


## How Risky is Helping Refugees? Cultural Cognition as a Determinant of Risk Perception



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What determines whether people perceive helping refugees as risky? Based on the predictions of the Cultural Theory of Risk, we experimentally investigated whether people's perception of risk depends on their value orientations and whether presenting balanced arguments affects risk assessments. The participants ( $N = 1004$ ) indicated the level of risk they see in the possibility of their country accepting refugees in the 2015 refugee crisis in Europe, as well as in a less polarizing topic of mandatory MMR vaccination for comparison. Half of the sample read balanced arguments about these topics before risk assessment and the other half did not. Contrary to our predictions, balanced arguments did not influence how people perceived risks in either domain. Rather, risk assessment was affected by their worldviews: those who held fundamentalist values and believed in a strong State, tended to see helping refugees as risky. Mandatory vaccination was threatening for those in favor of fundamentalist values, but opposed to state interventions. Moreover, the subjective feeling of being knowledgeable of the refugee crisis, regardless of the accuracy of this knowledge, increased risk perception; for vaccination, more information was associated with decreased risk. The results suggest that risk assessment is influenced by people's worldviews and the perceived urgency of the respective issues.

*Key words:* risk perception, cultural cognition, worldviews, refugees, vaccination

When it comes to choices in domains such as health, finance, environment or politics, accurate assessment of risks and benefits is of critical importance. Yet,

people tend to perceive risks in a biased manner<sup>1</sup>.

<sup>1</sup> For concrete examples, see *Supplementary material, Section I*.

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At the same time, they selectively seek, interpret, and recall information that is in line with their previous beliefs (Wason, 1960), which results in suboptimal choices, for instance in health settings (Nickerson, 1998). This tendency toward so-called “biased assimilation” of information is the main reason why people of opposing views become more divided in response to balanced arguments (Lord et al., 1979). Accordingly, the Cultural Cognition Theory posits that individuals evaluate information about risks in a way that corresponds to their worldviews and polarize along their cultural values (Kahan et al., 2009). Thus, if people perceive high or low risks of some kind, balanced arguments do not mitigate their views but might make them even more extreme. In our study, we examined whether the effect of exposure to balanced arguments would interact with cultural dimensions identified in Slovak society in influencing the risks perceived in two domains – the willingness to support refugees during the 2015-2016 refugee crisis and support for mandatory childhood vaccination. We chose these topics because both are potentially controversial, but they do not polarize society to the same extent. Unlike mandatory childhood vaccination, which is polarizing for a small minority of the population, the topic of welcoming refugees from a vastly different culture and religion at the height of the refugee crisis in Europe, when we conducted the study, has been immensely controversial and divisive in the local and international context. In the following sections, we will introduce the Cultural Theory of Risk, provide some background to the debate surrounding the impact of the refugee crisis in Slovakia, and then outline our objectives and design.

### **The Cultural Theory of Risk**

Disagreement on individual and societal risks is closely linked to memberships in groups

which are crucial for one’s personal identity, such as gender, race, and religious and political affiliation (Kahan & Braman, 2006). Another important source of risk controversy is the dynamic of cultural cognition (Kahan, 2012, 2013). The Cultural cognition approach is based on the Cultural Theory of Risk (Douglas & Wildavsky, 1983) according to which people shape risk-related beliefs in line with their view on how societies should be organized. Thus, people perceive risks in a way that reflects and reinforces their cultural worldviews. The Cultural cognition approach distinguishes two dimensions of people’s worldviews – individualism versus communitarianism, and hierarchism versus egalitarianism (Kahan, 2012). Communitarians favor a solidary society, in which collective needs are superior to individual ones and society is responsible for securing conditions of individual well-being. Individualists, on the contrary, do not support state interventions and expect that members of society will take responsibility for their own growth and prosperity. The typical feature of a hierarchical worldview is a preference for social order in which the distribution of resources, rights and obligations is based on stable personal characteristics, such as gender, ethnicity and lineage. According to egalitarians, these individual features are irrelevant to assigning privileges, wealth or status, and people should be treated equally, regardless of their origin or any other innate attribute (Kahan & Braman, 2006). It is the combination of these worldviews that leads to different perceptions of benefits and risks (Johnson & Swedlow, 2021; Thompson, 2018). Hierarchical individualists, for instance, neglect technological and environmental risks because their recognition might threaten markets and question the authority of social elites. Egalitarian communitarians, conversely, acknowledge that these kinds of risks pose a very real threat to society. Yet, they accept the risks as-

sociated with mandatory vaccination because ensuring collective immunity outperforms the restriction of personal freedom (Kahan et al., 2010). The Cultural cognition approach has generated a large body of research on risk assessment in domains such as gun control, climate change, HPV vaccination, abortion or new technologies (Kahan & Braman, 2003; Kahan et al., 2009, 2010, 2012).

