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HEALTH THREAT CONTROL AS PSYCHOLOGICAL DISTANCE REGULATION

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Não há um único argumento ou motivo válido para ser fumador. Mas são muito poucos os cigarros que não me dão prazer.

Post to a thematic Facebook group on that week's topic, "pleasures"

You can lead a horse to the water, but you cannot make it drink.

12th century English proverb

Abstract

This theses adapts the Zürich Model of Social Motivation to the context of health-relevant behavior and, specifically, fear appeal research. Within this framework, health-relevant behavior is viewed as part of a self-regulating process in which people opportunistically engage in risk taking behavior, while striving to maintain towards hazards what they experience as »safe distance«. The novelty of a health threat information (HTI) is conceptualized as an integral part of threat percept construal, and emotions are thought to play an instrumental role in communicating threat perceptions to the coping system. A study was conducted to test and explore the model's validity, in which participants where confronted with written, cancer-related HTIs, and questioned about their experience. Using structural equation modeling, the model was determined to be of good fit for the empirical data, novelty was confirmed to play a significant role in threat percept construal, and threat size to be positively correlated with tendency towards instrumental, as opposed to palliative, coping responses. No significant support was found for the mediation effect of emotions.

Resumo

Esta tese adapta o *Zürich Model of Social Motivation* ao contexto do comportamento relevante à saúde, e especificamente à pesquisa sobre *fear appeals*. Neste referencial teórico, o comportamento relevante à saúde é visto como parte de um processo auto-regulador que assegura que, enquanto os indivíduos se envolvem em comportamentos de risco, é mantido o que é percepcionado como estando em «distância segura» em relação à fonte de perigo. A novidade de uma informação sobre uma ameaça de saúde (HTI) é conceituada como parte integral da representação mental da ameaça, e as emoções são consideradas ter um papel instrumental em comunicar percepções de risco ao sistema de *coping*. Foi conduzido um estudo para testar e explorar a validade deste modelo, no qual os participantes foram confrontados com HTIs escritos, relativos a cancro, e questionados sobre as suas experiências. Usando modelos de equação estrutural, foi determinado que o modelo apresenta um bom *fit* relativamente aos dados empíricos. Foi confirmado o papel significativo da novidade das HTIs na construção de representações mentais de ameaça, e revelou-se uma correlação positiva entre o tamanho da ameaça e a tendência para respostas de *coping* instrumentais, ao invés de paliativas. Não foi encontrado suporte significativo para o efeito mediador das emoções.

Abbreviations, acronyms and symbols

α	Cronbach's alpha
AC	all cancers
AI	action impulse
ANOVA	analysis of variance
β	regression weight / factor loading
CR	coping response
EPPM	Extended Parallel Process Model
ER	emotional response
GCSE	General Certificate of Secondary Education
GSE	General Self-Efficacy Scale
HBM	Health Belief Model
HBT	health behavior theory
HRB	health-related behavior
HTI	health threat information
iAI	instrumental action impulse
iCR	instrumental coping response
JASP	JASP
LC	lung cancer
M	mean
pAI	palliative action impulse
pCR	palliative coping response
PMT	Protection Motivation Theory
PSPP	PSPP
RMSEA	Root Mean Square Error of Approximation
SABIC	Sample-Size Adjusted Bayesian Information Criterion
SD	standard deviation
SEM	structural equation modeling
TCM	Threat Control Model
TLI	Tucker Lewis Index
TP	threat percept
ZMSM	Zürich Model of Social Motivation

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Introduction

Why do people maintain behavior they know to pose a health risks to them? Health-relevant behavior, and especially reaction to so called *fear appeals*, have been studied for decades, and there are several theories and models aiming to explain it (for an overview see Lippke & Renneberg, 2006; Martin & DiMatteo, 2014; Noar & Zimmerman, 2005; Peters, Ruiter, & Kok, 2013; Ruiter, Kessels, Peters, & Kok, 2014; Waters, McQueen, & Cameron, 2014). Fear appeals are persuasive health risk communication messages that make use of contents meant to induce fear in order to provoke change in health-relevant behaviors (Dillard, 1994; Maloney, Lapinski, & Witte, 2011; Rogers, 1975). This kind of dissuasion-through-deterrence messages has a long tradition in popular Western pedagogics. Prominent examples are the folkloric invoking of the fabled bogeyman in Anglo-American, of the *papão* in Portuguese speaking cultures, or the German children's book *Struwwelpeter*, all of which use imaginary threats and consequences to deter children from behaving in unwanted manners. It has also a long history of being used in official initiatives aimed to shape public opinion and behavior politically, socially, and in terms of hygiene and health (cf. Janis & Feshbach, 1953). The research tradition of fear appeals goes back to the 1950s. Prominent models from this tradition still in use today are Roger's revised Protection Motivation Theory (Maddux & Rogers, 1983) and Witte's (1992) Extended Parallel Process Model.

The Protection Motivation Theory (PMT) was the first fear-appeal theory to not draw upon learning-theoretical drive models, but rather from early risk research based on the expected utility paradigm (e.g., Atkinson, 1957). It assumes that the tendency to adopt a proposed response to a threat is the higher, the more the following are given: high threat severity, high felt susceptibility, high response efficacy, high self-efficacy, low associated rewards for the discouraged behavior, and low associated costs for the encouraged behavior (Prentice-Dunn & Rogers, 1986). In its original form (Rogers, 1975), the PMT was »emotionless«, relying wholly on cognitive mediating processes. In its revised form, the PMT allows for minimal emotional influence, contending that "fear arousal influences perceived severity but has only an indirect effect on the eventual behavior enacted" (Maddux & Rogers, 1983).

The Extended Parallel Process Model (EPPM) is based on Leventhal's (1970) Parallel Process Model which, while drawing upon traditional, behaviorist drive models, used an

updated, cognitivist approach. The EPPM extends Leventhal's model, which features a single *danger control* process, by adding to it a second, complementary *fear control* process. It uses two main constructs: (perceived) threat and (perceived) efficacy. Threat is composed of perceived severity and perceived susceptibility. Efficacy is composed of self-efficacy (the degree to which a person considers him/herself able) and response efficacy (the degree to which a person considers a proposed response feasible). Upon exposure to a message, an individual will first engage in the assessment of the potential threat: severeness of its consequences and own susceptibility to its occurrence. If for that individual this results in a high enough threat, he/she will experience fear, in which case he/she will engage in efficacy assessment. If efficacy (response efficacy or self-efficacy) is found lacking, the individual will reduce their fear by adopting a fear control strategy, effectively rejecting the message. If, on the other hand, efficacy is found to be sufficient to avert the threat, the message receiver will adopt a danger control strategy, changing belief, attitude, intention, or behavior in accordance with the message's recommendations to, again, reduce his/her fear (Maloney et al., 2011). Thus, it is the tenet of the EPPM, that "fear *causes* maladaptive responses, and may indirectly *influence* adaptive responses, as mediated by perceived threat" (Witte, 1992, emphasis in the original).

For decades, however, researchers have been struggling to produce empirical data consistent with the different explicative models about persuasive health risk communication (cf. Peters et al., 2013). In a recent meta-analysis on the effectiveness of raising risk appraisal, Sheeran, Harris, and Epton (2014) observed only small direct effects of risk appraisals on intentions and behavior. In their review of sixty years of fear appeal research, Ruiter, Kessels, Peters and Kok (2014) come to the verdict that "alternative behavior change methods than fear appeals should be considered." And in their study, Hoor et al. (2012) offer the conclusion that the reason for the continued popularity of fear appeals in spite of the inconclusiveness of the empirical data on their effectiveness was that they were "intuitively appealing."

Sheeran et al. (2014) make it their key message to warn researchers and practitioners against expecting that "heightening individual elements of risk appraisal will, by itself, have a large effect on intentions or behavior,"[1] suggesting instead that research be directed toward

[1] This warning would seem like a belated echo of Janis' axiom from nearly fifty years earlier that an "optimal degree of emotional arousal […] is presumed to be a necessary but not a sufficient condition for acceptance of the communicator's recommendation" (Janis, 1967), were it not for the fact that, since the conception of the

"identifying and testing factors that could amplify or attenuate the impact of risk appraisal on intentions and behavior" and exploit "synergies among the elements of risk appraisal, and between risk appraisals and coping appraisals." Two such factors are perceived *response efficacy* (of the action proposed to counter the threat) and *self-efficacy*. They are widely recognized and are an integral part of both, the PMT and the EPPM, since their respective inceptions (cf. Rogers, 1975; Witte, 1992), as well as other health behavior theories like Bandura's Social Cognitive Theory and Fishbein's Integrated Theory (Lippke & Renneberg, 2006; Noar & Zimmerman, 2005). Another such factor, *novelty*, has emerged in Fischhoff, Slovic, Lichtenstein, Read, and Combs' (1978) study. Since then, novelty has figured as an important factor mainly within the psychometric paradigm in risk research (see Sjöberg, Moen, & Rundmo, 2004, for a review). However, it is not an explicit part of any fear appeal or health behavior theory.

Problem domain and approach

From his evaluation of the literature, Gutteling (2015) observes that scholars are increasingly working on the testing of hypotheses, gaining knowledge on "what works, and when". While it is obviously extremely important and useful to know what works under which circumstances, understanding *how* it works is nonetheless of greatest importance for advancing any given subject and (in the long run) its applications. Although a vast amount of research has been conducted throughout seven decades (for an overview see Dillard, 1994; Leventhal, 1970; Peters et al., 2013), there is no consensus as to what processes occur in reaction to the exposure to a potential threat and how they are to be integrated within the greater context of human motivation.

Although differing in theoretical assumptions and in the selection of intervening variables considered necessary for the particular model to adequately explain and predict behavior, health behavior models are actually quite similar in defining and approaching their problem domain: (1) They are primarily interested in the impact that an exogenous corrective intervention has on people's health behavior, and in how to optimize the outcome. This has been called the application bias (Dillard, 1994). (2) Mostly, they model health behavior as

structure of persuasive messages is so fundamentally different between drive theory based and cognitivist approaches, the two statements do not really refer to the same thing (cf. Dillard, 1994, p. 316). The parallel, nonetheless, seems noteworthy.

largely decontextualized singular linear or two-tiered processes of reacting to health-relevant stimuli (cf. Leventhal, 1970; Prentice-Dunn & Rogers, 1986; Witte, 1994),[2] typically, again, to a corrective intervention regarding a behavior considered maladaptive.[3] Also, (3) they do not adequately consider the importance of affect and emotion on threat perception and decision making (Dillard, 1994; Visschers et al., 2012)[4].

This thesis argues in favor of a different approach to a somewhat redefined problem domain. It proposes a model designed not foremost to represent singular instances, like being confronted with a corrective attempt of a health care professional, or being exposed to an acutely threatening situation, but the normal, continuous functioning of which such situations are part of. In doing so, it adopts a subject-centric, or simply *subjective*, view, thus avoiding viewing people as tendentially deficient, error-prone beings when handling health risks, emphasizing instead the enormous competence we humans mostly display when navigating the joys and perils of life.

The model I proposemodel proposed in this thesisproposed model is concerned with behavior towards perceived threats. As such, its problem domain is situated at the intersection of the fear appeal research tradition, the largely independent decision-making and risk research, and general health behavior theory. It is effectively concerned with *health-relevant behavior* (HRB), which is to mean any behavior that the engaging subject believes or suspects has the potential to affect his/her own health. This concept is much broader than the more commonly used *health behavior*, which Kasl and Cobb (1966) defined as "any activity undertaken by a person believing himself to be healthy, for the purpose of preventing disease or detecting it in an asymptomatic stage." Paired with a contemporary, inclusive concept of health itself as "a state of complete physical, mental and social well-being" (WHO | Constitution of WHO: Principles n.d.), this definition encompasses a considerable part of

[2] An exception is the Health Belief Model (HBM). Due to its field theoretical origins it extensively considers *life space* factors. Contrasting it with the PMT's process orientation, Floyd, Prentice-Dunn, and Rogers (2000) refer to the HBM as being "organized as a catalog of variables contributing to behavior." Although, judging from the summary from Prentice-Dunn and Rogers (1986; transcribed above), much the same could be said about the PMT.

[3] A prominent exception is the Transtheoretical Model which takes into consideration the maintenance of desired behavior changes (cf., Lippke & Renneberg, 2006).

[4] Witte's EPPM somewhat attenuates this situation. However, in her complex process model, emotions and rational thought seem inextricably entangled in what appears to be a Schachterian understanding of the emotion–reason relationship.

human behavior. The focus of this thesis, however, will be behavior with regard to health threats.

It is argued that a subjective, continuous view would best be represented by a dynamic feedback loop process model, or self-regulating, homeostatic model — in other words, a system-theoretical approach. For the sake of parsimony, it is advantageous to recur, if possible, to an established model in the same or an adjacent problem domain. As a structural science, psychology reduces diverse observational information by abstracting from the immediate problem area, ecology, or context (Bischof, 2014). Thus, by encapsulating any expected or observed divergencies inside the threat construct and its components, an HRB model can abstract from them, permitting it to be based on a more generalist model.

Models using a cost–benefit appraisal approach like Rogers' Protection Motivation Theory and the Health Belief Model, or other net-gain models, including expected utility models, effectively incorporate many analogs to the functional relations covered in this model. However, a control-theoretical model with a negative-feedback loop design implies the advantage that its behavior is at least co-determined by its homeostatic aim to optimize its own state values. Other particularities are system theory's inherent foundation in teleologic perspective, system-, and in therefore, subject-centricy, the assumption of circular causality and organismic spontaneity, and familiarity with complex causal semantic webs (Bischof, 2016). All of these should prove useful at some point when further exploring the complex system dynamics at hand.

A concept of threat

Objective and subjective aspects of threat

The use of terms like threat or risk has been inconsistent and confounding in the literature (cf. Noar & Zimmerman, 2005; Waters et al., 2014).[5] Both terms are often used interchangeably, when in fact they clearly refer to very different aspects of a common situation — as can be derived from the meaning of their respective verbal forms, to threaten and to risk. Moreover, they are often applied indiscriminately to ontic and phenomenal

[5] Waters, McQueen, and Cameron (2014) interpreted this circumstance rather euphemistically as "emblematic of the richness" of the research area. However, from a more critical perspective it might be read as a sign of its possibly still pre-scientific state (vide Kuhn, 1962/2012).

aspects of the situation, implicitly identifying them (e.g., Rogers, 1975; Witte, 1992). Throughout much of fear appeal and risk research, the importance of (subjective) perceptions and, in extension, their distinctiveness from objective facts, are recognized, e.g., when Witte (1994) distinguishes between *perceived threat* and *actual threat*. In practice, however, this distinction is often blurred.

To avoid this epistemological conundrum, it is necessary to define a terminology which consequently reflects this distinctiveness. Therefore, throughout this thesis, *risk* will refer to the objective chance of something considered undesirable happening, whereas *threat* denominates the always subjective perception of such a risk and its associated harmfulness. This view is compatible with much of the fear appeal literature, where threat is often conceived as a quantifiable entity constituted of the factors *perceived susceptibility*, which refers to the risk aspect, and *perceived severity*, which refers to the harm aspect (e.g., Leventhal, 1970; Maddux & Rogers, 1983; Rogers, 1975; Rosenstock, 1974; Witte, 1992).

However, additionally, there is an object to a threat: the adverse event from which the threat emanates, which shall be called *hazard*. For a smoker, for example, contracting lung cancer might be one such hazard. A threat representation also holds references to the hazard's causal linkage: the factors that influence the chance of its occurrence (which for the purpose of this model can be limited to HRBs), and its possible consequences, i.e., its *harm* (cf. Leventhal, Brisette, & Leventhal, 2003; Leventhal, Leventhal, & Contrada, 1998).

The concept's basal relational triangle (subject–behavior–hazard, see figure 1) can be used to map the multi-causal and multi-final nature of the relationship between the various HRBs and the various adverse *and* beneficial outcomes with which organisms are linked in a semantic web of probabilistic causal attributions. Such a mapping can help to contextualize the attitudes often perceived as puzzling by outsiders, which subjects display towards certain long-term threats that they have accepted as being part of their lives — be it with regard to health-relevant habits like smoking, work or sport related hazards, or environmental givens.[6]

[6] This habituation effect is being investigated under the term *risk normalization* (cf. Albert, 1999; Lima, Barnett, & Vala, 2005).

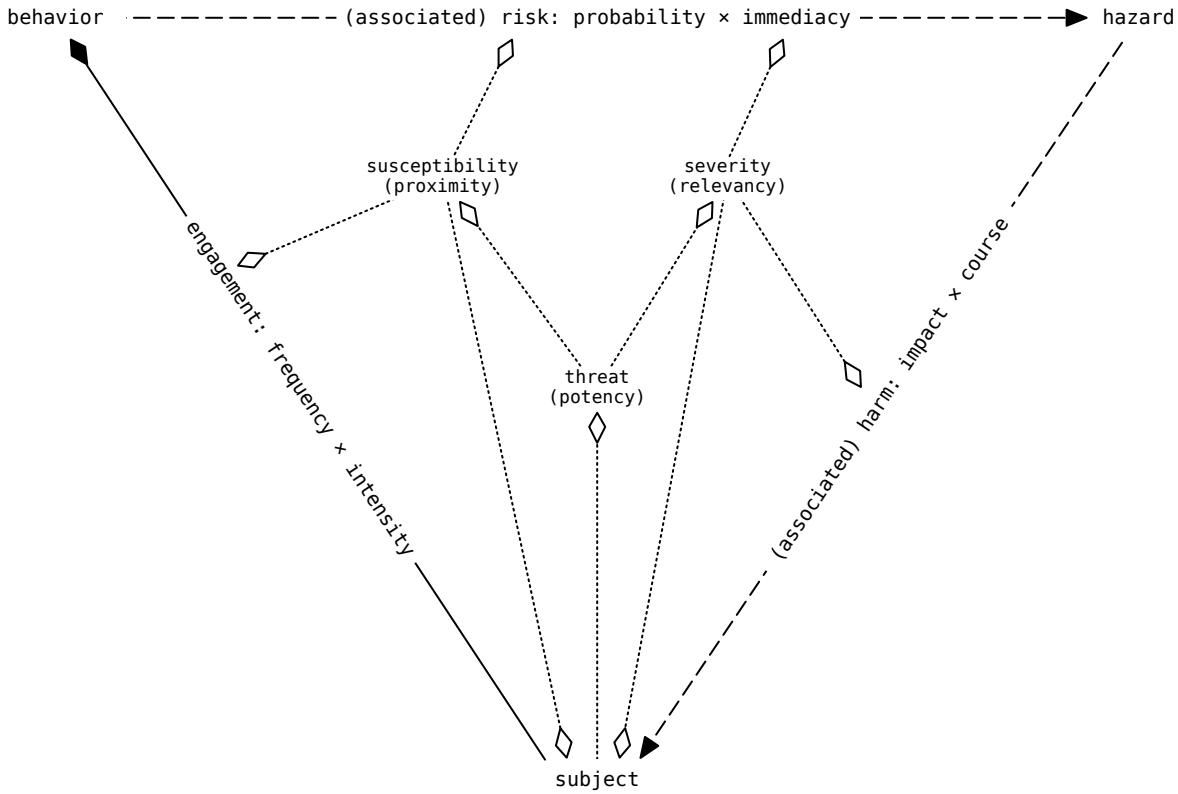

Figure 1. Graphic of the threat concept. The outer triangle represents objective relations. Dashed lines mean probabilistic, unobservable relations. The inner connections (the dotted lines) represent the subjective (phenomenally centrifugal) construal of threats. Note that the construal of both threat constituents, susceptibility and severity rely on self-reflective inferences about (subjectively) relevant characteristics of the subject itself.

