

## The Traveller's Risk Perception (TRiP) questionnaire: pre-travel assessment and post-travel changes

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**Background:** Travellers' risk perception is a key component of travel risk assessment because it influences the adequate implementation of safety precautions. The aims of this study are to validate a tool to analyse travellers' risk perception to identify which factors can influence it and how it changes upon return.

**Methods:** The Traveller's Risk Perception (TRiP) questionnaire was developed and administered to outpatients before and after travel in three travel clinics. A principal component analysis (PCA) was performed to validate the questionnaire and multivariate regression analysis was used to evaluate the effect of travellers' characteristics on the risk scores.

**Results:** A total of 1020 travellers completed the questionnaire. PCA identified two latent factors: 'generic-disseminated risks' and 'specific-circumstantial risks'. Cronbach's  $\alpha$  was acceptable (0.76 and 0.70, respectively). The 'generic-disseminated risks' dimension scored higher than the 'specific-circumstantial risks' ( $p < 0.001$ ). The items with the highest scores were insect bites, gastrointestinal disorders and malaria. The mean scores were significantly lower after the travel for all items but one.

**Conclusions:** The TRiP questionnaire is a valid and reliable tool for rating travellers' perceptions. Staff in travel clinics should be trained to systematically assess travellers' risk perception in order to tailor the consultation according to specific information needs.

**Keywords:** disease, perception, questionnaire, risk, travel

### Introduction

Over the past decade, two relevant changes have influenced travel medicine. First, there has been an increase in the number of travellers to an estimated 1.323 trillion in 2017.<sup>1</sup> Second, travel information has become more readily available due to the internet.<sup>2</sup> However, much of this information is mutable and ambiguous. Incorrect information may greatly impact travellers' risk tolerance and perceptions and may have a negative impact on the implementation of safety precautions.<sup>3</sup>

The perception of risk varies according to the perceiver's characteristics and value system and the mode of presentation of different risks. However, some risks seem more alarming than others, regardless of how the message is formulated. The combination of all these factors leads to great variability in risk perception, which may affect the efficacy of risk communication during travel medicine counselling. The traditional equation to

predict a risk ( $R$ ) is based on the probability ( $p$ ) that the event will occur multiplied by the damage ( $d$ ) caused ( $R=pd$ ). This formula is a measure of the expected loss connected with the occurrence of an adverse event, but it may be inadequate to capture the complexity of risk communication in the setting of travel medicine. A more useful prediction can be obtained by applying Sandman's formula,  $R=H+O$ , where  $H$  is the hazard (how much harm a certain risk is likely to do) and  $O$  is the outrage (how upset a certain risk is likely to make people). The measurable risk ( $H$ ) reflects traditional risk ( $R=pd$ ), while the outrage reflects the subjective element of risk and is connected to the nature of the risk and the way it is perceived. Therefore a more precise equation to describe risk in the setting of travel medicine may be  $R=(pd)+O$ . Higher degrees of outrage lead to more intense risk perception.<sup>4</sup>

Outrage can significantly influence the counselling process and must be handled very carefully. If the outrage is high despite

a low measurable risk, then professionals need to act with caution because a communication focused only on low hazards may induce patients to perceive that their concerns are underestimated. Adequate 'outrage management' may instead prevent a dangerous loss of trust and improve peoples' adherence to useful recommendations. On the other hand, low outrage despite high measurable risk may lead to an underestimation of the implementation of some essential safety precautions with a higher risk of exposure to preventable potential damage. Efficient risk communication needs to focus on 'precaution advocacy', such as alerting people to take potential hazards more seriously.

Despite the potential critical role of 'outrage' in ensuring travellers' safety and guiding risk communication, there are currently very few studies exploring travellers' risk perception and risk determinants.<sup>5,6</sup> Moreover, to our knowledge, only one paper has systematically compared the variation of risk perception before and after travel.<sup>7</sup> The aims of this study are to validate a specific and rapid tool to analyse travellers' risk perception and to describe both the main factors that influence it before travel and how the perception changes upon their return.

## Methods

### Study design and sample

A questionnaire investigating travel risk perception (the Traveller's Risk Perception [TRiP] questionnaire) was administered to a convenience sample of travellers requesting counselling at three different Italian travel clinics between January 2013 and April 2014. Two of these centres are public and one is a private clinic operating as part of the National Health Service. These three centres perform about 2000 counselling sessions per year. No exclusion criteria were applied.

