

	α	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. MAAS	.84	3.59	.62	1										
2. Health	.85	3.66	.92	.01	1									
3. Mood	.78	3.64	.84	-.35**	.48**	1								
4. Convenience	.82	4.12	.89	-.10	-.11	.12	1							
5. Sensory appeal	.67	4.68	.72	.03	.04	.13	.20*	1						
6. Natural content	.82	3.14	1.15	-.01	.67**	.38**	-.16	.02	1					
7. Price	.74	4.28	.83	.05	-.06	.03	.45**	.13	-.14	1				
8. Weight control	.89	3.39	1.22	-.09	.45**	.28**	.07	.04	.26**	.07	1			
9. Familiarity	.74	3.25	.99	-.04	-.07	.10	.33**	.14	-.10	.08	-.14	1		
10. Ethical concern	.73	2.43	.95	.06	.52**	.36**	-.13	.04	.56**	-.06	.14	-.13	1	
11. Decision basis (cogn – aff)	.93	4.73	1.60	-.02	-.05	.17	.09	.14	.02	-.09	-.18*	.08	-.10	1

*correlation is significant at the 0.05 level; ** correlation is significant at the 0.01 level

5.3 Discussion

As not much is known on how mindfulness relates to decisions about food, with Study 3 we attempt to provide some preliminary evidence. We rule out that more (vs. less) mindful individuals differ in other important factors underlying food choice (based on the FCQ) such as being more health conscious or more cognitive thinkers and exclude that this might be driving their healthy choice. This finding is important, as real-life decision making is not an isolated choice, but rather a series of choices and where using more cognitive effort could ultimately result in depletion. The only difference was found for mood, with higher trait mindfulness being related to seeking fewer mood-enhancing properties from food which is in line with previous findings (Alberts et al., 2012). As such, we tentatively assume that mindfulness impacts the unhealthy = tasty intuition by reducing the reliance on lay beliefs through dichotomous thinking and categorization, and not by changing the salience of specific factors underlying food choice (except for mood).

6. Study 4

In Studies 1 and 2 we found that consumers who are chronically high in mindfulness have a smaller tendency to dichotomize, resulting in a lower belief that unhealthy food is tastier and a healthy choice option more often. In Study 3, we excluded the possibility that mindful individuals differ in other relevant aspects following the FCQ (Steptoe et al., 1995). In Study 4, we will investigate whether a brief exercise can lead to situationally heightened (state) mindfulness and can decrease dichotomous thinking to improve consumer food decision making.

6.1 Design and Participants

100 U.S. members of Amazon Mechanical Turk took part in an online study. In Study 1 and 2, the construct accepting without judgment emerged as a principal determinant, motivating our choice to choose an exercise focusing on acceptance. The study followed a between-subjects design in which participants were randomly assigned to one of two conditions: mindfulness acceptance vs. control. Six participants failed the attention check, so were removed from the dataset, this resulted in 94 participants ($M_{\text{age}} = 35.05$, $SD = 9.70$; 63% male, $M_{\text{BMI}} = 27.35$).

6.2 Procedure and measures

Before the start of the study, participants were instructed to find a quiet space where they could complete the study undisturbed. They were also told that they should have earphones or headphones at their disposal or the possibility to turn on their sound.

First, they filled out the KIMS to assess their dispositional (trait) mindfulness. Next, they listened to an audio fragment of five minutes. Participants in the control condition listened to an audio fragment from a book by Nicholas Sparks. In the mindfulness condition they listened to an exercise in which they were taught to simply observe their thoughts and treat them just as thoughts and not as facts. The exercise teaches participants to be curious about their thoughts and become aware of them, without identifying with them. Afterwards, the participants were asked to evaluate the audio fragment on interestingness and difficulty (7-point bipolar scales). In the control condition we included an attention check by asking to indicate the names of the two characters in the fragment using three multiple choice answers. In the mindfulness condition, we took the number of clicks (above six) during the audio fragment as a way to check their attention.

The manipulations were pilot tested with a state version of the MAAS (Brown & Ryan, 2003) administered after the audio fragment as a manipulation check. The state MAAS includes five items from the larger trait MAAS measure, slightly rephrased to assess state mindfulness. Participants in the mindfulness induction condition scored higher ($M = 3.74$, $SD = .62$) than those in the control condition ($M = 3.19$, $SD = .74$) on the state MAAS, indicating that the mindfulness instructions were effective ($t(35) = -2.41$, $p = .021$).

The audio fragment was immediately followed with a state measure for dichotomous thinking. Whereas the DTEDS rather measures dispositional dichotomous thinking, in this study we use a categorization task adapted from King, Herman and Polivy (1987) in order to examine differences in ad hoc categorization and cognitive style. According to Rosch (1978), categorization serves the purpose of simplifying our environment where people tend to make groups based on having more attributes in common with other members of the category and having fewer attributes in common with members of contrasting categories. Thinking simplistically of food as either good or bad, should result in using fewer categories and would indicate a more black and white way of thinking, compared to distinguishing more (complex) attributes and using more categories. The participants were instructed to first read a list of 20 food product names ranging from very unhealthy to very healthy (see Appendix D, selection based on Huyghe, Verstraeten, Geuens & Van Kerckhove, 2017). Next, they were instructed to put the items that belong together according to them in groups by dragging each item. They could use minimum one and maximum 12 groups. Since the particular attributes that are perceived in a stimulus are determined by "the functional needs of the knower interacting with the physical and social environment" (Rosch, 1978, p. 29), we expected that a brief mindfulness exercise could

eliminate the predetermined mental schema of good vs. bad and increase the number of categories used in the categorization task, thereby reducing the unhealthy = tasty intuition.