### Objectives of the Present Study

Our motivation was twofold. Firstly, Kahan's framework is routinely used to assess domains which have already been neatly divided along political battle lines between Democrats and Republicans, such as gun control or climate change denial in the US (e.g., Braman & Kahan, 2003; Kahan et al., 2012). We wanted to know whether the framework could also be applied to an issue where political, worldview and cultural divisions are still "in the making", which the refugee crisis of 2015-2016 in Europe was a good example of. Secondly, we wanted to assess whether Kahan's framework would help us understand the heated response of the Slovak public to the crisis<sup>2</sup>. To this end, we also included a comparison domain, namely vaccination against measles, mumps, and rubella (MMR). The topic of vaccination has been investigated using Kahan's framework previously (Kahan et al., 2010) and, except for a relatively small group of extreme anti-vaccination activists, does not lead to strongly polarized views to the same extent as political themes.

### MMR Vaccination as a Comparison Domain

The reasoning behind choosing MMR vaccination as a comparison domain to the deeply

<sup>2</sup> In *Supplementary material, Section II*, we provide a more detailed analysis of the overall political context at the time of collecting data for the present study.

polarizing, politically charged topic of the refugee crisis, was that despite the different levels of perceived urgency of these topics, there are also several similarities. While mandatory childhood vaccination provokes less intense reactions, it is not an uncontroversial topic, at least in Slovakia. In fact, in some counties, MMR uptake dipped below the level recommended for herd immunity in recent years (for details, see Masaryk & Hatoková, 2017). First of all, both topics involve a perceived threat to personal autonomy from within one's governmental authority – vaccination is not completely risk-free and if mandated by the state, some parents feel that the authorities are threatening the health of their children (ibid.). A refugee becomes a threat in terms of potentially endangering one's security (inciting crime, violence) or economic identity (jobs, social security), and this is exactly how refugees were often portrayed in anti-immigration discourse (Landmann et al., 2019). Moreover, these decisions (mandatory vaccination, sheltering refugees) are made by political elites but can potentially have greater (subjective) negative consequences for individuals than for elites. The key difference is that while mandatory MMR vaccination is seen as a threat mainly by a small but vocal community of anti-vaccination parents or activists, refugees have been perceived as threatening more universally during our data collection.

### Study Outline

In the experiment presented here, we adopted the Cultural cognition approach to test the proposed mechanisms of biased assimilation of information due to people's worldviews (i.e., evaluating information about risks in a way that reflects and reinforces the cultural values they hold). We were specifically interested in the effect of argument exposure,

cultural worldviews, and their interactions on risk perception in two domains which polarize society to a different extent. We assessed participants' value orientations using Kahan's Cultural Cognition Worldview Scale questionnaire and then measured their risk perception via topic-specific risk scales. To assess whether exposure to balanced arguments will polarize those holding strong worldviews more than those holding more moderate worldviews, we randomly divided the sample into two groups. One group read balanced arguments in favor and against mandatory MMR vaccination and for and against supporting refugees from the Syrian conflict, before making their risk and benefits judgments, while the other group made their judgments without seeing the arguments first. Whether the manipulation affected risk perception was assessed via a comparison of the "argument" and "no argument" risk scores in a between-subjects design.

In addition, we examined another three predictors which may play a role in the evaluation of risks and benefits. The first one is education, which we anticipated to be in a negative relationship with risk perception because education should provide us with better tools for evaluating evidence in general (Guerre-Carrillo et al., 2017). However, education and general knowledge can also interact with political affiliation and personal worldview, and be used as a tool to justify one's ideology-based actions (as in Czarnek et al., 2021). Next, we focused on domain familiarity, i.e., specific knowledge about vaccination and the refugee crisis, which should be negatively linked to risk perception, because people tend to fear the unknown (Carleton, 2016). Previous research showed that familiarity reduces perceived risks (e.g., Shavit et al., 2016) but Kahan et al. (2009) failed to support the familiarity hypothesis, suggesting that when people learn more about novel topics, men-

tal shortcuts might exacerbate anxiety. The last relevant variable is Actively Open-Minded Thinking (AOT), a cognitive disposition characterized by non-rigid reasoning and the habit of routinely considering different perspectives (Baron, 1993). AOT is a strong predictor of rational judgments and choices, including resistance to myside bias and other one-sided thinking biases (Stanovich & West, 2008). Therefore, we expected that AOT will be negatively linked to risk perception.

