

**Ease of Retrieval, Judgmental Confidence and Information Seeking Behavior:  
How Accurate Are People at Estimating Their Knowledge on Tropical Diseases?**

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## **Abstract**

This research paper investigated to what extent ease of retrieval, the level of health education, and judgmental confidence influenced individuals' information seeking behavior in the context of tropical disease prevention. Even though information on tropical diseases is widely accessible, the extent to which travelers seek information depends on multiple factors, such as one's level of health education and judgmental confidence. It was hypothesized that the aforementioned variables engage in a moderated mediation, with the level of health education being the moderator between ease of retrieval and judgmental confidence, and judgmental confidence as the mediator between ease of retrieval and information seeking behavior. Based on the Dunning-Kruger effect, it was expected that high levels of health education weaken the relationship between ease of retrieval and judgmental confidence. Furthermore, based on the RISP model, it was expected that easy retrieval of information leads to an overall higher judgmental confidence which subsequently, leads to less information-seeking.

To test the hypothesis, 142 participants were recruited and took part in an online experiment. The participants were divided into two groups and completed a recall task that differed in its difficulty (easy vs. difficult retrieval). Furthermore, participants were asked to share their demographics and fill in a number of questionnaires. Results yielded that no moderated mediation could be found. Even though ease of retrieval significantly influenced individuals' judgmental confidence, participants' level of judgmental confidence did not significantly impact their information seeking behavior. However, a moderation effect was found. Contrary to the hypothesis, the level of health education strengthened the relationship between ease of retrieval and judgmental confidence. Future researchers should take into account the effect the task difficulty can have on individuals' judgmental confidence as well as choose a topic that is of higher relevance to the target group.

## 1. Introduction

Even though the majority of infections are preventable, each year, around 15 million individuals die of tropical diseases (Zumla & Ustianowski, 2012). This number has risen over the last years, which is largely due to the overall increasing amount of traveling, leading to more individuals coming in contact with tropical diseases (Alkadi, Salih, & Al Darbi, 2021). Especially tropical destinations like the Maldives, Mexico, or Bora Bora remain to be some of the most popular travel destinations worldwide (Glaesser et al., 2017). However, because of their climate and often underdeveloped health care systems, they are prone to infectious tropical diseases, such as dengue fever, tuberculosis, or the norovirus, which are mainly transmitted via contaminated food and water or mosquito bites (Shetty & Shetty, 2009). For instance, around 400 million individuals get infected with dengue fever each year (Murray, Quam, & Wilder-Smith, 2013). It is estimated that 1 out of 20 infected patients develop severe dengue, which can induce serious symptoms such as vomiting blood, potentially resulting in death. Even though a high number of infections could be prevented by applying mosquito repellents or wearing long-sleeved clothes, dengue fever remains to be the most prevalent mosquito-borne tropical disease (Murray, Quam, & Wilder-Smith, 2013). Thus, the question arises why the number of infections with tropical diseases among travelers are still particularly high.

One reason why tropical diseases, such as dengue fever, continue to be highly prevalent among travelers is because of the relatively low rates of health-risk information seeking prior to traveling (Chien et al., 2016). Alkadi, Salih, and Al Darbi (2021) conducted a study with international travelers and asked those who did not seek health-risk related information prior to traveling for their reasoning. Overall, 25.5% of participants indicated that they already know all the necessary information, suggesting that around ¼ of participants demonstrate high levels of confidence in their knowledge. Notwithstanding, only 18.1% of participants brought preventive medications on their trip and around half of the participants had some form of health insurance. This discrepancy between the confidence on the one hand and the lack of taking preventive measures on the other, might be explained by the Dunning-Kruger effect. More explicitly, the Dunning-Kruger effect suggests that the less knowledge someone has about a topic, the more confident they tend to be (Kruger & Dunning, 2000). Hence, travelers who are less educated in tropical disease prevention might be more confident in their knowledge, since they are not aware of the existence of many potential health risks in the first place.

In addition, for individuals to learn and seek information, there must first be a certain level of awareness of missing information (Yang, Aloe, & Feeley, 2014). With high levels of confidence, this recognition tends to decrease and consequently, confident individuals tend to seek less information. These findings are consistent with the findings of Kalanlar et al. (2018), who reported that 61.4% of international travelers did not have knowledge about the health care practices of their travel destination,

even though 86.5% were first-time visitors. To sum up, confidence seems to play an important role in whether travelers seek health-risk related information and overconfidence in this regard might lead to taking inadequate precautionary measures.

Because of the increasing amount of international travel and the subsequent increase of exposure to tropical diseases, it is important to understand if and how travelers inform themselves about potential health risks before traveling abroad. Getting deeper insight into this topic can provide a basis to tailor tropical disease prevention interventions. Furthermore, it can aid in establishing programs to increase health-risk information seeking among travelers and consequently, potentially lower the number of infections with tropical diseases. As a result, this research study aims to answer the following research question: To what extent is individuals' health-risk information seeking in the context of tropical diseases influenced by the ease of retrieval, level of health education, and judgmental confidence of individuals?

## **1.1 Theoretical Framework**

**1.1.1 Risk Information Seeking and Processing Model.** Information on how to prevent tropical diseases are widely accessible on the internet or through general practitioners. However, the extent to which travelers seek information on this topic varies greatly and depends on one's internal need to seek further information (Yang, Aloe, & Feeley, 2014). One model that has been frequently used to assess individuals' risk perception and drive to seek information is the Risk Information Seeking and Processing Model (RISP). Griffin and colleagues (1999), who developed the model, took into consideration the social and psychological factors that could either increase or decrease information seeking (Yang, Aloe, & Feeley, 2014). According to the researchers, information insufficiency and informational subjective norms are the two factors that directly influence whether someone seeks information or not.

Information insufficiency describes the discrepancy between one's current knowledge and the desired level of knowledge. Thus, if an individual feels like they do not have sufficient information about a certain topic, they are likely to seek further information to fill in the gap. In this context, a traveler who does not feel like they have sufficient information about tropical diseases before traveling abroad, is likely to search for more information before starting to travel. On the other hand, the term 'informational subjective norms' refers to the social norms an individual is exposed to (Yang, Aloe, & Feeley, 2014). In other words, if an individual is part of a social group or culture where it is expected to have a certain level of knowledge about a specific topic, they are likely to seek information in order to meet these expectations. Thus, according to the RISP model, information insufficiency and informational subjective norms are two crucial factors to consider when looking at individuals' health risk information seeking behavior.

**1.1.2 Judgmental Confidence.** Another factor that could play an important role in whether someone seeks information about health risks is their judgmental confidence. Judgmental confidence refers to how certain someone is that their current knowledge is sufficient to make an informed judgement about a certain topic (Radecki, & Jaccard, 1995). In this case, it describes how confident an individual is in their knowledge to protect themselves from infectious tropical diseases before traveling abroad. It is important to note that judgmental confidence is not necessarily equal to the actual knowledge a person has, it focuses merely on how confident someone is in their knowledge levels, which is influenced by many different factors. Thus, one's actual knowledge can be different from one's perceived knowledge and oftentimes, individuals tend to be overly confident in their current knowledge (Park, Gardner, & Thukral, 1988). A number of researchers even suggest that there are low correlations between individuals' perceived knowledge and their actual knowledge (Radecki, & Jaccard, 1995), and that overall, most individuals tend to overestimate how much knowledge they would be able to recall (Park, Gardner, & Thukral, 1988). In short, judgmental confidence can be understood as an estimation of one's actual knowledge, which can vary due to different factors.

It is assumed that judgmental confidence can play a crucial role in health-risk information seeking, because it might be strongly related to one's perception of information (in)sufficiency, as mentioned in the RISP model (Yang, Aloe, & Feeley, 2014). For instance, an individual who is planning to travel to a tropical destination and who is not confident in their knowledge about tropical diseases, might start to experience a feeling of information insufficiency. Consequently, they might assume that their level of knowledge would not be sufficient to protect themselves from tropical diseases, which could lead to them seeking additional information in order to feel more prepared. On the other hand, individuals who have a high level of initial judgmental confidence about their knowledge might not enter a state of information insufficiency and thus, do not feel a need to seek further information. However, if one's judgmental confidence is not necessarily a representation of one's actual knowledge, the question arises which factors influence individuals' judgmental confidence. Two important factors that might influence individuals' judgmental confidence, namely the ease of retrieval effect and the level of health education, will be discussed in the following.

**1.1.3 Ease of Retrieval.** Following up on the previous point, one's judgmental confidence can be influenced by factoring in the ease with which someone retrieves specific information. To be more specific, the ease with which someone recalls certain information can influence how confidently they estimate their level of knowledge (Wänke, Schwarz, & Bless, 1995). For instance, researchers found that individuals who are asked to recall two items are overall more confident in their knowledge than individuals who are asked to recall ten items about the same topic (Raghubir & Menon, 2005). This phenomenon can be described as the ease of retrieval effect, which refers to how difficult or easy it is for

someone to recall a given amount of information (Raghubir & Menon, 2005). Furthermore, researchers found that individuals often attribute and link the level of difficulty of a task directly to their level of knowledge, meaning that easy retrieval is attributed to high levels of knowledge while difficult retrieval is linked to low levels of knowledge (Raghubir & Menon, 2005). Notably, individuals who are asked to recall a small number of items tend to be relatively confident in their knowledge. They oftentimes do not question whether they were simply presented with an easy task but tend to assume the experienced ease is a reflection of their knowledge (Wänke, Schwarz, & Bless, 1995). Consequently, ease of retrieval might be an important factor that influences how confident individuals are in their knowledge.

