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Situated food safety behavior

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Abstract

Previous studies indicate that many consumers eat rare hamburgers and that information about microbiological hazards related to undercooked meat does not necessarily lead to changed behavior. With this study we aim to investigate whether consumers' willingness to eat hamburgers, both risky and safe, depends on the situation where they are confronted with the food.

A representative sample of 1046 Norwegian consumers participated in a web experiment. Participants were randomly divided into four groups. Each group was told to imagine a specific eating situation (at their friend's place, at home, at a restaurant abroad, at a domestic restaurant). Four pictures of hamburgers (rare, medium rare, medium, well-done) were presented in randomized order, and participants rated their intentions to eat each hamburger. Situated risk perception was measured as the stated likelihood of food poisoning from consuming hamburgers in eight different situations.

The results show that both risk perception and risk taking vary depending on the situation. In general, participants perceive their own home to be the safest place to consume a hamburger, but they are significantly more likely to consume an undercooked hamburger when at a friend's place. These findings indicate that situations play an important role for consumers' likelihood of eating unsafe food, and that risk taking does not always follow risk perception. That risk taking is elevated in situations that may have social consequences should be taken into consideration when developing food safety strategies.

Key words: Perceived risk, situated risk, food behavior, hamburger risk.

1. Introduction

Consumption of undercooked hamburgers contaminated with *E.coli* (Escherichia coli O157:H7 and other shigatoxigenic E.coli, STEC) can result in severe illnesses, hospitalization and, in worst case, death (Kiermeier, Jenson, Sumner, 2015; Kassenborg et al, 2004). Despite past outbreaks with fatal outcome in both US and Europe (Omer, Alvarez-Ordonez, Prieto M, Skjerve, Asehun, 2018; Alvseike; King et al., 2005), and widespread news coverage informing consumers of the importance of heating their hamburgers to above 68°C to inactivate the bacteria, many consumers still make and eat undercooked hamburgers (Røssvoll, Lavik, Ueland, Jacobsen, Hagtvedt, Langsrud, 2013; Taylor, Holt, Mahon, Ayers, Norton, Gould, 2012; Olsen, Røssvoll, Langsrud, Scholderer, 2014). Studies show that education and food safety information do not always result in proper food handling behavior (Brennan, McCarthy, Ritson, 2007). To be able to develop better prevention strategies, we need to understand the mechanisms that make some consumers eat potentially hazardous foods.

Consumers behave differently in different situations. Already 40 years ago, Belk described the situational effect on buying behavior (Belk, 1974; Belk, 1975). We know that consumption of food not only depends on the product, but also on the person, the place and the time where the product is to be consumed (Jaeger et al. 2011, Scholderer et al. 2013). What we do not know much about, is if these situational factors also influence consumption of risky food. Are there situations where people are more likely to consume products that might make them sick? One of the few studies investigating this is Veflen, Scholderer, & Langsrud (2020), which found that both risk perception and social norms influence risk taking.

There has been a considerable research interest in investigating people's perception of risk under various choice domains, and perception of risk has been shown to be influenced by whether

68 the risk is voluntary, whether the distribution of risk and benefit is equitable, the extent to which
69 the risk is unknown, the degree of personal control, individual dread etc. (Slovic, 1987). One
70 seminal example of the *domain-specific* aspects of risk is the framing effect of prospect theory,
71 stating that people code the possible outcomes as gains and losses rather than as final states
72 (Kahneman and Tversky, 1979; 1981, 2000). Kahneman and Tversky argue that a person's
73 perception of financial options can be changed, even reversed, with changes of perspective. A
74 given change in a value may be viewed as a gain or a loss depending on the framing (Wang &
75 Johnston, 1995). Weber, Blais, Betz (2002) and Blais and Weber (2006) did also report, in their
76 investigation of five content domains (financial decisions, health/ safety, recreational, ethical, and
77 social decisions), that respondents' degree of risk taking was highly domain specific. People may
78 be risk averse in one domain and risk seeking in others.
79 Although previous studies have shown that consumers' food choices are influenced by
80 context and that risk perception is domain specific, few studies have investigated how different
81 situations influence consumers' decision to eat risky food. In this study, we want to investigate if
82 consumers' inconsistency in preferences for risky food may have a deeper reason. We propose that
83 different situations may change the social meaning of the problem and thereby influence
84 consumers' decisions.
85
86 *1.1 Situated risk perception*
87 Risk perception, how vulnerable to danger or harm people consider themselves to be, is
88 typically defined as a function of two factors: perceived likelihood of experiencing the harm and
89 perceived severity of the harm (Slovic, 1987). The first of these factors, the perceived likelihood
90 of experiencing harm, may vary in different situations. A kitchen's perceived hygiene level and
91 ability to prepare food, may influence the perceived risk of consuming the same product (Tiozzo

et al 2017). The lower perceived quality of the kitchen, the higher perceived risk of consumption. Accordingly, we hypothesis that the perceived risk of consuming a hamburger from a not so good kitchen (e.g. a takeaway or petrol station) will be higher than the perceived risk of consuming the same burger from a good kitchen (e.g. at a restaurant).