Concrete and abstract threats

Threats can be characterized as either *concrete* or *abstract*. Concrete threats refer to those hazards for whose causal linkage the organism has evolved a detector and are thus directly perceptible to it.[7] Therefore, concrete threats are of what Michotte (1966) termed *phenomenal causality*, which means they are perceived as evident (cf. Michotte, 1966). On the other hand, determining causal relations in the absence of phenomenal causality, requires organisms to resort to sampling the available proximal cues, and inferring the distal (causal) relations on this basis (Brunswik, 1955/2001; Fiedler, 2007)[8]. Abstract threats, therefore, are not perceived as evident. In spite of this difference in what Trope and Liberman (2000/2003)

[7] Such perceptions can go beyond observable mechanic causality, like, for example, an acquired aversion to a certain food associated with an episode of food poisoning (cf. Garcia, McGowan, & Green, 1972).
[8] Juslin and Olsso (1997) call this state, which is distinguished by high proneness to external perceptual error due to reduced cue correlations, *Brunswikian uncertainty*.

call *level of construal,* it is proposed that, once perceived, concrete and abstract threats function analogically, thereby justifying the use of one, uniform threat model valid for both.

The organism–threat relationship

Considering concrete threats, the most fundamental determinant of its corresponding risk is the subject's physical distance to the respective source of danger. The objective likelihood of being affected by the hazard generally decreases with increasing distance from its source. For example, shunning to go near a bears' cave effectively decreases the likelihood of encountering, being attacked by and, ultimately, harmed by a bear. When trying to determine the *nature of the relationship* between the subject and the threat, it is tempting to assume a general imperative for minimal risk, i.e. maximum distance. But, on closer analysis, it becomes obvious that this maxim would be dysfunctional, as it would also minimize opportunity. In our example, there might be tasty, much sought after mushrooms that grow in the wild, but tend to be already mostly picked by other bear-fearing people in the areas farther away from the cave. Thus, the optimal strategy in this cost–benefit relation would be one that generously affords opportunity while keeping risk at a still acceptable level (cf. Higgins, 1997). On a representational level, and taking into account a multitude of relevant external and internal cues like observations about environmental conditions and assumptions about the own physical fitness, the physical distance translates into a corresponding *psychological distance*, making it experienceable. The specific (psychological) distance which a subject would still experience as satisfactory depends on various environmental and organismic factors, and hence can vary widely between subjects in a given situation, and between comparable situations, given a certain subject.

The Threat Control Model (TCM)

This thesis proposes adapting the Zürich Model of Social Motivation (ZMSM) to the domain of health behavior theory, deriving from it the Threat Control Model (TCM). The ZMSM evolved as an extension of attachment theory (cf. Bischof, 1972, 1975). It conceptualizes attachment as a form of (psychological) distance regulation towards relevant others which in turn is understood to be a function of the individual’s appetence for security from more familiar others versus his/her appetence for arousal from less familiar others

(Bischof, 1993, 2014; Gubler & Bischof, 1991; Scheffer & Heckhausen, 2010; Schneider, 2001). Analogically, the TCM conceptualizes health-relevant behavior towards threats as a form of psychological distance regulation.

The ZMSM follows an evolutionist, system theory based approach, featuring a self-regulating negative-feedback loop whose function is to regulate the state values of several drive systems in accordance with their respective reference values by adjusting proximity toward relevant objects. Within the ZMSM, *familiarity* is one of three central variables, besides *relevancy* and *proximity*, that co-determine the attractiveness of an object in the context of attachment, because, in a nutshell, closeness to a well-known conspecific affords high protective potential. Likewise, avoiding adverse health effects can be conceptualized as (and in the context of concrete threats often actually is) essentially a form of keeping a distance from known hazards that is experienced as comfortably safe. The TCM, therefore, views avoidance behavior (and the lack thereof) toward hazards in the light of interpreting perceived susceptibility as psychological distance. According to Fischhoff et al. (1978), one of risk-benefit analysis' fundamental questions is "How safe is safe enough?". The TCM pursues this very question in its field-theoretical reformulation of "How distant is distant enough?".

The TCM's principal *raison d'être* — apart from introducing to the field of threat perception the previously rather obscure factor it inherits from the ZMSM, novelty — is its theoretical descent itself. Having been derived from a rigorously founded, wide-reaching conceptual base enables this model to potentially contribute to science' other main objective besides the aggregation of knowledge: the reduction of knowledge. In comparison, both the PMT and the EPPM are »stand-alone solutions« lacking in integrative potential.

Distance regulation: regulation of susceptibility

"Part of the motivational inventory of most higher life forms including man is the tendency to keep an *optimal distance* towards certain distinguished objects" (Bischof, 1993; translation by this author; italics in the original). This tendency for distance regulation is posited to differ in degree with regard to the *relevancy* an object has for the life form. Within the context of attachment theory, relvancy refers to the object's aptness to serve as caregiver, or, in substitution, as source of comfort. It has its negative terminological equivalent in threat

severity, or aptness to inflict harm, a current term within general health behavior theory. Within the TCM, (perceived) severity is used interchangeably with negative relevancy which is maintained as a bipolar measure able to express both beneficial and harmful expected influence.

With regard to concrete threats, the distance towards a threat is equivalent to the actual physical distance separating the subject from the hazard. However, in order to accommodate the more abstract threats prevalent in health behavior theory, distance is conceptualized as a Lewinian *psychological distance*: the perceived susceptibility towards the threat.[9] Therefore, within the TCM, (psychological) distance regulation means the regulation of (perceived) susceptibility. Consequently, like several health behavior theories — e.g., the Health Belief Model (Rosenstock, 1974), the Protection Motivation Theory (Maddux & Rogers, 1983; Rogers, 1975), the (Extended) Parallel Process Model (Leventhal, 1970; Witte, 1992) — the TCM conceptualizes perceived severity and perceived susceptibility as being the two first-order factors of perceived threat.

It may merit emphasis that, in keeping with the ZMSM's optimal distance tenet, the TCM likewise hypothesizes organisms to strive for *optimal* susceptibility, not *zero* susceptibility. The reason for this supposition is that risk (the chance of something undesirable occurring) and opportunity (the chance of something desirable occurring) are understood to be highly positively correlated. Trying to eliminate risk completely would be dysfunctional since, simultaneously, it would severely impair opportunity (see The organism–threat relationship, above).

Unfamiliarity, entropy and confidence

Apart from perceived severity and perceived susceptibility, a perceived threat's most important characteristic is the novelty (i.e., inverse familiarity) it bears for the subject. In information theoretical terms, this is called *entropy,* meaning "unfamiliarity, uncertainty, difficulty with the interpretation of a datum on the grounds of existing knowledge or with the

[9] An obvious example of a concrete risk is the object of O'Neill, Brereton, Shahumyan, & Clinch's (2016) study on the impact of perceived flood exposure on flood-risk perception, where actual spatial distance is the basis for psychological distance. Beach, Gilliver, & Williams' (2013) study on risk reception regarding noise exposure, on the other hand, is an interesting »mixed case« where the frequency with which risk-aware participants choose to expose themselves to potentially damaging levels of sonic radiation seems to be used to regulate psychological distance to an abstract threat, whereas spatial distance-keeping from a source of noise could indicate avoidance of a concrete threat involving the phenomenal causality of actually perceived physical discomfort.

prediction of a chain of events" (Bischof, 1996, translation by this author). Within the TCM, entropy is a second-order parameter: it effectively refers to the degree of uncertainty the informational aggregate, that perceived severity and perceived susceptibility draw upon, is fraught with. Thus, for an individual with little or no familiarity with a certain perceived threat, being confronted with it will likely carry elevated entropy, and he will tend to place reduced confidence in the adequacy of his own threat construal. In other words, he is likely to be less sure, compared to a more familiar threat, of whether or not he judges the risk correctly.

From this follows that, when exposed to information about a little familiar abstract threat, a subject's uncertainty about his threat percept is likely to *increase*. In order to appreciate this somewhat contra-intuitive proposition, it is helpful to refer to Fiedler's concept of *distribution of stimulus information* regarding distal (i.e., not directly observable) relations. Fiedler (2007) differentiates three aspects of information distribution: the information's *density* (i.e., "the frequency of pertinent observations"), its *variability*, and its *redundancy*. Using this distinction, it becomes apparent that for an unfamiliar, abstract threat, i.e., one with low density information distribution, an additional piece of information is likely to be non-redundant and therefore induce variability. It is this raise in variability against a small established knowledge base that is responsible for the surge in uncertainty in spite of the fact that, objectively, the subject has increased his knowledge about the risk.

Arousal, venturesomeness and autonomy claim

In the ZMSM, the controlling of social distance is based mainly on the regulation of two affective states: *security* and *arousal* (Bischof, 1993). Distance regulation behavior towards various conspecifics is the means by which the organism is theorized to optimize its state in relation to the two corresponding endogenic reference values, *dependence* and enterprise, or *venturesomeness*. Although fundamentally trait-like, these are thought to vary with age and probably even on a situational basis.

The TCM dispenses with the security drive system, which with regards to HRBs would mean to consider their opportunistic aspects, and makes use only of the arousal system.[10] In

[10] In the context of attachment theory, the experience of security that the proximity of a parent (or another familiar conspecific) confers can be understood as the result of the dependent believing him/herself to be within the protective reach of that significant other, to be in a situation of *opportunity* to receive care. The opportunistic aspects of health-relevant behavior can also easily be contemplated from the perspective of the TCM. In fact, their consideration is an integral part of its overall approach: they are conceptualized as complementary

the TCM, arousal is defined as the product of perceived threat and entropy. The difference between arousal and its endogenic reference value venturesomeness can be positive, resulting in appetence, or negative, resulting in aversion (Bischof, 1993). Aversion is experienced as fear, and normally leads the organism to try to reduce the perceived threat by diminishing its perceived susceptibility to it. Appetence, on the other hand, should not be construed as seeking more proximity with the threat per se, but rather as surplus tolerance toward it, as available behavioral »leeway«, should the desired exploration of opportunistic aspects of the HRB call for it. Thus, venturesomeness can also be understood as *openness to risk*.

In the more elaborate versions of the ZMSM, *autonomy claim* is the reference value of an *autonomy system* in its own right, which is responsible for regulating assertiveness (cf. Bischof, 1993; Gubler, Paffrath, & Bischof, 1994; Schneider, 2001). It is assumed to underly venturesomeness in a positive, and security in negative, linear-correlative fashion. In representations not featuring a separate autonomy system, autonomy claim has been depicted as affecting behavior through the other two systems (Bischof, 1996, p. 500, Gubler & Bischof, 1991). Autonomy is an envelope construct for various self-referential value dimensions like power, competence, recognition, achievement, influence, etc., whose common denominator is the associated boost in self-certainty (Bischof, 1993). It can be considered the ethological counterpart to the themselves closely related social cognitivist constructs of *locus of control* and *self-efficacy* (Asendorpf, 2015; Bischof, 1993; Heckhausen & Heckhausen, 2010; Munro, Lewin, Swart, & Volmink, 2007), the latter being a frequent feature of health behavior theories (cf. Lippke & Renneberg, 2006; Munro et al., 2007; Noar & Zimmerman, 2005).

Emotions and the coping system

If a significant discrepancy evolves between a drive system's (in our case the arousal system's) target value and state value, due to the existence of a Lewinian barrier or inhibition through executive control, the *coping system* gets involved. Bischof's concept of a coping system is that of an all-round tool, a powerful and comprehensive mental problem solving

motivational antagonists, whose interdependency with their threatening counterparts alone makes risk-taking behavior sensible and understandable at all. However, the breadth of their motivational themes can be expected to encompass most of, if not the whole motivational inventory. Therefore, the formal integration of opportunistic and threatening aspects would mean the consideration of a comprehensive system of motivation in general, an undertaking vastly beyond the scope of the present work whose focus is the risk aspect of health-relevant behavior.

facility, which he likens to the psychoanalytical concept of the *ego apparatus* (cf. Nagera, 1968; Pine, 1983) and Köhler's *psychophysical Level* (cf. Köhler, 1920), or *neural correlates of consciousness* (cf. Bischof, 2013, 7'30"-7'54"; Bischof, 2014, chapter 12.4.2; Crick & Koch, 2003). The coping system is informed about the nature of the discrepancy problem by the affective phenomena which accompany the drive system's activation, turning them experienceable in the process in form of *emotions* (Bischof, 1993, 2014; Gubler & Bischof, 1991).[11]

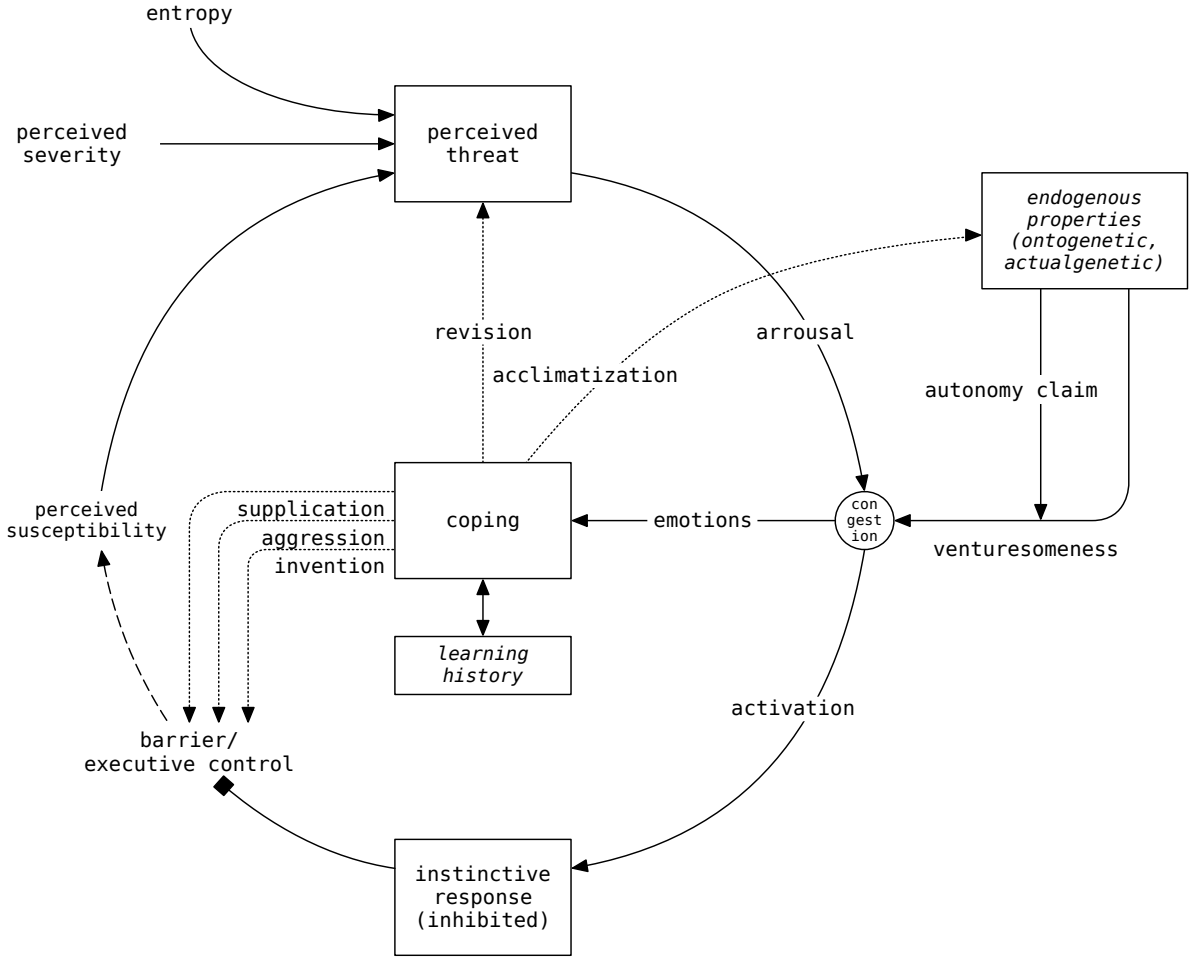

Figure 2. The Threat Control Model (TCM), adapted from (Bischof, 1996).