However, the ease of retrieval does not always take effect in determining individuals' judgmental confidence. Tybout et al. (2005) found that when the ease of retrieval task is based on content-related knowledge, individuals who have high levels of knowledge in that area tend to base their confidence on their knowledge levels and not on the task difficulty. Thus, in these cases, the level of knowledge seems to weaken the effect ease of retrieval has on individuals' judgments. For instance, individuals who are asked to complete a recall task about tropical diseases and who are well-educated on that topic, are more likely to subsequently base their judgmental confidence on their knowledge levels instead of on how difficult the previous recall task was. Therefore, when it comes to tropical disease prevention, the level of health education might be another important factor that influences individuals' judgmental confidence.

**1.1.4 Level of Health Education.** As mentioned before, another factor that could have an important influence on how confident individuals are about their current knowledge, is their level of health education. The level of health education, which is often referred to as 'health literacy' in literature, was defined as follows:

Health literacy is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course. (Sørensen et al., 2012, p. 3).

In other words, the level of health education describes to what extent individuals can process and understand health information and thus, it was found to highly influence their health outcomes and to what extent they seek treatment (Sørensen et al., 2012). More specifically, individuals with low levels of health education are less likely to seek healthcare services because they often do not have the tools and skills needed to seek help. Furthermore, they tend to underestimate health risks and the severity of symptoms and are consequently more prone to poorer health outcomes (Sørensen et al., 2012). High levels of health education on the other hand are an important prerequisite providing individuals with the skills needed to seek and adequately apply relevant health information. Consequently, multiple studies

found that high levels of health education lead to more information seeking (Baker, 2006; Paasche-Orlow & Wolf, 2007).

When incorporating the Dunning-Kruger effect, the level of health education might play a crucial role in determining individuals' judgmental confidence. More explicitly, the Dunning-Kruger effect describes how individuals with low knowledge on a certain topic tend to overestimate their knowledge and skills, while individuals with fairly high levels of knowledge underestimate themselves (Kruger & Dunning, 2000). In light of the current research, it is assumed that individuals who have high levels of health education in the area of tropical disease prevention still tend to underestimate their knowledge and thus, report lower levels of judgmental confidence than individuals who are not as educated in this area. This in turn would likely lead to more information seeking among individuals with high levels of health education, since their low levels of judgmental confidence elicit a feeling of information insufficiency. On the other hand, as mentioned before, individuals with low levels of health education tend to underestimate health risks and seek less health-related information. Thus, it is expected that individuals with lower levels of health education overestimate their judgmental confidence and consequently, seek less information since they might not experience a strong sense of information insufficiency.

Considering how the aforementioned factors interact and impact individuals' judgmental confidence, high levels of health education might weaken the relationship between ease of retrieval and judgmental confidence. More specifically, as mentioned before, individuals with high levels of health education are more likely to base their judgmental confidence on their actual level of knowledge on tropical diseases than on how easy or difficult the recall task was (Tybout et al., 2005). This is based on the idea that when knowledge levels are particularly high, the required information is more readily available to individuals, leading to individuals making the association between their actual level of knowledge and their confidence about their knowledge. On the other hand, individuals who only demonstrate moderate levels of knowledge on a certain topic are more likely to attribute their judgmental confidence to the task difficulty, since it tends to be more difficult for them to judge their level of knowledge on its own (Tybout et al., 2005). Consequently, when the actual level of knowledge is the main factor determining individuals' judgmental confidence, the Dunning-Kruger effect might take effect, meaning that individuals high in health education tend to demonstrate lower levels of judgmental confidence. Thus, the effect ease of retrieval has on individuals' judgmental confidence might decline when individuals possess high levels of health education.

## **1.2 The Current Study**

Based on the theoretical framework and the foundation of the RISP model, the aim of this study is to investigate individuals' information seeking behavior by manipulating the ease with which they

retrieve information on tropical disease prevention (easy versus difficult retrieval). Furthermore, it will be investigated if individuals' level of health education moderates the relationship between ease of retrieval and judgmental confidence. Based on the theory of the Dunning-Kruger effect, it is expected that high levels of health education weaken the relationship between ease of retrieval and judgmental confidence. More explicitly, it is hypothesized that individuals who possess high levels of health education do not base their judgmental confidence as much on the ease or difficulty of the previous task, but on their actual level of knowledge on tropical diseases. In this case, due to the Dunning-Kruger effect, individuals who demonstrate higher levels of health education are expected to have lower levels of judgmental confidence compared to individuals who are less health educated. These low levels of judgmental confidence are expected to lead to more information seeking among individuals because they might experience a feeling of information insufficiency. Therefore, it is hypothesized that the level of health education moderates the relationship between ease of retrieval, meaning that the effect of ease of retrieval on judgmental confidence is lower when health education levels are high.

In addition, it will be investigated if individuals' judgmental confidence mediates the relationship between ease of retrieval and information seeking behavior. It is expected that participants who experienced the recall task as easy demonstrate a higher level of judgmental confidence since they are asked to name only two precautions, likely leading to a higher level of confidence about their knowledge. Subsequently, it is expected that this high level of judgmental confidence leads to less information seeking among participants, since they might feel like their current knowledge level is sufficient. In conclusion, the current study investigates whether the aforementioned variables represent a moderated mediation, with level of health education being the moderator and judgmental confidence the mediator. The relationship between the aforementioned variables can be examined in the conceptual model below (see *Figure 1*), which was constructed based on Hayes' PROCESS model 7 describing a moderated mediation (2013).

**H:** The variables ease of retrieval, level of health education, judgmental confidence, and information seeking behavior interact in a moderated mediation relationship. More specifically, the effect of ease of retrieval on information seeking behavior is mediated by individuals' judgmental confidence, meaning that easy retrieval of information leads to an overall higher level of judgmental confidence which subsequently, leads to less information seeking on health-risk information pertaining to tropical diseases. Furthermore, the effect of ease of retrieval on judgmental confidence is moderated by the level of health education, meaning that high levels of health education will weaken the relationship between ease of retrieval and judgmental confidence, leading to lower judgmental confidence about one's knowledge on tropical disease prevention.



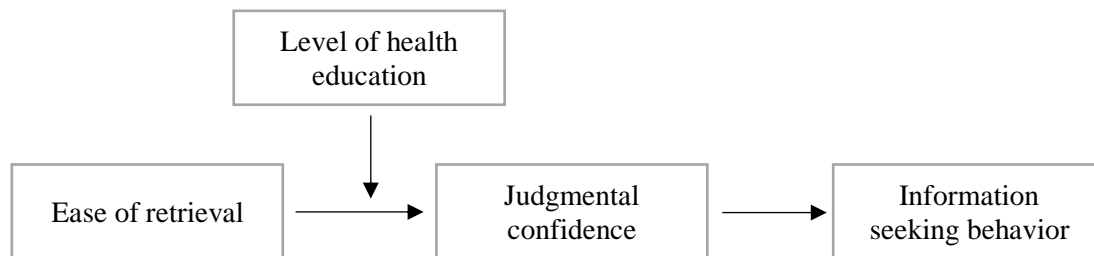


Figure 1. Conceptual model showing the relationship between the independent variables *ease of retrieval*, *judgmental confidence*, and *level of health education* and the dependent variable *information seeking behavior* based on Hayes' PROCESS model 7.

## 2. Method

This research study was conducted in a joint effort among three researchers. The researchers were interested in how uncertainty avoidance, promotion/prevention, and the level of health education influence the relationship between ease of retrieval, judgmental confidence, and information seeking behavior. However, the current research paper solely focuses on the effect individuals' level of health education had on the relationship between ease of retrieval, judgmental confidence, and information seeking behavior.

### 2.1 Participants

Initially, 174 participants were recruited via the online research tool *Sona Systems* of the University of Twente or through convenience sampling, using the researchers' personal connections. Participants who were recruited via *Sona Systems* received a compensation of 0.25 credits in *Sona* for their participation. No compensation was given to participants recruited through convenience sampling. Out of the 174 initial participants, 31 had to be removed from the data due to incomplete responses and one participant was removed because consent was not given, resulting in a total of 142 valid responses. It was expected that removing these responses did not have an effect on the results of the study, because the majority of deleted responses did not include sufficient information to analyze. Overall, 73 participants were assigned to the *easy-retrieval* condition and 69 to the *difficult-retrieval* condition.