### Questionnaire

The TRiP questionnaire is a new tool that was developed to measure traveller's perceptions (Appendix 1). The questionnaire examines people's risk perception of experiencing specific diseases or conditions during travel. The items of the questionnaire were selected by a focus group of seven experts. Initial development was based on the visual psychometric measuring instrument used by Zimmermann et al.<sup>7</sup> Furthermore, a literature review was conducted to guide the development of the final version by identifying main conditions that can affect travellers according to the severity, frequency of occurrence and estimated concerns. The questionnaire specifically investigates eight conditions, including the risk of gastrointestinal (GI) disorders, insect bites, malaria, accidents, sexually transmitted infections (STIs), rabies, terrorist attacks and vaccination-associated adverse events (VAEs). Participants were asked to rate their perceptions regarding the probability of incurring each of the eight conditions on a 7-point scale, where 1 corresponds to a no risk and 7 corresponds to a very high risk (e.g. 'Considering the place you are going to, how would you rate on a scale from 1 to 7 the risk of incurring each of the following conditions?'). Moreover, an additional item asks people to rate their perception of the overall risk related to the trip. Participants were also asked about information regarding the journey, such as the dates of

departure and return, the route, the type of accommodation, the reason for travel (business/study trip, volunteer, visiting friends and relatives [VFR] and tourism) and the number of previous trips outside Europe. Finally, sociodemographic data were collected, including age, sex, nationality, educational level (International Standard Classification of Education) and occupation. The questionnaire was made available in both Italian and English to encourage foreigners to complete it.

After being fully informed about the aims of the study, participants who agreed to take part in the project were asked to fill out the questionnaire before a medical consultation through a paper-based survey. People were then asked to agree to a phone interview upon their return to answer the same questions of the questionnaire. The travellers who agreed to be interviewed were called within 1 month of the end of their journey. Before its implementation, the TRiP questionnaire was tested on a group of 160 travellers to verify its comprehensibility and acceptability. In this pilot phase, responders were actively invited to highlight any ambiguity and report it to the travel medicine specialist. All comments were evaluated, leading to minor changes to the original version. The pilot test confirmed that the questionnaire was sufficiently clear and understandable and that the completion time was acceptable (<10 min).

### Statistical analysis

Psychometric analyses were done to assess the validity and reliability of the TRiP questionnaire. Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure

of sample adequacy were used to assess the suitability of the respondent data for factor analysis. Sampling is adequate if the KMO index is >0.6. A principal component analysis (PCA) was performed to identify the number of underlying components, or latent factors, and to evaluate construct validity. Pearson's correlation matrix was used to exclude items that are weakly correlated with others ( $r < 0.2$ ). Eigenvalues >1 were used as a cut-off to determine the number of dimensions. Varimax rotation and item-component correlations with absolute values >0.4 were used to determine a simple structure and to include the item in the dimension. The internal consistency and reliability of each component were assessed by Cronbach's  $\alpha$ ;  $\alpha$  values >0.70 suggest that the data are consistent. In addition, inter-item correlations and correlations between individual items and the corresponding factor >0.30 connote good reliability. The construct validity was also examined by calculating Pearson's correlation coefficients between the scale scores. The construct validity of each factor is reflected in scale scores that are moderately related. The missing value (MV) proportion was calculated to confirm the acceptability of the survey. MVs <10% indicate good acceptability.

Once the construct validity of the questionnaire was confirmed, we calculated the mean score of the items for each dimension. The normal distribution of the scores was checked by the Kolmogorov-Smirnov test. Descriptive statistics were used to summarize the population characteristics and the scores of the items and scales. A multivariate regression analysis was performed to assess the effect of the travellers' characteristics (independent variables) on the mean scores of each

item and dimension scores (dependent variables). Differences between the pre-travel and post-travel risk perceptions were evaluated with a paired t-test (statistical significance at  $p < 0.05$ ). All statistical analyses were done using SPSS Statistics for Windows version 20.0 (IBM, Armonk, NY, USA).

### Ethical considerations

This study was based on data regarding travellers' perceptions about the risks and safety of international journeys. In the analysis phase, all answers were de-identified to maintain confidentiality. The survey was performed in compliance with the ethical guidelines of the Helsinki Declaration. All participants received written information about the purpose of the study and were informed that the data would be treated confidentially. This study was exempt from the need for approval by the local ethics committee.