H1: The perceived likelihood of food poisoning from consuming a hamburger is higher at a takeaway than at a restaurant.

Another factor that may influence risk perception is familiarity. Since Zajonc (1968) published his seminal work on "mere exposure", illustrating that "*mere repeated exposure to a stimulus object enhances his attitude toward it"*, many empirical studies have demonstrated that people prefer the familiar to the unfamiliar. Familiarity seems to create warm feelings (Garcia-Marques & Mackie, 2000) and people often use affect as a heuristic in everyday judgment (Schwarz, 1990). In relation to risk perception, Slovic (1987) shows that unknown risks, like DNA technology and satellite crashes, are more dreaded by laypersons than known risks, like downhill skiing and smoking. Since familiarity has been found also to influence consumers' evaluation of restaurants' service quality (Patterson & Mattila, 2007), we propose that consumers will be biased and perceive eating in a familiar setting to be less risky than eating in a more unfamiliar setting.

H2: The perceived likelihood of food poisoning from consuming a hamburger is higher at a restaurant than at home.

1.2 Situated risk taking

According to numerous theories in social and health psychology, risk perception plays a central role in determining behavior. In the health belief model (Rosenstock, 1974), behavior is a trade-off of risk perception, motivation (defined as the perceived benefits minus the perceived barriers of conducting the behavior) and volitional aspects (cues that prompt action). In protection motivation theory (Rogers, 1983), perceived risk is traded off against the reward offered by the behavior (this is labeled "threat appraisal"). Together with "coping appraisal" (defined as motivational and volitional resources minus response cost) "threat appraisal" forms people's protection motivation. In both these theories and in many extensions, perceived risk explains behavior. The higher the perceived risk, the less likely the behavior. Some meta-analyses conclude that risk perception is enough to trigger safer behavior (Brewer et al. 2007; Floyd, Prentice, Roger, 2000), while others claim the process is more complex. In their meta-analysis of experimental studies of risk behavior, Sheeran, Harris and Epton (2014) found only a small main effect from risk perception. However, risk perception had a stronger effect on behavior when it also triggered emotions such as fear, worry, regret and guilt.

One reason that the findings for risk perception on behavior, differ in strength, may be that most studies of risk taking investigate risk taking on an individual level. Both expected utility theory (Van Neuman and Morgenstern, 1944) and prospect theory (Kahneman and Tversky, 1978), to mention two very influential theories, look at individual decision-making. In real life, risk taking is usually made in a social context where other people's opinions may influence the decision (Friedl, Pondorfer, and Schmidt, 2019). While risk perception may have a strong effect on behavior when people make individual decisions, especially when these behaviors are easy to carry out, this may not be the case in social situations. Not all risks and benefits related to food are health related. Environmental sustainability, economic, cultural and social factors need also to be considered (Rideout and Kosatsky, 2017). As for the social aspect, the fear of interpersonal rejection has been

found to improve the effect of health communication. Emphasizing the social consequences of negative health outcomes, increases perceived vulnerability and affects both risk perception and behavioral intention (Murdock and Rajagopal, 2017). Feeling isolated and ostracized is one of the greatest sufferings in life and something people will go to great length to avoid. Individuals may accordingly perceive a behavior to contain a food safety risk, but choose to accept it due to social factors (Wachinger, Renn, Begg, and Kuhlicke, 2013).