Regarding the demographics, 85 of the remaining participants were female (59.9%) and 57 were male (40.1%). Furthermore, the participants were between 18 and 70 years old ( $M = 27.37$ ,  $SD = 11.34$ ) and consisted of the nationalities German (78.2%), Dutch (9.2%), American (2.1%), French (1.4%), Turkish (1.4%), Bulgarian (0.7%), Colombian (0.7%), Cypriot (0.7%), Dutch/German (0.7%), Greek (0.7%), Italian (0.7%), Mexican (0.7%), Polish (0.7%), Portuguese (0.7%), Russian/German (0.7%), and

Spanish (0.7%). Next, 68.3% of participants were students, 24.6% were employees, 2.1% were self-employed, 1.4% were homemakers, 1.4% were freelancers, 1.4% were unemployed, and 0.7% were retired. In total, 47.9% of participants mentioned to have graduated high school or equivalent, 28.9% had a bachelor's degree, 12.7% had a master's degree, 7.7% had completed vocational training, 2.1% had completed 12<sup>th</sup> grade or less, and 0.7% had a doctorate/PhD.

Overall, 86.6% of participants indicated that they have traveled internationally more than 5 times and 82.4% have traveled outside of Europe at least once. Lastly, 41.5% of participants indicated that they have not traveled to tropical destinations before, 34.5% have traveled to tropical destinations 1-2 times, 14.1% have traveled to tropical destinations 3-5 times, and 9.9% of participants traveled to tropical destinations more than 5 times. The experiment was approved by the BMS Ethics Committee of the University of Twente in April 2022.

## 2.2 Design

This experiment consisted of a 1-factor, between-groups research design with one continuous moderator and one continuous mediator. The experiment measured the effects of three independent variables (IVs) on one dependent variable (DV). More specifically, *ease of retrieval* represented the IV, which was experimentally manipulated and contained the two experimental conditions (easy versus difficult retrieval). Furthermore, the DV of interest was *information seeking behavior*. *Judgmental confidence* was the proposed mediator variable between *ease of retrieval* and *information seeking behavior*. Next, the *level of health education* was the moderator variable expected to weaken the relationship between *ease of retrieval* and *judgmental confidence*. Lastly, *travel experience* was included as a potential covariate assumed to affect the level of *judgmental confidence* of participants in additional analyses. A concept model of the relationship between the aforementioned variables can be found in *figure 1*.

**2.2.1 Independent and dependent variables.** First, the *ease of retrieval* was manipulated by assigning the participants to one of two conditions that differed in their difficulty levels. Thus, participants were either asked to name two or six precautions that people can take to protect their health against tropical diseases before traveling abroad. In order to assess whether the manipulation worked, a manipulation check was employed. The participants were asked to rate the subjective ease of the previous task by answering three questions on a 7-point Likert scale, ranging from 1= extremely difficult to 7= extremely easy. An example of a question is “How easy was it to list precautions against tropical diseases?”. Because the items were adapted by the current researchers based on items used by Greifeneder, Bless, and Pham (2011), factor analysis was conducted to ensure the scale's validity. The items were deemed suitable for factor analysis based on a high Kaiser-Meyer Olkin (KMO) value of .70

and the Bartlett's test of sphericity being significant ( $p < .001$ ). Furthermore, principle component factor analysis with oblimin rotation yielded one factor with an Eigenvalue  $>1$ , suggesting that the three items adequately measured one construct. Overall, the aforementioned factor explained 74.07% of the total variance. The item content of the *ease of retrieval* scale can be found in *Appendix 6*.

Secondly, the dependent variable called *information seeking behavior* was assessed using one item asking if the participant would like to receive more information about possible precautions to protect their health against tropical diseases in form of a one-time email. This question could be answered by indicating which topic(s) the participant wanted to receive information about or by selecting "I am not interested". Possible topics included "travel vaccinations" or "food and water safety". Additionally, interested participants were asked to provide their email address. Since this scale consisted of a single item, the validity and reliability could not be assessed. The item content measuring *information seeking behavior* can be found in *Appendix 8*.

To assess participants' *judgmental confidence* after being subjected to one of the two conditions, the participants were asked to answer four questions. The first question consisted of the item "How much do you think you know about the topic of precautions against tropical diseases?" and could be answered on a 7-point Likert scale, ranging from 1= not at all knowledgeable to 7= extremely knowledgeable. The subsequent three questions were based on a previous study by Radecki and Jaccard (1995), who assessed the judgmental confidence of participants about a specific topic using these questions. For the purpose of this research, the topic used in the original study was replaced with the topic of the current study. The items could be answered on a 5-point Likert scale, ranging from 1= strongly disagree to 5= strongly agree and an example item was "In general, I am quite knowledgeable about possible precautions against tropical diseases.". Because the scale was adapted by the researchers to fit the current study, factor analysis was conducted to ensure the scale's validity. Based on a KMO of .81 and the Bartlett's test being significant ( $p < .001$ ), the items were deemed suitable for factor analysis. A principle component analysis with oblimin rotation yielded one factor with an Eigenvalue  $>1$ , suggesting that the four items measured one construct. In total, the factor explained 71.29% of the variance. Furthermore, the scale demonstrated good internal reliability ( $\alpha = .86$ ;  $\lambda-2 = .87$ ). The item content of the *judgmental confidence* scale can be found in *Appendix 7*.

In addition, participants' *level of health education* was assessed using the HLS-Q12 short version of the European Health Literacy Survey Questionnaire, which assesses health literacy levels of the general population (Finbråten et al., 2018). The questionnaire consisted of 12 items measured on a four-point Likert scale ranging from 1= very difficult to 4= very easy. An example of an item is "How easy would you say it is to understand why you need health screenings (e.g. breast exam, blood sugar test, blood pressure)?". To assess the psychometric properties of the short version, the developers of the scale

applied Rasch modelling, which indicated that a three-dimensional model yielded better psychometric properties than a one- or two-dimensional model (Finbråten et al., 2018). The three dimensions identified were (1) health care, (2) disease prevention, and (3) health promotion. Overall, the HLS-Q12 demonstrated good subscale correlation ( $r = .80$ ) and the best fit to the Rasch model compared to other short versions (Finbråten et al., 2018). The item content of the HLS-Q12 short version can be found in *Appendix 4*.

Lastly, participants' level of *travel experience* was introduced as a covariate with a possible effect on *judgmental confidence*. It was assumed that participants with high levels of travel experience had an overall higher level of judgmental confidence concerning their knowledge about tropical disease prevention, compared to participants with low levels of travel experience. To measure participants' level of travel experience, five items were developed by the researcher. For instance, participants were asked "How many times have you traveled internationally before?" and had the option to choose between four responses ranging from "I have not traveled internationally before." to "I have traveled internationally more than 5 times.". Because the items were developed by the researcher, factor analysis was conducted to ensure the scale's validity. The KMO measure of sampling adequacy was high (.72) and the Bartlett's test of sphericity showed sufficient correlation between the items ( $p < .001$ ), suggesting that the items are factorable. Through oblimin factor analysis, two factors with an Eigenvalue  $> 1$  were found. The two factors explained 68.95% of the total variance, of which factor 1 explained 48.25% and factor 2 explained 20.7% of the variance. Three items loaded high on factor 1, which was called "intercontinental travel experience" and two items loaded high on factor 2, which was named "general travel experience". The specific item content can be found in *Appendix 3*. Regarding the reliability, the "intercontinental travel experience" scale demonstrated good internal reliability ( $\alpha = .84$ ;  $\lambda^2 = .85$ ). For the "general travel experience" scale, the correlation was computed which suggested a weak positive correlation between the two items ( $r = .18$ ).

## 2.3 Procedure

This experiment was administered using the online survey tool *Qualtrics*. If participants took part via *Sona Systems*, they were provided with a link to the study through the University of Twente's *Sona* system. Participants who were recruited via convenience sampling received the link to the study directly from one of the three researchers. In *Qualtrics*, all participants were first asked to give their informed consent before proceeding to the demographic questions (see *Appendix 1*). The informed consent provided participants with incomplete information about the purpose of the study. However, the participants were informed that they will be debriefed at the end of the experiment. In the demographics survey, participants were asked to share their age, sex, nationality, highest level of completed education,

current occupation, and experience in international travel (see *Appendix 2* and *3*). Next, participants were directed to the questionnaire about promotion/prevention, followed by questionnaires about their level of health education (see *Appendix 4*) and uncertainty avoidance. After answering the questionnaires, the participants were provided either with the *easy-retrieval* condition or the *difficult-retrieval* condition. In the *easy-retrieval* condition, participants were asked to name two precautions that people can take to protect their health against tropical diseases before traveling abroad (see *Appendix 5a*). In the *difficult-retrieval* condition, participants were asked to name six precautions (see *Appendix 5b*). For both conditions, participants were asked to write the precautions down using text fields within *Qualtrics*.

After being presented with the experimental condition, a manipulation check was conducted by presenting the participants with three questions on the subjective ease of the prior task (see *Appendix 6*). This was followed by questions concerning the participants' level of judgmental confidence (see *Appendix 7*). Next, the participants were asked if they would like to receive more information on the topic of tropical diseases in form of a one-time email (see *Appendix 8*). The participants could answer this question either by selecting the topics they wanted to receive more information about or by selecting "I am not interested.". Participants who were interested were asked to share their email address. If participants did not want to receive further information on the topic, they were redirected to a different question asking them about their reasoning for not wanting to receive more information (see *Appendix 9*). The participants could then choose between different answer options or provide a reason themselves. Lastly, the participants were informed about the true purpose of the study in form of a debriefing, were thanked for their participation, and were provided with contact details of the researchers in case they have any questions about the study (see *Appendix 10*).