## Results

### Response rates and demographics

A total of 1020 travellers completed the TRiP questionnaire, representing about 43% of the total consults performed by the centres during the study period. Centre A collected 519 questionnaires (50.9%), Centre B collected 406 (39.5%) and Centre C collected 98 (9.6%). Males were 53.9% of the sample. The median age was 37.3 years (interquartile range [IQR] 28.6–50.3). The most represented age group was 26–35 y (31.0% of travellers), followed by 36–45 y (18.3%). Eight travellers (0.8%) were  $\leq 18$  y of age at the time of the consultation. Most responders were Italian (98.4%). Other information about travellers is summarized in Tables 1 and 2.

### Validation—psychometric analysis

The Bartlett's test of sphericity was significant ( $p < 0.001$ ) and the KMO was satisfactory (0.819), thus it was considered appropriate to perform a factor analysis. The PCA showed two latent dimensions. One dimension consists of the risk of accidents, STIs, rabies and terrorist attacks (factor 1, called 'specific-circumstantial risk'). The second includes GI disorders, insect bites, malaria and VAEs (factor 2, called 'generic-disseminated risk') Table 3 shows the item–component correlations (factor loadings) after Varimax rotation. All items were more strictly correlated to the latent factor to which they belong than to the other one. The dimension scores had a moderate correlation ( $r = 0.475$ ), which confirmed the construct validity. Cronbach's  $\alpha$  was 0.70 for the factor 2 dimension and 0.76 for the factor 1 dimension. In both cases, Cronbach's  $\alpha$  decreased if any one of the items was deleted, thus confirming the internal consistency of the factors (Table 4). The item describing the perception of overall risk was not included in the PCA but was considered separately. This item showed a significant correlation with both dimensions, but the correlation coefficient was greater for factor 2 ( $r = 0.71$ ,  $p < 0.01$ ) than for factor 1 ( $r = 0.61$ ,  $p < 0.01$ ). The score distributions of the eight risks and the dimension scores were not normal ( $p < 0.05$  in the Kolmogorov–Smirnov test). MV analysis revealed a maximum of four missing values (0.4%) in the

items investigating the risk perceptions. A few MVs were registered in the sociodemographic part (MV 0.1–1.6%), except for questions about previous journeys, which had a greater number of MVs ( $n = 99$  [9.7%]).

### TRiP questionnaire scores

Analysis of the mean scores revealed that the travellers rated factor 2 higher than factor 1 (mean  $3.6 \pm 1.2$  vs  $2.1 \pm 1.1$ ;  $p < 0.001$ ). Specifically, the items registering higher scores were insect bites ( $4.6 \pm 1.6$ ), GI disorders ( $4.4 \pm 1.6$ ) and malaria ( $3.1 \pm 1.7$ ). In contrast, travellers estimated STIs to be less likely ( $1.8 \pm 1.6$ ), along with rabies ( $2.0 \pm 1.3$ ) and terrorism ( $2.0 \pm 1.3$ ). The item and dimension mean scores are presented in Table 4. The multivariate analysis detected significant differences in the mean scores of dimensions and items due to travellers' characteristics. The score for factor 2 was influenced by gender, age group, education level, destination, reason for travel and previous travels. The score for factor 1 was modified by age group, destination and reason for travel. Detailed data are reported in Tables 1 and 2. At the time of counselling, 908 travellers (89.0%) gave written consent to be interviewed upon their return and 68.1% of these travellers ( $n = 619$ ) completed the post-travel form (158 refused the interview, 104 did not answer four phone calls and 27 cancelled the trip). Table 5 shows the scores of the dimensions and items before and after the journey. All values decreased after travel except for the risk of accidents, which increased from 2.6 to 3.0. All differences were significant except for the factor 2 dimension.

## Discussion

This study evaluated risk perceptions among travellers. Better understanding of travellers' risk perceptions may help make the communication of travel-related risks more effective, allowing for a greater influence on travellers' behaviours and improving their adherence to safety measures.

The questionnaire explores two domains. The first component includes risks that depend on the occurrence of specific circumstances, including accidents, unsafe sexual intercourse, contact with a rabies-infected animal or acts of terrorism. In contrast, the second dimension includes risks related to non-specific circumstances. For example, a GI disorder may be contracted by eating or drinking contaminated food or water, and bites from insects (including hosts of malaria) are quite common and may occur any time during travel. Finally, anyone who receives a vaccine before travel may experience a VAE (both expected/well known and rare/unknown). Accordingly, the two identified dimensions were named 'specific-circumstantial risk' and 'generic-disseminated risk'.