Bischof's conception of the function of emotions as signals to the coping system stems from the ethological view that equates not yet acted out drives with moods. This

[11] The idea that emotion be instrumental in the response to threat or the dealing with risk had fallen almost completely out of favor under the growing influence of cognitivism (Dillard, 1994; Witte, 1992). During the heyday of cognitivism, the concept of emotion itself suffered what might be called cognitivization (Bischof, 1989; Lazarus, 1982; Zajonc, 1980). In recent years, however, emotion in its own right is being rehabilitated and seems to be gaining ground in decision making and risk perception research (cf. Finucane, Alhakami, Slovic, & Johnson, 2000; Gigerenzer, 2013; Loewenstein & Lerner, 2003; Loewenstein, Weber, Hsee, & Welch, 2001; Slovic & Peters, 2006; Slovic, Finucane, Peters, & MacGregor, 2004; for an overview see Waters et al., 2014).

understanding of emotion as a kind of cognition (Bischof, 1989) resonates with other conceptualizations like feelings-as-information (cf. Schwarz & Clore, 1996), the affect heuristic (cf. Finucane et al., 2000) and risk as feelings (cf. Loewenstein et al., 2001). It also arises from a system-immanent necessity for the existence of some such communication provision which bridges the gap between the phylogenetically older (and originally independent) drive systems and the newer executive functions (Bischof, 2014). In humans, executive control is involved in all but the most reflexive or automatic behavior (Pribram, 2013). It inhibits the instinctive execution of consummatory actions in favor of conscious decision-making processes (Bischof, 2014). Through its constituents, *endothymic quale* or (simply) *feeling* (Coppin & Sander, 2016), *valence* or *appraisal*, and *action tendency* (cf. Coppin & Sander, 2016; Dewey, 1895; Eder & Brosch, 2017; Klages, 1910/2001; Lersch, 1938/1970; Otto, Euler, & Mandl, 2000), emotion possesses the properties necessary to fulfill the function of informing the coping system about which drive system requires its assistance and to what end (Bischof, 2014). Thus, in this view, coping refers to dealing with the (interim) unfulfilledness of needs for adjustment which originate in their respective drive systems, and are communicated, identified and experienced through concomitant emotions.

Several *coping strategies* for attempting to overcome the Lewinian barrier are contemplated within the model. The main strategies are *invention* (looking for an alternative approach), *aggression* (trying to destroy the barrier), and *supplication* (trying to get someone else to remove the barrier). Besides these *external* (assimilative) strategies which involve the manipulation of the environment, there are two *internal* (accommodative) strategies which conversely aim to adapt the organism to the environment: *Acclimatization* effectively adjusts the drive system's reference value to its state value instead of the other way around, while *revision* challenges the perception of the situation, looking for misconceptions and oversights (Bischof, 1993, 2014; Schneider, 2001).

The function of coping strategies is primarily *instrumental* in that they aim to either overcome the barriers' hinderance of the satisfaction of a drive, or eliminate the necessity to overcome them. However, should neither be accomplished within a reasonable amount of time, the stress from the continued tension of discrepancy would be dysfunctional. In this case, the coping system switches to a *palliative* strategy aimed solely at reducing this stress. In effect, any one of the five basic strategies can be either instrumental or palliative (Bischof,

2014). Palliative coping processes correspond to *reappraisal processes* (cf. Lazarus, Averill, & Opton Jr., 1970) and *defensive coping* (cf. van 't Riet & Ruiter, 2013), and are what is mainly implied in the context of *emotion regulation* (e.g., Nyklíček, Vingerhoets, & Zeelenberg, 2011).

Objectives

To test the validity of the proposed model, a study was conducted. Its main objective was (1) to test the model's fundamental adequacy for describing threat control processes. With regard to the TCM's more outstanding features compared to other models within health behavior theory, and especially fear appeal models, secondary goals were to test (2a) the predicted positive impact of threat entropy on threat construal and (2b) the predicted negative impact of a person's autonomy-claim on the resulting threat percept, mediated through venturesomeness; and (3) to verify the emotions' instrumental role in mediating between the perception of a threat and the ensuing reaction.

Lastly, while the theoretical model makes no predictions about which kind of coping reaction is triggered in response to a certain kind of threat percept, it is nonetheless of interest to examine whether or not a meaningful relationship between the two emerges. Of the two differentiations between coping reactions, external–internal and instrumental–palliative, the latter is clearly more integral to the tradition of health behavior research. Therefore, an exploratory objective of the study was (4) to test for significant effects towards instrumental as opposed to palliative coping responses.

Method

For this investigation, HRB towards health threats was studied in the context of cancer risk which has been chosen as subject matter because it has been found to be among the most frightening health threats (cf. Camilo, 2012). The study had a cross-sectional design and questionnaire format, and used a single measurement applied via web-based survey.[12] To maximize the reach of convenience sampling, the study was offered in English, German and

[12] Unfortunately, this design precludes observations, and thus conclusions, about the validity of the proposed self-regulating character of the TCM.

Portuguese.[13] In the making of this study the ethical principles of the American Psychological Association, the Deutsche Gesellschaft für Psychologie, and the Ordem dos Psicólogos Portugueses have been preserved.

Participants

Participants were recruited by various means: in person, by email, and through the social network platform *Facebook*. The only criteria for inclusion were being of age, and speaking one of the languages the survey was offered in. Of the 194 participants, 64.4% were female, and 35.6% were male. Ages ranged from 18 to 75 years, $M = 42.95$; $SD = 11.11$. One hundred and thirteen participants (none of which identified as non-native speakers) used the Portuguese version of the survey, 52 (including 17 identifying as non-native speakers) used English version, and 29 (including 3 identifying as non-native speakers) used the German version.

Table 1

Participants' level of education

Degree	*Frequency*	*valid %*
lower secondary education (e.g., GCSE)	6	4.00
upper secondary education (e.g., A-level)	24	16.00
Bachelor or equivalent	67	44.67
Master or equivalent	43	28.67
Doctoral or equivalent	10	6.67

N = 194

Measures

Autonomy claim

To measure autonomy claim, Schwarzer and Jerusalem's (1995) General Self-Efficacy Scale (GSE) was used. The GSE is a one-dimensional 4-point scale (with scores from 1 to 4) comprising 10 items that measures self-efficacy as being able to "perform a novel or difficult

[13] Due to the model's evolutionary underpinnings, cultural differences between participants of different origin should have no effect on the model validity.

tasks, or cope with adversity in various domains of human functioning". It is available in 32 languages, with Cronbach's alphas ranging from .76 to .90 (Schwarzer & Jerusalem, n.d.). In our mixed, three-language version sample, Cronbach's alpha was .79 after optimization through the elimination of one item (α = .69 for the English version, α = .82 for the German version, and α = .81 for the Portuguese version).

Venturesomeness

A 10-item selection from the venturesomeness subscale of the Impulsiveness, Venturesomeness and Empathy Questionnaires (Eysenck & Eysenck, 1978; Eysenck, Pearson, Easting, & Allsopp, 1985) was used. German and Portuguese versions were translations from the English original made for the purpose. The scale uses a yes–no answer format, permitting for a sum-score of up to 10 points. The selection, which was made to keep the volume of the preliminary section of the survey at a minimum, excluded in particular several items concerning certain risk-sports, which were deemed out of fashion (e.g., water-skiing and parachuting). The resulting greater thematic variety of the items might be responsible for the instrument's somewhat questionable internal consistency in our sample of α = .69, after the elimination of two items (α = .74 for the English version, α = .67 for the German version, and α = .63 for the Portuguese version), down from .77 to .84 reported by the authors of the scale.

Relevancy, entropy and perceived susceptibility

Relevancy and entropy were measured jointly using the 10 text items that comprised the main manipulation. These items were text blocks containing health threat information (HTI) regarding cancer, with an average of 64 words each, researched and composed for the purpose in a matter-of-fact style. To measure entropy, participants were asked to state how much the information of each block *surprised* them on a 5-point scale between "not at all" (0) and "very much" (4). To measure relevancy, they were asked to state and how *positive* or *negative* it seemed to them, using a 0-centered 7-point scale from "very positive" (3) to "very negative" (-3).

Two versions were used, designed to create a high-entropy experimental group and a low-entropy control group. It was expected that HTI about lung cancer were fairly known to the general public due to the long-standing prominence and pervasiveness of anti-smoking

campaigns throughout the European Union and many other parts of the world. The low-entropy version, therefore contained only items about lung cancer (LC-HTIs), while the high-entropy version contained information about cancer in general (AC-HTIs), which was deemed less known. Table 2 lists the relevancy and entropy measures' Cronbach's alphas for the high-entropy and the low-entropy conditions.

Table 2

Cronbach's alpha values for the relevancy and entropy measures

Scale		LC-HTIs	AC-HTIs
relevancy		.96	.94
	de	.82	.88
	en	.97	.95
	pt	.97	.93
entropy		.86	.88
	de	.84	.91
	en	.95	.92
	pt	.75	.84

de, en and pt refer to the German, English and Portuguese versions, respectively.

Perceived susceptibility towards contraction of cancer was measured by means of a single 7-point face-value item which asked participants to judge their own risk for contracting cancer in the range between "very low" and "very high".

Emotional response

Emotional response was measured using ten face-value items of single nouns designating emotions or emotional/dispositional states which were adapted for the purpose from those specified in the ZMSM (Bischof, 1993). Participants were asked to rate on a 5-point scale to what degree between "not at all" (0) and "very much" (4) they had experienced each of the following during or since reading the HTI texts from the previous section: anger, helplessness, worry, defiance, acquiescence, boredom/curiosity (using two discreet items), fear, surfeit, and loneliness. Several of these emotions stem from drive systems not covered in the model presented in this thesis, but were included for completeness. Of principal interest within the context of this study is the emotion associated specifically with arousal-aversion stemming from (over-)activation of the arousal system, fear; and those accompanying the

external coping mechanisms in general, anger, helplessness, and worry. Jointly, these four items presented a Cronbach's alpha of .72 (α = .71 for the English version, α = .74 for the German version, and α = .68 for the Portuguese version).

Action impulse

This measure used ten action impulse phrases describing possible responses to the HTIs participants had been subjected to previously. The individual options were modeled to reflect the ten possible coping strategies specified in the ZMSM, five of which are instrumental action impulses (iAIs) and five are palliative action impulses (pAIs). Participants were to identify the one (and, if desired, a second) phrase from the selection which most resembled their actually felt impulses. For scoring, a value of 2 was attributed for first-choice AIs, 1 value for second-choice AIs, and a value of zero for all not-chosen AIs. Using sum-scoring, the iAIs and pAIs scores allowed for a range of 0 to 3.

Table 3

Calculation method of model variables

Variable	Method of calculation
venturesomeness	sum-score
self-efficacy	mean-score
entropy	mean-score
relevancy	mean-score
felt susceptibility	mean-score
iAIs	sum-score
pAIs	sum-score

iAIs = instrumental action Impulses; pAIs = palliative action impulses

Procedure

The survey was deployed online, using LimeSurvey (version 2.62.2+170203 with the *Ubuntu orange skin*). This delivery platform adaptively serves different layouts depending on the viewing device's form factor, making it possible to participate using either a traditional computing device like a desktop computer or, alternatively, some sort of hand-held device like a tablet or mobile phone. Participation was unaccompanied and typically took between 20 and 30 minutes. The position of individual items within any measure of the survey was always

randomized. The welcoming page contained instructions and informed the would-be participant, among other things, about the topic and purpose of the survey, the voluntary character of participation, and means to contact the author.

First, the dispositional measures for autonomy claim and venturesomeness were displayed in random order. A following page randomly contained either the high or the low entropy version of the threat manipulation, and participants were asked to rate how surprising (pertaining to novelty or entropy) and how positive or negative (pertaining to relevancy or severity) each individual HTI items seemed to them. On the following page, participants were asked to rate their emotional affectedness during or since the preceding manipulation, with respect to ten discrete emotions and emotional states. Then, participants were asked to judge their own risk of contracting cancer, and how much they thought this risk to be under their own control, followed by the collection of sociographic data. Next, participants were asked to reflect on their motivational state considering the HTIs they had been confronted with, and then to identify with up to two out of ten action impulse phrases designed to reflect the individual coping strategies. Finally, participants were thanked for their participation and reminded to contact the author with any questions or concerns they might have.

Results

Basic statistical evaluations were conducted using PSPP 1.0.1 and JASP 0.8.6. Table 4 displays correlations and descriptive measures of the observed variables. The effectiveness of the main manipulation was checked conducting a one-way ANOVA. It determined that the attempt to manipulate entropy in the two experimental groups had been unsuccessful, $F(1, 78) = .10$, $p = .753$. Neither did means of felt susceptibility differ significantly between groups, $F(1, 147) = .27$, $p = .604$. Only regarding mean relevancy did the two groups differ significantly, $F(1, 76) = 6.31$, $p = .014$), with participants from the all-cancers HTIs group finding the information offered to them on average more positive ($M = .71$, $SD = 1.37$) than participants from the lung cancer HTIs group ($M = -.20$, $SD = 1.79$). As a consequence, the division of the test population into high entropy and low entropy groups was abandoned, and all participants' results were treated uniformly.

Table 4

Pearson correlations and descriptive measures of observed variables

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*M*	*SD*
1. venturesomeness	—										4.86	1.43
2. self-efficacy	.22**	—									3.03	.34
3. entropy	.06	-.16	—								1.45	.77
4. relevancy	-.12	-.14	.05	—							.22	1.65
5. susceptibility	-.07	-.15	.05	.11	—						4.03	1.57
6. ER anger	-.02	.05	.11	-.01	.04	—					1.04	1.25
7. ER helplessness	.03	-.05	.01	.12	.13	.24*	—				1.68	1.44
8. ER worry	-.05	-.14	.25*	.01	.16*	.32***	.43***	—			2.52	1.16
9. ER fear	.05	-.02	.06	-.03	.19*	.29***	.37***	.64***	—		1.72	1.27
10.iAIs	.06	-.01	.15	-.20	.19*	.04	.17*	.23**	.23**	—	1.21	1.20
11. pAIs	.00	.02	-.17	.16	-.22*	-.00	-.20*	-.20*	-.19*	-.92***	1.51	1.14

*p < .05, **p < .01, ***p < .001; ER = emotional response; iAIs = instrumental action impulses; pAIs = palliative action impulses.

Main hypothesis testing and exploration was conducted by structural equation modeling (SEM) using Ωnyx 1.0-1007. Although the sample size of this study is fairly low for this kind of statistical analysis, it can be considered sufficient when using the minimal criterium of a 5-to-1 ratio of sample size to the number of free parameters (cf. Kenny, 2015). Nonetheless, to limit the complexity of the SEM model, but also because of the constrains intrinsic to the design of the action impulse measure, only one latent variable for either instrumental or palliative coping response is contained (see figure 3). As expected, both variants rendered essentially equal results in respect to both regression coefficients and model parameters (including fit indices), except for the to-be-expected inversion of signs on the factor loadings between emotional response and coping response, and between threat percept and coping response. Therefore, only one variant, namely the instrumental one, will be shown and discussed.

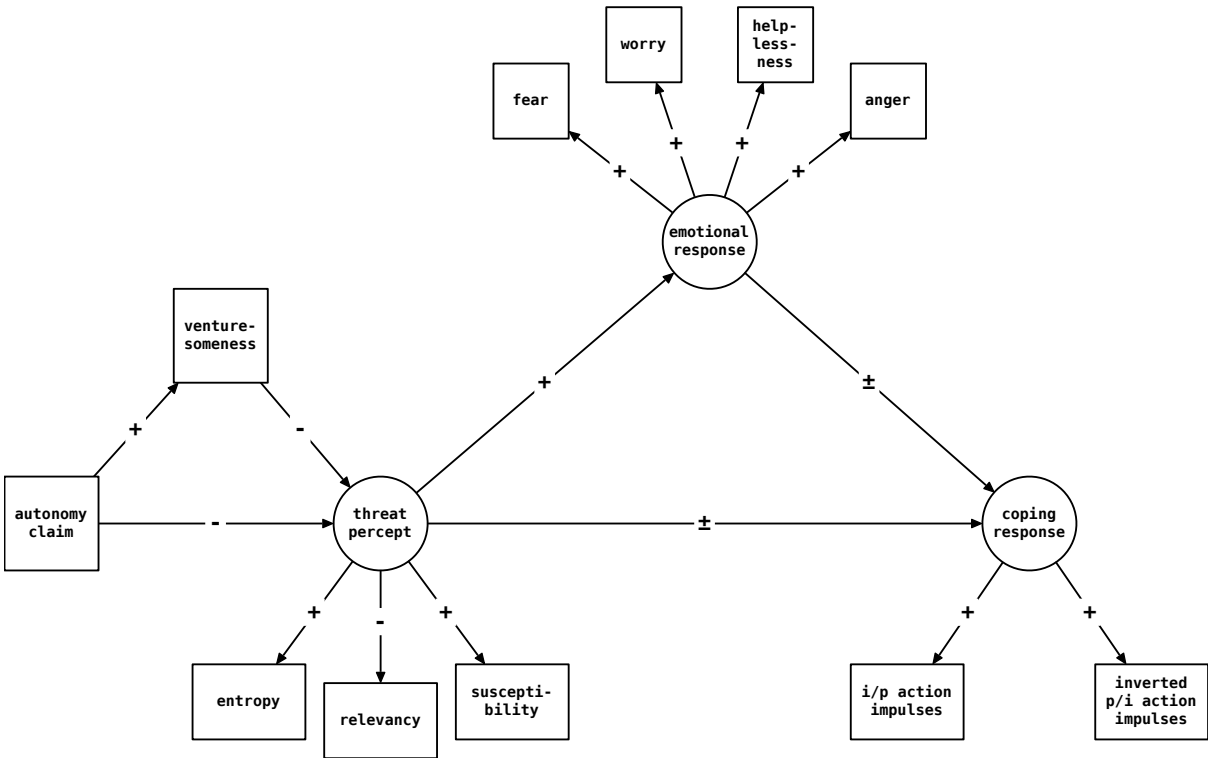

Figure 3. Diagram of the SEM implementation of the TCM with indication of the expected sign of each association; The symbol ± indicates that no prediction was made about this association with a particular kind of coping response; i = instrumental; p = palliative.

While the χ^2-test is considered generally a reasonable measure of fit for models with up to 200 cases, it can be too liberal for small populations, leading to the acceptance of poor models (type II error). Furthermore, χ^2 is affected by the size of the correlations in the model leading to type I errors (Kenny, 2015; Newsom, 2017). Therefore, the *Root Mean Square Error of Approximation* (RMSEA) and, since Kenny's (2015) criterium for the RMSEA of the (independent) null-model was met ($RMSEA_0 > 0.158$), the Tucker Lewis Index (TLI) is reported as well.

The presented estimation result was reliably converged and represents the best maximum likelihood optimum found in a stabilized overall estimation situation. All three fit indices (see table 5) show a good fit for the model with the collected data (cf. Kenny, 2015; Newsom, 2017).