### 3. Results

#### 3.1 Descriptive statistics

In total, 115 participants were not interested in receiving a one-time email containing information about tropical diseases (81%), while 27 participants were interested (19%). When asked why the 115 participants were not interested in receiving further information, 54% indicated that they will not travel to tropical areas anytime soon, 23% mentioned they will seek more information by themselves, 10.6% said they do not have time, 8.8% were not interested, 1.8% indicated that they already know everything about possible precautions, and 1.8% provided other reasons.

**3.1.1. Correlations.** A correlation matrix consisting of all independent and dependent variables of this study was created to assess if any of the variables influence each other (see *table 1*) and a number of correlations should be highlighted. Firstly, the level of completed education positively correlates with having traveled outside of Europe, ( $r(140) = .30, p < .001$ ), meaning that overall, participants with higher

education levels tend to travel outside of Europe more frequently than individuals with lower education levels. Secondly, how frequently participants have traveled internationally before does not seem to correlate strongly with any other variables that assessed the participants' overall travel experience, besides weak positive correlations with traveling outside of Europe, ( $r(140) = .22, p = .007$ ), and the continents participants have visited ( $r(140) = .18, p = .037$ ). Furthermore, participants' overall travel experience positively correlated with their judgmental confidence ( $r(140) = .42, p < .001$ ), suggesting that participants who have traveled frequently tend to have higher confidence levels regarding their knowledge about tropical diseases compared to participants who are less experienced travelers. Lastly, there seemed to be a weak positive correlation between the level of health education and the participants' age ( $r(140) = .25, p = .006$ ), meaning that overall, older participants tend to demonstrate higher levels of health education compared to younger participants.

**Table 1.**

*Means (M), standard deviations (SD), and Pearson correlations of all independent and dependent variable(s) (N= 142)*

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	27.37	11.34	-													
2. Gender	-	-	-.03	-												
3. Nationality	-	-	.09	-.12	-											
4. Completed education	-	-	<b>.38</b>	<b>-.25</b>	.09	-										
5. International travel experience	3.85	0.39	.14	-.05	.05	.16	-									
6. Travelling outside Europe	2.59	1.08	<b>.23</b>	-.07	.13	<b>.30</b>	<b>.22</b>	-								
7. Travelling to trop. destinations	1.92	0.98	<b>.19</b>	-.10	.10	<b>.25</b>	.06	<b>.62</b>	-							
8. Travel company	1.94	2.41	<b>.19</b>	.11	.06	-.06	.03	<b>-.17</b>	-.10	-						
9. Continents visited	2.54	1.36	.16	-.15	<b>.20</b>	<b>.26</b>	<b>.18</b>	<b>.73</b>	<b>.62</b>	<b>-.18</b>	-					
10. Level of health education	2.88	0.41	<b>.25</b>	-.08	-.06	.15	.07	-.01	.07	.08	-.04	-				
11. Ease of retrieval <sup>1</sup>	3.94	1.53	<b>.27</b>	-.00	.00	.16	.11	.12	.16	.14	.12	<b>.19</b>	-			
12. Judgmental confidence	2.64	0.94	<b>.28</b>	-.12	.11	.16	.13	<b>.25</b>	<b>.30</b>	<b>.25</b>	<b>.22</b>	<b>.33</b>	<b>.50</b>	-		
13. Information seeking	-	-	-.01	.03	.15	-.00	-.05	.00	-.15	<b>.28</b>	-.14	.00	.01	.03	-	
14. Total travel experience	-	-	<b>.32</b>	-.04	<b>.18</b>	<b>.23</b>	<b>.28</b>	<b>.65</b>	<b>.63</b>	<b>.53</b>	<b>.67</b>	.06	<b>.23</b>	<b>.42</b>	.09	-

**Note 1.** Variable 5, 6, 7, 8, and 10 were measured on a 4-point Likert scale, variable 9 on a 6-point Likert scale, and variables 12 and 13 on a 5-point Likert scale.

**Note 2.** Values in bold demonstrate correlations that are significant at the .05 level (2-tailed).

<sup>1</sup> N= 141

## 3.2 Inferential statistics

**3.2.1 Manipulation check.** First, the manipulation was tested to check if the difficulty between the two conditions (easy vs. difficult retrieval) was significantly different. The difficulty of the tasks were assessed on a 4-point Likert scale, ranging from ‘very easy’ to ‘very difficult’. To assess whether the tasks of naming either two or six precautions were significantly different in their difficulty, an independent sample t-test was conducted comparing the two group means. To conduct the independent sample t-test, it was first checked for equal variance between the two group means (easy-retrieval:  $M = 3.47$ ,  $SD = 1.36$ ; difficult-retrieval:  $M = 4.39$ ,  $SD = 1.57$ ). Based on Levene’s test for equal variance, it could be assumed that the variances are approximately equal ( $p = .123$ ). Furthermore, the independent sample t-test yielded that the null hypothesis could be rejected and a statistically significant difference was found between the mean scores of the two groups,  $t(139) = 3.67$ ,  $p < .001$ . Thus, on average, the participants in the *easy-retrieval* condition perceived the task to be easier compared to the participants in the *difficult-retrieval* condition. Consequently, the manipulation check was successful and it can be assumed that the conditions significantly differed in their difficulty.

**3.2.2 Moderated mediation analysis.** To test the hypothesis of a moderated mediation between the variables *ease of retrieval*, *judgmental confidence*, *level of health education*, and *information seeking behavior*, a moderated mediation analysis was conducted using Hayes’ PROCESS macro model 7 in SPSS. More specifically, the moderated mediation analysis assessed whether there was an interaction (moderation) effect between ease of retrieval and the level of health education on judgmental confidence, as well as a mediation effect of judgmental confidence on the relationship between ease of retrieval and information seeking behavior. The moderation analysis indicated that the level of health education significantly moderated the effect of ease of retrieval on judgmental confidence (interaction  $B = 0.24$ ,  $Bse = .12$ ,  $t(137) = 2.10$ ,  $p = .037$ ). In other words, the effect of ease of retrieval on judgmental confidence was stronger for individuals who demonstrated higher levels of health education, compared to individuals with lower levels of health education (see *figure 2*). In total, the interaction between ease of retrieval and level of health education accounted for 33.3% of the variance in judgmental confidence ( $R^2 = .33$ ). Consequently, contrary to the expectation that the level of health education would weaken the relationship between ease of retrieval and judgmental confidence, it strengthened the relationship. Thus, even though a significant moderation effect was found, this part of the hypothesis had to be rejected.

Next, the results of the mediation analysis showed that judgmental confidence did not significantly mediate the relationship between ease of retrieval and information seeking behavior. Even though a significant a-path was found (ease of retrieval on judgmental confidence) ( $B = 0.36$ ,  $p < .001$ ), the b-path was non-significant (judgmental confidence on information seeking behavior) ( $B = 0.07$ ,  $p = .756$ ). In other words, even though easy retrieval of information significantly increased individuals’



judgmental confidence, the judgmental confidence was not found to be a significant predictor of participants' information seeking behavior. Therefore, the overall mediation was found to be non-significant, Effect = .02, 95% CI [-0.2, 0.2]. Furthermore, no main effect of ease of retrieval on information seeking behavior was found for the c-path ( $B = -0.01, p = .964$ ), meaning that ease of retrieval did not directly have an influence on individuals' information seeking behavior. Consequently, the hypothesis that judgmental confidence mediates the effect of ease of retrieval on information seeking behavior had to be rejected. The test results for each path can be observed in *figure 3*.

Lastly, using the index of moderated mediation within Hayes' PROCESS macro package, no moderated mediation was found, since zero lied within the bootstrap confidence interval, index = .017, 95% CI [-0.1, 0.2]. In other words, the aforementioned variables were not found to represent a significant moderated mediation. Consequently, the hypothesis had to be rejected.

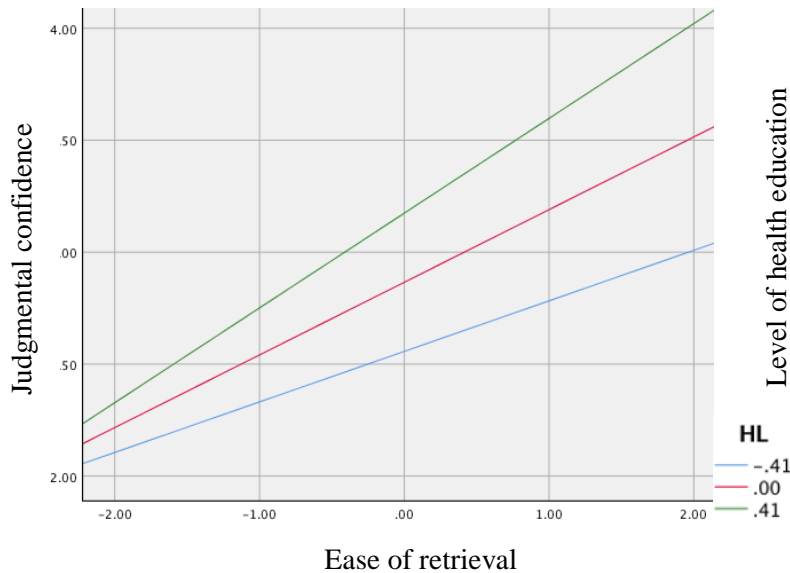


Figure 2. Line graph representing the moderation (interaction) effect of level of health education on the relationship between ease of retrieval and judgmental confidence.