The 'generic-disseminated risk' dimension scored significantly higher than the 'specific-circumstantial risk' dimension. Specifically, risks related to insect bites, GI disorders and malaria scored the highest, whereas STIs, rabies and terrorism scored the lowest. Moreover, the mean score of the item investigating the overall risk showed a stronger relation with the 'generic-disseminated risks' dimension. These data suggest that people may feel more confident in dealing with 'specific-circumstantial risks' rather than

**Table 1.** Influence of travellers' characteristics on risk perception scores for the dimension 'generic-disseminated risk'

Characteristics	n	%	GID			IB			Malaria			VAE			Generic-disseminated risks		
			Mean	SD	p-Value	Mean	SD	p-Value	Mean	SD	p-Value	Mean	SD	p-Value	Mean	SD	p-Value
<b>Sex</b>																	
Female	470	46.1	4.6	1.6	<b>&lt;0.01</b>	4.7	1.6	0.06	3.2	1.8	0.20	2.6	1.5	<b>0.02</b>	3.8	1.2	<b>&lt;0.01</b>
Male	550	53.9	4.3	1.6		4.5	1.6		3.1	1.7		2.3	1.4		3.5	1.1	
<b>Age group (years)</b>																	
<25	153	15	4.5	1.5	0.07	4.6	1.4	<b>&lt;0.001</b>	3.1	1.8	0.80	2.7	1.4	0.80	3.7	1.1	<b>&lt;0.01</b>
26–35	316	31	4.6	1.6		4.8	1.5		3.1	1.5		2.6	1.4		3.8	1.0	
36–45	187	18.4	4.5	1.6		4.5	1.6		3.1	1.7		2.3	1.3		3.6	1.2	
46–55	170	16.7	4.5	1.7		4.8	1.6		3.3	1.9		2.4	1.5		3.8	1.2	
56–65	136	13.3	4.0	1.7		4.2	1.6		3.2	1.8		2.2	1.4		3.4	1.2	
>65	57	5.6	3.5	1.8		3.8	1.8		2.8	1.9		2.0	1.4		3.0	1.3	
<b>Education level (ISCED)</b>																	
0–2	119	11.7	3.7	1.8	<b>&lt;0.001</b>	4.2	1.7	0.27	2.7	1.7	0.07	2.1	1.4	<b>0.04</b>	3.2	1.2	<b>&lt;0.01</b>
3–5	489	48.1	4.3	1.6		4.6	1.6		3.2	1.7		2.4	1.4		3.6	1.2	
>5	408	40.2	4.7	1.5		4.7	1.5		3.2	1.7		2.6	1.5		3.8	1.1	
<b>Destination</b>																	
Africa	567	55.6	4.3	1.7	<b>&lt;0.001</b>	4.7	1.6	<b>&lt;0.01</b>	3.6	1.7	<b>&lt;0.001</b>	2.6	1.5	<b>0.001</b>	3.8	1.2	<b>&lt;0.001</b>
South/Central America	143	14	4.7	1.6		4.6	1.6		2.4	1.5		2.3	1.4		3.5	1.0	
Asia	288	28.2	4.7	1.5		4.4	1.6		2.7	1.5		2.2	1.3		3.5	1.0	
Other	12	1.2	3.1	1.2		2.7	1.1		1.2	0.4		1.8	0.8		2.2	0.5	
<b>Reason for travel</b>																	
Business/study	183	18	4.6	1.7	<b>0.02</b>	4.4	1.7	0.44	3.3	1.8	<b>0.01</b>	2.5	1.4	<b>&lt;0.01</b>	3.7	1.3	<b>0.04</b>
Tourism	643	63.2	4.4	1.6		4.6	1.6		3.0	1.7		2.4	1.4		3.6	1.1	
VFR	15	1.5	3.3	1.6		4.1	1.9		3.2	1.9		1.9	1.0		3.1	1.1	
Volunteer	176	17.3	4.6	1.6		4.8	1.5		3.6	1.7		2.7	1.4		3.9	1.1	
<b>Length of travel (days)</b>																	
<7	65	6.4	4.1	1.7	0.30	4.3	1.7	0.33	3.3	1.9	<b>0.04</b>	2.4	1.4	0.80	3.5	1.3	0.13
8–15	404	39.6	4.3	1.7		4.5	1.6		3.1	1.7		2.5	1.4		3.6	1.2	
16–30	341	33.4	4.5	1.5		4.8	1.5		3.1	1.6		2.4	1.4		3.7	1.0	
31–90	117	11.5	4.5	1.7		4.5	1.6		3.1	1.8		2.4	1.5		3.6	1.2	
>91	77	7.7	4.7	1.8		4.6	1.8		3.3	1.8		2.4	1.4		3.7	1.2	
<b>Trips to the same destinations</b>																	
No	807	79.1	4.4	1.6	<b>0.02</b>	4.6	1.6	0.09	3.1	1.7	0.74	2.5	1.4	<b>0.01</b>	3.7	1.1	<b>0.02</b>
Yes	115	11.3	4.0	1.7		4.3	1.8		3.1	1.8		1.9	1.2		3.3	1.2	
<b>Number of travels</b>																	
<5	512	50.2	4.5	1.6	0.37	4.6	1.5	0.59	3.1	1.7	0.53	2.7	1.5	<b>&lt;0.001</b>	3.8	1.1	<b>0.03</b>
5–10	238	23.3	4.2	1.6		4.5	1.7		2.9	1.6		2.2	1.2		3.4	1.1	
>10	171	16.8	4.2	1.7		4.5	1.7		3.1	1.9		2.0	1.3		3.5	1.3	