Table 5

Estimate parameters and goodness-of-fit indices

N	*df*	χ^2	*RMSEA*	*TLI*
194	38	34.826 (*p* = .62)	.036	.969

df = degrees of freedom

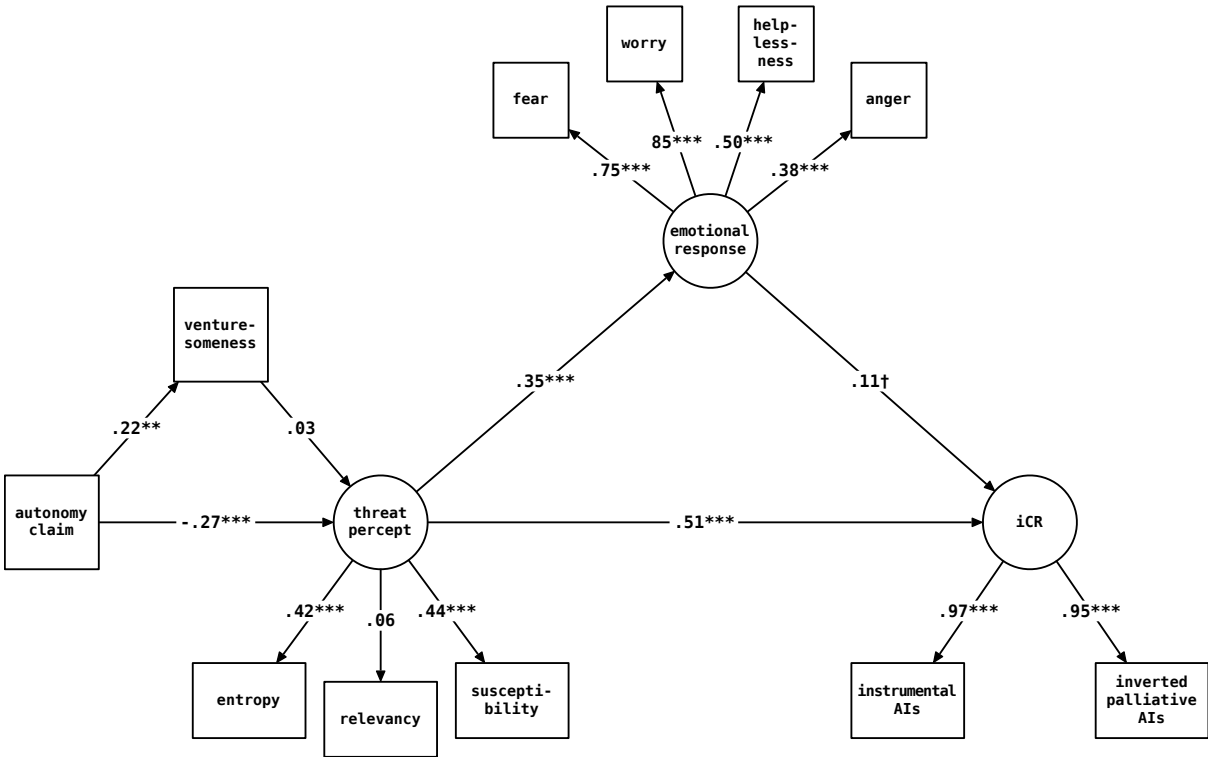

Figure 4. Path diagram of the SEM model with path loadings for instrumental coping responses (iCR); AIs = action impulses; *p < .05,**p < .01, ***p < .001, † = 0.063

For the most part, path loadings were consistent with model implications and predictions. With respect to the objective (4) of exploring potential effects of the size of threat percept on the kind of action impulses participants stated to feel most inclined towards (instrumental vs. palliative coping reaction), the estimate clearly shows a positive correlation with instrumental responses. Supporting hypothesis 2a, the estimate shows entropy to contribute substantially to the construal of threat percept (β = .42, p < .001). However, while the attenuating effect of autonomy claim on threat percept was also confirmed (β = -.27, p < .001), that of venturesomeness was not (β = .03, p = .340), meaning that the proposed mediation hypothesis (2b) was not supported. And while no *significant* support was found for the proposed mediating role of emotions between threat construal and coping response

(hypothesis 3; indirect effect β = .04, p = .297), the effect of emotional response on instrumental (or, alternatively, palliative) coping response was found to be marginally significant (β = .11, p = .063). Contrary to expectations, the association of threat percept to its indicator relevancy was positive, albeit very small and non-significant (β = .06 at p = .203).

Discussion

The strong support from the statistical analyses' results concerning the importance of entropy as a second order characteristic of a threat percept can be appreciated most unambiguously. It appears that entropy constitutes in fact a valuable addition to traditional conceptualizations of threat perception that rely solely on perceived susceptibility and perceived severity (e.g., Maddux & Rogers, 1983; Witte, 1992) which could improve predictive reliability.

However, in order to reach a conclusion about the outcome of the study's principal objective, to test the hypothesis that the TCM does in fact adequately describe threat control processes, it is necessary to first look at the possible causes of the SEM analysis' most unexpected result: the apparent non-involvement of relevancy in threat construal. According to the theoretical model, relevancy was expected to have a sizable negative impact on threat percept. This supposition is by no means unique to the TCM. Rather, with relevancy as an inverse, bipolar super-construct to severity, it is shared throughout health behavior theory as an integral part of the respective threat concepts. The most likely explanation is that faulty construct operationalization was responsible for the aberrant results. In fact, along with its degree of novelty, participants had actually been asked as to how positive or negative they judged each HTI per se, not the hazard it was about. Consequently, instead of a basis for inferring overall severity attributed to the health threat as had been intended, message valence was assessed. Although these two constructs may not be uncorrelated, they are most certainly distinct. While such confounding data could potentially compromise the consistency of the statistical analysis' results, it can be argued that, because of this faulty indicator's low factor loading, the results' integrity can be assumed to be fundamentally intact.

Were one to investigate the only significant difference in outcome between the two experimental groups, and speculatively deconstruct what was actually measured with the ill-

operationalized relevancy indicator, one plausible reading would be: something akin to *response efficacy*. Response efficacy refers to the belief about the degree of effectiveness of a given response to counter a threat (Dillard, 1994; Floyd et al., 2000; Witte & Allen, 2000). It is part of both, the PMT and the EPPM (cf. Maddux & Rogers, 1983; Witte, 1992).[14] Although there were no explicit response advices given within the HTI catalog, certain message aspects might implicitly have contributed to perceived efficacy of known or inferred responses. A tentative ad hoc qualitative evaluation of the highest ranking HTIs in terms of relevancy suggests prevalent message aspects like high controllability and positive prospects. It is conceivable that such aspects of hopefulness in the HTIs contributed to the perceived efficacy of implicit responses to particular threats, tendentially contributing to the favoring of instrumental coping responses. Complementarily, in terms of relevancy of the lowest ranking HTIs, a message tenor of powerlessness or, at least, limited control seems predominant.

The study did not produce support for venturesomeness affecting the outcome of threat perception, as posited by the TCM, whereas the influence of autonomy-claim was strongly supported. A possible cause for this outcome could be the moderate degrees of entropy generated by the HTI material. Under such circumstances, for most people, the arousal system's set value threshold is unlikely to be exceeded. But, since the over-arousal threshold itself is theorized to be determined by a person's degree of venturesomeness, not exceeding it might leave any correlation between entropy and venturesomeness undetectable. Any future experimental research on the TCM should contemplate ways to deal with this theoretical limitation. Another possible cause might be the limited adequacy of the psychometric instrument used. It might prove fruitful to explore the use of contextualized dispositional measures, i.e., instruments that probe convictions and attitudes within the realm of health-relevant behavior.

As for the posited instrumentality of emotions in mediating relevant perceptions such as a health threat to the coping system, the SEM estimate only produced marginally significant support. Since this hypothesis is central to the TCM, failure to produce substantial support for it can potentially seriously undermine the model's claim of validity. Looking for an explanation for the unexpectedly low loading association of emotional response with coping

[14] Other health behavior theories (HBTs) include related concepts, such as the Health Believe Model's perceived benefits and Social Cognitive Theory's expected outcomes where response efficacy could play an implicit part. See Noar and Zimmerman (2005) for a comparison of common HBT elements.

response, it would seem reasonable to attribute this outcome to the low urgency and possibly not so engaging character of the used HTI material, manifest in the overall mediocrity of the emotional response. Coincidently, the used HTIs were all about abstract threats, as are a great part of real life HTIs in general. Consequently, one might argue, the possibility should be considered that such subdued emotional response might be inherent to confrontation with abstract threats in general. A conclusion to that end would severely curtail the applicability of the principles of Bischof's ZMSM within the domain of health-related behavior. However, in a study that also used HTIs about cancer, Camilo (2012) showed personal messages to cause a greater emotional response compared to impersonal messages. Thus, the muted emotional response might rather be due to the matter-of-fact style HTIs used in this study. On the other hand, while the level of engagingness, or corporeality, of a threat exposure experience may well be of interest for a future revision of the threat concept itself — at the moment it only contemplates an immediacy factor for the causal link between behavior and hazard —, the halfhearted emotional response can meanwhile also be reduced model-immanently to an effect of HTI novelty (i.e., entropy): with this, ER's highest loading indicator, ER worry, has a significant correlation — the highest of any of ER's indicators towards any of threat percept's indicators. Unfortunately, due to the failed manipulation of this crucial factor, no more definite conclusions can be drawn at this point.

Apart from the somewhat unsatisfactory outcome concerning the involvement of emotions, and not without reservations due to the operationalization issue outlined above, the model estimate suggests a substantial direct positive effect of the size of the threat percept on outcomes involving instrumental coping responses. It must be taken into account, however, that Bischof's so to speak agenda-less categorization into instrumental and palliative coping strategies equates to very liberal criteria when applied one-to-one to the adaptive–maladaptive dichotomy commonly used in health psychology. This circumstance might well be related to the evidence of this apparently straight forward effect. Herein also lies another possible explanation for the low mediation effect of ER: that, while the instrumental–palliative differentiation may effectively correlate with threat perception when not processed through emotions (i.e., when processed primarily rationally), this same dimension may simply not correspond as well with the product of emotional mediation.

It proved problematic to have relied on the use of HTI about lung cancer for the low-entropy manipulation experimental group. Not only did the intended main manipulation turn out ineffective, it also inadvertently introduced the differences in valence into the two HTI materials reflected in the differing relevancy means between experimental groups. A future study should test any HTI materials previously and assure equivalence in all but the dimensions intended for manipulation. Several other instruments, especially versions translated by the study author, were also untested in the form used. The instrument for the measurement of action intentions would probably best be revised using items that resulted from a qualitative pre-study for the purpose. Equally revised should be certain design decisions concerning this instrument, which were meant to favor intuitiveness for the participants, but inadvertently also resulted in unfavorable psychometric properties.

Conclusion

Overall, this study has produced evidence in support of the TCM. Particularly, in accordance with one key prediction of the TCM, novelty was shown to play a significant part in the construal of health-threat-related perceptions. This was not a clinical study, and it was the first study based on the TCM. Therefore, any attempt to deduct direct clinical consequences with regard to the design or application of persuasive health risk communications would have be quite speculative. However, there is some indication that there is truth in what commonsense psychology dictates all along: that, in order to persuade someone, making the same argument that has not worked before over and over again, may not be the best approach. Not limited to, but particularly for abstract threats, doing so might lead to effects of risk normalization (cf. Lima et al., 2005) and be connected to the backfiring of persuasive health risk communication interventions in some situations (cf. Peters et al., 2013). Instead, providing new information may be crucial for success. Especially in conjunction with the previous reflections on the opportunity aspect of HTIs, the found importance of novelty in HTIs implies that not only could it be crucial to pay attention to the newness of fear-inducing message aspects, but even more so that of hope-inspiring aspects of HTIs. Obviously, this is easier said than done, but due to the ever growing availability and pervasiveness of HTIs, which will likely contribute to cumulative risk normalization (cf. Albert, 1999; Lima et al., 2005), it may even be of growing importance.

This thesis represents a useful step in creating a valid integrative model about continuous human experience and behavior in the context of health-relevant risks and opportunities. While more empirical research is needed to consolidate the findings from this first study, it is clear that, at some point, the TCM should be extended—or rather be supplanted by a more encompassing model—to include not only repelling threats, but also their counterparts: attractive prospects. This is one factor Sheeran and colleagues (2014) identified as potentially moderating the impact of risk appraisal on intentions and behavior. Studying threats and prospects together would permit a unified view at what can in some ways be considered opposite sides of the same coin, which usually are looked at one-sidedly.

The self-regulating process character of the TCM should be studied. This experiment used a cross-sectional design, permitting only a momentary snapshot. As a first step to validate the TCM's systemic character, a computer simulation could be devised, using a methodology similar to Gubler, Paffrath, and Bischof's (1994). Eventually, an experiment permitting longitudinal observations would be needed to substantiate any validation by simulation. Resorting to ideas from gaming theory and risk research might be fruitful for this purpose. Ideally, it would be tried to bridge the so-called *intention–behavior gap*, which refers to the observed considerable incongruence between intention and actual behavior (Peters et al., 2013).

Within system theory, and in extension in the TCM, there are two fundamental ways which lead to the exceeding of a motivational system's set value, and thus to the organism being induced to adapt in some way. The first way is the one which fear appeals and other persuasive health risk communications typically seek when they seek to "increase threat perceptions" (Witte & Allen, 2000) or "heighten risk appraisals" (Sheeran et al., 2014). It means that rising environmental stimuli cause the state value to exceed a constant threshold. This approach, when brought about intentionally, almost always has an paternalistic aspect to it, and in some cases, the intrusive confrontation with potential health threats can be outright aggressive.[15] The other way a set value can be exceeded, is through it itself being reduced below a state value held constant by unchanged environmental stimulation. It's obvious, that this second way is by far not as amenable to external manipulation as the first one, and typically requires rather a lot of involvement from the person seeking to alter his or her

[15]The EU norms for tobacco packaging are a good example of an aggressive, stimuli-rising campaign.

experience. However, there is currently research underway to explore the benefits that meditation and awareness or mindfulness training can have, for example, on smoking-behavior (cf. Elwafi, Witkiewitz, Mallik, Thornhill, & Brewer, 2013; Tang, Tang, & Posner, 2013). Heightening awareness certainly implies the lowering of perceptive thresholds. This approach leaves responsibility and control with the individual, and making use of it shows promise of conferring longer lasting and farther reaching effects than current standard approaches (cf. Brewer et al., 2011). Promoting this way would be for health psychology to follow through with what von Holst and Mittelstaedt (1950) initiated by proposing a change of scientific perspective to supplant the behaviorist S–O–R view: through a consequent subject-centric view based on the reafference principle. Associated with this subject-centricity were, furthermore, the assumption of a teleologic perspective, circular causality as a commonplace phenomenon, and the spontaneity of human and animal behavior (cf. Bischof, 2016). For health psychology, as a research discipline and an applied science, these would certainly be good and useful principles to adopt.

References

Albert, E. (1999). Dealing with danger: The normalization of risk in cycling. *International Review for the Sociology of Sport*, *34*(2), 157-171. Retrieved from Google Scholar.

Asendorpf, J. B. (2015). Persönlichkeitsbereiche. In *Persönlichkeitspsychologie für bachelor* (3 ed., pp. 65-120). Berlin: Springer.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review, 64*(6), 359-372.

Beach, E., Gilliver, M., & Williams, W. (2013). Leisure noise exposure: Participation trends, symptoms of hearing damage, and perception of risk. *International Journal of Audiology, 52*(sup1), 20-25.

Bischof, N. (1972). Inzuchtbarrieren in säugetiersozietäten. *Homo*, 330-351. Retrieved from Google Scholar.

Bischof, N. (1975). A systems approach toward the functional connections of attachment and fear. *Child Development*, *1975*(46), 801-817.

Bischof, N. (1989). Emotionale verwirrungen – oder: Von den schwierigkeiten im umgang mit der biologie. *Psychologische Rundschau*, (40), 188-205. Retrieved from Google Scholar.

Bischof, N. (1993). Untersuchungen zur systemanalyse der sozialen motivation I: Die regulation der sozialen distanz—von der feldtheorie zur systemtheorie. [Social Distance Regulation—From „field“ to „system“] *Zeitschrift Für Psychologie*, *201*(1), 5-43. Retrieved from EBSCO Host.

Bischof, N. (1996). *Das Kraftfeld der Mythen* [The Force Field of Myths]. München: Piper.

Bischof, N. (2013). *Ignoramus ... et ignorabimus?* [Talk at the Turm der Sinne symposium in Fürth on 6 Oct 2013] (Talk at the Turm der Sinne symposium in Fürth on 6 Oct 2013) [video recording]. Retrieved from https://www.youtube.com/watch?v=sGIYA_SjeZo

Bischof, N. (2014). *Psychologie* [Psychology] (3rd ed.). Stuttgart: Verlag W. Kohlhammer.

Bischof, N. (2016). *Struktur und Bedeutung* [Structure and Meaning] (3rd ed.). Bern: Hogrefe.

Brewer, J. A., Mallik, S., Babuscio, T. A., Nich, C., Johnson, H. E., Deleone, C. M., . . . Rounsaville, B. J. (2011). Mindfulness training for smoking cessation: Results from a randomized controlled trial. *Drug and Alcohol Dependence*, *119*(1-2), 72-80. doi:10.1016/j.drugalcdep.2011.05.027

Brunswik, E. (2001). Representative design and probabilistic theory in a functional psychology. In K. R. Hammond & T. R. Stewart (Eds.), *The essential brunswik: Beginnings, explications, applications.* Oxford University Press. (Original work published 1955)

Camilo, C. (2012). *Riscos ameaçadores e as suas consequências: A partilha social da emoção como estratégia para lidar com o impacto emocional da exposição a riscos de saúde.* Doctoral Thesis.

Coppin, G., & Sander, D. (2016). Theoretical approaches to emotion and its measurement. In H. L. Meiselman (Ed.), *Emotion measurement.* San Diego: Elsevier Science. Retrieved from Google Books: http://sbiproxy.uqac.ca/login?url=http://international.scholarvox.com/book/88832725

Crick, F., & Koch, C. (2003). A framework for consciousness. *Nature Neuroscience*, *6*(2), 119-126. Retrieved from Google Scholar.