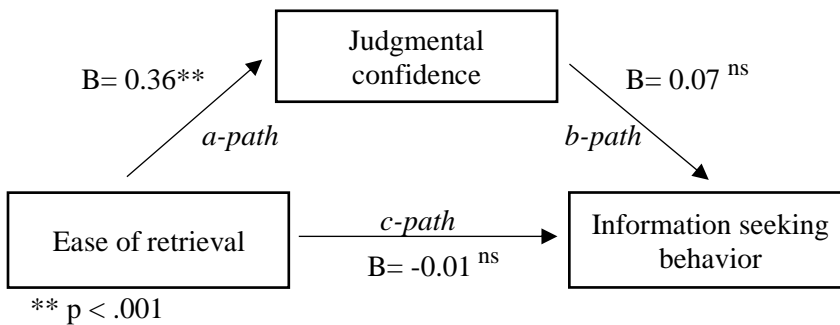


Figure 3. Mediation test results for the a-path, b-path, and c-path (ns = non-significant).

### **3.3 Central outcomes**

Overall, the hypothesis of a moderated mediation had to be rejected. Judgmental confidence did not significantly mediate the relationship between ease of retrieval and information seeking behavior. However, a moderation effect of the level of health education on the relationship between ease of retrieval and judgmental confidence was found. Contrary to the hypothesis, the level of health education strengthened the relationship between ease of retrieval and judgmental confidence. Furthermore, the manipulation worked and a statistically significant difference was found between the task difficulty of the two groups. More specifically, listing six precautions was considered to be more difficult than listing two precautions. Notably, correlational analyses yielded that participants' level of travel experience positively correlated with their judgmental confidence, suggesting that higher levels of travel experience predicted higher levels of judgmental confidence among participants (see *table 1*).

## **4. Discussion**

This research paper investigated to what extent individuals' judgmental confidence about tropical disease prevention and their level of health education influenced the effect ease of retrieval had on their information seeking behavior. It was hypothesized that the aforementioned factors interact in a moderated mediation relationship, where judgmental confidence was the mediator between ease of retrieval and information seeking behavior and the level of health education the moderator between ease of retrieval and judgmental confidence. Results indicated that no significant moderated mediation could be found. To be more specific, a significant effect of ease of retrieval on judgmental confidence was found, however, judgmental confidence in turn did not have a significant effect on individuals' information seeking behavior, suggesting that no mediation was found. On the other hand, a significant moderation effect was found, suggesting that the effect of ease of retrieval on judgmental confidence was higher for individuals with higher levels of health education, compared to individuals with lower levels of health education. However, contrary to the hypothesis, the level of health education strengthened the relationship between the variables instead of weakening it. Thus, the hypothesis had to be rejected. Relating this to the research question, it can be concluded that overall, individuals' judgmental confidence about tropical disease prevention did not significantly influence the effect ease of retrieval had on their information seeking behavior. However, the level of health education did turn out to be a significant moderator between ease of retrieval and judgmental confidence.

When breaking down the hypothesis and looking at the moderation and mediation results separately, a number of important points can be discussed. The results of the moderation analysis yielded that the level of health education significantly moderated the relationship between ease of retrieval and judgmental confidence. Initially, it was expected that the level of health education would weaken the

relationship between ease of retrieval and judgmental confidence, meaning that individuals who demonstrate high levels of health education would rate their confidence in their knowledge lower than individuals who are less health-educated. This hypothesis was largely based on the theory of the Dunning-Kruger effect which suggests that individuals with lower levels of knowledge in a certain area tend to be overly confident in their knowledge (Coutinho et al., 2021).

However, in this study, the level of health education seemed to have the opposite effect, meaning that high levels of knowledge increased the effect ease of retrieval had on participants' judgmental confidence. One possible explanation for this could be that participants with high levels of health education did not evaluate their knowledge levels solely based on everything they know about tropical disease prevention, but also based on how difficult the task was they were presented with. This contradicts the research of Tybout et al. (2005), who found that when knowledge levels are high, individuals tend to base their judgmental confidence on their actual level of knowledge and not on the task difficulty. However, these contradictory findings could be explained by the fact that Tybout and colleagues (2005) looked at the influence of these factors as being rather mutually exclusive. More specifically, the researchers analyzed if either the task difficulty or the knowledge levels influenced one's judgmental confidence. However, in this study, the interaction between these two factors was examined. Consequently, presenting individuals who are well-educated in tropical diseases with an easy recall task might lead to an increased judgmental confidence, because due to the simplicity of the task, the individuals could be reassured in their preexisting assumption that they know a lot about tropical diseases. Thus, looking at ease of retrieval and level of health education as an interaction instead of two separate factors could explain the deviating results.

Furthermore, in this case, where the interaction between the two factors is considered, the Dunning-Kruger effect might be overshadowed by the ease of retrieval effect, meaning that the judgement about one's knowledge would not be a result of the Dunning-Kruger effect, but be traced back to the task difficulty and knowledge levels. More specifically, individuals who were presented with the easy recall task and have a high level of knowledge about the topic might assume that being able to finish the task quickly and completely is a reflection of their high level of knowledge on tropical diseases. Thus, their judgmental confidence would no longer be a result of the Dunning-Kruger effect but would be impacted by the ease of the task. Furthermore, because the task of the current study might have indeed been easier to complete for individuals with high levels of health education, this could explain why they rated their judgmental confidence higher than individuals with lower levels of health education. Thus, one's level of knowledge is not put in the context of all there is to know about tropical diseases but in the context of the previous recall task that was completed. Hence, the Dunning-Kruger effect might not have played as

much of a role in this case, since participants' judgmental confidence about their knowledge was related to how easy the task was instead of the full scope of knowledge on tropical diseases.

This is in line with findings from Winkielman, Schwarz, and Belli (1998), who conducted a similar ease of retrieval study where they told one group of participants that they were presented with a difficult task after the task was completed. Results showed that participants who were informed about the difficulty of the task were significantly less likely to attribute their level of knowledge to the difficulty of the task, compared to participants who did not know that the task was designed to be difficult. Thus, when eliminating the ease of retrieval effect, participants tended to base their judgmental confidence on a different factor than on the task difficulty.

This insight is crucial for future research because it could imply that the judgmental confidence in these types of studies might not be a direct reflection of participants' general confidence in the topic, but rather a reflection of how difficult they found a certain task to be. Consequently, for future research it could be interesting to replicate studies like Tybout et al. (2005) and Winkielman, Schwarz, and Belli's (1998) to assess to what extent different factors influence individuals' confidence levels. Furthermore, these findings show how one's judgement about one's knowledge tends to be ambiguous and fluctuates depending on different factors. While in some instances it can be based on task difficulty and the level of knowledge on the topic, in other cases, one's confidence can be the result of the Dunning-Kruger effect. This raises the question if there are more factors that interact with each other and influence individuals' judgmental confidence, which would open up an interesting area of research in the field of health-risk information seeking behavior.

Next, the results of the mediation analysis showed that the ease with which participants recall precautions significantly influenced how confident they are in their knowledge about tropical diseases. Thus, the easier it was for participants to name a specific number of precautions, the higher they rated their judgmental confidence. However, this judgmental confidence in turn was not a sufficient predictor of whether participants want to receive further information or not, meaning the hypothesis had to be rejected. When examining the reasons why participants did not want to receive further information, it becomes apparent that almost half of the participants declined additional information because they were not traveling to tropical destinations anytime soon.

This finding is consistent with the research on the RISP model, which stresses that the framework of the RISP model should only be used on topics that are of relevance to the target group (Yang, Aloe, & Feeley, 2014). Since this crucial information was not taken into account in the current research design, it might have been an important factor for why most participants were not interested in receiving more information. To be more specific, it was expected that not being confident in one's knowledge would elicit a feeling of information insufficiency in the participants, as it was described in the RISP model

(Yang, Aloe, & Feeley, 2014). Consequently, it was expected that this feeling of information insufficiency would motivate participants to fill their knowledge gap by indicating that they want to receive an email with information about tropical diseases. However, because the topic was irrelevant to many participants in the first place, they likely never experienced a feeling of information insufficiency nor a desire to increase their knowledge on the topic, since having knowledge about tropical diseases would not have benefitted them in their current environment.

Additionally, as mentioned in the theoretical framework, one factor of the RISP model that directly affects if individuals seek information on a certain topic is the ‘informational subjective norms’ an individual is exposed to. Informational subjective norms refer to the areas of knowledge someone is expected to have in their current environment or culture (Yang, Aloe, & Feeley, 2014). Since most of the participants were Europeans and lived in areas that are not prone to tropical diseases, it is not necessarily an expected area of expertise for most individuals. Consequently, since tropical diseases are not part of the target group’s informational subjective norms, knowledge on the topic might seem irrelevant to most of the participants. Thus, the choice of topic might again fail to elicit a feeling of information insufficiency among the participants and consequently, led to the disinterest in receiving further information on the topic.