To conclude, participants filled out the UTI scale (same as in Studies 1 and 2). The survey ended with socio-demographics age, gender, height and weight

6.3 Results

Based on the KIMS, no differences were found in dispositional trait mindfulness between the two conditions ($p = .90$). There were also no differences in interestingness or difficulty of the two audio fragments (p 's $> .50$). See Appendix A for a summary of the means for the variables used.

An independent-samples t-test was conducted to examine whether the number of categories respondents used in the categorization task differed between conditions. The results reveal a significant difference, with participants using more categories to group the different products in the mindfulness condition ($M_{\text{acceptance}} = 6.78$, $SD = 2.12$) than participants in the control condition ($M_{\text{control}} = 5.95$, $SD = 1.57$; $t(89.46) = -2.16$; $p = .037$). Put differently and in line with our expectations, a brief mindfulness exercise can stimulate participants to distinguish more categories, thereby decreasing rigid thinking.

Next, a regression analysis was carried out to examine the effects of condition and the number of categories on UTI. The model was not significant ($F(2,91) = 1.82$; $p = .17$). When adding the interaction term, the model does become significant ($F(3,90) = 2.66$; $p = .05$) and we find a significant interaction between condition and number of categories used on UTI ($B = -.36$; $p = .043$) (See Table 2). Looking at the effect for each condition separately, we find that in the mindfulness condition, participants who used more categories to group the different items, in turn

expressed a lower belief that unhealthy food is tastier ($B = -.32$; $p = .025$). In the control condition no relation between number of categories and UTI was found ($B = .13$; $p = .43$).

Table 2. Main and interaction effects of condition and number of categories on the unhealthy = tasty intuition.

DV = UTI	Model 1			Model 2		
	β	t	p	β	t	p
Condition	.29	1.22	.23	2.62	2.32	.02
Categories	-.14	-1.70	.09	.10	.71	.48
Condition x Categories				-.36	-2.06	.04
Change R ²	.038			.043*		

Note: * significant at $p < .05$

6.4 Discussion

Taken together, our study provides empirical support that a brief mindfulness exercise can increase perceived differences among food products by stimulating consumers to distinguish more categories. In turn, distinguishing more categories can decrease the subscription to the unhealthy = tasty intuition. Contrary to our expectations, the effect of the categorization task on the unhealthy = tasty intuition differed between conditions. In the control condition there was no relation between the number of categories used and the subscription to the unhealthy = tasty intuition. Possibly the mindfulness exercise influences this relation by challenging existing beliefs and automatic inferences. As a result of distinguishing more categories, consumers might realize that tasty does not necessarily imply unhealthy or that not only unhealthy products are necessarily tasty, ultimately decreasing the intuition. The categorization exercise also might steer them away from the traditional healthy / unhealthy or tasty / untasty dichotomy often used to group items.

Whereas in the control condition, the categorization task does not serve to question existing beliefs but is rather an expression of quick and impulsive grouping with no significant impact on the unhealthy = tasty intuition.

7. *General discussion*

One of the most important causes of obesity is the overconsumption of food; however the preceding factors should not be overlooked. The modern health media and food industry have shaped public views of healthy eating together with the tendency to view food as good or bad for health (Nestle, 2013; Patterson, Satia, Kristal, Neuhouser & Drewnowski, 2001; Rozin et al., 1996). The present results demonstrate a potential danger of the image that is being portrayed. By highlighting the dichotomous nature of the food products, the unhealthy = tasty intuition might also be strengthened. The studies presented in this research provide a possible way to counteract this detrimental way of thinking. We provide evidence that day-to-day trait mindfulness, as well as situationally heightened state mindfulness could reduce the extent to which people subscribe to the unhealthy = tasty intuition and that this process happens through decreased dichotomous thinking.

Study 1 demonstrated that higher trait mindfulness is associated with reduced dichotomous thinking and a lower unhealthy = tasty intuition. Study 2 replicates this finding and demonstrated that a weaker unhealthy = tasty intuition results in a healthy snack option more often. With Study 3, we ruled out that more (vs. less) mindful individuals are more cognitive thinkers or more health conscious. Finally, Study 4 demonstrated that a brief mindfulness exercise can increase the number of categories used in the categorization task and consequently reduce the unhealthy = tasty intuition. In Studies 1 and 2, we also observed a direct negative effect of trait mindfulness on the unhealthy = tasty intuition, indicating that higher trait mindfulness is related to a weaker unhealthy

= tasty intuition. In sum, our empirical findings provide evidence that mindfulness can reduce the reliance on personal strategies (categorization and the unhealthy = tasty intuition), thereby addressing a recent call for more studies on how to reduce biases in judgment and improve decision making (Milkman, Chugh & Bazerman, 2009).