Dewey, J. (1895). The theory of emotion. *Psychological Review*, *2*(1), 13. doi:10.1037/h0070927

Dillard, J. P. (1994). Rethinking the study of fear appeals: An emotional perspective. *Communication Theory*, *4*(4), 295-323. doi:10.1111/j.1468-2885.1994.tb00094.x

Eder, A. B., & Brosch, T. (2017). Emotion. In J. Müsseler & M. Rieger (Eds.), *Allgemeine Psychologie* (3rd ed.). Berlin/Heidelberg: Springer.

Elwafi, H. M., Witkiewitz, K., Mallik, S., Thornhill, T. A., & Brewer, J. A. (2013). Mindfulness training for smoking cessation: Moderation of the relationship between craving and cigarette use. *Drug and Alcohol Dependence*, *130*(1–3), 222–229.

Eysenck, S. B., & Eysenck, H. J. (1978). Impulsiveness and venturesomeness: Their position in a dimensional system of personality description. *Psychological Reports*, *43*(3 suppl), 1247-1255. Retrieved from Google Scholar.

Eysenck, S. B., Pearson, P. R., Easting, G., & Allsopp, J. F. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality and Individual Differences*, *6*(5), 613-619. Retrieved from Google Scholar.

Fiedler, K. (2007). Information ecology and the explanation of social cognition and behavior. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (2 ed.). Retrieved from Google Books.

Finucane, M. L., Alhakami, A., Slovic, P., & Johnson, S. M. (2000). The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making*, *13*(1), 1. Retrieved from Google Scholar.

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sciences*, *9*(2), 127-152. Retrieved from Google Scholar.

Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, *30*(2), 407-429. Retrieved from Google Scholar.

Garcia, J., McGowan, B. K. & Green, K. F. (1972) Biological constraints on conditioning. In: M. E. P. Seligman & J. L. Hager (Eds.), *Biological boundaries of learning* (pp. 21–43). New York: Appleton-Century-Crofts

Gigerenzer, G. (2013). *Risiko: Wie man die richtigen Entscheidungen trifft* [Risk Savvy: How to Make Good Decisions]. München: C. Bertelsmann Verlag.

Gubler, H., & Bischof, N. (1991). A systems theory perspective. In M. E. Lamb & H. Keller (Eds.), *Infant development: Perspectives from german-speaking countries* (pp. 35-66). London: Lawrence Erlbaum Associates. Retrieved from EBSCO Host.

Gubler, H., Paffrath, M., & Bischof, N. (1994). Untersuchungen zur Systemanalyse der sozialen Motivation III: Eine Ästimationsstudie zur Sicherheits- und Erregungsregulation während der Adoleszenz. *Zeitschrift Für Psychologie*, (202), 95-132. Retrieved from Google Scholar.

Gutteling, J. M. (2015). Risk communication. In G. Mazzoleni (Ed.), *The international encyclopedia of political communication* (1st ed., pp. 1-5). John Wiley & Sons, Inc. Retrieved from Google Scholar.

Heckhausen, J., & Heckhausen, H. (2010). Motivation und Entwicklung. In J. Heckhausen & H. Heckhausen (Eds.), *Motivation und Handeln* (pp. 427-488). Berlin/Heidelberg: Springer-Verlag.

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, *52*(12), 1280. Retrieved from Google Scholar.

Hill, C. A. (1987). Affiliation motivation: People who need people… but in different ways. *Journal of Personality and Social Psychology*, *52*(5), 1008. Retrieved from Google Scholar.

von Holst, E., & Mittelstaedt, H. (1950). Das Reafferenzprinzip. (Wechselwirkungen zwischen Zentralnervensystem und Peripherie.). *Die Naturwissenschaften*, *37*(20), 464–476.

Janis, I. L. (1967). Effects of fear arousal on attitude change: Recent developments in theory and experimental research. *Advances in Experimental Social Psychology*, *3*, 166-224. Retrieved from Google Scholar.

Janis, I. L., & Feshbach, S. (1953). Effects of fear-arousing communications. *The Journal of Abnormal and Social Psychology*, *48*(1), 78. Retrieved from Google Scholar.

Juslin, P., & Olsson, H. (1997). Thurstonian and brunswikian origins of uncertainty in judgment: A sampling model of confidence in sensory discrimination. *Psychological Review*, *104*(2), 344. Retrieved from Google Scholar.

Kasl, S. V., & Cobb, S. (1966). Health behavior, illness behavior and sick role behavior. *Archives of Environmental Health: An International Journal*, *12*(2), 246–266. doi:10.1080/00039896.1966.10664365

Kenny, D. A. (2015). Measuring model fit. *SEM: Fit (David A. Kenny)* [Web page]. Retrieved from davidakenny.net: http://davidakenny.net/cm/fit.htm

Klages, L. (2001). *Die Grundlagen der Charakterkunde* [Principles of Characterology] (16 ed.). Bonn: Bouvier Verlag.

Köhler, W. (1920). *Die physischen Gestalten in Ruhe und im stationären Zustand: Eine naturphilosophische Untersuchung.* Braunschweig: Friedr. Vieweg & Sohn. Retrieved from Google Scholar.

Kuhn, T. S. (2012). *The structure of scientific revolutions.* Chicago: The University of Chicago Press. (Original work published 1962)

Lazarus, R. S. (1982). Thoughts on the relations between emotion and cognition. *American Psychologist*, *37*(9), 1019. doi:10.1037/0003-066X.37.9.1019

Lazarus, R. S., Averill, J. R., & Opton Jr., E. M. (1970). Towards a cognitive theory of emotion. In *Feelings and emotions: The loyola symposium* (pp. 207-232).

Lersch, P. (1970). *Aufbau der Person* [Structure of the person] (11 ed.). München: Johann Ambrosius Barth.

Leventhal, H. (1970). Findings and theory in the study of fear communications. *Advances in Experimental Social Psychology*, *5*, 119-186. Retrieved from Google Scholar.

Leventhal, H., Brisette, I., & Leventhal, E. A. (2003). The common-sense model of self-regulation of health and illness. In L. D. Cameron & H. Leventhal (Eds.), *The self-regulation of health and illness behaviour.* London; New York: Routledge.

Leventhal, H., Leventhal, E. A., & Contrada, R. J. (1998). Self-regulation, health, and behavior: A perceptual-cognitive approach. *Psychology and Health*, *13*(4), 717–733. doi:10.1080/08870449808407425

Lima, M. L., Barnett, J., & Vala, J. (2005). Risk perception and technological development at a societal level. *Risk Analysis*, *25*(5), 1229-1239. Retrieved from Google Scholar.

Lippke, S., & Renneberg, B. (2006). Theorien und modelle des gesundheitsverhaltens. In B. Renneberg & P. Hammelstein (Eds.), *Gesundheitspsychologie* (pp. 35-60). Heidelberg: Springer-Medizin-Verlag . Retrieved from Google Scholar.

Loewenstein, G. F., & Lerner, J. S. (2003). The role of affect in decision making. In *Handbook of affective science* (pp. 619-642). Retrieved from Google Scholar.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin*, *127*(2), 267-286. Retrieved from Google Scholar.

Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology*, *19*(5), 469-479. Retrieved from Google Scholar.

Maloney, E. K., Lapinski, M. K., & Witte, K. (2011). Fear appeals and persuasion: A review and update of the extended parallel process model. *Social and Personality Psychology Compass*, *5*(4), 206-219. Retrieved from Google Scholar.

Martin, L. R., & DiMatteo, M. R. (2014). From communication to healthy behavior and adherence. In L. R. Martin & M. R. DiMatteo (Eds.), *The oxford handbook of health communication, behavior change, and treatment adherence.* Oxford University Press.

Michotte, A. (1966). Die Kausalitätswahrnehmung. In *Handbuch der Psychologie* (Vol. 1-1, pp. 954-977).

Munro, S., Lewin, S., Swart, T., & Volmink, J. (2007). A review of health behaviour theories: How useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS? *BMC Public Health*, *7*, 104. doi:10.1186/1471-2458-7-104

Nagera, H. (1968). The concept of ego apparatus in psychoanalysis. *The Psychoanalytic Study of the Child*, *23*(1), 224-242.

Newsom, J. T. (2017). Some clarifications and recommendations on fit indices. *Ho_fit 2.Pdf* [Web page]. Retrieved from http://web.pdx.edu/~newsomj/semclass/ho_fit.pdf

Noar, S. M., & Zimmerman, R. S. (2005). Health behavior theory and cumulative knowledge regarding health behaviors: Are we moving in the right direction? *Health Education Research*, *20*(3), 275-290. doi:10.1093/her/cyg113

Nyklíček, I., Vingerhoets, A., & Zeelenberg, M. (2011). Emotion regulation and well-being: A view from different angles. In I. Nyklíček, A. Vingerhoets, & M. Zeelenberg (Eds.), *Emotion regulation and well-being* (pp. 1-9). Springer.

O'Neill, E., Brereton, F., Shahumyan, H., & Clinch, J. P. (2016). The impact of perceived flood exposure on flood-risk perception: The role of distance. *Risk Analysis : An Official Publication of the Society for Risk Analysis, 36*(11), 2158-2186. doi:10.1111/risa.1259

Otto, J. H., Euler, H. A., & Mandl, H. (2000). Begriffsbestimmungen. In H. Mandl, H. A. Euler, & J. H. Otto (Eds.), *Emotionspsychologie.* Weinheim: Beltz PsychologieVerlagsUnion. Retrieved from Google Scholar.

Peters, G. -J. Y., Ruiter, R. A., & Kok, G. (2013). Threatening communication: A critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychology Review*, *7*(sup1), S8-S31. Retrieved from Google Scholar.

Pine, F. (1983). The development of ego apparatus and drive: A schematic view. *Contemporary Psychoanalysis*, *19*(2), 238-247. doi:http://dx.doi.org/10.1080/00107530.1983.10746606

Prentice-Dunn, S., & Rogers, R. W. (1986). Protection motivation theory and preventive health: Beyond the health belief model. *Health Education Research*, *1*(3), 153-161. doi:10.1093/her/1.3.153

Pribram, K. H. (2013). *The form within: My point of view.* New York: Easton Studio Press, LLC.

van ‘t Riet, J., & Ruiter, R. A. (2013). Defensive reactions to health-promoting information: An overview and implications for future research. *Health Psychology Review*, *7*(sup1), S104-S136. doi: 10.1080/17437199.2011.606782

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology*, *91*(1), 93–114. doi:10.1080/00223980.1975.9915803

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs*, *2*(4), 328-335. Retrieved from Google Scholar.

Ruiter, R. A., Kessels, L. T., Peters, G. -J. Y., & Kok, G. (2014). Sixty years of fear appeal research: Current state of the evidence. *International Journal of Psychology*, *49*(2), 63-70. Retrieved from Google Scholar.

Scheffer, D., & Heckhausen, H. (2010). Eigenschaftstheorien der motivation. In J. Heckhausen & H. Heckhausen (Eds.), *Motivation und Handeln* (pp. 43-72). Berlin Heidelberg: Springer-Verlag.

Schneider, M. E. (2001). Systems theory of motivational development. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social & behavioral sciences* (pp. 10120-10125). Elsevier Science.

Schwarz, N., & Clore, G. L. (1996). Feelings and phenomenal experiences. In *Social psychology: Handbook of basic principles* (2 ed., pp. 385-407).

Schwarzer, R., & Jerusalem, M. (n.d.). The general self-efficacy scale. *The general self* [Web page]. Retrieved from userpage.fu-berlin.de: http://userpage.fu-berlin.de/%7Ehealth/engscal.htm

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In J. Weinman, S. C. Wright, & M. Johnson (Eds.), *Measures in health psychology: A user’s portfolio. Causal and control beliefs.* Windsor: NFER-NELSON.

Sheeran, P., Harris, P. R., & Epton, T. (2014). Does heightening risk appraisals change peoples intentions and behavior? A meta-analysis of experimental studies. *Psychological Bulletin*, *140*(2), 511. Retrieved from Google Scholar.

Sjöberg, L., Moen, B. -E., & Rundmo, T. (2004). Explaining risk perception. *An Evaluation of the Psychometric Paradigm in Risk Perception Research*, *10*(2), 665-612. Retrieved from Google Scholar.

Slovic, P., & Peters, E. (2006). Risk perception and affect. *Current Directions in Psychological Science*, *15*(6), 322-325. Retrieved from Google Scholar.

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis*, *24*(2), 311-322. doi:10.1111/j.0272-4332.2004.00433.x

Tang, Y. -Y., Tang, R., & Posner, M. I. (2013). Brief meditation training induces smoking reduction. *Proceedings of the National Academy of Sciences*, *110*(34), 13971-13975. doi:10.1073/pnas.1311887110

Ten Hoor, G. A., Peters, G. J., Kalagi, J., de Groot, L., Grootjans, K., Huschens, A., . . . Kok, G. (2012). Reactions to threatening health messages. *BMC Public Health*, *12*, 1011. doi:10.1186/1471-2458-12-1011

Trope, Y., & Liberman, N. (2000). Temporal construal and time-dependent changes in preference. *Journal of Personality and Social Psychology*, *79*(6), 876-889. Retrieved from Google Scholar.

Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review*, *110*(3), 403-421. Retrieved from Google Scholar.

Visschers, V. H. M., Wiedemann, P. M., Gutscher, H., Kurzenhäuser, S., Seidl, R., Jardine, C. G., & Timmermans, D. R. M. (2012). Affect-inducing risk communication: Current knowledge and future directions. *Journal of Risk Research*, *15*(3), 257-271. doi:10.1080/13669877.2011.634521

Waters, E. A., McQueen, A., & Cameron, L. D. (2014). Perceived risk and its relationship to health-related decisions and behavior. In L. R. Martin & M. R. DiMatteo (Eds.), *The oxford handbook of health communication, behavior change, and treatment adherence.* Oxford University Press.

WHO | Constitution of WHO: Principles. (n.d.). [Web page]. Retrieved from www.who.int: http://www.who.int/about/mission/en/

Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs*, *59*(4), 329-349. doi:10.1080/03637759209376276

Witte, K. (1994). Fear control and danger control: A test of the extended parallel process model (EPPM). *Communications Monographs*, *61*(2), 113-134. doi:10.1080/03637759409376328

Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior*, *27*(5), 591-615. Retrieved from Google Scholar.

Witte, K., Cameron, K. A., McKeon, J. K., & Berkowitz, J. M. (1996). Predicting risk behaviors: Development and validation of a diagnostic scale. *Journal of Health Communication, 1*(4), 317–342. doi: 10.1080/10810739612798

Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist*, *35*(2), 151. doi:10.1037/0003-066X.35.2.151

Appendix A. General Self-Efficacy Scale (GSE)

01	When facing opposition, I can find the means and ways to get what I want.	Wenn sich Widerstände auftun, finde ich Mittel und Wege, mich durchzusetzen.	Quando confrontado com oposição, encontro sempre maneira de conseguir o que quero.
02	I can solve most problems if I invest the necessary effort.	Die Lösung schwieriger Probleme gelingt mir immer, wenn ich mich darum bemühe.	Se eu me esforçar, consigo sempre resolver problemas difíceis.
03	It is easy for me to stick to my aims and accomplish my goals.	Es bereitet mir keine Schwierigkeiten, meine Absichten und Ziele zu verwirklichen.	Para mim é fácil manter-me fiel às minhas intenções e atingir os meus objetivos.
04	Thanks to my resourcefulness, I know how to handle unforeseen situations.	In unerwarteten Situationen weiß ich immer, wie ich mich verhalten soll.	Em situações inesperadas, sei sempre como reagir.
05	I am confident that I could deal efficiently with unexpected events.	Auch bei überraschenden Ereignissen glaube ich, daß ich gut mit ihnen zurechtkommen kann.	Creio que sei lidar bem com acontecimentos inesperados.
06	I can remain calm when facing difficulties because I can rely on my capabilities.	Schwierigkeiten sehe ich gelassen entgegen, weil ich meinen Fähigkeiten immer vertrauen kann.	Sou capaz de manter a calma ao enfrentar dificuldades, pois sei que posso confiar nas minhas capacidades.
07	I can usually handle whatever comes my way.	Was auch immer passiert, ich werde schon klarkommen.	Aconteça o que acontecer, safo-me sempre.
08	I can find a solution to any problem.	Für jedes Problem kann ich eine Lösung finden.	Consigo encontrar uma solução para qualquer problema.
09	When something new comes up, I know how to handle it.	Wenn eine neue Sache auf mich zukommt, weiß ich, wie ich damit umgehen kann.	Quando sou confrontado com uma coisa nova, sei como lidar com ela.
10	Should a problem arise, I can take care of it.	Wenn ein Problem auftaucht, kann ich es aus eigener Kraft meistern.	Quando surge um problema, consigo ultrapassá-lo por força própria.

Appendix B. Venturesomeness

-28	Do you find it hard to understand people who risk their necks climbing mountains?	Fällt es Ihnen schwer, nachzuvollziehen warum manche Menschen ihren Hals beim Bergsteigen riskieren?	Tem dificuldades em compreender pessoas que arriscam a vida a escalar montanhas?
04	Do you quite enjoy taking risks?	Macht es Ihnen Spaß Risiken einzugehen?	Gosta de correr riscos?
30	Do you sometimes like doing things that are a bit frightening?	Mögen Sie es, manchmal Dinge zu tun, die ein wenig beängstigend sind?	Às vezes gosta de fazer coisas que são um pouco assustadoras?
-12	Do you think hitch-hiking is too dangerous a way to travel?	Meinen Sie, dass per Anhalter zu reisen zu gefährlich ist?	Considera viajar de boleia demasiado perigoso?
17	Do you welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional?	Mögen Sie neue und aufregende Erfahrungen, auch wenn sie ein wenig beängstigend und unkonventionell sind?	Gosta de experiências novas e excitantes, até quando são um pouco assustadoras e inconvencionais?
-34	Generally do you prefer to enter cold sea water gradually, to diving or jumping straight in?	Bevorzugen Sie es, eher langsam ins kalte Wasser zu gehen, statt direkt hineinzuspringen?	Geralmente prefere entrar na água fria aos poucos, em vez de mergulhar logo?
-02	Usually do you prefer to stick to brands you know are reliable, to trying new ones on the chance of finding something better?	Bevorzugen Sie es, sich an in Ihren Augen verlässliche Marken zu halten, statt neue auszuprobieren, in der Hoffnung etwas besseres zu finden?	Normalmente prefere comprar as marcas de sua confiança, em vez de experimentar novas na esperança de encontrar algo melhor?
-47	Would you be put off a job involving quite a bit of danger?	Würde Sie eine ziemlich gefahrenreiche Arbeit abschrecken?	Estaria dissuadido/a de um trabalho se implicava bastante perigo?
41	Do you enjoy fast driving?	Mögen Sie schnelles Fahren?	Gosta de condução acelerada?
-37	Would you make quite sure you had another job before giving up your old one?	Würden Sie ganz sicher gehen, eine neue Arbeitsstelle zu haben, bevor Sie die alte aufgeben?	Asseguraria ter já outro trabalho antes de deixar o antigo?