On the other hand, it is important to note that there were a number of participants who did want to receive further information about tropical disease prevention. There are multiple explanations for why this was the case. For instance, some participants might want to travel to tropical destinations in the future and thus, the information would be of relevance to them. Additionally, some individuals are generally curious and enjoy learning about topics they are not well-educated in (Schattner, 2015). Thus, exposing them to the topic of tropical disease prevention might have elicited a feeling of curiosity in them, leading to a willingness to receive additional information about the topic. This is consistent with the research of Lalazaryan and Zare-Farashbandi (2017), who identified curiosity as one of the factors contributing to individuals’ health-risk information seeking behavior. Therefore, even though the topic of tropical diseases might have been irrelevant for most participants, some individuals could have still been interested in the topic due to their natural curiosity.

To summarize, the reason for why most participants did not want to receive further information might be because it was not relevant information to them neither at the moment nor in the near future. For future research, it can be suggested that researchers choose a topic that is of higher relevance to the target group while still choosing a topic that not everyone can be expected to have extensive knowledge about. This way, it is more likely that participants feel a need to bridge the gap between their feeling of information insufficiency and their desired level of knowledge to feel adequately informed (Yang, Aloe, & Feeley, 2014). Another option would be to narrow down the target group and, for instance, conduct a

study at an airport with international travelers who are flying to a tropical destination, similar to Alkadi, Salih, and Al Darbi's (2021) study. This way, the relevance to the target group would be increased significantly, allowing for a more fitting application of the RISP model.

Lastly, as mentioned in the results, the level of international travel experience did not strongly correlate with the other variables of the 'travel experience' scale. When looking at the sample in more detail, it becomes apparent that the vast majority of participants are Europeans and most of them have traveled internationally at least once before, resulting in a floor effect in the data. Due to geographical and political advantages, such as the Schengen agreement, it is highly common for Europeans to have visited other European countries before (Popa, 2016). However, this does not necessarily imply that they have traveled to further destinations, that might require more extensive preparation regarding health risks than visiting a neighboring country. Thus, this item could be dropped in future research on a similar sample, since it does not provide conclusive information and could be mistaken for the intercontinental travel experience that is of interest in these type of studies.

#### **4.1 Limitations and strengths of the study**

Besides discussing the findings, a few limitations should be considered. Firstly, the sample was relatively young and a majority of the participants consisted of students. Even though tropical diseases can be of danger to anyone, regardless of the age, younger individuals tend to be less concerned about health risks than older individuals (Kim, Park, & Kang, 2018). Research shows that young individuals tend to have a sense of immortality and think that sickness or death is not a current concern for them (Henley & Donovan, 2003). Consequently, they spend less time informing themselves about potential health risks and tend to act more recklessly toward their health compared to older individuals (Henley & Donovan, 2003). Thus, it might be possible that the average age of the sample had a particular effect on the dependent variable, meaning whether participants wanted to receive further information about tropical disease prevention or not. Furthermore, as discussed before, the topic of tropical disease prevention was not of high relevance to the majority of the participants. Thus, it was difficult to elicit feelings of information insufficiency in the participants and consequently, adequately measure their information seeking behavior. This should be regarded as the biggest limitation of this study and future researchers should take this factor into consideration when conducting similar studies.

However, besides discussing the limitations of this study, a few strengths should be mentioned as well. Firstly, with this study, we were able to demonstrate that the ease with which individuals retrieve information does indeed influence how confident individuals are about their knowledge. This is an important finding that opens the doors for further research into this topic, because it shows that individuals' confidence about their knowledge is not necessarily linked to their actual knowledge, but that

it is based on multiple different factors, such as the ease with which they retrieve information and the level of knowledge they possess about a certain topic. By conducting further research into what determines individuals' judgmental confidence, tropical disease prevention interventions can be tailored and improved to increase individuals' actual knowledge by targeting the most important factors. Furthermore, the findings that individuals' level of (health) education did correlate with their judgmental confidence provides grounds to assume that health education plays an important role in tropical disease prevention. Therefore, this topic should be researched more deeply in order to find ways to improve the level of health education among the general population. Lastly, the psychometric properties of the scales measuring constructs such as judgmental confidence or ease of retrieval were good, suggesting that they can be used by future researchers in similar studies.

### **4.3 Conclusion**

In conclusion, this research paper investigated to what extent ease of retrieval, the level of health education, and judgmental confidence had an effect on individuals' information seeking behavior in the context of tropical diseases. Even though the hypothesis of a moderated mediation had to be rejected, a number of notable findings were examined. Thus, this study provides grounds for future researchers in the field of tropical disease prevention, which can be used to learn more about individuals' health-risk information seeking behavior and improve tropical disease prevention interventions in the future. This way, hopefully a substantial amount of infections with tropical disease such as Dengue fever can be prevented in the future. Therefore, if the limitations are taken into consideration, this research has the potential to make important contributions to the research on judgmental confidence and the field of tropical disease prevention.

## References

- Alkadi, W., Salih, S., & Al Darbi, M. (2021). Assessment of knowledge, attitudes, and practices regarding travel health among (King Abdulaziz) international airport travelers in Jeddah, Kingdom of Saudi Arabia 2019. *Journal of Family Medicine and Primary Care*, 10(8), 3013–3020. doi:10.4103/jfmpe.jfmpe\_148\_21
- Baker, D. W. (2006). The meaning and the measure of health literacy. *Journal of General Internal Medicine*, 21(8), 878-883. doi: 10.1111/j.1525-1497.2006.00540.x
- Bechini, A., Zanobini, P., Zanella, B., Ancillotti, L., Moscadelli, A., Bonanni, P., & Boccalini, S. (2021). Travelers' attitudes, behaviors, and practices on the prevention of infectious diseases: a study for non-European destinations. *International Journal of Environmental Research and Public Health*, 18(6), 1-10. doi:10.3390/ijerph18063110
- Chien, P. M., Sharifpour, M., Ritchie, B. W., & Watson, B. (2017). Travelers' health risk perceptions and protective behavior: a psychological approach. *Journal of Travel Research*, 56(6), 744-759. doi:10.1177/0047287516665479
- Coutinho, M. V., Thomas, J., Alsuwaidi, A. S., & Couchman, J. J. (2021). Dunning-Kruger Effect: intuitive errors predict overconfidence on the cognition reflection test. *Frontiers in Psychology*, 12, 1-10. doi:10.3389/fpsyg.2021.603225
- El-Ghitany, E., Abdelmohsen, M., Farghaly, A., Abd El-Gawwad, E., & Abd El-Wahab, E. (2018). Travel health survey: risk perception, health-seeking behavior, and subjective evaluation of travel health services in Egypt. *International Journal of Travel Medicine and Global Health*, 6(1), 16-24. doi:10.15171/ijtmgh.2018.04
- Finbråten, H. S., Wilde-Larsson, B., Nordström, G., Pettersen, K. S., Trollvik, A., & Guttersrud, Ø. (2018). Establishing the HLS-Q12 short version of the European Health Literacy Survey Questionnaire: latent trait analyses applying Rasch modelling and confirmatory factor analysis. *BMC Health Services Research*, 18(1), 506. doi:10.1186/s12913-018-3275-7



- Glaesser, D., Kester, J., Paulose, H., Alizadeh, A., & Valentin, B. (2017). Global travel patterns: an overview. *Journal of Travel Medicine*, 24(4), 1-5. doi:10.1093/jtm/tax007
- Greifeneder, R., Bless, H., & Pham, M. T. (2011). When do people rely on affective and cognitive feelings in judgment? A review. *Personality and Social Psychology Review*, 15(2), 107-141. doi:10.1177/1088868310367640
- Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis : A Regression-Based Approach*. New York: Guilford Press.
- Kalanlar, B., Makbule, S., Gürsel, E. T., & Gönül, N. (2018). International travelers' behaviors and knowledge of travel health, travel-related diseases, and vaccinations: a cross-sectional study. *International Journal of Travel Medicine and Global Health*, 6(4), 168-173. doi:10.15171/ijtmgh.2018.30
- Kim, Y., Park, I., & Kang, S. (2018). Age and gender differences in health risk perception. *Central European Journal of Public Health*, 26(1), 54-59. doi:10.21101/cejph.a4920
- Kruger, J., & Dunning, D. (2000). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology*, 77(6), 1121-1134. doi:10.1037//0022-3514.77.6.1121
- Lalazaryan, A., & Zare-Farashbandi, F. (2014). A review of models and theories of health information seeking behavior. *International Journal of Health System and Disaster Management*, 2(4), 193-203. doi:10.4103/2347-9019.144371
- Murray, N. E., Quam, M. B., & Wilder-Smith, A. (2013). Epidemiology of dengue: past, present and future prospects. *Clinical Epidemiology*, 5, 299-309. doi:10.2147/CLEP.S34440
- Paasche-Orlow, M., & Wolf, M. (2007). The causal pathway linking health literacy to health outcomes. *American Journal of Health Behavior*, 31(1), 19-26. doi: 10.5993/AJHB.31.s1.4
- Park, C. W., Gardner, M. P., & Thukral, V. K. (1988). Self-perceived knowledge: some effects on information processing for a choice task. *The American Journal of Psychology*, 101(3), 401-424. doi:10.2307/1423087

