

UNDERSTANDING OF THE MECHANISMS UNDERLYING PERCEPTION OF RISK

CORESTA workshop, 29 September 2022

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Traditional Scale Development

- Development of a conceptual framework and item generation
- Confirmation of the conceptual framework and item reduction (development of final scale)
- Validity: Do we measure what we claim to measure?
- The ABOUT™ – Perceived Risk (Health Risk)
 - Conceptual framework: Salzberger, Chrea, Cano, et al. (2017)
 - Final scale development and validation: Cano, Chrea, Salzberger, et al. (2018)
 - 18-item long form, 9-item short form
 - *Do we measure perceived risk?*

Qualitative research
Content validity

Quantitative research
Statistics, Construct validity

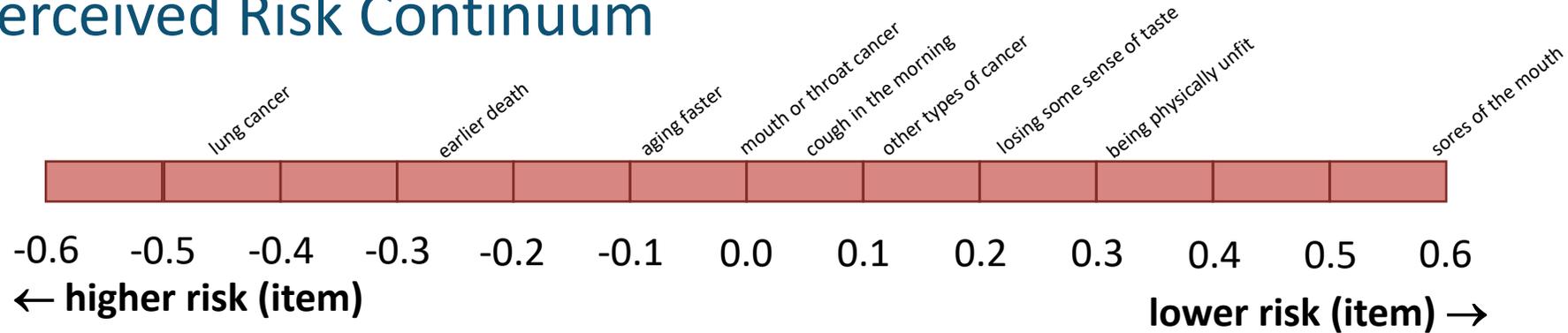
Content and Construct validity
Generally poorly linked

} Psychometrics



Salzberger, T., Chrea, C., Cano, S. J., et al., Perceived risks associated with the use of tobacco and nicotine-containing products: findings from qualitative research. *Tobacco Science and Technology*, 50 (Suppl 1) (2017) 32-42.
Cano, S., Chrea, C., Salzberger, T., et al., Development and validation of a new instrument to measure perceived risks associated with the use of tobacco and nicotine-containing products. *Health Quality Life Outcomes*, 16 (1) (2018) 192–206.

Perceived Risk Continuum



- What drives the level of perceived risk of each health condition (item)?
 - Measurement mechanism, explanatory model
- Definition of risk as a function of probability and (negative) utility
 - “combination of the risk of exposure and the impact = combination of (*likelihood of the threat* being able to expose an element(s) of the system) and *impact*” [BSi - Information Security Risk Management ISO/IEC 270019]
 - The *possibility* that *something unpleasant* or unwelcome will happen: “reduce the risk of heart disease” [Oxford Dictionaries]
- Separate measurements of the probability and the negative utility should explain the level of perceived risk (items and persons)
- Strong evidence of validity (do we measure perceived risk)
 - Linking content validity and construct validity



Operationalisation of Measurement Mechanism of Perceived Risk

(Perceived) Probability

*Scenario of **cigarette smoking** (one pack of cigarettes a day, starting at age 18)*

*What do you think are **the chances that this cigarette smoker gets the following health problems sometime during their lifetime...?***