## Method

### Participants and Design

A sample of Slovak adults was recruited from an online panel of a local survey agency in November 2015<sup>3</sup>. Each participant was randomly allocated to one of two conditions: with (experimental) or without (control) argument exposure. A criterion of at least 30 seconds spent on reading the arguments was applied to filter out non-attentive participants. As a result, we analyzed data from 1004 participants, 521 in the control group and 483 in the experimental group. In both groups, we applied quota sampling with approximately equal distribution of gender, age, education and the county of residence, as is characteristic of the Slovak population (see the *Supplementary material, Section III*).

### Materials and Procedure

After providing informed consent, the participants completed four items crucial to our quota sampling (gender, age, education, and county). A randomly chosen half of the final sample started with the "Worldviews" block, followed by the "Risk perception" block, while the other half completed the two blocks in

<sup>3</sup> Raw data are available upon request from the corresponding author.

the reversed order. We also randomized the order of topics – “Refugees” and “MMR vaccination”. The topics were introduced neutrally and we provided explanations of the terms to ensure similar mental representation among all the participants. The only difference between the control and experimental group was argument exposure before the risk perception scales. Lastly, the participants answered several socio-demographic questions and were debriefed. Figure 1 summarizes the design and counterbalancing in more detail.

### Worldviews

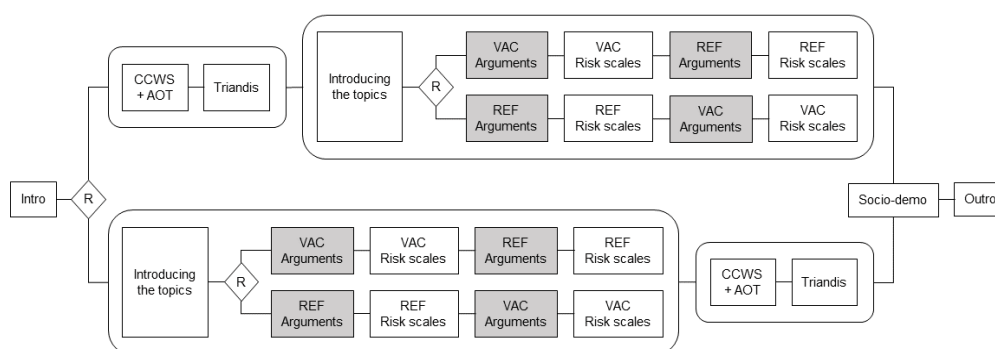
We measured people’s worldviews with the *Cultural Cognition Worldview Scales* (CCWS; Kahan, 2012), using the long form with 30 items. We have translated the original English version to Slovak and, as an additional check, it was translated back to English by a Slovak-English bilingual speaker. In addition, we have conducted 3 in-person cognitive interviews with Slovak students to make sure that they understand the questions as they were intended (for example, what comes to their

mind when an item says “traditional family” or “people of color”).

The scale required participants to express their agreement with the statements on a 6-point Likert scale (anchored at 1 = *completely disagree* and 6 = *completely agree*). In the US samples, the scale captured two constructs, Hierarchy-Egalitarianism and Individualism-Communitarianism. Due to the scale being used in a different cultural context, and with no information on its development, validation or psychometric properties, we decided to analyze the underlying structure of the measure with exploratory factor analysis (see the *Supplementary material, Section IV*, for details).

The three factors we identified from the CCWS were labeled as follows:

a) *State interventions* (6 items,  $\alpha = .86$ ): items which channeled an attitude towards the government adopting a role of the regulator, watchdog, or nanny, and thus impinging on the individual’s economic, or simply general, freedom (e.g., “If the government spent less time trying to fix everyone’s problems, we’d all be a lot better off.”).