- Popa, C. E. (2016). The challenges of the Schengen area. *International Relations*, 4(3), 96-104. Retrieved from: [https://www.researchgate.net/publication/320690707\\_The\\_Challenges\\_of\\_the\\_Schengen\\_Area](https://www.researchgate.net/publication/320690707_The_Challenges_of_the_Schengen_Area)
- Radecki, C. M., & Jaccard, J. (1995). Perceptions of knowledge, actual knowledge, and information search behavior. *Journal of Experimental Social Psychology*, 31(2), 107-138.  
doi:10.1006/jesp.1995.1006
- Raghubir, P., & Menon, G. (2005). When and why is ease of retrieval informative? *Mem Cognit.*, 33(5), 821-832. doi:10.3758/bf03193077
- Schattner, A. (2015). Curiosity. Are you curious enough to read on? *Journal of the Royal Society of Medicine*, 108(5), 160-164. doi:10.1177/0141076815585057
- Shetty, N. P., & Shetty, P. S. (2009). Epidemiology of disease in the tropics. *Manson's Tropical Diseases*, 19-34. doi:10.1016/B978-1-4160-4470-3.50007-0
- Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., & Brand, H. (2012). Health literacy and public health: A systematic review and integration of definitions and models. *BMC Public Health*, 12(1), 1-13. doi:10.1186/1471-2458-12-80
- Tybout, A. M., Sternthal, B., Malaviya, P., Bakamitsos, G. A., & Park, S. (2005). Information accessibility as a moderator of judgments: The role of content versus retrieval ease. *Journal of Consumer Research*, 32(1), 76-85. doi:10.1086/426617
- Wänke, M., Schwarz, N., & Bless, H. (1995). The availability heuristic revisited: Experienced ease of retrieval in mundane frequency estimates. *Acta Psychologica*, 89(1), 83-90. doi:10.1016/0001-6918(93)E0072-A
- Winkielman, P., Schwarz, N., & Belli, R. F. (1998). The role of ease of retrieval and attribution in memory judgements: Judging your memory as worse despite recalling more events. *Psychological Science*, 9(2), 124-126. doi:10.1111/1467-9280.00022
- Yang, Z. J., Aloe, A. M., & Feeley, T. H. (2014). Risk information seeking and processing model: a meta-analysis. *Journal of Communication*, 64(1), 20-41. doi:10.1111/jcom.12071

Zumla, A., & Ustianowski, A. (2012). Tropical diseases: definition, geographic distribution, transmission, and classification. *Infectious Disease Clinics of North America*, 26(2), 195-205.

doi:10.1016/j.idc.2012.02.007

## Appendices

### Appendix 1.

#### *Informed consent form*

Dear participant!

Thank you for taking part in this experiment! In this study, we investigate individuals' information seeking behavior concerning tropical diseases. The term '**tropical disease**' refers to *any disease that is indigenous to tropical or subtropical areas of the world*, such as geographical areas near the equator and parts of North and South America, Africa, Asia, and Australia. Common tropical diseases include malaria, yellow fever, and dengue.

Due to the nature of the experiment, we are not able to fully disclose the purpose of our research at this point. However, we will debrief you at the end of this experiment and be available via email to answer any questions that you might have.

Furthermore, your participation is completely voluntary and if you decide to withdraw your response during the study or after being informed about its full purpose, you can withdraw your consent without the need to provide an explanation. Your response will then be deleted. Your participation in this experiment is anonymous and your data will be handled with confidentiality, meaning that the information you provide cannot be used to reveal your identity. No risks are known to possibly affect you by participating in this experiment. With your participation, you can contribute to the understanding and improvement of tropical disease prevention.

This experiment is part of our bachelor theses in the department of psychology at the University of Twente and its results might be published on the University of Twente's website. The research team is supervised by Dr. Ir. Peter de Vries (1st supervisor) and Karla Duarte (2nd supervisor). The study was reviewed and approved by the BMS ethics committee of the University of Twente in April 2022. If you have any concerns or questions about this experiment, feel free to contact one of the research team members via one of the following e-mail addresses:

Erik Kartaun (e.kartaun@student.utwente.nl)

Klaas Rah (k.e.rah@student.utwente.nl)

Vanessa Schubert (v.schubert@student.utwente.nl)

By selecting '**I agree**', I confirm that I have read and understood the information above and agree to participate in this experiment. I understand that my participation is voluntary and that I am allowed to withdraw from the study at any time. I understand that I will be informed about the full purpose of this research at the end of the experiment. Furthermore, I was provided with contact details in case I have any questions or concerns about the experiment.

I agree

I disagree

### Appendix 2.

#### *Demographic questions*

The purpose of this study is to gather information about people's information seeking behavior regarding tropical diseases.

In the following, you will be asked a few questions about your demographics and past travel experiences.

For each question, please select the response that best describes you.

**What is your age?**

**Please indicate your gender.**

- Male
- Female
- Non-binary/ third gender
- Prefer not to say.

**What is your nationality?**

- Dutch
- German
- Other, namely:

**What is your highest level of completed education?**

- 12<sup>th</sup> grade or less
- Graduated high school or equivalent
- Vocational training (e.g. the German ‘Ausbildung’)
- Bachelor’s degree
- Master’s degree
- Doctorate/ PhD

**What describes your current occupation?**

- Student
- Employee
- Unemployed
- Homemaker
- Retired
- Other, namely:

### **Appendix 3.**

*Questions about travel experiences*

**How many times have you traveled internationally before (internationally meaning outside of your home country)?**

- I have not traveled internationally before.
- I have traveled internationally 1-2 times.
- I have traveled internationally 3-5 times.
- I have traveled internationally more than 5 times.

**If you have traveled internationally before, how many times have you traveled outside of Europe?**

- I have not traveled outside of Europe.
- I have traveled outside of Europe 1-2 times.
- I have traveled outside of Europe 3-5 times.
- I have traveled outside of Europe more than 5 times.

**If you have traveled internationally before, how many times have you traveled to tropical destinations?**

- I have not traveled to tropical destinations before.
- I have traveled to tropical destinations 1-2 times.
- I have traveled to tropical destinations 3-5 times.
- I have traveled to tropical destinations more than 5 times.

**If you have traveled internationally before, who accompanied you? (Multiple answers possible)**

- I traveled with my parents/caregivers.
- I traveled with my friends.
- I traveled by myself.
- Other, namely:

**If you have traveled internationally before, please select all areas you have traveled to:**

- Europe
- North America (Canada & U.S.)
- Latin America (Mexico & Central and South America)
- Middle East
- Asia/Pacific (including Australia)
- Africa

**Appendix 4.**

*Questions about health education (HLS-Q12 Short Version)*

In the next section, you will be asked questions on your general health practices. Please answer them as truthfully as possible.

On a scale from very difficult to very easy, how easy would you say it is to...

	Very difficult	Somewhat difficult	Somewhat easy	Very easy
...find information on treatments of illnesses that concern you?				
...understand what to do in a medical emergency?				
...judge the advantages and disadvantages of different treatment options?				
...follow the instructions on medication?				
...find information on how to manage mental health problems like stress or depression?				
...understand why you need health screenings (e.g. breast exam, blood sugar test, blood pressure)?				
...judge if the information in the media on health risks is reliable (TV, internet or other media)?				

...decide how you can protect yourself from illness based on advice from family and friends?  
...find information on healthy activities such as exercise, healthy food and nutrition?  
...understand information on food packaging?  
...judge which everyday behavior is related to your health (drinking and eating habits, exercise, etc.)?  
...make decisions to improve your health?

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**Appendix 5a.**

*Easy-retrieval condition*

In the following, we ask you to...

...name **2 precautions** that people can take to protect their health against tropical diseases before traveling abroad.

(**Tropical disease** = any disease that is indigenous to tropical or subtropical areas of the world, including geographical areas near the equator, as well as parts of North and South America, Africa, Asia, and Australia.)

Note: Please take your time and try to name as many precautions as you can come up with (max. 2). However, if you cannot come up with 2 precautions, that is fine as well. Name as many as you can and proceed to the next section.

Precaution 1


Precaution 2

**Appendix 5b.**

*Difficult-retrieval condition*

In the following, we ask you to...

...name **6 precautions** that people can take to protect their health against tropical diseases before traveling abroad.

(**Tropical disease** = any disease that is indigenous to tropical or subtropical areas of the world, including geographical areas near the equator, as well as parts of North and South America, Africa, Asia, and Australia.)

Note: Please take your time and try to name as many precautions as you can come up with (max. 6). However, if you cannot come up with 6 precautions, that is fine as well. Name as many as you can and proceed to the next section.