Appendix C. Interpersonal Orientation Scale (IOS)

01	One of my greatest sources of comfort when things get rough is being with other people.	Wenn man es mal schwer hat, ist es ein großer Trost mit anderen zusammen zu sein.	Em momentos difíceis, é um grande conforto estar com outras pessoas.
14	When I am unsure of what is going on, I find that I often have the desire to be around other people who are having the same experience.	Wenn ich nicht so recht weiß was los ist, habe ich oft den Wunsch, in Gesellschaft anderer zu sein, denen es auch so geht.	Quando estou inseguro do que se está a passar, sinto que muitas vezes tenho o desejo de estar com outros que se encontram em situações semelhantes.
15	During times when I have to go through something painful, I usually find that having someone with me makes it less painful.	In Zeiten wo ich schmerzhaftes durchmache, finde ich, dass es meist weniger schlimm ist wenn jemand bei mir ist.	Quando estou a passar por um período doloroso, sinto que estar na companhia de alguém me alivia.
16	I often have a strong need to be around people who are impressed with what I am like and what I do.	Ich habe oft ein starkes Bedürfnis, in Gesellschaft von Leuten zu sein, die davon beeindruckt sind wie ich bin und was ich tue.	Muitas vezes sinto a necessidade forte de estar com pessoas que se impressionam comigo e com que faço.
17	If I feel unhappy or kind of depressed, I usually try to be around other people to make me feel better.	Wenn ich unglücklich oder deprimiert bin, suche ich meist die Gesellschaft anderer, um mich besser zu fühlen.	Quando me sinto infeliz ou deprimido, normalmente tento estar com outras pessoas para me sentir melhor.
18	I find that I often look to certain other people to see how I compare to others.	Oft orientiere ich mich an bestimmten anderen Leuten, um zu vergleichen wie ich dastehe.	Já reparei que muitas vezes olho para determinadas pessoas para perceber como sou em comparação com outros.
21	I often have a strong desire to get people I am around to notice me and appreciate what I am like.	Ich verspüre oft den starken Wunsch, Leute um mich herum dazu zu bringen von mir Notiz zu nehmen und wertzuschätzen wie ich bin.	Muitas vezes sinto a necessidade forte de fazer com que as pessoas à minha volta tomem nota de mim e que dêem valor a como sou.
23	I usually have the greatest need to have other people around me when I feel upset about something.	Ich habe meist das große Bedürfnis andere Leute um mich zu haben wenn ich über etwas aus der Fassung bin.	Normalmente sinto uma enorme necessidade de ter outras pessoas à minha volta quando estou chateado/a com alguma coisa.
24	I think being close to others, listening to them, and relating to them on a one-to-one level is one of my favorite and most satisfying pastimes.	I glaube, anderen nah zu sein, ihnen zuzuhören und ihnen von Mensch zu Mensch zu begegnen, ist eine meiner liebsten und befriedigendsten Beschäftigungen.	Acho que estar próximo/a a outros, ouvir-los e relacionar-me com eles de pessoa para pessoa é um dos meus passatempos favoritos e mais satisfatórios.
25	I would find it very satisfying to be able to form new friendships with whomever I liked.	Ich fände es großartig, mit jedem beliebigen Menschen Freundschaft knüpfen zu können.	Dava-me uma grande satisfação poder fazer amizade com quem quer que quisesse.

Appendix D. AC-HTIs

01	When cancer begins, it produces no symptoms. Signs and symptoms appear as the mass grows or ulcerates. The findings that result depend on the cancer's type and location. Few symptoms are specific. Cancer is a "great imitator". Thus, it is common for people diagnosed with cancer to have been treated for other diseases, which were hypothesized to be causing their symptoms.	Anfänglich ruft Krebs keine Symptome hervor. Anzeichen und Symptome treten auf wenn der Tumor anwächst oder zum Geschwür wird. Die sich dann ergebenden Befunde hängen vom Typ und der Lokalisation des Tumors ab. Die meisten Symptome sind unspezifisch. Krebs wird als „großer Nachahmer“ bezeichnet, da es nicht ungewöhnlich ist, dass Krebspatienten vor ihrer Diagnose bereits gegen andere Krankheiten behandelt wurden, von denen angenommen wurde, sie wären für die Symptome verantwortlich.	Inicialmente, o cancro não causa sintomas. Sinais e sintomas só surgem quando o tumor cresce ou ulcera. A avaliação que se segue depende do tipo e da localização do cancro. Poucos dos sintomas são específicos. O cancro é um “grande imitador”. Por isso, é comum que, antes do seu diagnóstico, pacientes de cancro tenham sido tratados contra outras doenças, as quais se achou responsáveis pelos sintomas.
02	In principle, any organ of the human body can contract cancer. Currently, approximately 100 different types of cancer are known. These can vary greatly in terms of treatment options and tendency to metastasize (spread to other organs). Survival rates vary by cancer type and by the stage at which it is diagnosed. Once a cancer has metastasized, prognosis normally becomes much worse. About half of patients receiving treatment for cancer die from that cancer or its treatment.	Prinzipiell kann jedes Organ des menschlichen Körpers von Krebs befallen werden. Es sind gegenwärtig etwa 100 verschiedene Krebserkrankungen bekannt, die sich in Hinsicht auf Behandlungsmöglichkeiten und der Neigung zur Metastasierung (Absiedeln) teilweise stark unterscheiden. Die Überlebensrate variiert in Abhängigkeit von der Krebsart und dem Krankheitsstadium zum Zeitpunkt der Diagnose. Haben sich bereits Metastasen gebildet, verschlechtert sich die Prognose meist drastisch. Etwa die Hälfte der behandelten Krebspatienten sterben an Krebs oder an den Folgen der Behandlung.	Em princípio, qualquer órgão do corpo humano pode contrair cancro. Atualmente são conhecidos cerca de 100 tipos diferentes de cancro, os quais podem variar consideravelmente em termos de opções de tratamento e tendência de formar metástases (colónias). A taxa de sobrevivência varia em função do tipo de cancro e do estágio em que foi diagnosticado. Uma vez tendo um cancro formado metástases, o prognóstico, por norma, piora drasticamente. Cerca de metade dos pacientes de cancro morre do mesmo ou do seu tratamento.
03	Most patients don’t die from the (original) primary tumor, but due to the effects of its metastases. Their uncontrolled multiplication harms vital organs to the point when they can no longer carry out their function. Frequent immediate causes of death include embolisms, cachexia (wasting syndrome), or infections that can no longer be controlled by the organism (sepsis).	Die meisten Patienten sterben nicht am (ursprünglichen) Primärtumor, sondern an den Auswirkungen von dessen Metastasen. Deren unkontrollierte Vermehrung schädigt lebenswichtige Organe, bis diese ihre Funktion nicht mehr erfüllen können. Häufige unmittelbare Todesursachen sind Gefäßverschlüsse (Embolien), Tumorkachexie (Auszehrung) oder vom Organismus nicht mehr beherrschbare Infektionen (Sepsis, Blutvergiftung).	A maioria dos pacientes não morre do tumor primário (original), mas dos efeitos das suas metástases, cuja multiplicação incontrolável danifica órgãos vitais até ao ponte de deixarem de poder efetuar as suas devidas funções. Causas imediatas de morte frequentes incluem embolias, caquexia e infeções já não controláveis pelo organismo (sepsia).

04	Patients who survive for at least five years without recurrence are considered cured. After this time, the average life expectancy for most types of cancer approximates that of the same-age healthy population. Approximately 90% of all cancer cures are exclusively due to localized treatment of the affected body tissues, i.e. through surgery or radiation therapy.	Als geheilt gilt ein Patient, der mindestens fünf Jahre lang ohne Rückfall (Rezidiv) überlebt. Nach dieser Zeit nähert sich bei den meisten Krebsarten die durchschnittliche Lebenserwartung derjenigen von gleichaltrigen Gesunden an. Von allen Krebsheilungen werden ca. 90 % ausschließlich durch die lokal auf die Tumorregion gerichtete, sogenannte lokoregionäre Behandlung, also durch Operation und Strahlentherapie (»Stahl und Strahl«) erreicht.	Um paciente é considerado curado quando sobrevive no mínimo cinco anos sem recaída (recidivo). Na maioria dos tipos de cancro, depois deste tempo a expectativa de vida aproxima-se à da população saudável da mesma idade. De todos as curas de cancro, cerca de 90% são alcançadas exclusivamente por tratamentos direccionados directamente para a região do tumor, ou seja por cirurgia ou radioterapia.
05	The risk of cancer increases with age, which is in general the most significant risk factor, and many cancers occur more commonly in high-longevity developed countries. As one cancer researcher put it, "if we lived long enough, sooner or later we all would get cancer."	Das Krebsrisiko steigt mit dem Alter, welches überhaupt der bedeutsamste Risikofaktor ist, und viele Krebsarten treten häufiger in den Industrieländern mit ihrer hoher Lebenserwartung auf. Ein Krebsforscher hat es wie folgt ausgedrückte: „Lebten wir lange genug, bekämen wir früher oder später alle Krebs.“	O risco de cancro aumenta com a idade (em geral o factor de risco mais significante), sendo que muitos tipos de cancro ocorrem com mais frequência nos países desenvolvidos com elevada expectativa de vida. Citando um pesquisador de cancro: “Se vivêssemos tempo suficiente, mais cedo ou mais tarde todos nós teríamos cancro.”
06	In 2012, approximately 14 million cancers were diagnosed worldwide and in 2015 nearly 8.8 million people died. Cancers account for approximately 13% of deaths. The most common are lung cancer (1.7 million deaths), liver cancer (788,000), colorectal cancer (774,000), stomach cancer (754,000) and breast cancer (571,000). This makes cancer the leading cause of death in the developed world and the second leading in the developing world. Statistically, one in three Europeans develops cancer during the course of his/her life.	Etwa 14 Mio. Krebsfälle wurden 2012 weltweit diagnostiziert und fast 8,8 Mio. Menschen starben 2015 an Krebs. Das entspricht etwa 13% aller Todesfälle. Die häufigsten Krebsarten sind Lungenkrebs (1,7 Mio. Tote), Leberkrebs (788.000), Darmkrebs (774.000), Magenkrebs (754.000) und Brustkrebs (571.000). Das macht Krebs zur Haupttodesursache in Industrieländern und zur zweithäufigsten Todesursache in Entwicklungsländern. Statistisch gesehen entwickelt jeder dritte Europäer im Laufe seines Lebens Krebs.	Em 2012, cerca de 14 milhões de casos de cancro foram diagnosticados mundialmente e em 2015 quase 8,8 milhões de pessoas morreram por causa da doença, sendo que aproximadamente 13% das mortes são causadas por cancro. Os tipos mais comuns são o cancro de pulmão (1,7 milhão de mortes), o cancro de fígado (788 mil), o cancro colorretal (774 mil), o cancro do estômago (754 mil), e o cancro da mama (571 mil), tornando-se o cancro a principal causa de morte nos países desenvolvidos e a segunda nos países em desenvolvimento. Em termos estatísticos, um em cada três europeu desenvolve cancro durante o curso da sua vida.

07	Up to 95% of common cancer cases are due to environmental risk factors. The remaining 5%–10% are due to inherited genetics. Many of the environmental factors are controllable lifestyle choices. Common environmental factors that contribute to cancer death include tobacco, diet and obesity, infections, radiation, stress, lack of physical activity and environmental pollutants. Thus, cancer is potentially preventable.	Bis zu 95% der gewöhnlichen Krebsfälle sind auf umweltbedingte Faktoren zurückzuführen. Die restlichen 5%–10% der Fälle gehen auf angeborene Gendefekte zurück. Viele der Umweltfaktoren sind abhängig vom Lebensstil und somit kontrollierbar. Häufige Umweltfaktoren, die zu Krebssterblichkeit beitragen sind der Tabak, Ernährung und Übergewicht, Infektionen, Strahlung, Stress, Bewegungsarmut und Umweltgifte. Dementsprechend kann Krebs als vorbeugbar gelten.	Até 95% dos cancros comuns originam-se devido a fatores de risco ambientais. Os 5% a 10% restantes devem-se à hereditariedade genética. Muitos dos factores ambientais dependem de escolhas pessoais de estilo de vida. Entre os principais fatores ambientais que contribuem para a morte por cancro estão o tabagismo, maus hábitos alimentares e obesidade, além de infecções, radiação, stress, sedentarismo e poluentes ambientais. Deste modo, cancro é potencialmente evitável.
08	Worldwide, approximately 18% of cancer deaths are related to infectious diseases. This proportion ranges from a high of 25% in Africa to less than 10% in the developed world. Viral infections appears to be involved in the development of more than 90% of cases of cervical cancer, 80% of liver cancers, and 15%–20% of the other cancers. Apart from viruses, cancer bacteria and parasites may also play a role.	Etwa 18% der Krebstodesfälle weltweit stehen in Zusammenhang mit Infektionskrankheiten. Dieses Verhältnis variiert von unter 10% in den Industrieländern bis zu 25% in Afrika. Über 90% der Fälle von Gebärmutterhalskrebs, 80% der Leberkrebsfälle und 15%–20% anderer Krebsfälle scheinen die Folge von Virusinfektionen zu sein. Neben Viren, können krebserregende Bakterien und Parasiten ebenfalls eine Rolle spielen.	Mundialmente, cerca de 18% das mortes por cancro estão relacionadas com doenças infecciosas. Esta proporção varia em diferentes regiões do mundo de um máximo de 25% na África até menos de 10% nos países desenvolvidos. Infeções virais parecem estar envolvidas em mais que 90% dos casos de cancro cervical, 80% dos de cancros de fígado e 15%–20% dos de restantes cancros. Além de vírus, bactérias e parasitas cancerígenos também podem estar envolvidos.
09	Obesity and drinking alcohol are confirmed causes of cancer. In 2015, the International Agency for Research on Cancer of the World Health Organization has classified both, alcohol and processed meat (e.g., bacon, ham, hot dogs, sausages) as Group 1 carcinogens.	Übergewicht und Alkoholkonsum sind erwiesene Krebsursachen. Die Internationale Agentur für Krebsforschung der Weltgesundheitsorganisation (WHO) hat 2015 sowohl Alkohol als auch verarbeitetes Fleisch (z.B. Pökelfleisch, Wurst oder Schinken) als Krebserreger der Gruppe 1 eingestuft.	A Obesidade e o consumo de álcool são causas confirmadas de cancro. Em 2015, a Agência Internacional de Pesquisa em Cancro da Organização Mundial de Saúde (OMS) classificou o álcool e as carnes processadas (p.ex. bacon, fiambre e enchidos) como carcinógenos do Grupo 1.

10	Diet, physical inactivity and obesity are related to up to 30%–35% of cancer deaths. Physical inactivity is believed to contribute to cancer risk, not only through its effect on body weight but also through negative effects on the immune system and endocrine (hormone) system. More than half of the effect from diet is due to overnutrition (eating too much), rather than from eating too few vegetables or other healthful foods.	Ernährungsgewohnheiten, Bewegungsarmut und Übergewicht stehen im Zusammenhang mit bis zu 35% der Krebssterblichkeit. Es wird davon ausgegangen, dass Bewegungsarmut nicht nur durch ihren Beitrag zum Übergewichtigkeit zum Krebsrisiko beisteuern, sondern auch durch ihren negativen Einfluss auf Hormon- und Immunsystem. Über die Hälfte des Ernährungseffektes ist auf Überernährung zurückzuführen, und nicht auf zu geringe Zusichnahme von Gemüsen oder anderen gesunden Lebensmitteln.	Os hábitos alimentares, o sedentarismo e a obesidade estão relacionados com 30% a 35% das mortes por cancro. Acredita-se que o sedentarismo (a falta de exercício físico) possa contribuir para o risco de cancro, não só através do seu efeito sobre o peso corporal, mas também através dos efeitos negativos sobre os sistemas endocrino (hormonal) e imunológico. Mais de metade do efeito negativo da alimentação deve-se à supernutrição (comer demasiado), e não à pouca falta de ingestão de legumes ou outros alimentos saudáveis.

Appendix E. LC-HTIs

01	Non-smokers who are exposed to second-hand smoke at home or work are thought to increase their heart disease risk by 25%–30% and their lung cancer risk by 20%–30%. Second-hand smoke has been estimated to cause 38,000 deaths per year, of which 3,400 are deaths from lung cancer in non-smokers.	Von Nichtrauchern, die zuhause oder am Arbeitsplatz dem Passivrauchen ausgesetzt sind, wird angenommen, dass sich dadurch ihr Risiko einer Lungenkrebserkrankung um 20%–30% und das einer Herz-Kreislauf-Erkrankung um 25%–30% erhöht. Es wird geschätzt, dass Passivrauchen 38.000 Todesfälle im Jahr verursacht, von denen es sich bei 3400 um Lungenkrebstodesfällen bei Nichtrauchern handelt.	Julga-se que não-fumadores apresentam, ao serem expostos a fumo passivo em casa ou no trabalho, um risco acrescido por 25% a 30% de contraírem uma doença cardiovascular e por 20% a 30% de contraírem cancro do pulmão. Estima-se que fumo passivo causa 38.000 mortes anuais, das quais 3400 de cancro do pulmão em não-fumadores.
02	Worldwide in 2012, lung cancer occurred in 1.8 million people and resulted in 1.7 million deaths in 2015, representing 19.2% of all deaths from cancer. The highest rates are in North America, Europe and East Asia, with over a third of new cases in 2012 in China. Rates in Africa and South Asia are much lower.	Weltweit gab es 2012 1,8 Mio. neue Fälle von Lungenkrebs und 2015 1,7 Mio. Todesfälle, die auf Lungenkrebs zurückgingen. Das entspricht 19,2% aller Krebstodesfälle. Nordamerika, Europa und Ostasien sind die Regionen mit den höchsten Lungenkrebsraten, wobei alleine auf China über ein Drittel der Neufälle entfällt. In Afrika und Südasien dagegen liegen die Raten erheblich niedriger.	Em 2012, houve 1,8 milhões de novos casos e, em 2015, 1,7 milhões de mortes por cancro do pulmão, representando 19,2% de todas as mortes por cancro. As maiores taxas estão na América do Norte, na Europa e na Ásia Oriental, com mais de um terço dos novos casos em 2012 na China. As taxas na África e na Ásia do Sul estão bastante mais baixas.
03	The overall survival rate for at least five years after diagnosis for lung cancer was estimated at about 17.5% in the US (2016) and Germany (2012), and at 9.5% (2011) in England and Wales. Outcomes on average are worse in the developing world.	Insgesamt wurde die Überlebensrate für Lungenkrebspatienten in den Vereinigten Staaten (2016) und Deutschland (2012) auf c.a. 17,5% geschätzt und in England und Wales (2011) auf 9,5%. In Entwicklungsländern sind die Ergebnisse im Durchschnitt schlechter.	Estimou-se que, após o diagnóstico de cancro do pulmão, a taxa de sobrevivência de no mínimo cinco anos é de cerca de 17,5% nos Estados Unidos (2016) e na Alemanha (2012), e de 9,5% na Inglaterra e no País de Gales (2011). Em países em desenvolvimento, em média, as taxas estão piores.