7.1 Theoretical and practical implications

Our results add to the growing body of research investigating the salutary effects of mindfulness on healthy behavior. Research has provided support for the beneficial effects of mindfulness on coping with inner feelings; however investigations of mindfulness on external factors such as categorizing foods or the use of lay beliefs are scarce. By shedding light on the process behind these positive effects, more effective interventions can be developed and directions for future research are pinpointed. We demonstrate that dichotomous thinking might be an important element to target, as it is likely a key determinant to reduce the unhealthy = tasty intuition and stimulate healthy choice behavior. Targeting dichotomous thinking through mindfulness is one possible way to reduce the reliance on the unhealthy = tasty intuition, other ways exist as well. For example, Kidwell, Hasford & Hardesty (2015) found that emotional ability training can reduce heuristic processing (and reliance on the unhealthy = tasty intuition), by increasing goal-relevant emotional thoughts. Investigating alternative interventions simultaneously could indicate which approach might be more effective.

Differences exist in the how mindfulness should be conceptualized, either as a single construct (e.g. MAAS) or encompassing a range of specific skills (e.g. KIMS; Baer et al., 2006; Bishop et al., 2004). The findings on how these measures relate to one another are mixed; research by Van de Veer et al. (2015) reports the absence of correlations and even negative correlations

between the two. Others have criticized the MAAS for measuring the absence of mindlessness rather than the presence of mindfulness (Grossman, 2011). However, some have overturned this critique by arguing that the MAAS captures the same variety of outcomes as mindfulness training is theorized to yield (Brown et al., 2011). Possibly, depending on the context under investigation and the focus of attention, findings might differ. In our research, we were interested in disrupting the automatic associative process of the unhealthy = tasty intuition and increases on both scales proved to be effective in doing so.

With our research, we also respond to the need of a number of researchers for dismantling studies on mindfulness (Cavanagh, Vartanian, Herman & Polivy, 2014). Considering the wide range of strategies and interventions referred to as mindfulness, different techniques focusing on different components of mindfulness may work in different ways. In this research we focused on a state of acceptance as the most important component. Next to the audio fragment that was used in Study 4 focusing on acceptance of thoughts, in Studies 1 and 2, the accepting without judgment subscale from the KIMS demonstrated the strongest relation with dichotomous thinking and the unhealthy = tasty intuition. Together, these findings indicate that specifically the accepting component of mindfulness is an important element to reduce automatic inference making.

7.2 Limitations and future research

Evidence has shown that the unhealthy = tasty intuition might differ depending on the country (e.g., US vs. France) (Werle, Trendel & Ardito, 2013) and the operating level (e.g., implicit vs. explicit) (Raghunathan et al., 2006) under investigation. Regardless of cross-national differences and type of measurement used, we believe that the extent of the reliance on the unhealthy = tasty intuition serves as an important individual difference measure guiding everyday food choices. In

this research, we only took into account the explicit belief in the unhealthy = tasty intuition and made use of samples from Belgium and the US. We note that on average, a higher unhealthy = tasty intuition for the US samples was observed compared to the Belgian samples. As a follow-up, it would be interesting to investigate whether a brief mindfulness exercise could reduce the unhealthy = tasty intuition at an implicit level as well. A study by Papies, Barsalou and Custers (2012) found that a mindful attention training could eliminate the impulsive approach toward images of attractive foods with an implicit approach-avoidance task. Impulsivity is also particularly important in a supermarket context, hence it would be interesting to investigate whether mindfulness could reduce impulsive decision making.

Next to using a validated scale, we introduced a categorization task as a situational measure of dichotomous thinking in Study 4. We expected that the more categories a participant used would reduce the extent to which he/she believes in the unhealthy = tasty intuition and that mindfulness would lead to using more categories. We confirmed that a brief mindfulness exercise increased the number of categories used in the categorization task compared to the control condition. However, the categorization task only had a significant impact on UTI in the mindfulness condition and not in the control condition. As a response, we returned to the literature. Most research on food categorization compares strategies of dieters with non-dieters or problematic eaters with non-problematic eaters. Categorizing items involves making groups of similar items. One stream of literature suggests that dieters and problematic eaters will form *fewer* categories and only distinguish between foods that will make them lose weight and foods that will not make them lose weight (Rosch, 1978; Garner, Garfinkel & Bemis, 1982). Other evidence suggests that dieters will form *more* categories than non-dieters due to their pre-occupation with food, which translates to an overdefining of categories and boundaries (Reed, 1969). In an attempt

to resolve this discussion, King, Herman and Polivy (1987) did not find any differences in the number of categories used between dieters and non-dieters. Moreover, this type of categorization task is also frequently used to measure construal level, where an abstract level results in few categories and a concrete level in more categories (Liberman, Sagristano & Trope, 2002). Additionally, the number of categories people use can also depend on the goal they have in mind (Barsalou, 1982; Ratneshwar & Shocker, 1991). It is possible that the manipulations triggered different goals or levels of construal, thereby impacting the way in which categories were created. In sum, it becomes clear that the relation between the number of categories used and the conclusions to draw, might not be as straightforward as we assumed.

When individuals create categories they can make few, broad categories, many, narrow categories or a combination of a few broad with some narrow categories. Creating few, broad categories can indicate two different things, either participants use a rigid way of thinking (related to dichotomous thinking) or it could be a sign of categorization flexibility, where objects can belong to multiple groups. Research found that food categorization flexibility increases the preference for indulgent foods (Khare & Chowdhury, 2015). Thus, although the underlying processes might differ, the outcome of using few broad categories appears to be similar, promoting unhealthy behavior.