Evolutionary psychology suggests that the decision between entering or not entering social relationships has been so important to our ancestors' evolutionary success that natural selection has designed domain specific cognitive architecture for how to behave in social settings (Johnson, Myagkov, Orbell, 2013). The fear of a solitary life or to be expelled from your in-group is so overwhelming that humans are biased towards entering social relationships regardless of the possible losses from doing so. A review of the social facilitation of eating shows that people eat more food in groups than when alone (Herman, 2015). This social facilitation effect has often been explained by the fact that social meals have a longer duration than individual meals (Pliner, Bell, Hirsch, and Kinchlab, 2006). Herman (2015) proposes that expectations and impression management might be alternative explanations. In some situations it is a matter of common courtesy to serve guests a lot of food, and for guests to eat what is offered. Studies have found that it is not only the size of the group, but also whom the group consists of that matters. We eat more with family and friends, than with strangers (Herman, Roth, & Polivy, 2003). This can be explained by impression management. We become highly self-conscious when we eat with strangers, since we know they will evaluate us. Such self-consciousness may suppress eating that might be interpreted negatively (see Vartanian, Herman, & Polivy, 2007). These explanations are supported by Veflen, Scholderer, & Langsrud (2020) who found that the pressure to eat disliked food, varied across situations. The expected consequences of non-compliance and the average empathy

participants felt with the imagined other were factors found to explain the pressure to comply with the social norm in a particular situation were.

Based on these findings, we propose that consumers will be more willing to eat risky food, such as an undercooked hamburger, if it is offered by a friend than by a stranger. To turn down a food offer may feel like declining a request for friendship, and may for some people be perceived as riskier than a foodborne illness. In such a situation the fear of hurting your friend, which may negatively affect your relationship, is weighted against the fear of food poisoning. We propose that while risk taking will follow risk perception in a situation where avoiding the risk will have no social consequences (such as at home or at a restaurant), risk taking will diverge from risk perception and be significantly elevated when avoiding the risk may have social consequences (such as at a friend's place).

H3: Both perception of the product and perception of the situation influence the intention to eat a hamburger.

H4: Intention to consume a risky hamburger (Risk taking) follows perceived likelihood of food poisoning (Risk perception) at home and at a restaurant, but increases and diverges from risk perception at a friend's place.

2. Materials and methods

2.1 Participants

A representative sample of 1046 Norwegian consumers was randomly selected from a consumer panel maintained by TNS Gallup, a professional market research company. The consumer panel consists of 49,000 people living in Norway (about 1% of the Norwegian population). A sample of respondents 18 years or older, with gender and age (average: 45 years) proportional to the population in Norway, was selected (Table 1). All respondents who completed the web survey were awarded 10 points from the market research company's own incentive program (TNS Gallup, 2012).

2.1 Stimuli

Hamburgers were made from vacuum-packed ground meat and cooked to four different core temperatures of 55°C (rare), 65°C (medium rare), 73°C (medium well-done) and 80°C (well-done). Immediately after reaching the predefined core temperature, the hamburgers were sliced perpendicular across the center of the flat surface of the patty to reveal the internal color and arranged together with hamburger buns, salad and French fries. Pictures were taken of each of the four different hamburgers (Figure 1).

2.3 Procedure

We conducted an online experiment with a between sample design for situation. To measure situated risk taking, the participants were randomly divided into four groups and asked to imagine that they had ordered a hamburger in a specific situation (either at their friend's place (n=246), at home (n=266), at a domestic restaurant (n=269), or at a restaurant abroad (n=266). Confronted with a picture of all the four hamburgers (rare, medium rare, medium well-done, well-done) in a randomized order they were asked "What is the likelihood that you would eat this hamburger if

served in this situation"?". They answered on a five-point scale with response categories "very low", "low", "neither high nor low", "high" and "very high". A "do not know" alternative was also included.

To measure situated risk perception, all respondents were asked to indicate their perceived likelihood of being food poisoned by eating a hamburger under different situations (Take-away, petrol station, catering, fast food chain, restaurant/café, garden party, friend's place and at home). No information related to the hamburgers' core temperature was given. They answered on a five-point scale with response categories "very unlikely (1)", "unlikely (2)", "neither unlikely nor likely (3)", "likely (4)", "very likely" (5), or "do not know". Since data for perceived risk at a restaurant abroad was not collected, we decided to conduct the comparative analysis of risk perception and risk takings for the three specific situations where we had both risk perception and risk taking data (at home, at a friend's place, at a restaurant).

2.3 Statistical analysis

To test H1, H2 and H3 the data from the experiment were analyzed by means of a mixed model ANOVA, with *hamburger* (rare, medium rare, medium well-done, well-done) as a fixed effect within subjects factor, *situational context* (at their friend's place, at home, at a domestic restaurant, at a restaurant abroad) as a fixed effect between subjects factor, and *participant* as a random factor.