Precaution 1	
Precaution 2	
Precaution 3	
Precaution 4	
Precaution 5	
Precaution 6	

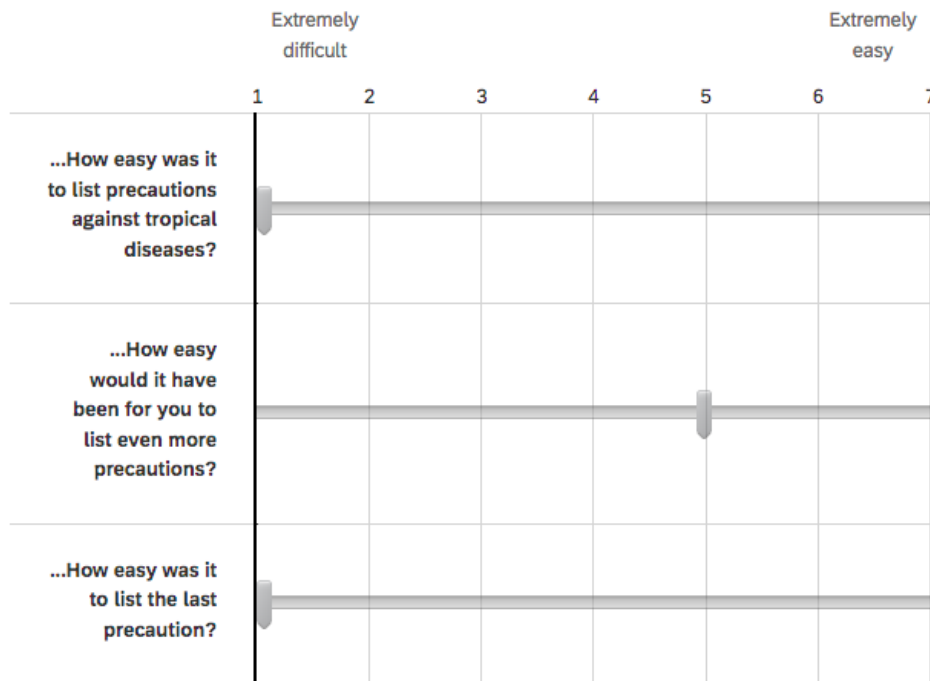
**Appendix 6.**

*Questions about ease of retrieval*

In the following, you will be asked to answer a few questions about the previous task.

Please answer the following questions based on how easy or difficult you perceived the previous task to be, by moving the slider to the number that represents what you believe.

On a scale from **1**= extremely difficult to **7**= extremely easy, ...



**Appendix 7.**

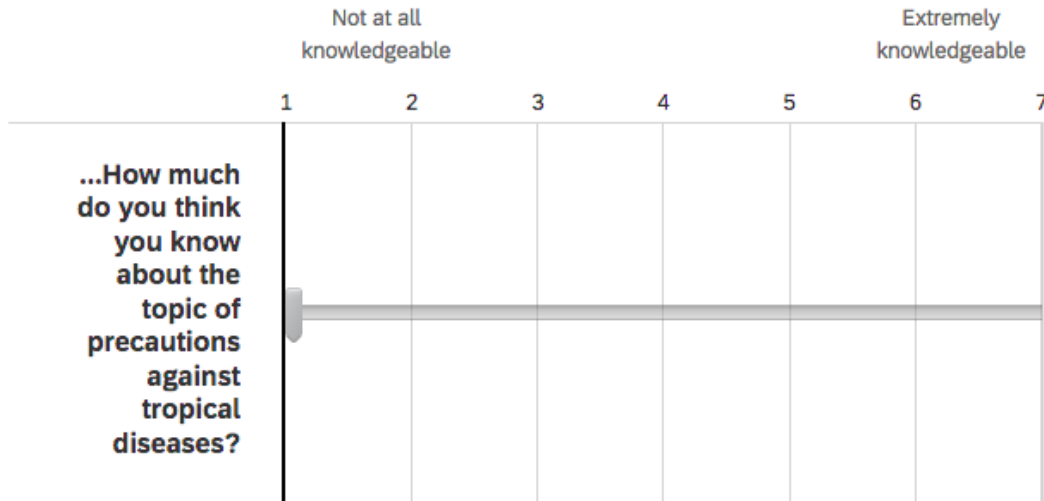
*Questions about judgmental confidence*

Next, we ask you to rate your knowledge on tropical disease prevention.

Please answer the following question by moving the slider to the number that represents what you believe.

On a scale from **1**= not knowledgeable at all to **7**= extremely knowledgeable, ...

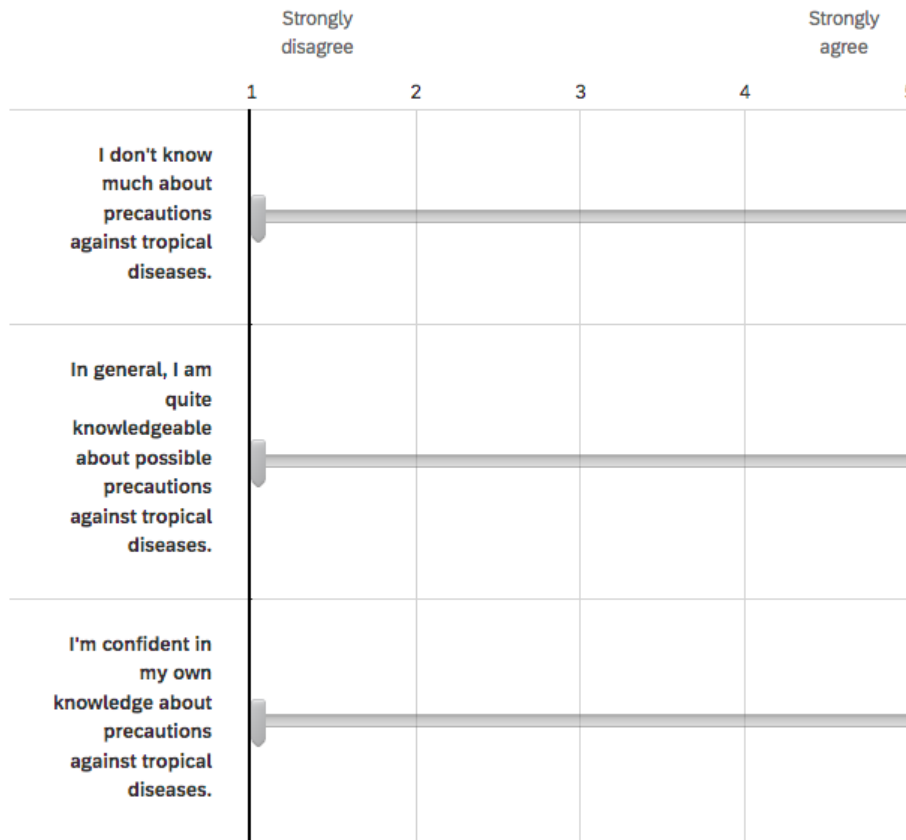




Next, we again ask you to rate your knowledge on tropical disease prevention.

Please answer the following question by moving the slider to the number that represents what you believe.

On a scale from **1**= strongly disagree to **5**= strongly agree, how much do you agree with the following statements?



## **Appendix 8.**

### *Questions about information seeking behavior*

Being adequately informed about tropical diseases is important because the vast majority of infections are preventable. Clean water, sanitary food handling, and mosquito repellents can prevent the majority of infections. Thus, knowledge about how to prevent or handle tropical diseases in case of infection could protect you from many health consequences. Knowledge in this area cannot only help you to prevent infections with tropical diseases but also the contraction of other infectious diseases that are common in your environment as well.

Would you like to receive more information about tropical disease prevention?

If yes, you would receive a **one-time** email (no spam) with information from websites and about topics of your choice. Your email address will not be used for other purposes.

If you would like to receive further information, please select the topic(s) and/or website you would like to receive information from (multiple answers possible) and enter your email address below.

If you do not wish to receive further information, please select "I am not interested".

World Health Organization (WHO)

Travel vaccinations

Malaria prevention

Mosquito-borne diseases

Food and water safety

Travel pharmacy

Travel insurance

Other, namely:

I am not interested.

Please enter your email address here to receive a **one-time** email about tropical disease prevention:

## **Appendix 9.**

### *Reasons for receiving no further information*

What reason describes best why you do not want to receive information about tropical disease prevention?

I am not interested.

I have no time.

I will not travel to tropical destinations anytime soon.

I know everything about possible precautions.

I will seek more information by myself.

Other, namely:

## **Appendix 10.**

### *Debriefing*

You have reached the end of the experiment.

Thank you for taking the time to participate in our study!

For the purpose of this experiment, the information that was shared in the beginning about its true nature was incomplete.

The aim of this study was to investigate individuals' information seeking behavior in the context of tropical disease prevention. This was done by manipulating the ease with which participants retrieved information about tropical diseases to assess whether this affected the confidence they had about their knowledge. It was expected that individuals who had to list fewer precautions demonstrate an overall higher level of confidence in their own knowledge. Subsequently, it was investigated if this so-called 'judgmental confidence' influenced how much information participants wanted to receive about tropical diseases. It was expected that participants with a higher level of confidence wanted to receive less information.

We had to withhold this information from you so that your responses concerning your confidence would not be influenced by the true purpose of this study, since this could have influenced our results.

Please note:

**You will not receive an email with travel-related information.** This question was only asked to see if participants would technically be interested in receiving information about tropical disease prevention.

If you have any questions or concerns, or if you want your response to be deleted now that you know about the full purpose of this study, please email one of the following research team members:

Erik Kartaun (e.kartaun@student.utwente.nl)

Klaas Rah (k.e.rah@student.utwente.nl)

Vanessa Schubert (v.schubert@student.utwente.nl)

We thank you for your time spent taking this survey.

Your response has been recorded.