Final Psychometric Evaluation and Cultural Adaptation of the Perceived Risk Instrument (PRI) to Measure Perceived Risks Associated with the Use of Tobacco and Nicotine-Containing Products

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Introduction

The need for valid methods to measure consumer responses to novel tobacco products has been widely acknowledged [1]. Philip Morris International undertook the development of a new self-reported psychometric instrument, the Perceived Risk Instrument (PRI), that aims at quantifying perceived risks of various types of tobacco and nicotine-containing products in adult smokers and adult non-smokers. Initial items were constructed on the basis of a literature review, consumer focus groups and expert opinions [2]. This contribution reports the findings on the two-stage field-testing of the instrument. Stage 1 focused on scale formation and Stage 2 on the full psychometric evaluation and cross-cultural comparability of the PRI.

Methods

Study Design and Participants

Cross-sectional, population-based internet surveys (US for Stage 1 and US, Italy and Japan for Stage 2) were conducted with stratified sampling of four sub-populations (current smokers with and without intention to quit smoking; former smokers and never smokers).

2020 US participants (aged 18-68 years) completed Stage 1 and 4984 participants completed Stage 2 (US N=1640, aged 18-92 years; Italy N=1623, aged 18-76 years; Japan N=1618, aged 20-81 years).

Measures

The Pilot PRI in Stage 1 and its reduced version in Stage 2 (based on Stage 1 findings) were administered to participants for conventional cigarettes; THS 2.2, a heat-not-burn tobacco product; nicotine replacement therapy products; e-cigarettes (only in Stage 2) and cessation (having quit smoking successfully).

Five items on short-term and long-term consequences of smoking (STLTCS) [3], and two visual analog scales (VAS) on overall health and addiction risks, were administered as convergent measures.

Psychometric assessment was based on Classical Test Theory (CTT) and Rasch Measurement Theory (RMT).

Results

Psychometric Evaluation of the PRI

CTT and RMT psychometric evaluation conducted in both stages supported the formation of an 18-item *Perceived Health Risk scale* and a 7-item *Perceived Addiction Risk scale* (Table 1):

- **Targeting**: Person measurements were well covered (75% to 87%).
- **Suitability**: Response option thresholds were ordered correctly for all items (see Figure for Perceived Health Risk scale).
- **Item Fit:** Overall fit to the Rasch Model was good. All items had non-significant χ^2 values.
- **Reliability:** Satisfactory person separation indices (≥0.93), Cronbach's alphas (≥0.98) and item-total correlations (0.88 to 0.95).
- **Item Invariance:** No differential item functioning (DIF) by smoking status, gender, age, and education, supporting the stability of item psychometric performance in these sub-groups.
- **Scale Calibration:** Using US-based data (N=2020 + 1640), a conversion table was produced for each scale, which converts unweighted sum scores to logit measures, finally transformed to a 0-100 scale.

In addition to the two unidimensional scales, two single items on *Perceived Harm to Others* (*i.e.,* risk of secondhand smoke and risk for the unborn baby) were included in the final PRI.

Summary of PRI Psychometric Analysis

PRI		RMT Analysis					CTT Analysis	
Scale (# items)	Stage	Distribution of Item thresholds (% coverage)	% items with residuals outside -2.5/+2.5	% items with significant χ^2	Person separation index	% items with significant DIF	Cronbach's alpha	Item-total correlations (Mean, Range)
Health Risk (18)	1	84	61	0	0.97	0	0.99	(0.91, 0.89-0.93)
	2	87	72	0	0.97	0	0.99	(0.90, 0.88-0.92)
Addiction Risk (7)	1	75	100	0	0.93	0	0.98	(0.92, 0.90-0.93)
	2	78	86	0	0.94	0	0.98	(0.94, 0.92-0.95)

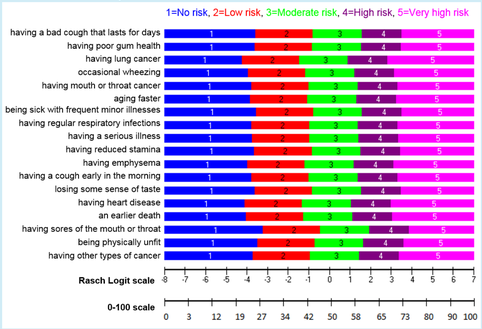
Construct Validity of the PRI

Convergent Validity: Supported by moderate correlations with the two VASs (r_s 0.52 to 0.67) and with the five STLTCS items (r_s 0.10 to 0.46).

Known Group Validity: Supported by significant PRI scale score differences (t-tests at α=5%) in the expected direction (*e.g.,* perceived risk of smoking was lower for current smokers than for never smokers).

Results

Threshold Map for all Items of the Perceived Health Risk Scale



The vertical axis shows the 18 items of the Perceived Health Risk scale.

The upper x-axis (in logits ranging from −8 to +7) represents the perceived health risks construct assessed by the scale. The lower x-axis shows the corresponding 0–100 scale.

Participant perceived health risks associated with tobacco use increase to the right of the map and decrease to the left.

Cultural Adaptation of the PRI

Cross-cultural comparability: Supported by (i) the satisfactory psychometric performance of the two PRI scales with the Italian and Japanese data and (ii) the absence of DIF by country.

Conclusions

- The PRI is applicable for various types of tobacco and nicotine-containing products, and provides a comparable measurement between adult smokers and adult non-smokers.
- By quantifying important aspects of perceived risk, the PRI can support clinical and population-based studies and allows comparison of data across regions (see [4] for an application).
- Detailed information on the conditions to access and use the PRI is provided by the Mapi Research Trust (e-mail: PRO-information@mapi-trust.org).

REFERENCES

[1] Rees VW et al. Assessing consumer responses to potential reduced-exposure tobacco products: a review of tobacco industry and independent research methods. Cancer Epidemiol. Biomarkers Prev. 18: 3225-3240 (2009).
[2] Chrea C et al. Development of a new instrument to measure perceived risks associated with the use of tobacco and nicotine-containing products. Poster presented at the Society for Research on Nicotine and Tobacco Europe, Santiago De Compostela, Spain (2013). Available from www.pmiscience.com
[3] Slovic P. What does it mean to know a cumulative risk? Adolescents' perceptions of short-term and long-term consequences of smoking. J. Behav. Dec. Making 13: 259-266 (2000).
[4] Beacher F et al. Study to quantitatively assess THS 2.2 potential messages. Poster presented at the Society for Research on Nicotine and Tobacco , Chicago, USA (2016). Available from www.pmiscience.com

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