After reporting the mean results for the situated risk perception, the data from three of the four between sample groups in the experiment were analyzed by means of a mixed-model ANOVA, with dimension (risk perception, risk taking) as a within-subjects factor, situational context (at home, at a friend's place, at a restaurant) as a mixed within-between subjects factor (within subjects

for the risk perception dimension, between subjects for the risk taking dimension), and participant as a random factor. This analysis was done to test H4. All analyses were conducted in SAS 9.3.

3. Results

In this study, we find that people perceive the likelihood of food poisoning from consuming a hamburger to vary under different situations. As illustrated in Figure 2, the least squares mean scores for perceived risk of consuming a takeaway hamburger is higher than when the hamburger is from a restaurant (support for H1), and higher at a restaurant than at home (support for H2). We also find significant differences both between the intention to eat the different hamburgers and between intended consumption of a hamburger under different situations (support of H3), but no interaction effect between these two factors. The parsimonious model tested explained 67% of the variance in intention to eat a hamburger. From Figure 3 we can see that out of the four hamburgers, the respondents are least likely to consume the rare hamburger, while the medium rare hamburger, cooked to 65 °C core temperature and therefore still a risky hamburger, is the hamburger with the highest likelihood of intended eating ($p<0.001$). We can also see that out of the four situations the respondents are most likely to eat all hamburgers when offered at their friend's place, followed by at home, at a domestic restaurant, and least likely when offered at a restaurant abroad ($p<0.001$). No interaction effects between doneness and situation were found ($p=0.4$).

There was a significant main effect of situational context (see Table 3): risk perception and risk taking were generally lower in the situational context of participants' own homes than in the two social contexts of a friend's place or a restaurant ($p<.001$). The effect was qualified by a significant interaction between situational context and dimension ($p<.001$). As hypothesized in H4, a significant effect was only found in the situational context of a friend's place: here, risk perception

and risk taking were significantly increased relative to participant's own homes, whereas in the context of a restaurant, risk perception was increased but risk taking was not (Figure 4).

4.Discussion

To improve our understanding of why some people consume potentially hazardous foods, we investigated how both perception of the product and perception of the situation influence risk perception and risk taking. We find that the likelihood of eating hamburgers varies with both the products' doneness and the situation (Support for H3). The perceived likelihood of food poisoning from consuming a hamburger also varies across situation. That the risk of consuming a hamburger is perceived higher at a takeaway place than at a restaurant, and lowest at home, indicates that both the perceived quality of a kitchen and familiarity of a place matters for the perception of a product's safety (supports H1 and H2).

Our finding that consumers are more likely to eat a risky hamburger when this is offered by a friend, indicates that the social context influences consumers' risk behavior. That the decision to eat a hamburger is influenced by who offers it, is in line with previous research showing that people eat more in a social situation (Herman, 2015), and when together with friends (Herman, Roth, & Polivy, 2003). They even eat risky food in situations with a pressure to comply with the social norm (Veflen, Scholderer, Langsrud, 2020). In this study, we find that social aspects of a situation influences people's consumption of risky food. As an explanation we propose, based on the findings from Veflen, Scholderer, & Langsrud (2020), that people consider the social risk of hurting their friend, which may negatively affect the friendship, when deciding to eat an undercooked hamburger or not. This is why consumers are less likely to eat a hamburger with the same degree of doneness when they are at their own home compared to when they are at their

friend's place. That consumers are more likely to eat hamburgers, both rare and well-done, at a domestic restaurant than at a restaurant abroad, indicates that familiarity removes skepticism. The warm feeling, evoked by something familiar, bias consumers and make them more likely to consume risky food from a restaurant in their own country than from a restaurant in a less known country (Patterson & Mattila, 2007).

Our finding that situation has an effect on risk taking independent of risk perception, supports our proposition that situational context influences the risk perception—risk taking relationship. That the decision to eat an undercooked hamburger is influenced by where it is offered, is in line with previous research showing that situation specific social norms influence the consumption of risky food (Veflen, Scholderer, & Langsrud, 2020). In some situations, the anticipated social consequences become more salient than the food safety risk, and risk taking does not follow risk perception. We observe that even though people perceive hamburgers offered at their friend's place to be more risky than the hamburgers served at home (Figure 2, 3, 4), they are still more likely to consume the hamburgers offered by their friend's. Accordingly, we find support for our hypothesis (H4) that in the absence of social consequences, differences in risk taking follow differences in risk perception, while risk taking diverges from risk perception and becomes significantly elevated in situations that may have social consequences. These findings support the idea proposed by Sjøberg (2000) that *"risk perception is a reflection of the social context an individual finds him- or herself in (p. 9)"*. But while Sjøberg (2000) claims it is risk perception that is influenced by the social context, we find that it is risk taking that is mostly affected. We can of course only speculate why. Is it because they are afraid of being evaluated negatively? Is it because they are afraid of hurting their friends? Is it because the social setting triggers positive emotions and inhibits their skepticism? More studies are needed to investigate these different explanations.