*Note.* Only the members of the experimental group were presented with the arguments depicted in grey color. R – randomized allocation, CCWS – Cultural Cognition Worldview Scales, AOT – Actively Open-minded Thinking scale, VAC – vaccination, REF – refugees.

Figure 1 Design of the experiment.

b) *Fundamentalism* (7 items,  $\alpha = .76$ ): expresses the wish to “equalize” society in the sense that nobody gets “special” rights (i.e., that minorities keep a low profile and do not ask for their needs to be met, such as “*The women’s rights movement has gone too far.*”). Moreover, fundamentalists honor traditions, for example, traditional families where the husband works and the wife takes care of the family, and traditional gender roles (i.e., opposing “soft”, feminine boys). Lastly, fundamentalists want the State to guard this status quo.

c) *Solidarity* (6 items,  $\alpha = .68$ ): expresses the wish that the Government should take care of people and ensure that there is equality in the sense that people’s basic needs are met regardless of their status or whether they belong to the majority or minority (e.g., “*Our society would be better off if the distribution of wealth was more equal.*”).

As the last indicator of a person’s world-views, we used a short version of the Actively Open-Minded Thinking Scale (AOT – 7 items; Haran et al., 2013) containing items such as whether people revise their beliefs when met with contradictory evidence or whether it is a sign of good character to allow oneself to be convinced by opposing arguments (“*People should take into consideration evidence that goes against their beliefs.*”). Participants rated their agreement or disagreement with each statement on a 1 to 6 Likert scale. Given the absence of correlations between some items, we conducted another exploratory factor analysis (GLS method;  $KMO = .71$ ,  $\chi^2(21) = 722.84$ ,  $p < .001$ ) and as a result shortened the scale to three items ( $\alpha = .70$ ), listed in the *Supplementary material, Section V*.

### Risk Perception

In designing our 7-item risk perception scales, we were inspired by items used in previ-

ous studies on cultural cognition (Kahan et al., 2010; Kostovičová et al., 2017). Some of them involved potential dangers (e.g., refugees: “Foreign religions are a threat to us” or vaccination: “Cons of the MMR vaccination outweigh its pros”), others focused on possible benefits (e.g., refugees: “The arrival of refugees in Slovakia could benefit our economy” or vaccination: “Vaccinating children against MMR is beneficial”). The participants expressed their views on 6-point Likert scales. Given strong correlations between all the items, we created composite indicators (both alphas  $> .80$ ), reversing the items so a higher score stands for greater risk perception. Moreover, we were interested in whether the two topics elicited fear (“To what extent do you feel worried about vaccination/refugees?”, 1 = *not at all*, 6 = *a lot*), and how much people already knew about them (“How much did you know about vaccination/refugees until today?”, 1 = *nothing at all*, 6 = *a lot*).

### Arguments

We have formulated the pro and con arguments so that they were roughly balanced in terms of their quantity, persuasiveness and emotional charge. They were either based on the available empirical evidence, for instance: “No association of the MMR vaccine with autism has been demonstrated in numerous peer-reviewed scientific studies” or on common beliefs such as “Many of the refugees are economic migrants because they tend to choose the richest countries of the European Union”. The complete wording of the arguments is provided in the *Supplementary material, Section VI*. The two types of arguments were displayed in two separate columns and rotated in position. Unlike the original study that we based our approach on (Kahan et al., 2010), we did not explicitly link the content of arguments

to the value orientations on the CCWS scale but sampled their contents from the public discourse about vaccination and refugees. Participants rated the persuasiveness and comprehensibility of the arguments in the last part of the experiment using a 6-point Likert scale, with comparable ratings in both domains (persuasiveness:  $Mdn_{REF} = 5$ ,  $IQR = 1$ ;  $Mdn_{VAC} = 5$ ,  $IQR = 1$ ; comprehensibility:  $Mdn_{REF} = 6$ ,  $IQR = 1$ ;  $Mdn_{VAC} = 5$ ,  $IQR = 1$ ).