The findings from Study 4 illustrate that the categorization task might have worked differently depending on the condition. In the mindfulness condition, more categories were associated with a lower unhealthy = tasty intuition, whereas no relation could be found in the control condition. For future research it is important to shed light on how categorizing might reduce the unhealthy = tasty intuition. It would be interesting to manipulate the way, in which participants create categories, to investigate which attributes were used by having participants

label the groups they created or by looking at the number of items per group. It might also be important to take into account individual differences variables such as dieting tendency. We also want to note that considering the distribution of the number of categories participants used in the categorization task, it might be better to use the term rigid thinking instead of dichotomous thinking. The tendency to group items in only two groups was not commonly observed in the data.

In sum, with this research we provided preliminary insights on how mindfulness can influence decision making and choice. However, some questions remain unanswered and deserve further attention. Specifically measuring the impact of state mindfulness on ad hoc categorization should be further explored.

Researchers focusing on individual and collective well-being understand that merely providing information is not enough to stimulate positive behavioral change, instead empowering consumers has more ability to change consumption choices (Mick, Pettigrew, Pechmann & Ozanne, 2012). The capacity to be mindful and become aware of phenomena as they occur, rather than as the objects of our conceptually constructed world, takes a great deal of training and practice. However, even a brief exercise can be the starting point and deserves to be explored as in how it can be integrated into our daily lives as a way to enhance well-being.

8. References

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9. Appendices

9.1 Appendix A – Means and standard deviations of the scales

	Study 1		Study 2	
	Mean (SD)	Range	Mean (1SD)	Range
Age (years)	42.76 (11.15)	24-70	23.66 (7.35)	18-59
BMI (kg/m ²)	25.50 (6.26)	16.7-45.3	21.84 (2.70)	17.2-33.0
Mindfulness (MAAS)	4.62 (.87)	2.2-6.0		
Mindfulness (KIMS)	4.67 (.65)	3.0-6.3	4.29 (.45)	3.2-5.6
- Observe	4.54 (.93)	2.3-7.0	4.47 (.82)	2.8-6.6
- Describe	4.93 (1.27)	1.9-7.0	4.25 (.54)	2.8-5.5
- Acting with Awareness	4.55 (.75)	2.6-6.5	3.84 (.75)	2.3-5.7
- Accepting without Judgment	4.74 (1.21)	1-7	4.58 (1.02)	1.6-5.4
Dichotomous Thinking	3.09 (1.02)	1.2-5.6	3.28 (.77)	1.6-5.4
- Eating	3.21 (1.25)	1.0-6.0	3.47 (.89)	1.3-5.5
- General	3.03 (1.07)	1.0-5.7	3.16 (.84)	1.3-5.6
UTI	3.37 (1.69)	1-7	2.58 (1.09)	1-5.3

Study 3	Mean (SD)	Range
Age (years)	20.85 (1.41)	18-28
BMI (kg/m ²)	21.59 (2.30)	17.4-30.09
Mindfulness (MAAS)	3.59 (.62)	2.1-5.6
Dichotomous Thinking	3.35 (.78)	1.3-5.4
- Eating	3.47 (1.02)	1.0-5.8
- General	3.28 (.87)	1.0-5.3
UTI	2.43 (1.23)	1.0-6.0

Study 4	Full sample		Control	Mindfulness
	Mean (SD)	Range	Mean (SD)	Mean (SD)
Age (years)	35.05 (9.70)	21-63	36.11 (11.15)	34.12 (8.22)
BMI (kg/m ²)	27.35 (7.10)	18.0-55.7	26.80 (5.89)	27.84 (8.0)
Mindfulness (KIMS)	4.55 (.73)	2.8-6.6	4.56 (.74)	4.54 (.72)
- Observe	4.37 (1.05)	1.3-6.8	4.27 (1.00)	4.46 (1.10)
- Describe	4.68 (1.14)	2.0-7.0	4.80 (1.11)	4.57 (1.17)
- Acting with Awareness	4.51 (.79)	2.9-6.8	4.51 (.84)	4.51 (.74)
- Accepting without Judgment	4.73 (1.38)	1.3-7.0	4.80 (1.32)	4.67 (1.43)
Categories	6.39 (1.92)	2-12	5.95 (1.57)	6.78 (1.72)
UTI	3.50 (1.52)	1.0-6.7	3.36 (1.24)	3.63 (1.72)

9.2 Appendix B – Effect of mindfulness on UTI through dichotomous thinking by subscale

	Study 1		Study 2	
	Indirect effect	95%CI	Indirect effect	95%CI
DTEDS-General	-.39*	-.74, -.15	-.06	-.25, .01
DTEDS-Eating	-.16*	-.42, -.01	-.13*	-.43, -.01