4.1 Limitations and future studies

That people perceive it less risky to eat hamburgers at home, compared to at a restaurant or at a friend's place, indicates that familiarity removes skepticism. The positive affect evoked by something familiar appears to bias consumers and make them perceive undercooked hamburgers from their own kitchen to be safer than the same hamburgers when served by friends or when bought at a restaurant. In future studies, the well-known familiarity effect observed here needs to be investigated in more depth. How does interaction between the familiarity of the product, the place (situation) and the presence of people influence the risk taking? We might expect that an undercooked hamburger, which is a familiar food, will be perceived safer than a raw salmon tartar, but we do not know how risk taking will vary under different familiar and unfamiliar situations. The interaction effects between familiarity and social context deserve further investigation. How will risky products offered by friends at an unfamiliar situation affect risk taking?

Another factor that deserves more attention in future studies of risk taking is perceived control. Previous research has found that people tend to see hazardous behavior as less risky if they have some control of the risk (Slovic, 1986; Klein and Kunda, 1994). Although considerable amounts of research have emphasized the importance of perceived control and even suggested that the desire to have an influence on our environment is a universal preference (Langer and Rodin, 1976), little attention has been paid to understand what is meant by control (Harris, 1996). In an attempt to conceptualize perceived control in risk perception, Nordgren, van der Pligt, and van Harreveld (2007) distinguish between two distinct aspects: command over exposure to the risk (volition) and command over the outcome (control). In three studies, they demonstrate that volition and control exert opposing influences on risk perception: control deceases perceived risk while volition increases perceived risk. The latter prediction, which may be seen as counterintuitive, is explained in relation to regret. They propose that a voluntary appraisal elicits anticipated regret, which

increases perceived risk. We found in this study that the intention to eat an undercooked hamburger at home was at the same level as the intention to eat the same hamburger at a restaurant. One explanation for why perceived control had no substantial effect on risk taking may be that the two contradictory aspects of perceived control, volition and outcome control neutralize each other. Future studies should therefore investigate these two aspects of perceived control separately to be able to see if they interact.

In a parallel study (Røssvoll, Sørheim, Heir, Møretrø, Olsen, Langsrud (2014), the inactivation of STEC was determined for hamburgers cooked to the same temperatures as in the pictures used in this study. For the rare and medium rare hamburger, the inactivation did not meet the performance criteria for cooking meat (99.999% reduction) and they should be regarded as unsafe to eat. From a food safety perspective it is very worrying that consumers tend to prefer undercooked hamburgers, despite several outbreaks and subsequent risk communication from food safety authorities. The present study demonstrates that not only do many consumers prefer hamburgers that are unsafe, those who prefer well-done hamburgers tend to eat rare hamburgers in certain social situations. It has been estimated that STEC causes 2.8 mill acute illnesses annually, and the impact is highest in infants and children (Majowicz, Scallan, Jones-Bitton, Sargeant, Stapleton, Angulo, et al. (2014). One possible path for future studies, would be to elaborate on the social pressure people feel in specific situations and focus on investigating behavioural change where it will have most impact: Target people that prepare and serve food to children.

5. Conclusion

We found that a rare, risky hamburger that may cause an *E.coli* infection was more likely to be eaten if offered at their friend's place, and less likely when offered at a foreign restaurant or at home. These findings indicate that situation plays an important role for consumers' likelihood

of eating unsafe food, and that social factors and familiarity should be taken into consideration when food safety strategies are developed.

This study shows that the effect of the situational context influences the relationship between risk perception and risk taking. By conducting an experiment where risk taking was measured under different situations, and comparing the results with risk perception for the same situations, we were able to demonstrate that risk taking does not follow risk perception in situations influenced by possible social consequences. All hamburgers, also undercooked hamburgers that may cause an *E.coli* infection, were significantly more likely to be eaten if served at a friend's place and less likely when served at a restaurant or at home. This indicates that a situation with social consequences influences risk taking. These findings can help us understand why risk taking not always follow risk perception and why information, which may affect risk perception, is not enough to change risk behavior. If we are to contribute significantly to the understanding of risk behavior, future studies need to move beyond the individualistic level and develop a more ambitious socially-oriented agenda for risk behavior research. Studies that explain the mechanisms for what we observe here (e.g. is risk taking explained mostly by the social aspects of a situations or a situations familiarity?) are also needed.