04	One study found that male and female smokers lose on average of 13.2 and 14.5 years of life, respectively. Another found a loss of life of 6.8 years. Each cigarette that is smoked is estimated to shorten life by an average of 11 minutes. At least half of all lifelong smokers die earlier as a result of smoking. Smokers are three times as likely to die before the age of 60 or 70 as non-smokers.	Laut einer Studie ist die Lebensdauer männlicher Rauchern im Durchschnitt um 13,2 und die weiblicher um 14,4 Jahren verkürzt. Eine andere Studie beziffert den Verlust an Lebenszeit mit durchschnittlich 6,8 Jahren. Jede gerauchte Zigarette verringert die Lebensdauer um schätzungsweise 11 Minuten. Mindestens die Hälfte aller lebenslangen Raucher sterben auf Grund des Rauchens verfrüht. Raucher haben eine dreimal so große Wahrscheinlichkeit vor dem Alter von 60 oder 70 Jahren zu sterben als Nichtraucher.	Segundo um estudo, os fumadores masculinos perdem em média 13,2 anos de vida e os femininos 14,5 anos. Outro estudo constatou uma perda de tempo de vida média de 6,8 anos. Estima-se que cada cigarro fumado encurta a vida em 11 minutos. Metade ou mais dos fumadores morrem prematuramente devido ao fumo. Um fumador é três vezes mais provável de morrer antes dos 60 ou 70 anos do que um não fumador.
05	Smoking, particularly of cigarettes, is by far the main contributor to lung cancer. Cigarette smoke contains at least 73 known carcinogens, including a radioactive isotope, polonium-210. Across the developed world, 90% of lung cancer deaths in men, and 70% for women, during the year 2000 were attributed to smoking. Smoking accounts for about 85% of lung cancer cases.	Rauchen – insbesondere das Zigarettenrauchen – leistet bei weitem den größten Beitrag zur Entstehung von Lungenkrebs. Zigarettenrauch enthält mindestens 73 bekanntermaßen krebserregende Stoffe, einschließlich eines radioaktiven Isotops, Polonium-210. In den Industrieländern wurden im Jahr 2000 90% aller Lungenkrebs-Todesfälle bei Männern, und 70% bei Frauen, auf das Rauchen zurückgeführt. Fünfundachtzig Prozent aller Lungenkrebsfälle gehen auf das Rauchen zurück.	O tabagismo, particularmente o consumo de cigarro, é de longe o principal factor para o cancro do pulmão. O cigarro contém mais de 73 carcinógenos conhecidos, incluindo um isótopo radioativo do radio. No ano 2000, nos países desenvolvidos, 90% das mortes por cancro do pulmão em homens e 70% em mulheres foram atribuídas ao fumo. O fumo é responsável por 85% de todos os casos de cancro do pulmão.
06	For men who smoked their whole adult life, the probability to contract lung cancer by the age of 75 is 1 in 6. For men who stopped smoking by the age of 60, 50, 40 or 30, the probabilities are 1 in 10, 1 in 16, 1 in 33 and 1 in 50, respectively. For men who never smoked, the probability is approximately 1 in 250.	Die Wahrscheinlichkeit, bis zum 75. Lebensjahr an Lungenkrebs zu erkranken, liegt bei Männern, die ihr gesamtes erwachsenes Leben geraucht haben, bei 1:6. Bei Männern die bis zum Lebensalter von 60, 50, 40 oder 30 Jahren das Rauchen aufgegeben haben, liegt die Wahrscheinlichkeit bei 1:10, 1:16, 1:33 bzw. 1:50. Bei Männern, die nie geraucht haben, liegt die Wahrscheinlichkeit bei ca. 1:250.	A probabilidade de homens que fumaram durante toda a sua vida adulta adoecerem de cancro do pulmão é de 1 em 6. Em homens que deixaram de fumar até aos 60, 50, 40 ou 30 anos, a probabilidade é de 1 em 10, 1 em 16, 1 em 33 e 1 em 50, respetivamente. Em homens que nunca fumaram, a probabilidade é cerca de 1 em 250.

07	Common lung related symptoms may include a chronic cough, shortness of breath, coughing up blood, and wheezing. Lung cancers may press on nerves in the chest causing hoarseness. When lung cancer grows larger or spreads, symptoms such as fatigue, unintended weight loss, and loss of appetite may occur. Lung cancer which has spread to the brain may cause headaches, speech difficulties, memory loss, and weakness. Lung cancer which spreads to the liver may cause abdominal pain and jaundice. And lung cancer which spreads to the bones may cause pain in the back, shoulders, and chest.	Zu den Symptomen von Lungenkrebs zählen gewöhnlich chronischer Husten, einschließlich Bluthusten, Keuchen und Kurzatmigkeit. Der Tumor kann auf Brustnerven drücken und Heiserkeit verursachen. Bei größeren oder sich ausbreitenden Tumoren können Erschöpfungszustände, Gewichts- und Appetitverlust auftreten. Wandert der Lungenkrebs in das Hirn, können sich Kopfschmerzen, Sprachschwierigkeiten, Gedächtnisverlust und Asthenie (Kraftlosigkeit) einstellen. Wandert er in die Leber, kann er Bauchschmerzen und Gelbsucht verursachen; durch in die Knochen gewanderter Krebs, können sich Rücken-, Schulter- und Brustschmerzen einstellen.	Sintomas comuns do cancro do pulmão podem incluir tosse crónica, respiração ofegante, tossir sangue, e sibilo. O cancro do pulmão pode pressionar nervos do pulmão, causando rouquidão. O crescer ou se espalhar de um cancro do pulmão, pode resultar em sintomas tais como fatiga, perda de peso e de apetite. Um cancro do pulmão que se espalhou para o cérebro pode causar dores de cabeça, dificuldades da fala, perda de memória e fraqueza. Tendo-se espalhado para o fígado, pode causar dores de barriga e icterícia. Tendo-se espalhado para os ossos, pode causar dores nas costas, ombros e peito.
08	Lung cancer starts as a symptom-free disease and many of its symptoms (poor appetite, weight loss, fever, fatigue) are not specific. In many people, the cancer has already spread beyond the original site by the time they have symptoms and seek medical attention. In developed countries, more than half of those with lung cancer pass away within a year of diagnosis. Patients diagnosed early are twice as likely to live five or more years compared to those diagnosed with late-stage cancers.	Lungenkrebs ist anfangs symptomfrei und viele seiner späteren Symptome (Appetitlosigkeit, Gewichtsverlust und Erschöpfungszustände) sind unspezifisch. Wenn sich Symptome erst einstellen und ärztliche Hilfe aufgesucht wird, hat sich in vielen Fällen der Tumor bereits über seinen Ursprungsort hinaus ausgebreitet. In den Industrieländern sterben mehr als die Hälfte der Lungenkrebspatienten innerhalb des ersten Jahres nach der Diagnose. Frühzeitig diagnostizierte Patienten überleben mit doppelt so hoher Wahrscheinlichkeit mindestens fünf Jahre lang als solche, die in einem Spätstadium diagnostiziert wurden.	Inicialmente, o cancro do pulmão não causa sintomas e muitos dos sintomas mais tardios não são específicos. Em muitos casos, na altura que os primeiros sintomas surgem e assistência médica é procurada, o cancro já se espalhou. Nos países desenvolvidos, mais de metade dos pacientes com cancro do pulmão morrem dentro do primeiro ano a partir do diagnóstico. Pacientes que são diagnosticados cedo têm duas vezes mais probabilidade de sobreviver durante cinco anos ou mais do que os que são diagnosticados em estágios avançados.

09	The population segment most likely to develop lung cancer is people age 55–74 who have smoked the equivalent amount of a pack of cigarettes daily or more for 30 years, including time within the past 15 years. The most common age at diagnosis is 70 years.	Die Bevölkerungsschicht mit der höchsten Wahrscheinlichkeit an Lungenkrebs zu erkranken ist die der 55- bis 74-Jährigen mit einem Zigarettenkonsum, der dem von mindestens einer Packung täglich über 30 Jahre entspricht und dabei Konsum innerhalb der letzten 15 Jahre einschließt. Das häufigste Diagnosealter ist 70 Jahre.	O segmento populacional mais propício a desenvolver cancro de pulmão tem 55 a 74 anos de idade e apresenta um histórico de tabagismo, tendo fumado a equivalência de um maço de cigarros por dia durante mais que 30 anos, tendo ocorrido parte deste consumo nos últimos 15 anos. A idade mais comum quando diagnosticado é de 70 anos.
10	Lung cancer is the most common cause of cancer-related death in men and second most common in women after breast cancer. While the mortality rate in men began declining more than 20 years ago, women's lung cancer mortality rates have been rising over the last decades. Though they have recently begun to stabilize, lung cancer is projected to surpass breast cancer as the most common cause of cancer-related death in women in Europe.	Lungenkrebs ist die häufigste Krebs-Todesursache bei Männern und, nach Brustkrebs, die zweithäufigste bei Frauen. Während die Sterblichkeitsraten bei den Männern seit über 20 Jahren sinken, sind die der Frauen mit Lungenkrebs über die letzten Jahrzehnte gestiegen. Obwohl sie sich seit kurzem zu stabilisieren begonnen haben, wird damit gerechnet, dass in Europa Lungenkrebs bei Frauen Brustkrebs als häufigste Krebs-Todesursache ablösen wird.	O cancro do pulmão é a causa mais comum de mortes relacionados ao cancro em homens, e a segunda mais comum em mulheres. Enquanto a taxa de mortalidade dos homens tem diminuído por mais que 20 anos, as taxas de mortalidade das mulheres tem aumentado durante as últimas décadas. Embora terem começado de estabiliza-se, o cancro do pulmão é previsto de ultrapassar o cancro da mama nas mulheres na Europa.

Appendix F. Emotional Responses

	en	de	pt
anger	anger	Ärger	arrelia
helplessness	helplessness	Hilflosigkeit	impotência
worry	worry	Besorgnis	preocupação
assertion	defiance	Trotz	oposição
submission	acquiescence	Fügsamkeit	transigência
curiosity	curiosity	Neugierde	curiosidade
boredom	boredom	Langeweile	tédio
fear	fear	Angst	medo
surfeit	surfeit	Überdruss	enfado
loneliness	loneliness	Einsamkeit	solidão

Appendix G. Action Intentions (AIs)

	en	de	pt
iAgg	Free myself in one swift strike from all that is unhealthy in my life (e.g., throw away the cigarettes, the alcohol, the sweets).	Mich auf einen Schlag von allem befreien, was ungesund ist in meinem Leben (z.B. die Zigaretten, den Alkohol, die Süßigkeiten wegwerfen).	Libertar-me de uma só vez de todas as coisas não saudáveis na minha vida (p.ex. deitar fora o tabaco, o álcool, as doces).
pAgg	Bawl at somebody or something. That might make me feel good again.	Jemanden oder etwas anbrüllen. Danach würde ich mich vielleicht wieder gut fühlen.	Gritar com alguém ou alguma coisa. Desde modo talvez me sinta bem outra vez.
iSup	Seek help in undertaking steps to safeguard my health.	Hilfe suchen beim Ergreifen von Maßnahmen zum Schutz meiner Gesundheit.	Procurar ajuda para tomar medidas que salvaguardem a minha saúde.
pSup	Pray that none of these terrible things ever happen to me.	Darum beten, dass mir keine dieser schrecklichen Sachen je passiert.	Rezar para que nenhuma destas coisas horríveis alguma vez me aconteça.
iExp	Learn more about cancer prevention recommendations, to find out all the things I can do to stay healthy.	Mehr über Vorbeugungsempfehlungen gegen Krebs erfahren, um herauszufinden was ich alles tun kann um gesund zu bleiben.	Informar-me mais sobre as recomendações de prevenção de cancro, para saber tudo o que posso fazer para ficar saudável.
pExp	Find some less one-sided source of information about cancer, to see how much there really is to all this.	Eine weniger einseitige Informationsquelle über Krebs finden, um herauszufinden was an all dem wirklich dran ist.	Encontrar alguma fonte de informações menos tendenciosa sobre o cancro, para perceber quanta verdade há nisso tudo.
iAcc	Finally change my behavior (e.g., give up smoking, lose weight, take up exercising)	Endlich mein Verhalten ändern (z.B. das Rauchen aufgeben, abnehmen, Sport treiben)	Finalmente mudar o meu comportamento (p.ex. parar de fumar, perder peso, iniciar um atividade física)
pAcc	Do something fun or relaxing, or even get some work done, instead of thinking about this dreary stuff.	Etwas lustiges oder entspannendes unternehmen, oder aber auch etwas erledigen, statt über dieses trübe Zeug nachzudenken.	Fazer alguma coisa divertida ou relaxante, ou até despachar algum trabalho, em vez de pensar nestas coisas tristes.
iRev	Take a moment—maybe even with a friend—to reflect if I've learned something game-changing about cancer. And who knows, there might even be a positive side to all of this.	Einen Moment für mich nehmen—vielleicht sogar mit einem Freund —, um zu überlegen ob ich irgend etwas umwälzendes über Krebs erfahren habe. Und wer weiß, vielleicht gibt es der Sache sogar etwas positives abzugewinnen.	Tomar um momento—talvez até com um/a amigo/a—para refletir se descobri alguma coisa reveladora sobre o cancro. E, às tantas, até saia algo de bom disto.
pRev	Stay calm and don't panic. After all, I've got plenty to show for that my way of life can't be that bad. In fact I think I am actually striking quite good a balance between *good* and *healthy* living.	Die Ruhe bewahren und nicht in Panik geraten. Immerhin gibt es genug, das mir zeigt, dass meine Lebensart nicht so schlimm sein kann. Überhaupt, denke ich, halte ich eine ganz gute Balance zwischen *gutem* und *gesundem* Leben.	Manter a calma e não entrar em pânico. Tenho muitas provas em como o meu estilo de vida não pode ser assim tão mau. Alias, eu estou, na verdade, a conseguir um bom balanço entre a vida *boa* e *saudável*.

Welcome and thank you for taking an interest and the time to participate in this survey! The survey is available in English, German and Portuguese. Please make sure you chose the language you are most familiar with. It takes approximately 20 minutes to complete. Ideally, you would not let yourself be disturbed or distracted during this time.

In this survey we will ask you personal questions about yourself and about your appraisal of some health relevant information you will be shown. Any information you might give to us is strictly confidential and will be handled anonymously. No individual data set will ever be made public. Please, if possible, answer all questions.

Some questions are simple yes-or-no questions, but many others offer intermediate options, for you to indicate to which degree a statement is true for you. Questions regarding your attitude and reaction may be put repeatedly in only slightly different wording. Please, answer the questions as quickly and spontaneously as possible.

If you have any comments or questions about this study, please contact Sebastian Winkler at segwinkler@gmail.com.

Section A: Venturesomeness

A1. Please answer the following questions as best as you can.

	yes	no
Do you find it hard to understand people who risk their necks climbing mountains?	☐	☐
Do you quite enjoy taking risks?	☐	☐
Do you sometimes like doing things that are a bit frightening?	☐	☐
Do you think hitch-hiking is too dangerous a way to travel?	☐	☐
Do you welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional?	☐	☐
Generally do you prefer to enter cold sea water gradually, to diving or jumping straight in?	☐	☐
Usually do you prefer to stick to brands you know are reliable, to trying new ones on the chance of finding something better?	☐	☐
Would you be put off a job involving quite a bit of danger?	☐	☐
Do you enjoy fast driving?	☐	☐
Would you make quite sure you had another job before giving up your old one?	☐	☐

Section B: Security

B1. Please rate how much you agree with the following statements.

	not at all true	slightly true	somewhat true	mostly true	completely true
One of my greatest sources of comfort when things get rough is being with other people.	☐	☐	☐	☐	☐
When I am unsure of what is going on, I find that I often have the desire to be around other people who are having the same experience.	☐	☐	☐	☐	☐
During times when I have to go through something painful, I usually find that having someone with me makes it less painful.	☐	☐	☐	☐	☐
I often have a strong need to be around people who are impressed with what I am like and what I do.	☐	☐	☐	☐	☐
If I feel unhappy or kind of depressed, I usually try to be around other people to make me feel better.	☐	☐	☐	☐	☐
I find that I often look to certain other people to see how I compare to others.	☐	☐	☐	☐	☐
I often have a strong desire to get people I am around to notice me and appreciate what I am like.	☐	☐	☐	☐	☐
I usually have the greatest need to have other people around me when I feel upset about something.	☐	☐	☐	☐	☐
I think being close to others, listening to them, and relating to them on a one-to-one level is one of my favorite and most satisfying pastimes.	☐	☐	☐	☐	☐
I would find it very satisfying to be able to form new friendships with whomever I liked.	☐	☐	☐	☐	☐

Section C: Self Efficacy

C1. Please rate to what degree the following statements apply to you.