### Results

First of all, people perceived the risks associated with refugees ( $M = 4.88$ ,  $SD = 0.93$ ) as substantially higher than risks of MMR vaccination ( $M = 2.67$ ,  $SD = 1.02$ ),  $t(1003) = 53.05$ ,  $p < .001$ ,  $d = 2.37$ . The same applies to fear (refugees:  $M = 4.98$ ,  $SD = 1.27$ ; vaccination:  $M = 3.10$ ,  $SD = 1.54$ ),  $t(1003) = 31.98$ ,  $p < .001$ ,  $d = 1.43$ . The correlation between the indicators of risk perception for the two topics was negligible,  $r = .09$ ,  $p = .005$ . Moreover, the participants also felt more familiar with the topic of refugees ( $M = 4.65$ ,  $SD = 1.06$ ) than with the MMR vaccination ( $M = 3.60$ ,  $SD = 1.31$ ),  $t(1003) = 20.33$ ,  $p < .001$ ,  $d = 0.91$ . While subjective knowledge was positively linked with risk and fear in the refugee domain (both  $r_s = .22$ ,  $p < .001$ ), it correlated negatively with risk perception of MMR vaccination ( $r = -.26$ ,  $p < .001$ ) and there was no relationship with fear of the vaccination ( $r = .01$ ,  $p = .784$ ). We report all zero-order correlations in the *Supplementary material, Section VII*.

Overall, there was no effect of argument exposure on risk perception. The control and experimental group expressed almost identical levels of perceived risks in the Refugees domain (CG:  $M = 4.88$ ,  $SD = 0.90$  vs. EG:  $M = 4.88$ ,  $SD = 0.97$ ),  $t(1002) = -0.05$ ,  $p = .963$ ,  $d < 0.01$ , as well as in the MMR vaccination domain (CG:  $M = 2.67$ ,  $SD = 0.99$  vs. EG:  $M = 2.67$ ,  $SD = 1.05$ ),  $t(1002) = 0.04$ ,  $p =$

$.965$ ,  $d < 0.01$ . Since the same applies to the levels of fear, argument exposure entered subsequent analyses as a predictor only in interaction with other variables, namely the three worldview factors: state interventions, fundamentalism and solidarity. The last interaction had to be excluded due to multicollinearity problems. The remaining predictors were the three worldview indicators, actively open-minded thinking (AOT), subjective knowledge and education (6 categories). We tested the assumptions that need to be met for performing regression analyses, namely data normality and homoscedasticity, and the absence of collinearity problems, outliers, influential cases and autocorrelation in the residuals (we used the standards outlined in Field, 2009). As a result, 13% of the sample was excluded, and thus we conducted the regression analyses with 873 participants. Stepwise regressions with forward method resulted in the following patterns.

### Refugees

According to the model with the best fit,  $R^2 = .132$ ,  $F = 43.99$ ,  $p < .001$ , there were three significant predictors of risk perception: fundamentalism, subjective knowledge and state interventions. Fear was positively predicted by subjective knowledge and fundamentalism, and negatively predicted by education,  $R^2 = .148$ ,  $F = 50.48$ ,  $p < .001$ . For easier reading, we include the corresponding statistics in Table 1.

### MMR Vaccination I.

The model with the best fit,  $R^2 = .129$ ,  $F = 32.11$ ,  $p < .001$  (Table 2), showed that risk perception was negatively predicted by subjective knowledge, AOT and state interventions, and positively predicted by fundamentalism. We identified two predictors of fear,  $R^2 = .026$ ,  $F = 11.47$ ,  $p < .001$ , fundamental-

Table 1 Predictors of risk perception and fear associated with refugees

	$\beta$	SE	B	t	p	R <sup>2</sup> change
I. RISK PERCEPTION						
Fundamentalism	.28	.04	0.25	7.88	< .001	.074
Subjective knowledge	.19	.03	0.24	7.39	< .001	.052
State interventions	.08	.04	0.07	2.92	.022	.005
II. FEAR						
Fundamentalism	.34	.05	0.24	7.45	< .001	.058
Subjective knowledge	.27	.03	0.25	8.04	< .001	.076
Education	-.13	.03	-0.12	-3.87	< .001	.015

Note.  $\beta$  stands for standardized regression coefficients

Table 2 Predictors of risk perception and fear of MMR vaccination I

	$\beta$	SE	B	t	p	R <sup>2</sup> change
I. RISK PERCEPTION						
Subjective knowledge	-.20	.02	-0.28	-8.65	< .001	.093
AOT	-.21	.04	-0.17	-5.10	< .001	.020
State interventions	-.13	.04	-0.11	-3.32	.001	.012
Fundamentalism	.08	.04	0.07	2.13	.034	.005
II. FEAR						
Fundamentalism	.27	.06	0.14	4.17	< .001	.021
State interventions	-.14	.07	-0.07	-2.05	.041	.005

ism being a positive one and state interventions being a negative one. Yet, the model represents a poor fit given less than three per cent of explained variance in perceived fear. Therefore, we performed another pair of analyses with additional three predictors which were weakly correlated: gender (0 = male, 1 = female), perceived relevance (1 to 6) and having children (0 = no, 1 = yes).