9.3 Appendix C – Scales

1. MAAS: 6-point Likert scale (1 = almost never, 6 = almost always)

- 1) I could be experiencing some emotion and not be conscious of it until sometime later. **(R)**
- 2) I break or spill things because of carelessness, not paying attention, or thinking of something else. **(R)**
- 3) I find it difficult to stay focused on what's happening in the present. **(R)**
- 4) I tend to walk quickly to get where I'm going without paying attention to what I experience along the way. **(R)**
- 5) I tend not to notice feelings of physical tension or discomfort until they really grab my attention. **(R)**
- 6) I forget a person's name almost as soon as I've been told it for the first time. **(R)**
- 7) It seems I am "running on automatic" without much awareness of what I'm doing. **(R)**
- 8) I rush through activities without being really attentive to them. **(R)**
- 9) I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there. **(R)**
- 10) I do jobs or tasks automatically, without being aware of what I'm doing. **(R)**
- 11) I find myself listening to someone with one ear, doing something else at the same time. **(R)**
- 12) I drive places on "automatic pilot" and then wonder why I went there. **(R)**
- 13) I find myself preoccupied with the future or the past. **(R)**
- 14) I find myself doing things without paying attention. **(R)**
- 15) I snack without being aware that I'm eating. **(R)**

2. KIMS: 4 factors, 7-point Likert scale (1 = never or very rarely true, 7 = almost always or always true)

a) Observe

- 1) I notice changes in my body, such as whether my breathing slows down or speeds up
- 2) I pay attention to whether my muscles are tense or relaxed.
- 3) When I'm walking, I deliberately notice the sensations of my body moving.
- 4) When I take a shower or a bath, I stay alert to the sensations of water on my body.
- 5) I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
- 6) I pay attention to sensations, such as the wind in my hair or sun on my face.
- 7) I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
- 8) I notice the smells and aromas of things.

- 9) I intentionally stay aware of my feelings.
- 10) I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
- 11) I pay attention to how my emotions affect my thoughts and behavior.
- 12) I notice when my moods begin to change.

b) Describe

- 1) I'm good at finding the words to describe my feelings.
- 2) I can easily put my beliefs, opinions, and expectations into words.
- 3) I'm good at thinking of words to express my perceptions, such as how things taste, smell, or sound.
- 4) It's hard for me to find the words to describe what I'm thinking **(R)**
- 5) I have trouble thinking of the right words to express how I feel about things **(R)**
- 6) When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words **(R)**
- 7) Even when I'm feeling terribly upset, I can find a way to put it into words.
- 8) My natural tendency is to put my experiences into words.

c) Act with awareness

- 1) When I do things, my mind wanders off and I'm easily distracted **(R)**
- 2) When I'm doing something, I'm only focused on what I'm doing, nothing else.
- 3) I drive on "automatic pilot" without paying attention to what I'm doing **(R)**
- 4) When I'm reading, I focus all my attention on what I'm reading.
- 5) When I do things, I get totally wrapped up in them and don't think about anything else.
- 6) I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted **(R)**
- 7) When I'm doing chores, such as cleaning or laundry, I tend to daydream or think of other things **(R)**
- 8) I tend to do several things at once rather than focusing on one thing at a time **(R)**
- 9) When I'm working on something, part of my mind is occupied with other topics, such as what I'll be doing later, or things I'd rather be doing **(R)**
- 10) I get completely absorbed in what I'm doing, so that all my attention is focused on

d) Accept without judgment

- 1) I criticize myself for having irrational or inappropriate emotions **(R)**
- 2) I tend to evaluate whether my perceptions are right or wrong **(R)**
- 3) I tell myself that I shouldn't be feeling the way I'm feeling **(R)**

- 4) I believe some of my thoughts are abnormal or bad and I shouldn't think that way
(R)
- 5) I make judgments about whether my thoughts are good or bad (R)
- 6) I tend to make judgments about how worthwhile or worthless my experiences are
(R)
- 7) I tell myself that I shouldn't be thinking the way I'm thinking (R)
- 8) I think some of my emotions are bad or inappropriate and I shouldn't feel them
(R)
- 9) I disapprove of myself when I have irrational ideas (R)

3. DTEDS: 2 factors, 6-point Likert (1 = strongly disagree, 6 = strongly agree)

a) Eating

- 1) I think of food as either "good" or "bad"
- 2) I view my attempts to regulate my food intake as either successes or failures
- 3) When regulating my food intake, if I eat something that I had planned not to, I think that I have failed
- 4) When regulating my food intake, I view my eating as either been good or bad

b) General

- 1) I think of things in "black and white" terms
- 2) I think of myself as either good or bad
- 3) I think of myself as either in control or out of control
- 4) I think of myself as either clever or stupid
- 5) I either get on very well with people or not at all
- 6) I think of myself as either ugly or good-looking
- 7) I think of myself as doing things either very well or very badly

4. UTI: 7-point Likert scale (1 = strongly disagree, 7 = strongly agree)

- 1) There is no way to make food healthier without sacrificing taste
- 2) Things that are good for me rarely taste good
- 3) Healthy food is usually less tasty

5. FCQ: 6-point Likert scale (1=very unimportant, 6=very important)

It is important to me that the food I eat on a typical day:

Food choice motive	Questionnaire item
a) Health	Contains a lot of vitamins and minerals
	Keeps me healthy
	Is nutritious
	Is high in protein
	Is good for my skin/teeth/hair/nails etc
	Is high in fibre and roughage
b) Mood	Helps me cope with stress