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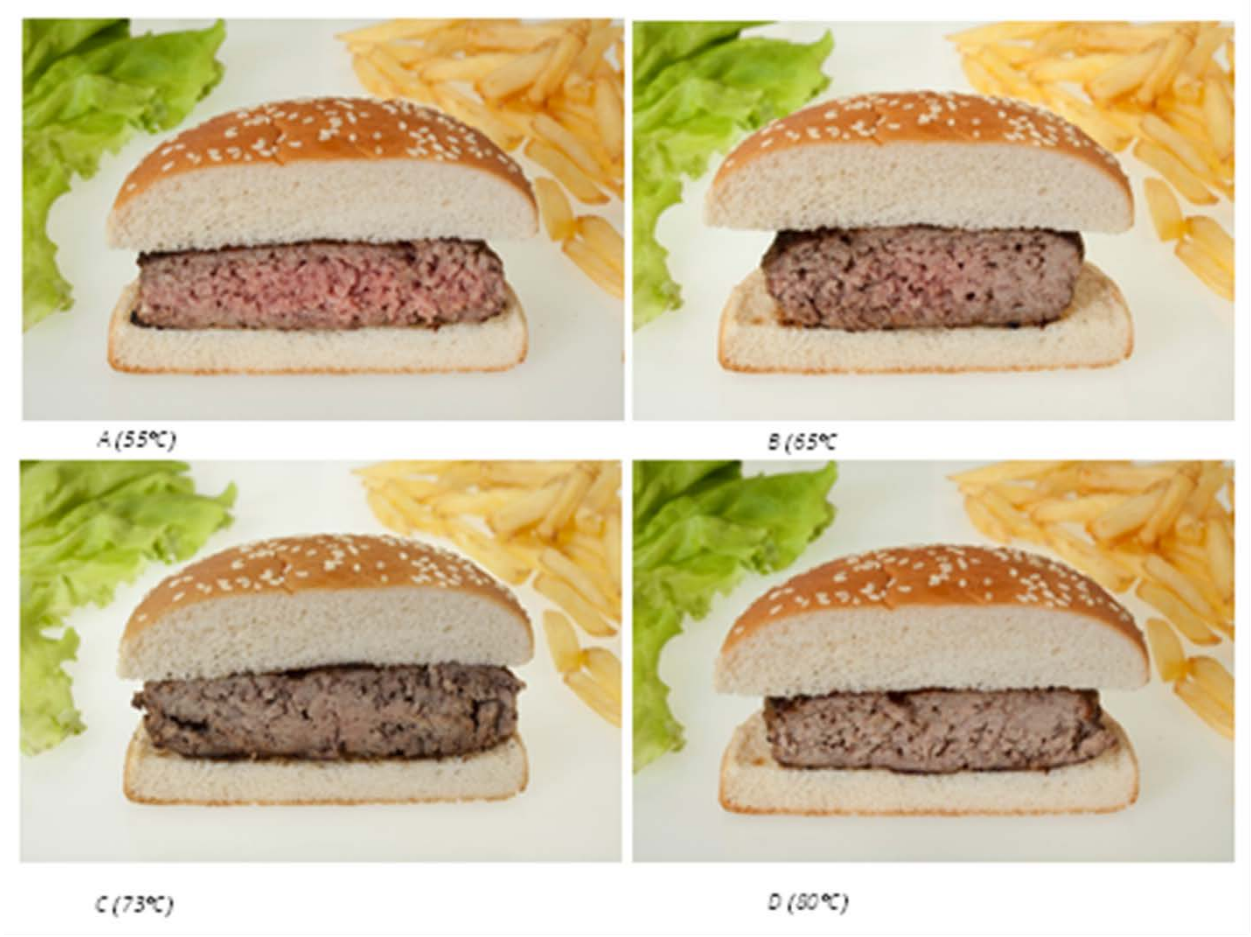


Fig. 1. The four hamburger pictures used as stimuli in the experiment. The respondents of the survey were asked not to take the shape and thickness of the hamburgers into account when considering the pictures, but to look at the meat color and texture.