#### MMR Vaccination II.

According to the models with the best fit, risk:  $R^2 = .140$ ,  $F = 23.58$ ,  $p < .001$ , fear:  $R^2 = .110$ ,  $F = 21.53$ ,  $p < .001$ , there were four negative and two positive predictors of risk perception,

and three positive and two negative predictors of perceived fear, as depicted in Table 3.

To sum up, there were ten potential predictors of risk and fear perception associated with refugees and MMR vaccination: arguments, three worldview indicators (State interventions, Fundamentalism, Solidarity), three interactions of arguments and the indicators, and three cognitive factors (Actively open-minded thinking, Subjective knowledge, Education). In the vaccination domain, we proposed three additional predictors: gender, perceived relevance, and having children. Contrary to our predictions, argument exposure, its interactions with worldview indicators, and solidarity failed to predict any of the



Table 3 Predictors of risk perception and fear of MMR vaccination II

	$\beta$	SE	B	t	p	R <sup>2</sup> change
<b>I. RISK PERCEPTION</b>						
Knowledge	-.18	.02	-0.25	-7.49	< .001	.093
AOT	-.20	.04	-0.16	-4.86	< .001	.020
State interventions	-.13	.04	-0.11	-3.34	.001	.012
Relevance	-.05	.02	-0.09	-2.59	.010	.006
Gender	.14	.06	0.08	2.41	.016	.005
Fundamentalism	.09	.04	0.07	2.34	.019	.005
<b>II. FEAR</b>						
Relevance	.24	.03	0.26	7.66	< .001	.059
Fundamentalism	.28	.06	0.15	4.59	< .001	.019
Gender	.42	.10	0.14	4.32	< .001	.018
Knowledge	-.12	.04	-0.10	-2.96	.003	.009
State interventions	-.14	.06	-0.07	-2.27	.023	.005

Table 4 Summary of the results

	State int.	Fundam.	AOT	Knowledge	Education	Gender	Relevance
Risk Refugees	↑	↑		↑			
Fear Refugees		↑		↑	↓		
Risk MMR	↓	↑	↓	↓		↑	↓
Fear MMR	↓	↑		↓		↑	↓

target variables. Nor was the perception of vaccination-related risks linked to having children. In Table 4 we provide a visualization of the findings with significant predictors only. The direction of the arrow indicates whether it is a positive (↑) or a negative (↓) predictor. For instance, higher risk perception associated with refugees was positively predicted by support for state interventions, fundamentalist worldviews, as well as subjective knowledge about the topic.

### Discussion

We have employed Kahan's Cultural Theory of Risk framework to assess the perception of

risk in two domains: MMR vaccination of children, and accepting refugees in one's home country.

In contrast to the predictions of the Cultural Theory of Risk, giving people relevant, two-sided, balanced information did not play any role in how they perceived risk in either of the domains. There was no difference in risk perception for the group exposed to arguments, nor was there an interaction between argument exposure and any of the value orientations. There are several possible reasons for this. One is that, at least for the refugees, people were already familiar with all these arguments because of extensive media coverage of the crisis and heated public debate in the

months before data collection, and exposure to arguments did not make much additional difference. Another reason, applicable to both topics, might be due to the differences between our and Kahan's approaches to formulating the arguments. While Kahan's (Kahan et al., 2010) arguments mirrored the distinctions found in the Cultural Cognition Worldview Scales (CCWS) and thus might have triggered culturally motivated risk attitudes, we opted for more general, yet more balanced arguments. Therefore, instead of "fitting" the arguments around the worldviews, we created balanced arguments around what we perceived to be the most frequently discussed issues in the debates on these topics (see the *Supplementary material, Section VI*).

#### **Predictors of Perceived Risk: Fundamentalism, State Interventions and Subjective Knowledge**

Our second main finding concerns the actual predictors of risk perception and the differences between them across the two domains. Importantly, the overall level of perceived risk was significantly different to start with, with average values for Vaccination and high values for Refugees.