	Helps me cope with life
	Helps me relax
	Keeps me awake/alert
	Cheers me up
	Makes me feel good
c) Convenience	Is easy to prepare
	Can be cooked very simply
	Takes no time to prepare
	Can be bought in shops close to where I live or work
	Is easily available in shops and supermarkets
d) Sensory appeal	Smells nice
	Looks nice
	Has a pleasant texture
	Tastes good
e) Natural content	Contains no additives
	Contains natural ingredients
	Contains no artificial ingredients
f) Price	Is not expensive
	Is cheap
	Is good value for money
g) Weight control	Is low in calories
	Helps me control my weight
	Is low in fat
h) Familiarity	Is what I usually eat
	Is familiar
	Is like the food I ate when I was a child
Ethical concern	Comes from countries I approve of politically
	Has the country of origin clearly marked
	Is packaged in an environmentally friendly way

6. Decision Basis: 7-point bipolar scales

My final decision about which snack to choose was driven by:

- 1) my thoughts - my feelings
- 2) my willpower - my desire
- 3) my prudent self - my impulsive self
- 4) the rational side of me - the emotional side of me
- 5) my head - my heart

9.4 Appendix D –Products Categorization Task Study 4

- 1 1 Snickers bar
- 2 1 oz potato chips
- 3 1 chocolate chip cookie
- 4 2 tbsp chocolate hazelnut spread
- 5 9 wine gums
- 6 1 frankfurter wiener sausage
- 7 1 slice pizza margherita
- 8 1 cup chocolate milk
- 9 1 piece lasagna with meat
- 10 1 cup pasta
- 11 1 cup Cheerios
- 12 1 regular slice brown bread
- 13 1 cup semi-skimmed
- 14 1 cup tomato soup
- 15 8 oz. strawberry yogurt
- 16 ½ cup apple sauce
- 17 1 pear
- 18 1 banana
- 19 1 cup snow peas (chopped)
- 20 1 cup broccoli

CHAPTER V:
CONCLUSIONS,
CONTRIBUTIONS,
AND FURTHER RESEARCH

CHAPTER V: CONCLUSIONS, CONTRIBUTIONS, AND FURTHER RESEARCH

Research on the predictors of food decision making remains a highly prevalent topic for a broad range of disciplines. A recent investigation by Symmank and colleagues (2017) categorized 60 years of research from more than ten disciplines in line with the recently proposed DONE (Determinants of Nutrition and Eating) framework (Stok et al. 2016; Figure 1). The study revealed that cultural and policy-related influences on food choice are scarcely considered. In this dissertation we respond to this gap by exploring practical interventions (in Chapter II, Chapter III and IV) and by adopting a cultural perspective (in Chapter III).

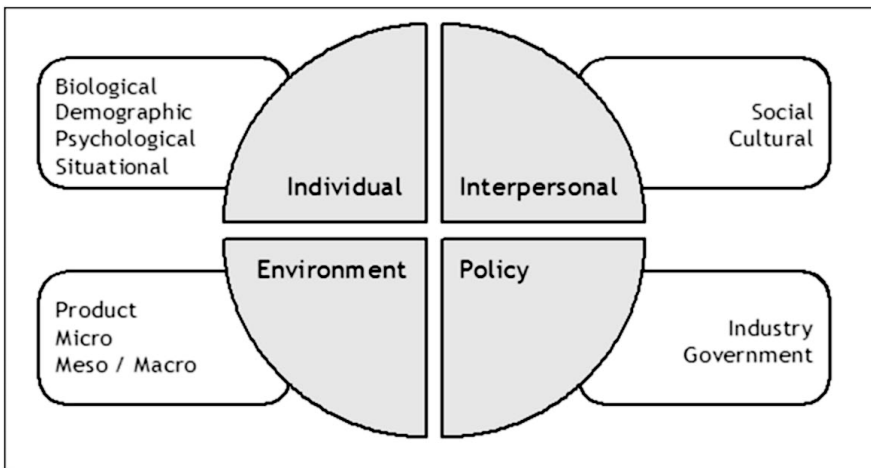


Figure 1. DONE (Determinants Of Nutrition and Eating behavior) framework from Symmank et al. 2017.

1. Recapitulation of core findings

In Chapter II, *Same Same But Different: Using Anthropomorphism in the Battle Against Food Waste*, we investigated how anthropomorphism can be used as an effective intervention to stimulate the sale of misshapen fruits and vegetables and reduce food waste. We argue that produce that deviates from the norm prompts risk perceptions, which also affects other quality perceptions. Study 1 demonstrates that lower purchase intentions for misshapen produce indeed stem from increased risk and lower taste perceptions. In Study 2 we show that anthropomorphism can increase purchase intentions for misshapen produce because it positively influences consumers' moods, which leads to less perceived risk and more positive taste perceptions. Study 3 furthers our understanding that this effect is most pronounced when environmental concern is low and in Study 4 we extended our findings to actual food choice.

In Chapter III, *Cross-National Investigation of the Drivers of Obesity: Re-Assessment of Past Findings and Avenues for the Future*, we investigated the link between nationality, food attitudes and weight status. In a cross-sectional web-based survey of 2167 participants, we explored how health and taste attitudes to food, together with the unhealthy = tasty intuition varied between four different countries (US, UK, BE and FR). Beyond differences in food attitudes, we also included behavioral measures for food choice and small physical activities. Logistic regressions were fitted to estimate the impact of these different factors on weight status. Despite previous reported differences that the French consider food a source of pleasure and worry the least about its impact on health and that Americans associate food with health and least with pleasure (Rozin et al. 1999), we found that the French attach most importance to following a healthy diet and Americans attach most importance to eating tasty food. Believing that unhealthy food is tasty was associated with a higher chance of being obese, whereas incorporating more small physical activities and

having a higher health interest was associated with lower chances of obesity. Choosing more healthy foods was associated with a lower chance of being overweight.