1. No chance, almost no chance (less than 1 in 10 chance)
2. Very slight possibility (1 in 10 chance)
3. Slight possibility (2 in 10 chance)
4. Some possibility (3 in 10 chance)
5. Fair possibility (4 in 10 chance)
6. Fairly good possibility (5 in 10 chance)
7. Good possibility (6 in 10 chance)
8. Probable (7 in 10 chance)
9. Very probable (8 in 10 chance)
10. Almost sure (9 in 10 chance)
11. Certain, practically certain (more than 9 in 10 chance)

Negative Utility

How bad would it be if you got each of the following, sometime during your lifetime ...

1. Slightly bad
2. Moderately bad
3. Very bad
4. Extremely bad
5. The worst imaginable



Measurement Mechanism

For item locations

Mean of perceived probability for each item

Mean of negative utility for each item

Perceived risk as a function of

- The product of probability and negative utility (expected value of negative utility)
- Probability and negative utility contributing additively to perceived risk

For person measurements

Mean across the products of individual levels of perceived probability and negative utility

Mean across individual levels of perceived probability (of the 9 items)

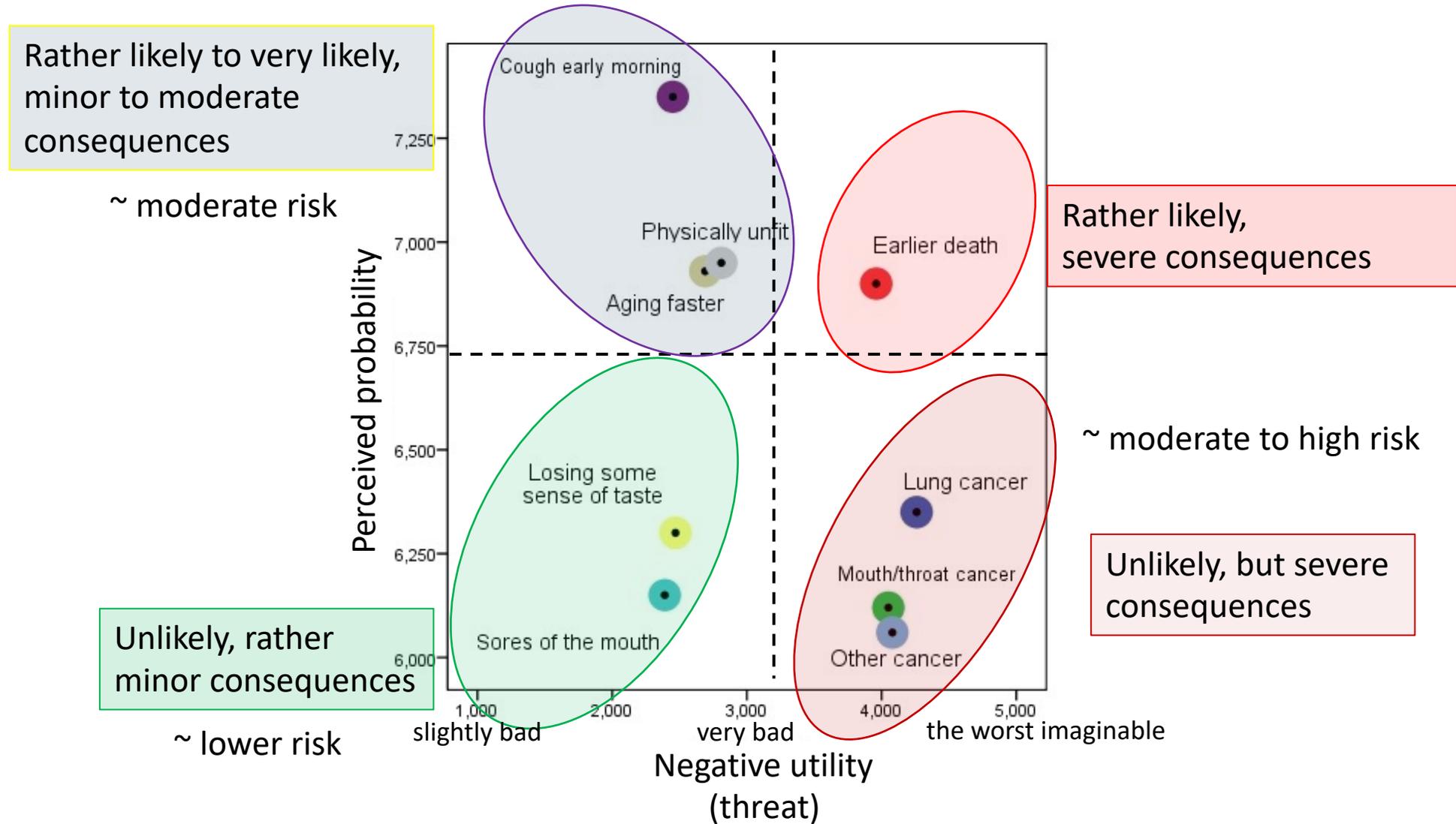
Mean across individual levels of negative utility