GID: gastrointestinal disorder; IB: insect bite; ISCED: International Standard Classification of Education; SD: standard deviation.  
p-Values <0.05 are in bold type.

**Table 2.** Influence of travellers' characteristics on risk perception scores for the dimension 'specific-circumstantial risks'

Characteristics	n	%	Accidents			STI			Rabies			Terrorism			Specific-circumstantial risks		
			Mean	SD	p-Value	Mean	SD	p-Value	Mean	SD	p-Value	Mean	SD	p-Value	Mean	SD	p-Value
Sex																	
Female	470	46.1	2.6	1.3	0.40	1.6	1.4	<b>&lt;0.01</b>	1.9	1.2	0.22	1.9	1.2	0.71	2.0	1.0	0.10
Male	550	53.9	2.8	1.5		1.9	1.7		2.1	1.3		2.0	1.4		2.2	1.1	
Age group (years)																	
<25	153	15	2.6	1.2	<b>&lt;0.01</b>	1.9	1.7	0.14	2.1	1.2	0.22	2.0	1.3	0.56	2.2	1.0	<b>0.01</b>
26–35	316	31	2.7	1.3		1.7	1.4		1.9	1.2		1.9	1.2		2.0	1.0	
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56–65	136	13.3	2.4	1.3		1.6	1.4		1.7	1.1		1.9	1.2		1.9	0.9	
>65	57	5.6	2.0	1.3		1.2	1.1		1.7	1.4		1.6	0.9		1.6	0.8	
Education level (ISCED)																	
0–2	119	11.7	2.4	1.5	<b>0.03</b>	1.6	1.5	0.99	1.9	1.2	0.68	1.8	1.2	0.69	1.9	1.0	0.17
3–5	489	48.1	2.6	1.4		1.8	1.6		2.0	1.3		2.0	1.3		2.1	1.1	
>5	408	40.2	2.9	1.3		1.8	1.6		2.0	1.2		2.1	1.3		2.2	1.0	
Destination																	
Africa	567	55.6	2.7	1.4	<b>0.04</b>	1.8	1.7	0.11	2.0	1.3	<b>0.02</b>	2.1	1.4	<b>&lt;0.001</b>	2.2	1.1	<b>0.04</b>
South/Central America	143	14	2.6	1.1		1.6	1.3		1.8	1.1		1.6	0.9		1.9	0.8	
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Other	12	1.2	3.3	1.8		2.3	1.9		1.3	0.5		2.8	1.5		2.4	1.0	
Reason for travel																	
Business/study	183	18	3.2	1.6	<b>0.02</b>	2.4	2.1	0.09	2.4	1.6	<b>&lt;0.001</b>	2.5	1.7	<b>&lt;0.01</b>	2.6	1.4	<b>0.01</b>
Tourism	643	63.2	2.5	1.3		1.6	1.4		1.9	1.2		1.9	1.2		2.0	0.9	
VFR	15	1.5	2.5	1.3		1.9	1.6		1.3	0.6		1.7	1.0		1.9	0.7	
Volunteer	176	17.3	2.7	1.3		1.7	1.5		2.0	1.1		1.9	1.2		2.1	0.9	
Length of travel (days)																	
<7	65	6.4	3.0	1.6	0.95	2.2	2.0	0.18	2.4	1.7	0.79	2.4	1.6	0.76	2.5	1.3	0.32
8–15	404	39.6	2.5	1.3		1.6	1.4		1.9	1.2		2.0	1.3		2.0	1.0	
16–30	341	33.4	2.7	1.3		1.9	1.6		2.0	1.2		1.9	1.2		2.1	1.0	
31–90	117	11.5	2.7	1.4		1.7	1.4		1.9	1.3		1.8	1.2		2.0	1.0	
>91	77	7.7	3.0	1.7		2.2	1.8		2.0	1.2		2.1	1.4		2.3	1.2	
Trips to the same destinations																	
No	807	79.1	2.6	1.3	0.08	1.6	1.4	0.07	1.9	1.2	0.20	2.0	1.3	0.71	2.0	1.0	0.17
Yes	115	11.3	2.9	1.7		1.9	1.7		2.0	1.4		1.9	1.3		2.2	1.2	
Number of travels																	
<5	512	50.2	2.6	1.3	0.65	1.5	1.3	0.05	1.9	1.2	0.82	1.9	1.2	0.43	2.0	0.9	0.37
5–10	238	23.3	2.6	1.4		1.7	1.4		1.9	1.1		2.0	1.3		2.0	1.0	
>10	171	16.8	2.8	1.6		1.9	1.8		1.9	1.4		2.2	1.4		2.2	1.2	