In Chapter IV, *Mind Your Intuition – How Mindfulness Can Reduce the Unhealthy = Tasty Intuition*, we investigated how mindfulness can reduce the use of suboptimal strategies, such as categorizing and the unhealthy = tasty belief. Study 1 showed that higher dispositional mindfulness is associated with less tendency to apply a good/bad dichotomy, resulting in a lower unhealthy = tasty intuition. In Study 2 we replicate and extend this finding by demonstrating that this leads to a healthy choice option more often. In Study 3A we introduce a categorization task as a measure for dichotomous thinking. In Study 3B we induced situationally heightened state mindfulness to demonstrate that a brief exercise can increase the number of categories used in a categorization task and decrease the unhealthy = tasty intuition. Together these findings provide evidence that higher trait and state mindfulness can reduce the unhealthy = tasty intuition, by relying less on preconceived mental schemes and by distinguishing more categories.

2. Theoretical contributions

Each empirical chapter highlighted important contributions; in this paragraph we will give an overview on how our research advances current findings.

The effects evidenced in the three chapters advance our understanding of the food choice process (FCP) and demonstrate how positive changes can be stimulated through small interventions (Furst et al. 1996; Falk et al, 1996; Sobal et al 2006; Thaler & Sunstein, 2008). We draw from important values (health, taste, safety), strategies (categorizing, unhealthy = tasty intuition, mood-as-information), and the importance of culture, to propose and test meaningful interventions. In Chapter II we demonstrate how the importance attached to different values underlying food choice (taste, safety) might be used to stimulate the adoption of misshapen fruits

and vegetables and reduce food waste, by focusing on another important strategy (mood-as-information). In Chapter III, we demonstrate that societal evolutions (e.g. globalization, urbanization and modernization) might impact cultural differences in food attitudes (health and taste) and that frequent updates are necessary to adjust our understanding and investigate the use of the small changes approach to promote weight management. In Chapter IV, we propose an intervention to stimulate healthy choice behavior by reducing a frequently adopted strategy by consumers, i.e. categorizing (Connors, Bisogni, Sobal and Devine, 2001). We also demonstrate how categorizing might foster another suboptimal decision strategy, i.e. the unhealthy = tasty intuition (Raghunathan, Naylor & Hoyer, 2006).

In all three chapters we add to the existing literature by adopting a shift in focus from what has been previously done. . In Chapter II, we shift the focus from reducing household food waste (Melbye, Onozaka & Hanse 2016; Porpino, Wansink & Parente 2016; Stancu, Haugaard & Lähteenmäki 2016; Visschers, Wickli & Siegrist 2016), to reducing food waste at the intersection of the distribution and point-of purchase level and provide a strategy that could benefit actors upstream the food supply chain. In Chapter III we adopt a joint approach focusing on food choice and physical activity to determine the association with weight status. Previous research adopted a single approach relying on either food choice (Rozin et al. 1999; Pienak, Pérez-Cueto, and Verbeke, 2009; Perez-Cueto, Verbeke, Barcellos, Kehagia, Chryssochoidis et al., 2010) or physical activity (Blair, Archer & Hand, 2013, Fox & Hillsdon, 2007; Luke & Cooper, 2013; Swinburn, 2013). We found that the incorporation of small physical activities proved to be an important determinant to reduce the chance for obesity and should be taken into account for future research. In Chapter IV, we advance the literature on mindfulness by moving away from the impact of mindfulness on eating behavior, and instead focusing on how mindfulness affects

decision making and choice. A recent article states that the impact of mindfulness on decision making is still in its nascent phase (Karelaia & Reb, 2015). Moreover research on mindfulness and decision making is often focused on ethical, organizational or managerial decision making (Dane, 2011; Dane & Pratt, 2007; Ruedy & Schweitzer, 2010), whereas research on mindfulness and weight management is focused on eating behavior (Tapper, 2017). In Chapter IV we bridge this gap by investigating the impact of mindfulness on food-related decision making to improve weight management.

Chapters II and IV both extend categorization literature. To make sense of the various products in the marketplace, consumers assign them to different classes (Loken & Ward, 1990). This strategy often operates at an implicit level making it difficult to be offset. In Chapter II we demonstrate how the use of anthropomorphism can make consumers accept a product that they would otherwise categorize as incongruent by activating a positive human scheme. In Chapter IV we demonstrate how mindfulness might reduce this suboptimal strategy. We also demonstrate how using more categories can reduce the unhealthy = tasty intuition.

In Chapters II and IV, demonstrating the underlying psychological processes was central to our research. In Chapter II, we demonstrate the underlying process *why* consumers reject misshapen fruits and vegetables. Increased risk perceptions, which negatively impact consumers taste perceptions, represent the primary driver of reduced purchase inclinations. In Chapter IV, we explore a possible route *how* mindfulness might reduce the attractiveness of unhealthy foods and promote healthier choice behavior. Through reduced dichotomous thinking the extent to which unhealthy foods are considered tastier weakens, resulting in a healthy choice option more often.