For comparison, we included the same predictors in both models. Turning to the value orientations first, two of the three value orientations were associated with risk perception. In both domains, the higher people scored on Fundamentalism, the more risk they saw in both Refugees and Vaccination. Fundamentalism reflects a worldview where a person wishes to "equalize" society; however, not in terms of granting everybody universal human rights, but rather in terms of making sure that nobody gets "special treatment". In this view, minorities, including women and LGBTI, want "too many" rights, and our tolerance for them has gone too far; importantly, the government should play a

strong paternalistic role and if necessary, limit people's choices. The last ingredient of fundamentalism is the focus on traditions, meaning that whatever is traditional is good.

It is not surprising that people who prefer traditional society, conformity to majority norms and a firm hand of the State do not want to challenge the established order in their homeland with what they perceive is an influx of people with different values, religions and cultural background (Lancaster, 2022). When it comes to vaccination, the link is less obvious, since there is no inequality or competition inherent in vaccination. One possible reason is that people with a fundamentalist worldview see higher risks overall, regardless of the particular domain. In the whole sample, both correlations are positive and significant, yet one is very weak,  $r_{REF} = .25, p < .001$ ;  $r_{VAC} = .08, p = .011$ . For comparison, when looking at the data of the control group only (which are not "contaminated" by experimental manipulation), the results are similar,  $r_{REF} = .25, p < .001$ ;  $r_{VAC} = .10, p = .028$ .

Another value orientation that predicts risk perception in both domains is what we call State intervention. Interestingly, the predictions for Refugees and Vaccination go in opposite directions. For Refugees, those who believe in a strong State – i.e., one that oversees many aspects of its citizens' lives, imposes regulations, takes care of its citizens, and does not allow for an unregulated free market – perceive the arrival of refugees as highly threatening. In conjunction with Fundamentalism, this might indicate that they want a powerful State, but one that takes care of the citizens, not of "intruders" from different cultures. For Vaccination, the pattern is reversed, as mandatory vaccination is one of the ways that the State interferes with people's individual freedoms.

Interestingly, we did not see any association between the two domains and Solidarity, which embodies the view that people should have equal rights and that the government

should ensure that these rights are observed and its weaker citizens are taken care of. We especially expected to see such a link with Refugees. However, it is possible that the intense scaremongering campaign of the Slovak government, and in fact of the entire Central European region (Slovakia, Czechia, Poland, Hungary), has dehumanized refugees and people no longer perceived them as deserving solidarity. While we did not directly test this claim, the work of Bruneau et al. (2017) suggests that the blatant dehumanization of refugees during the 2015-2016 crisis was higher in their Eastern European sample (Hungary and the Czech Republic) and was only weakly mitigated by trait empathy.

The last factor playing a role in both domains was subjective knowledge. Those who rated themselves as having lower knowledge about Vaccination perceived it as riskier than those who rated themselves as highly knowledgeable. Understanding vaccination requires a certain level of knowledge and those who have it are better equipped to assess the relatively low risk inherent in the MMR vaccine. Surprisingly, the pattern for Refugees was reversed, and those who indicated to know more about the refugee crisis also indicated that they saw greater risk in supporting refugees. This counter-intuitive result might be contingent on the way we assessed knowledge, i.e., through a single question – *How much have you known about .... so far?*. When asking about subjective knowledge, we have no control over the accuracy of it. It might well be that what participants consider as facts are inaccuracies or hoaxes. As indirect evidence, this has indeed proven to be the case in a follow-up study on the refugee crisis (Bašňáková & Valuš, 2023), where we included both subjective and objective knowledge questions, and there was no correlation between the two. A lot of what participants considered to be facts were myths, such as that the majority of refugees from

Syria and Afghanistan are currently in Western European countries – while disproportionately more refugees fled to countries neighboring the conflict zones. In *Supplementary material, Section VIII*, we discuss how other value orientations or inter-individual differences can potentially influence risk perception.