ISCED: International Standard Classification of Education; SD: standard deviation.  
p-Values <0.05 are in bold type.

'generic-disseminated risks' or that they underestimate some risks such as STIs, rabies or accidents. This evidence may warrant some reflection regarding preventive counselling provided to travellers. Pre-existing notions of some risks by travellers may influence the consultation and lead to a wider discussion of already-known risks that are perceived by travellers as greater risks.<sup>5</sup> Risks included in the dimension 'generic-disseminated risks' are generally more widely discussed during pre-travel consultations. The risks of diarrhoea and malaria are actually very common and well recognized as a fundamental part of travel consultations.<sup>8,9</sup> More than 10 000 people per year contract malaria during travel, and diarrhoea is the most common travel complaint, with an incidence of 10–40%.<sup>6,10,11</sup> In contrast, risks included in the 'specific-circumstantial risks' dimension may be less known by travellers and less discussed during pre-travel consultations.

The literature shows wide variability in the information given by travel centres, with advice on how to prevent diarrhoea, malaria and other vector-borne diseases given more often than information on the prevention of potential rabies exposure and

STIs.<sup>12</sup> It is interesting to note that the first component refers to risks that may have a much higher emotional content than the second. Indeed, accidents, rabies and terrorist attacks can all result in death, and STIs carry significant social stigma. Lower scores related to this dimension may be related to a tendency to underestimate and minimize risks that cause greater concerns. In our sample, the perception of STI risk scored the lowest, with significantly higher (but still small) risks in males vs females. Despite this low risk perception, the literature shows that the prevalence of travel associated with casual sex is quite high (about 20%), and half of it is unprotected,<sup>13</sup> especially among men. This supports the higher value observed in our male subsample.<sup>14,15</sup> A reliable evaluation of risk perception about STI remains very complicated because of social stigma about these diseases. Similarly, the risk for rabies was rated low and had the same value as the risk of terrorism. According to a US study, rabies was one of the three most refused vaccines, with a percentage of refusal near 50%.<sup>16</sup> Most of the travellers indicated that the reason for refusal was that they were not concerned with the illness, which indicates a dangerous distorted perception of this risk. Indeed, according to the evidence, dog bites affect 6.9 per 1000 people per month.<sup>17,18</sup>

Finally, the risk of accidents was the fourth-ranked risk and had a rate of about half that of GI disorders. According to WHO data, accidents are recognized as the most common cause of morbidity and mortality among travellers, again revealing a dangerous underestimation. Pre-travel consultations should actively investigate travellers' concerns and perceptions about STIs, rabies and accidents and, whenever appropriate, they should reduce the time spent discussing other more recognized risks, such as GI disorders.