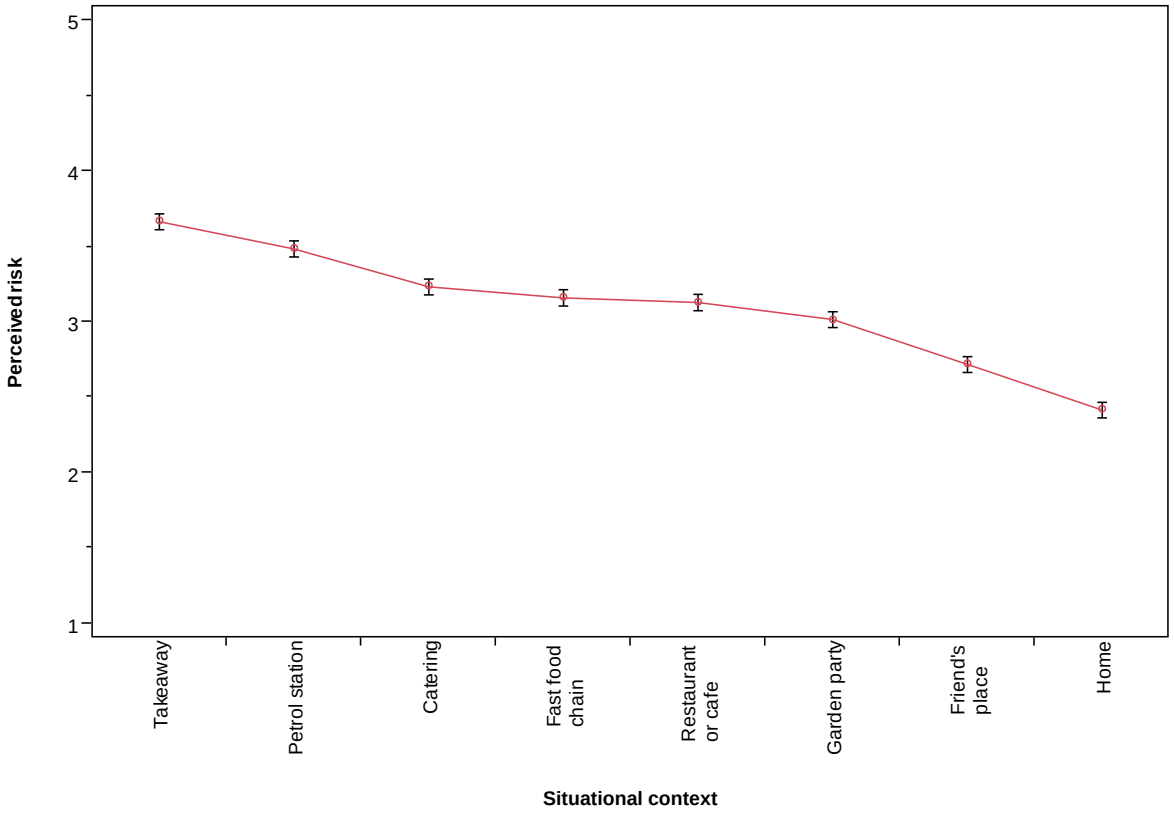


Figure 2: Least squares mean scores for perceived risk to eat hamburgers in different situational contexts, R^2: 0.604 (error bars indicate 95% confidence intervals).