In each chapter we paid attention to limit common method bias by proposing alternative ways of measurement beyond the use of validated scales and advocate scholars in the field to take these

approaches into consideration. According to common method bias, up to 25% of variance might be due to systematic sources of measurement error (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). By including methodological or psychological separation of measurement, we partly address this shortcoming. In Chapter II, we used a cover story to create psychological separation between the predictor and criterion variables (Study 4) and created methodological separation by studying both intentions (Study 1, 2, & 3) and choice (Study 4). In Chapter III, next to the use of scales, we included behavioral measures. In Chapter IV we used a categorization task to measure situational dichotomous thinking.

3. Practical contributions

The proposed interventions in the empirical chapters offer immediate practical contributions for consumers, public policy makers, market researchers and retailers for different public problems such as food waste and obesity.

In Chapter II, applying anthropomorphism to misshapen produce might be an effective way to increase purchase intentions and reduce waste. Food waste poses an important problem and researchers have highlighted the need to shift from analysis to solutions (Aschemann-Witzel, de Hooge, Amani, Bech-Larsen & Oostindjer 2015). Retailers are an integral part of society and as such they have a responsibility to make a positive contribution (Maloni & Brown, 2006). Our intervention provides a strategic advantage for retailers to increase their corporate social responsibility (de Hooge, van Dulm, & van Trijp, 2018). Consumer perceptions and habits are shaped by their upbringing, the social and cultural background and the food market environment they are exposed to (Aschemann-Witzel, de Hooge, Amani, Bech-Larsen & Oostindjer 2015). We demonstrated that anthropomorphism positively impacts mood and other quality perceptions

(safety and taste), as a consequence anthropomorphism can be the starting point to structurally influence consumer perceptions as opposed to price reductions which might be aggravating the problem (Blattberg & Neslin, 1990).

In Chapter III, we demonstrated that the incorporation of small lifestyle changes might be an effective way to reduce the rising obesity rates for individuals. Moreover, the small changes approach offers an approach that is easily transferable and measureable across different cultures which might prove interesting for market researchers. The approach also offers inspiration for governments and businesses to promote people to be more active (e.g. walking meetings, stimulating use of stairs over elevator).

In Chapter IV, mindfulness is explored as an effective way to stimulate healthy choice behavior. The findings can be used to inform people about the salutary effects of brief mindfulness exercises, to organize sessions that teach relevant exercises or they can be implemented in advertising strategies to make people more mindful. The rapid increasing popularity of meditation and mindfulness apps demonstrates that consumers are actively looking for ways to experience the positive effects of being mindful (Zhu, Hedman, Feng, Li & Osika, 2017).

4. Limitations and suggestions for future research

The research presented in this doctoral dissertation outlined several contributions, however further research is necessary to address certain limitations.

Societal changes have a substantial impact on the food choice process. Rising obesity rates and the success of fast-food restaurants in France motivated our reinvestigation of cultural differences in attitudes to food (in Chapter III). Similarly, it might be interesting to reinvestigate what Americans (and other nations) have learned about categorizing food. Most research on

categorization and stereotypical thinking was conducted over 10 years ago (Oakes, 2005; Oakes & Slotterback, 2005, Rozin et al, 1996; Carels, Harper & Conrad, 2006). Faced with an information overload about food risks, individuals tended to just categorize foods as good or bad and did not think in terms of amount of intake (Rozin, 2005). The results from the categorization task in Chapter IV (Study 4) indicate that consumers tend to use multiple categories. For a field that attaches increasing importance to the power of replication (Hunter, 2001), it would certainly be a valuable avenue for future research to investigate the presence of categorization in contemporary societies.

In this dissertation we focused on dismantling the underlying process of certain behaviors; investigating the impact of how mindfulness can influence decision making (Chapter IV) and how anthropomorphism can promote the choice for misshapen fruits and vegetables (Chapter II). However, an important limitation is that we develop our models from theory and that we did not test competing models, nor investigated causality. Future research should address this limitation, by systematically manipulating the mediating variables to demonstrate causal effects.

Further, the focus of this dissertation was on investigating practical interventions to stimulate positive behavioral changes. In doing so, we adopted a short term, single decision approach. For mindfulness, a next step would be to investigate how our findings can be implemented in a marketing context. Decision making in real life is not an isolated choice, but rather a series of choices. It would be interesting to investigate the effects of a short mindfulness exercise on decision making during grocery shopping. For example, by using mobile eye-tracking and using unknown products and brands, participants cannot rely on previous knowledge or routine and are forced to make decisions based on heuristics (e.g. unhealthy product looks tasty) or elaboration (e.g. consulting the nutrition facts panel). For anthropomorphism, it would be interesting to

examine how long the positive effects of applying anthropomorphism would last or how they could stimulate lasting positive behavioral changes.

Intentions are good predictors of behavior, however a large intention-behavior gap persists (Sutton, 1998). To address this issue, in Chapter III we included behavioral measures, however no questions on actual food intake, exercise or other lifestyle factors were included. Especially for sustainable consumption the intention-behavior gap is large (Vermeir & Verbeke, 2006). In Chapter II (Study 4) we attempted to capture behavior, but respondents might have behaved in a socially desirable manner. Consequently it might be interesting to test our intervention at an actual retailer.

Scientific progress depends on new ideas spurred by creativity; however one needs to establish facts through replication in order to advance the field. The current dissertation proposes creative, hands-on interventions to stimulate positive consumption behavior for important public problems and we hope future research will deepen our understanding through replication and elaboration.

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