In contrast to other risks in the 'specific-circumstantial risks' dimension, the fear of terrorism seems to be overestimated, as confirmed by other research specifically conducted on this topic.<sup>19</sup> According to the available data, the actual risk of terrorism remains low.<sup>20</sup> The observed overestimation of this risk may be partially explained by the media influence. As soon as a terrorist attack occurs, the media (including social media) tend to share images and videos that have a high emotional impact. This leads to a rapid and often uncontrollable social amplification of

**Table 3.** Factor loadings at PCA after Varimax rotation

Conditions	Factor 1: specific- circumstantial risks	Factor 2: generic- disseminated risks
Gastrointestinal disorders	0.113	<b>0.721</b>
Insect bites	0.118	<b>0.796</b>
Malaria	0.383	<b>0.633</b>
VAEs	0.143	<b>0.616</b>
Accidents	<b>0.652</b>	0.310
STIs	<b>0.786</b>	0.003
Rabies	<b>0.800</b>	0.186
Terrorism	<b>0.704</b>	0.258

Numbers in bold indicate items with correlations >0.4.

**Table 4.** Reliability characteristics of the factors and mean scores of the items and dimensions

Items/dimensions	n	Mean score	SD	Cronbach's $\alpha$	Cronbach's $\alpha$ if item deleted	Corrected item-total correlation
<b>Generic-disseminated risks</b>	<b>1017</b>	<b>3.6</b>	<b>1.2</b>	<b>0.7</b>		
Gastrointestinal disorders	1017	4.4	1.6		0.65	0.46
Insect bites	1017	4.6	1.6		0.57	0.57
Malaria	1017	3.1	1.7		0.62	0.51
VAEs	1017	2.5	1.4		0.68	0.39
<b>Specific-circumstantial risks</b>	<b>1017</b>	<b>2.1</b>	<b>1.1</b>	<b>0.76</b>		
Accidents	1016	2.7	1.4		0.71	0.53
STIs	1016	1.8	1.6		0.72	0.52
Rabies	1016	2	1.3		0.66	0.63
Terrorism	1016	2	1.3		0.7	0.56

SD: standard deviation.



**Table 5.** Risk perception scores before and after travel

Items/dimensions	Before travel		After travel		Differences		p-Value
	Mean	SD	Mean	SD	Mean	SD	
Generic-disseminated risks	3.7	1.1	2.4	1.1	-1.2	1.31	<b>&lt;0.001</b>
Gastrointestinal disorders	4.4	1.6	3.3	1.9	-1.2	2.11	<b>&lt;0.001</b>
Insect bites	4.7	1.6	2.9	1.7	-1.8	2.00	<b>&lt;0.001</b>
Malaria	3.1	1.6	2.0	1.4	-1.1	1.80	<b>&lt;0.001</b>
VAEs	2.5	1.5	1.6	1.2	-0.9	1.78	<b>&lt;0.001</b>
Specific-circumstantial risks	2.1	1.0	2.0	1.0	-0.6	1.11	0.62
STIs	1.7	1.6	1.5	1.3	-0.2	1.45	<b>&lt;0.001</b>
Rabies	1.9	1.2	1.8	1.3	-0.1	1.54	<b>0.01</b>
Terrorism	1.9	1.2	1.7	1.3	-0.2	1.42	<b>&lt;0.001</b>
Accidents	2.6	1.3	3.0	1.9	+0.4	1.97	<b>&lt;0.001</b>
Overall risk	3.2	1.1	2.7	1.2	-0.5	1.30	<b>&lt;0.001</b>

SD: standard deviation.  
p-Values <0.05 are in bold.

risk perceived as something highly threatening, even in people who have never directly experienced it. Evidence-based data do not have the same emotional impact and generally take much more time to collect and disseminate to the public, which leads to difficulties in altering distorted opinions once they form.<sup>21</sup> In order to avoid unnecessary anxiety, the outrage related to terrorism should be actively explored and discussed. The same can be said regarding VAEs: despite the advantages of vaccination widely outweighing the risks, people included in our study tended to overestimate this risk.