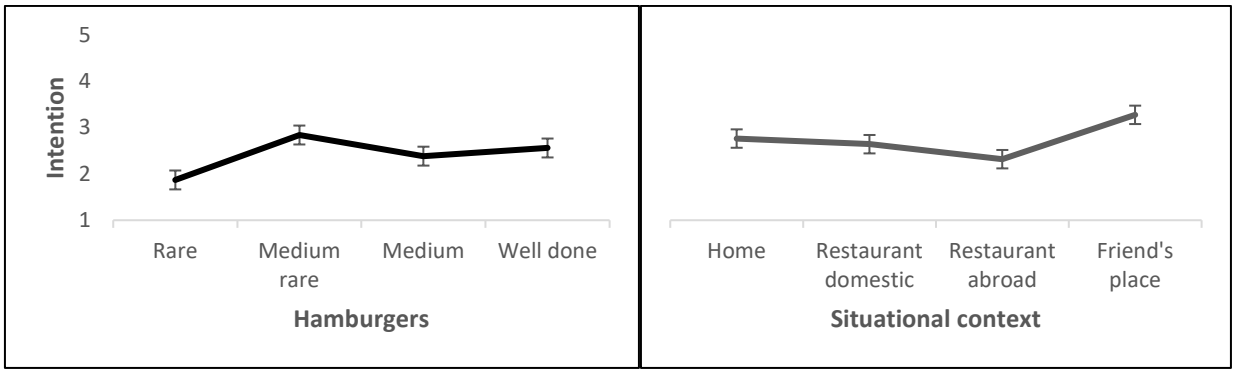
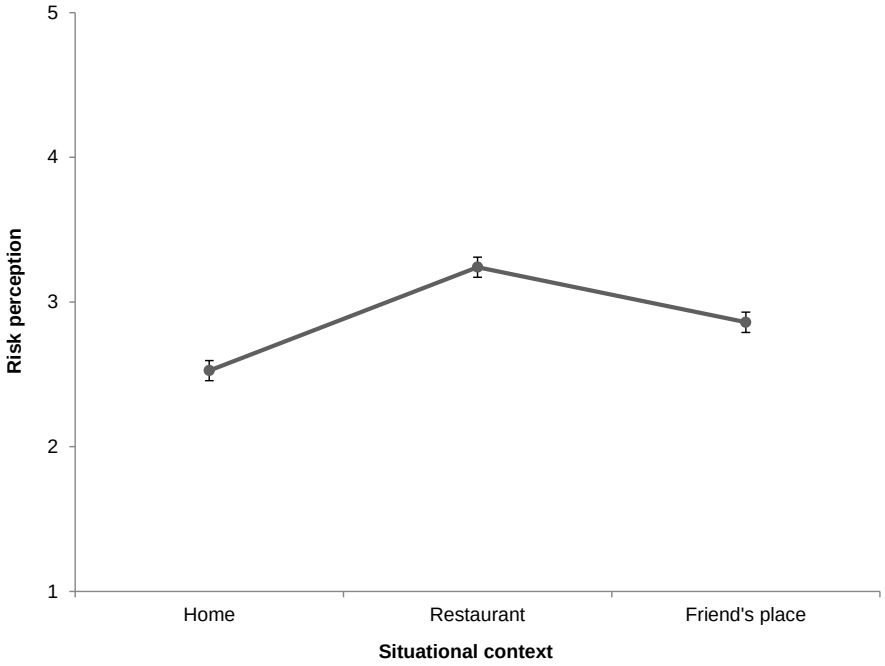


Figure 3: Mean scores for intention to eat hamburgers with different core temperatures (left) and in different situational contexts (right).



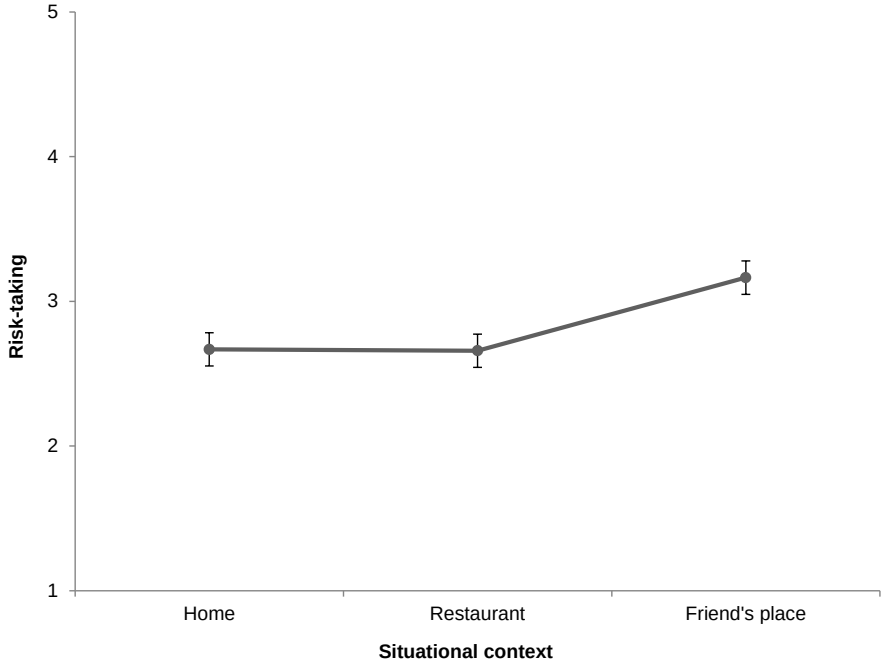


Figure 4. Risk perception and risk taking as a function of situational context (error bars indicate 95% confidence intervals).