	Not at all true	Hardly true	Moderately true	Exactly true
When facing opposition, I can find the means and ways to get what I want.	☐	☐	☐	☐
I can solve most problems if I invest the necessary effort.	☐	☐	☐	☐
It is easy for me to stick to my aims and accomplish my goals.	☐	☐	☐	☐
Thanks to my resourcefulness, I know how to handle unforeseen situations.	☐	☐	☐	☐
I am confident that I could deal efficiently with unexpected events.	☐	☐	☐	☐
I can remain calm when facing difficulties because I can rely on my capabilities.	☐	☐	☐	☐
I can usually handle whatever comes my way.	☐	☐	☐	☐
I can find a solution to any problem.	☐	☐	☐	☐

	Not at all true	Hardly true	Moderately true	Exactly true
When something new comes up, I know how to handle it.	☐	☐	☐	☐
Should a problem arise, I can take care of it.	☐	☐	☐	☐

Section D: Cancer Info

D1. {rand(1,2)}

D2.

Following are several blocks of facts on cancer. For each block, please state how much the information it contains surprises you.Please, rate also how positive or negative the information seems to you.

surprising valence 0 1 2 3 4 –3 –2 –1 0 +1 +2 +3 not at all • | • very much very negative • • | • • very positive

Note: Should the text columns be uncomfortably narrow on your display (with the window width maxed out already), you can force a reflow of the layout by reducing the window width. On a tablet, switch to portrait mode.

surprising:

	0	1	2	3	4
When cancer begins, it produces no symptoms. Signs and symptoms appear as the mass grows or ulcerates. The findings that result depend on the cancer's type and location. Few symptoms are specific. Cancer is a "great imitator". Thus, it is common for people diagnosed with cancer to have been treated for other diseases, which were hypothesized to be causing their symptoms.	☐	☐	☐	☐	☐
In principle, any organ of the human body can contract cancer. Currently, approximately 100 different types of cancer are known. These can vary greatly in terms of treatment options and tendency to metastasize (spread to other organs). Survival rates vary by cancer type and by the stage at which it is diagnosed. Once a cancer has metastasized, prognosis normally becomes much worse. About half of patients receiving treatment for cancer die from that cancer or its treatment.	☐	☐	☐	☐	☐
Most patients don't die from the (original) primary tumor, but due to the effects of its metastases. Their uncontrolled multiplication harms vital organs to the point when they can no longer carry out their function. Frequent immediate causes of death include embolisms, cachexia (wasting syndrome), or infections that can no longer be controlled by the organism (sepsis).	☐	☐	☐	☐	☐

surprising:

0 1 2 3 4

Patients who survive for at least five years without recurrence are considered cured. After this time, the average life expectancy for most types of cancer approximates that of the same-age healthy population. Approximately 90% of all cancer cures are exclusively due to localized treatment of the affected body tissues, i.e. through surgery or radiation therapy.

The risk of cancer increases with age, which is in general the most significant risk factor, and many cancers occur more commonly in high-longevity developed countries. As one cancer researcher put it, "if we lived long enough, sooner or later we all would get cancer."

In 2012, approximately 14 million cancers were diagnosed worldwide and in 2015 nearly 8.8 million people died. Cancers account for approximately 13% of deaths. The most common are lung cancer (1.7 million deaths), liver cancer (788,000), colorectal cancer (774,000), stomach cancer (754,000) and breast cancer (571,000). This makes cancer the leading cause of death in the developed world and the second leading in the developing world. Statistically, one in three Europeans develops cancer during the course of his/her life.

Up to 95% of common cancer cases are due to environmental risk factors. The remaining 5%–10% are due to inherited genetics. Many of the environmental factors are controllable lifestyle choices. Common environmental factors that contribute to cancer death include tobacco, diet and obesity, infections, radiation, stress, lack of physical activity and environmental pollutants. Thus, cancer is potentially preventable.

Worldwide, approximately 18% of cancer deaths are related to infectious diseases. This proportion ranges from a high of 25% in Africa to less than 10% in the developed world. Viral infections appears to be involved in the development of more than 90% of cases of cervical cancer, 80% of liver cancers, and 15%–20% of the other cancers. Apart from viruses, cancer bacteria and parasites may also play a role.

Obesity and drinking alcohol are confirmed causes of cancer. In 2015, the International Agency for Research on Cancer of the World Health Organization has classified both, alcohol and processed meat (e.g., bacon, ham, hot dogs, sausages) as Group 1 carcinogens.

Diet, physical inactivity and obesity are related to up to 30%–35% of cancer deaths. Physical inactivity is believed to contribute to cancer risk, not only through its effect on body weight but also through negative effects on the immune system and endocrine (hormone) system. More than half of the effect from diet is due to overnutrition (eating too much), rather than from eating too few vegetables or other healthful foods.

valence:

−3 −2 −1 0 +1 +2 +3

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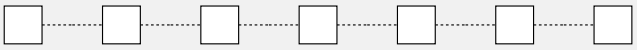

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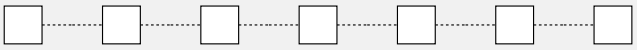

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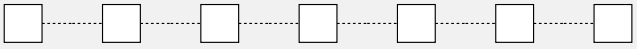

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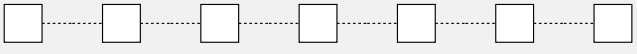

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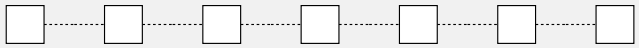

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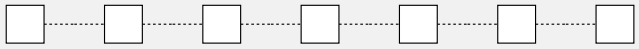

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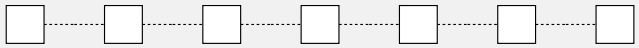

D3.

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surprising valence 0 1 2 3 4 –3 –2 –1 0 +1 +2 +3 not at all • | • very much very negative • • | • • very positive

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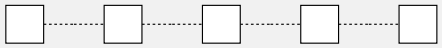
surprising:

0 1 2 3 4

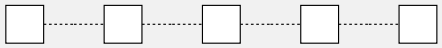
Non-smokers who are exposed to second-hand smoke at home or work are thought to increase their heart disease risk by 25%–30% and their lung cancer risk by 20%–30%. Second-hand smoke has been estimated to cause 38,000 deaths per year, of which 3,400 are deaths from lung cancer in non-smokers.

Worldwide in 2012, lung cancer occurred in 1.8 million people and resulted in 1.7 million deaths in 2015, representing 19.2% of all deaths from cancer. The highest rates are in North America, Europe and East Asia, with over a third of new cases in 2012 in China. Rates in Africa and South Asia are much lower.

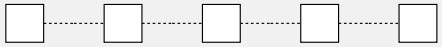


The overall survival rate for at least five years after diagnosis for lung cancer was estimated at about 17.5% in the US (2016) and Germany (2012), and at 9.5% (2011) in England and Wales. Outcomes on average are worse in the developing world.

One study found that male and female smokers lose on average of 13.2 and 14.5 years of life, respectively. Another found a loss of life of 6.8 years. Each cigarette that is smoked is estimated to shorten life by an average of 11 minutes. At least half of all lifelong smokers die earlier as a result of smoking. Smokers are three times as likely to die before the age of 60 or 70 as non-smokers.



Smoking, particularly of cigarettes, is by far the main contributor to lung cancer. Cigarette smoke contains at least 73 known carcinogens, including a radioactive isotope, polonium-210. Across the developed world, 90% of lung cancer deaths in men, and 70% for women, during the year 2000 were attributed to smoking. Smoking accounts for about 85% of lung cancer cases.

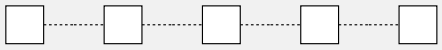


For men who smoked their whole adult life, the probability to contract lung cancer by the age of 75 is 1 in 6. For men who stopped smoking by the age of 60, 50, 40 or 30, the probabilities are 1 in 10, 1 in 16, 1 in 33 and 1 in 50, respectively. For men who never smoked, the probability is approximately 1 in 250.

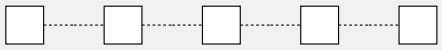
surprising:

0 1 2 3 4

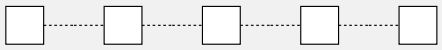
Common lung related symptoms may include a chronic cough, shortness of breath, coughing up blood, and wheezing. Lung cancers may press on nerves in the chest causing hoarseness. When lung cancer grows larger or spreads, symptoms such as fatigue, unintended weight loss, and loss of appetite may occur. Lung cancer which has spread to the brain may cause headaches, speech difficulties, memory loss, and weakness. Lung cancer which spreads to the liver may cause abdominal pain and jaundice. And lung cancer which spreads to the bones may cause pain in the back, shoulders, and chest.



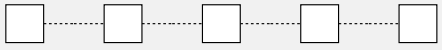
Lung cancer starts as a symptom-free disease and many of its symptoms (poor appetite, weight loss, fever, fatigue) are not specific. In many people, the cancer has already spread beyond the original site by the time they have symptoms and seek medical attention. In developed countries, more than half of those with lung cancer pass away within a year of diagnosis. Patients diagnosed early are twice as likely to live five or more years compared to those diagnosed with late-stage cancers.



The population segment most likely to develop lung cancer is people age 55–74 who have smoked the equivalent amount of a pack of cigarettes daily or more for 30 years, including time within the past 15 years. The most common age at diagnosis is 70 years.



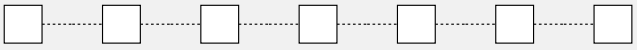
Lung cancer is the most common cause of cancer-related death in men and second most common in women after breast cancer. While the mortality rate in men began declining more than 20 years ago, women's lung cancer mortality rates have been rising over the last decades. Though they have recently begun to stabilize, lung cancer is projected to surpass breast cancer as the most common cause of cancer-related death in women in Europe.



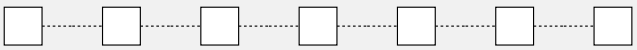
valence:

−3 −2 −1 0 +1 +2 +3

Non-smokers who are exposed to second-hand smoke at home or work are thought to increase their heart disease risk by 25%–30% and their lung cancer risk by 20%–30%. Second-hand smoke has been estimated to cause 38,000 deaths per year, of which 3,400 are deaths from lung cancer in non-smokers.



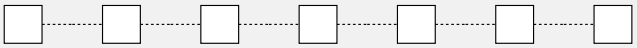
Worldwide in 2012, lung cancer occurred in 1.8 million people and resulted in 1.7 million deaths in 2015, representing 19.2% of all deaths from cancer. The highest rates are in North America, Europe and East Asia, with over a third of new cases in 2012 in China. Rates in Africa and South Asia are much lower.



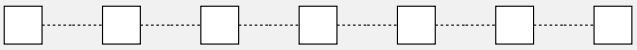
valence:

−3 −2 −1 0 +1 +2 +3

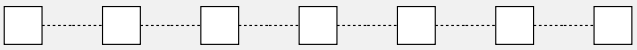
The overall survival rate for at least five years after diagnosis for lung cancer was estimated at about 17.5% in the US (2016) and Germany (2012), and at 9.5% (2011) in England and Wales. Outcomes on average are worse in the developing world.



One study found that male and female smokers lose on average of 13.2 and 14.5 years of life, respectively. Another found a loss of life of 6.8 years. Each cigarette that is smoked is estimated to shorten life by an average of 11 minutes. At least half of all lifelong smokers die earlier as a result of smoking. Smokers are three times as likely to die before the age of 60 or 70 as non-smokers.

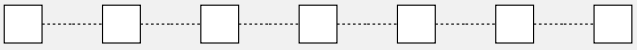


Smoking, particularly of cigarettes, is by far the main contributor to lung cancer. Cigarette smoke contains at least 73 known carcinogens, including a radioactive isotope, polonium-210. Across the developed world, 90% of lung cancer deaths in men, and 70% for women, during the year 2000 were attributed to smoking. Smoking accounts for about 85% of lung cancer cases.



For men who smoked their whole adult life, the probability to contract lung cancer by the age of 75 is 1 in 6. For men who stopped smoking by the age of 60, 50, 40 or 30, the probabilities are 1 in 10, 1 in 16, 1 in 33 and 1 in 50, respectively. For men who never smoked, the probability is approximately 1 in 250.

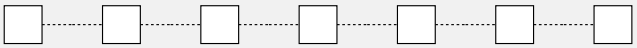
Common lung related symptoms may include a chronic cough, shortness of breath, coughing up blood, and wheezing. Lung cancers may press on nerves in the chest causing hoarseness. When lung cancer grows larger or spreads, symptoms such as fatigue, unintended weight loss, and loss of appetite may occur. Lung cancer which has spread to the brain may cause headaches, speech difficulties, memory loss, and weakness. Lung cancer which spreads to the liver may cause abdominal pain and jaundice. And lung cancer which spreads to the bones may cause pain in the back, shoulders, and chest.



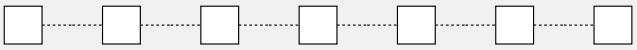
valence:

−3 −2 −1 0 +1 +2 +3

Lung cancer starts as a symptom-free disease and many of its symptoms (poor appetite, weight loss, fever, fatigue) are not specific. In many people, the cancer has already spread beyond the original site by the time they have symptoms and seek medical attention. In developed countries, more than half of those with lung cancer pass away within a year of diagnosis. Patients diagnosed early are twice as likely to live five or more years compared to those diagnosed with late-stage cancers.



The population segment most likely to develop lung cancer is people age 55–74 who have smoked the equivalent amount of a pack of cigarettes daily or more for 30 years, including time within the past 15 years. The most common age at diagnosis is 70 years.



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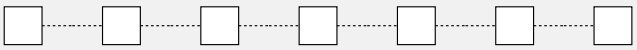
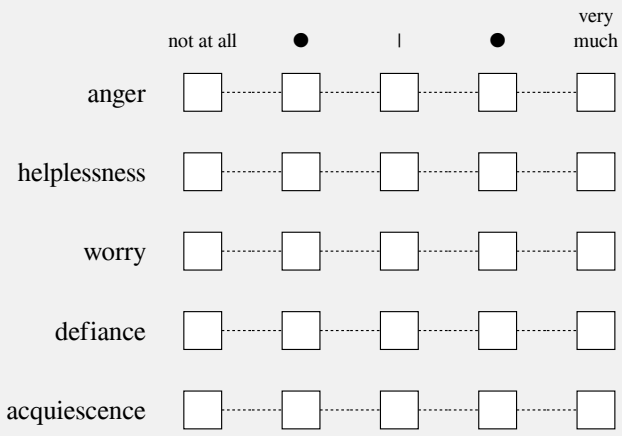


Section E: Emotional Response

E1. Following is a list of terms describing feelings and attitudes you may or may not have had while reviewing the information on the previous page.

Please indicate how much you had (or still have) each of these feelings and attitudes.



	not at all				very much
curiosity	☐	☐	☐	☐	☐
boredom	☐	☐	☐	☐	☐
fear	☐	☐	☐	☐	☐
surfeit	☐	☐	☐	☐	☐
loneliness	☐	☐	☐	☐	☐

Section F: Affectedness

F1. How do you judge your own risk to contract cancer?

- ☐ very low
- ☐ •
- ☐ •
- ☐ —
- ☐ •
- ☐ •
- ☐ very high

F2. How much do you think the risk of contracting cancer is under your own control?

- ☐ not at all
- ☐ •
- ☐ •
- ☐ —
- ☐ •
- ☐ •
- ☐ completely

Section G: Sociographic Data

Please answer the following questions about your person.

G1. Age

How old are you in years

☐☐☐☐☐☐☐☐☐☐

G2. Sex

What sex are you?

male ☐

female ☐

G3. Body

Your body height and weight in metric units.

height(in centimeters) | | | | | | | | | | |

weight(in kilograms) | | | | | | | | | | |

G4. {round (body_weight / (body_height * body_height) * 10000, 1)}

G5. document.write(geoplugin_countryName());

G6. Is English your native tongue?

yes ☐

no ☐

G7. Educational level

Please, chose the highest educational level you have completed.

primary education ☐

lower secondary education (e.g., GCSE) ☐

upper secondary education (e.g., A-level) ☐

Bachelor or equivalent ☐

Master or equivalent ☐

Doctoral or equivalent ☐

G8. Do you smoke?

No, I never smoked. ☐

No, I quit. ☐

Yes ☐

G9. How many years ago did you quit?

| | | | | | | | | | |

G10. For how many years {if(smokes==1,"did you smoke","have you been smoking")}?

| | | | | | | | | | |

G11. How many cigarettes on average {if(smokes==1,"did you use to smoke before you quit","do you smoke")}?

- Less than 1 cigarette per month ☐
- Less than 1 cigarette per week ☐
- Less than 1 cigarette per day ☐
- Less than ½ pack of cigarettes daily ☐
- Between ½ pack and 1½ packs daily ☐
- Between 1½ pack and 2½ packs daily ☐
- More than 2½ packs daily ☐

G12. Do you exercise?

- never ☐
- ● ☐
- — ☐
- ● ☐
- regularly ☐

G13. Do pay attention to eating healthy?

- not at all ☐
- ● ☐
- — ☐
- ● ☐
- very much ☐

G14. Do you or have you ever suffered from any disease mentioned in this survey?

- yes ☐
- no ☐

Section H: Exit Intentions

H1.

To conclude, we would like to know something about your reaction to your participation in this study.

Considering the health relevant questions you have been confronted with, please ask yourself for a moment, what it is you feel like doing now.Then, from the following list of exemplary actions, chose the one or two in which you most recognize your actually felt impulses.

Free myself in one swift strike from all that is unhealthy in my life (e.g., throw away the cigarettes, the alcohol, the sweets). ☐

Bawl at somebody or something. That might make me feel good again. ☐

Seek help in undertaking steps to safeguard my health. ☐

Pray that none of these terrible things ever happen to me. ☐

Learn more about cancer prevention recommendations, to find out all the things I can do to stay healthy. ☐

Find some less one-sided source of information about cancer, to see how much there really is to all this. ☐

Finally change my behavior (e.g., give up smoking, lose weight, take up exercising) ☐

Do something fun or relaxing, or even get some work done, instead of thinking about this dreary stuff. ☐

Take a moment —maybe even with a friend — to reflect if I've learned something game-changing about cancer. And who knows, there might even be a positive side to all of this. ☐

Stay calm and don't panic. After all, I've got plenty to show for that my way of life can't be that bad. In fact I think I am actually striking quite good a balance between good and healthy living. ☐

H2. Were you able to fill out this survey undistracted?

yes ☐

no ☐

Thank you very much for your participation!

If you have any comments or questions about this study, please contact Sebastian Winkler at segwinkler@gmail.com.