Perceived risk as a function of

- The product of probability and negative utility (expected value of negative utility)
- Probability and negative utility contributing additively to perceived risk



Perceived Probability and Negative Utility



Measurement Mechanism for Items

- Data on probability (N = 1336) and negative utility (N = 793) collected in a UK study
- Explanation of item location calibration based on (a) a US scale development and validation study, and (b) a UK study

| Predicted item locations | Model (predictors) | Regression analysis | | |
|--|--|---------------------|----------------|-----------------|
| | | r | r ² | p (F) |
|  (a) US scale development calibration | [1] Probability × Negative utility (multiplicative model) | 0.79 | 0.62 | 0.01 |
| | [2] Probability + Negative utility (additive model) | 0.83 | 0.69 | 0.03 |
|  (b) UK calibration all available data | [3] Probability × Negative utility (multiplicative model) | 0.81 | 0.65 | 0.01 |
| | [4] Probability + Negative utility (additive model) | 0.93 | 0.87 | <0.01 |

- Negative utility somewhat more important than perceived probability



Measurement Mechanism for Persons

- “Risk perception is rarely entirely rational.” (David Ropeik; Harvard Mental Health Letter, June 2011)
 - **Origin.** People are less concerned about risks they incur themselves than the ones others impose on them.
 - **Control.** Perceived control over outcomes also matters.
 - **Familiarity.** Novel risks are perceived to be more dangerous than more familiar threats.
 - **Fun factor.** Engaging in risky behavior may not seem that way if it involves pleasure.
 - and 10 other factors
- Explaining perceived risk at the individual level likely to be more difficult

| Predicted participant locations | Model (predictors) | Regression analysis | | |
|---------------------------------|---|---------------------|----------------|-----------------|
| | | r | r ² | p (F) |
| Exclusive use of cigarettes | [1] Probability × Negative utility (multiplicative model) | 0.65 | 0.43 | <0.01 |
| | [2] Probability + Negative utility (additive model) | 0.70 | 0.49 | <0.01 |

- Perceived probability predominant (impact on perceived risk more than four times stronger than that of negative utility)



Summary and Conclusion

- Proposed measurement mechanism of perceived risk proves viable for items
 - Variance explained very high with $r^2 = 0.87$ (UK estimates) and $r^2 = 0.67$ (US estimates)
 - Strong evidence of validity
- Proposed measurement mechanism of perceived risk also proves tenable for person measures
 - Almost half of the variance explained ($r^2 = 0.49$)
 - Very high given the broad spectrum of potential factors impacting risk perception
- Probability and negative utility contribute additively
- Better understanding of perceived risk
 - Disentangling perceived risk in terms of perceived probability and negative utility
 - e.g. *lung cancer* below average probability but highest threat (negative utility)
cough early in the morning rather likely but among conditions of lowest threat
 - Possibility to screen additional health conditions currently not included in the instrument