Regarding destination, Africa was rated as the most risky continent, followed by Asia and South America. Risk for insect bites, malaria and terrorism contributed the most to the higher values observed among these three continents. The perception of Africa as the most risky continent is confirmed by the literature. Africa accounts for the most malaria cases, and many African countries also have security or safety problems.<sup>22,23</sup> Risk perception for GI disease rated higher in Asia than other continents, and this perception agrees with available epidemiological data.<sup>9,24</sup>

The risk perception was also influenced by some demographic and travel-related characteristics. Young people showed a higher risk perception for both of the dimensions compared with older people. This result is consistent with the study of Zimmermann et al.,<sup>7</sup> where young people perceived a higher risk than elderly travellers. However, the role of age remains ambiguous: other studies report that older people exhibit a higher risk perception than other age groups, despite the fact that younger people take more risks while traveling.<sup>25,26</sup> This attitude towards risk could be due to the inclination of young people to create new experiences, to go on 'wild travels' and to adapt to basic living conditions that expose them to a higher rate of adverse health events.<sup>27</sup>

Education level had a significant impact on the risks for VAEs, GI disorders and accidents. Specifically, people with higher

education levels scored them the highest. The results for GI disorders and accidents confirm existing evidence that people with a higher education level have a greater awareness of risk that influences their attitude to engage in preventive and risk control behaviours.<sup>28,29</sup> Significantly, education level does not seem to have an influence on STIs and rabies, suggesting that the level of awareness about these issues remains low. A higher level of education was also related to a higher perceived risk related to vaccination.

No significant differences in risk perception were found between groups with different lengths of stay, even if the evidence shows a higher likelihood of risk behaviours for people travelling 1–6 months compared with people travelling for <1 month.<sup>27</sup> On the other hand, previous trips to the same destination decreased risk perceptions in the 'generic-disseminated risks' dimension, as well as for GI disorders and VAEs. Interestingly, a greater number of travels (>10) compared with fewer (<5) significantly decreased the risk perception of VAEs but did not show any impact on others explored risks. People who travel the most probably become used to vaccinations. According to this result, people who are less used to travel may need a more extensive consultation on the risk of VAEs compared with people who travel more often.

The data analysis of the scores from before and after travel showed that risk perception tends to decrease for all of the explored risks except for the risk of accidents, which significantly increased. This reduction may be related to an increased awareness among experienced travellers on how to take risks under control and prevent eventual harm, and it may also be related to experiences of safe travels. Experiencing safe travels may lead to an excessive reduction of perceived risks (overconfidence bias). Overconfidence bias may also involve relatives or friends who could receive wrong suggestions about health topics for specific travel destinations. Regarding accident risk, the local transportation experienced during the trip probably made

travellers more aware of the risks of traumatic injuries, thus increasing their level of risk perception.<sup>30</sup> Increasing awareness about this kind of risk during the pre-travel consultation may be useful in order to encourage travellers to actively search for useful information to prevent and minimize harm (e.g., local road systems, high crime areas and accessibility of emergency care).

This study suffers from some limitations. Only a few VFRs completed the TRiP questionnaire, even though an English version was available. A specific assessment should be performed on this subgroup in order to evaluate differences in the risk perception profile. The recruitment method (convenience sampling from three pre-travel centres) may also have led to selection bias that favours people who are more aware and focused on risk assessment and management. Finally, the questionnaire was administered in a paper format and by telephone before and after the trip, respectively, leading to potential information bias. However, this choice was aimed at obtaining a high response rate.

## Conclusions

The TRiP questionnaire is a valid instrument for assessing both pre- and post-travel risk perception. It is easy to perform and presents good acceptability for travellers. The results suggest that some risks are underestimated compared with others (e.g., STIs, rabies and accidents), leading to potential inefficient preventive and protective measures and unwarranted exposure to greater hazards. Travel clinic staff should be trained to systematically assess travellers' risk perception in order to tailor the consultation to their specific information needs, correct misperceptions of risks and guarantee that all potential hazards are sufficiently explored and discussed. Moreover, specific knowledge of travellers' characteristics such as age, education level, and travel habits may guide the pre-travel consultation to further explore certain items rather than others and enable efficient use of the time dedicated to the consultation. Further studies should be considered to understand which reasons explain the observed variability in risk perceptions and what the most powerful messages are for better management of personal outrage of travellers, as well as to improve their adherence to safety measures

## Supplementary data

Supplementary data are available at *International Health* online (<http://inthealth.oxfordjournals.org>).

**Authors' contributions:** ST, F Marchiori and AR conceived the study. ST, AR, F Marchiori, FT, DB and MM designed the study protocol. AR, BD, F Marchiori, MM, AT, SF, FT and GN collected the data. AZ, F Marchiori and F Moretti analysed and interpreted the data. F Marchiori, AZ, AR, ST and F Moretti drafted the manuscript. AZ, F Marchiori and F Moretti critically revised the manuscript. All authors read and approved the final manuscript.

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