### Vaccination-Only Predictors

In addition to factors that predicted risk perception in both domains, there were three independent predictors for Vaccination: the ability to engage in open-minded thinking, gender and personal relevance (“I feel that the topic of MMR vaccination is personally relevant for me,” rated 1 „*not at all relevant*“ to 6 „*very relevant*“). As expected, women saw more risk in vaccination, which might be explained by the fact that it is women who typically take care of the children and therefore are also more likely to think about vaccination (Masaryk & Hatoková, 2017). Similar reasoning can be applied to relevance – those who did not consider vaccination personally relevant did not perceive it as risky, possibly due to being less aware of the controversies surrounding it. Lastly, participants who were more open-minded, i.e., willing to consider evidence against their beliefs and revise their arguments in the light of new data, saw vaccination as less risky in comparison to participants who were unwilling to do so. We presume that this reflects their long-term strategies in how they work with facts, which decreases their chances of falling for bad science (e.g., the MMR – autism link) or for unbalanced views (i.e., that vaccination is more dangerous than the diseases it prevents).

### Fear as a Dependent Variable

We have included the “fear” variable as a separate measure of risk associated with vaccina-

tion and refugees, to have a predictor based on people's actual experience and not on their rational assessment of what they would expect to happen. Even though fear was not originally conceived as one of our central predictors or outcome measures, it turned out to be strongly correlated with both risk scales, as well as explained by almost identical predictors. However, there might be a more interesting story to tell about the role of fear. It is possible that people's fear *determined* their risk perception, at least for the Refugee topic. During the refugee crisis, the potential presence of refugees in Slovakia, especially Muslim ones, has been used by politicians to scare people and to score political points (Smoleňová, 2017). These tactics seemed to have worked, reflected also in the high average levels of fear our participants indicated (almost 5 out of 6, as opposed to only 3 for vaccination). However, since we have placed the "fear" item after the arguments, we cannot rule out that the information contained in the arguments influenced the level of fear people felt. In future studies, to investigate the role of fear as an independent predictor, it is important to inquire about fear before any arguments are presented.

The significant impact of fear on risk perception, potentially much more powerful than any of the worldviews or other more cognitive variables, is illustrated by the fact that its contribution to explaining the overall variance of the model was substantially higher than that of any other predictors (explained variance without Fear was 13% in the Refugee condition, and Fear itself explained 44%).

One question that remains open is whether the emotion of fear itself, independent of value orientations, affected risk perception, especially given that the general level of fear and anxiety in the country was very high at the point of data collection. We discuss this issue in more detail in *Supplementary material, Section IX*.

### Limitations and Outstanding Questions

One of the most prominent adjustments to the original research plan was the way we analyzed the CCWS questionnaire, which displayed markedly different psychometric properties from previous, US-based, samples. In the future, we recommend using worldview scales which are more relevant to the cultural, social, and political conditions of Central Europe (e.g., Halman & Voicu, 2010), as well as more suitable analytical methods<sup>4</sup>.

Another outstanding question is the role of fear in risk perception. Future studies should include fear as a predictor in the model, including having a clearer distinction between fear or anxiety provoked by the specific topic and fear/anxiety as a trait-level individual difference.

Lastly, we want to address the fact that the study was conducted at the peak of the migration crisis in 2015, which was relatively long ago. The geopolitical situation has substantially changed since then; most notably, with the war in Ukraine, there has been another recent wave of refugees to Slovakia in 2022. While the demographics are similar to the 2015 situation, Ukrainian refugees come from a culturally and geopolitically closer country, and a recent study with young Slovak participants has shown that non-Muslims are indeed preferred (Findor et al., 2022). While they were initially almost universally greeted with solidarity (<https://ec.europa.eu/migrant-integration/news/slovakia-public-opinion-favour-supporting-those-arriving-ukraine-en>), this support is progressively weakening with time (<https://www.iom.sk/en/activities/iom-response-ukraine/overview.html>). Therefore, future studies might be needed to further refine our findings. In particular, it is an

<sup>4</sup> For a detailed discussion, see *Supplementary material, Section X*.

open question to what extent the obtained pattern of results is robust, and to what extent it is contingent on the fact that the data was collected during the unfolding crisis and that the refugees came from a different background.

### Conclusion

In conclusion, our study did not confirm the predictions of the Cultural cognition approach to risk perception. Presenting people with balanced arguments related to controversial issues did not have any effect on the level of risk they associated with these issues on its own, or in interaction with their worldviews. However, we have shown that risk perception was influenced by value orientations, namely fundamentalism and the belief in a strong State, as well as the subjective level of knowledge about the issues. Future studies should use more culturally appropriate measures of worldviews, and take into account the role of fear, especially in such polarized matters as accepting refugees from vastly different cultural backgrounds.

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