

SUPPLEMENTARY MATERIAL

I. Examples of research on biased risk assessment

People tend to perceive risks in a biased manner. To name just a few examples, they ignore base rates (Bar-Hillel, 1980), and overestimate the role of accessibility of examples in memory (Tversky & Kahneman, 1974). In other words, they neglect the incidence of a certain phenomenon and incorrectly conclude that what is easily recalled is likely to be probable (e.g., distorted perception of rare but easily memorable risks such as plane crash versus heart disease or poverty in retirement, which are common but receive less attention in media). The most robustly documented fallacies people fall prey to are framing (Tversky & Kahneman, 1981), and format effects (e.g., Sirota et al., 2014). In the case of framing, different phrasing strongly affects participants' responses: a yoghurt that is 80% fat-free is perceived as healthier than the same one labelled as having 20% fat. The effects of format concern the impact of various ways in which statistical information is presented, for example, people are much more afraid of a particular disease if they are told that 1 in 10 people die from it, compared to the information that 10 out of 100 people die.

II. The refugee crisis and Slovakia's response

The political unrest in Syria started in 2011 and escalated into an international military conflict in 2015, continuing until the present day. While there have been civilians fleeing violence since the beginning of the conflict, Europeans have only really started registering them in the summer of 2015, when thousands of people including families with small children made the life-threatening journey across the Mediterranean Sea and began moving through the Southern and Central Europe, many of them on foot.

The response of Slovakia's citizens to this humanitarian crisis has been mixed. On the one hand, the refugee crisis did not affect Slovakia directly, as the number of asylum applicants in 2015 was only 330 and has been dropping since; this number is far from the 11,395 applications from elsewhere recorded in 2004 which was the highest point in the country's history (<https://www.minv.sk/?statistiky-20>). Yet, the high number of refugees was barely registered as a media topic in 2004. In contrast, there has been an intense fearmongering campaign in the media in 2015, fueled by many politicians, including the then Prime Minister. He made the refugee crisis one of the central topics of his political campaign for the Parliamentary election in May 2016, even holding a makeshift press conference in front of a refugee camp on the Greek-Macedonian border in the days leading to the elections (Smoleňová, 2017). Such a treatment of the refugee topic is far from unique; in fact, it is quite common for the media and elites all over the world to use such uncertain situations to portray refugees as "invaders" or "enemies at the gate" (Esses et al., 2013, p. 518). Although virtually no Muslim refugees were interested in applying for asylum in Slovakia, this strategy seemed to have worked. Opinion polls from September 2015 showed that only 18 per cent of the population would be willing to accept refugees in our country (Dubéci, 2015). On the other hand, there have been isolated initiatives set to help refugees, either to help them relocate, supporting them with food and clothes during their journey through the neighboring countries, or assisting them in various other

ways (e.g., cooking meals and providing entertainment for inhabitants of nearby Austrian temporary refugee camps) (Nič & Sturm, 2016).

III. Sample composition

Table S1

Sample composition in terms of age, education and county

Age	Education	County
18-29 years: 27%	Elementary school: 10%	Bratislava: 12%
30-44 years: 34%	Vocational high school: 29%	Trnava: 11%
45+ years: 39%	High school with graduation: 44%	Trenčín: 11%
	University degree: 17%	Nitra: 13%
		Žilina: 13%
		Banská Bystrica: 12%
		Prešov: 14%
		Košice: 14%

IV. Psychometric analysis of the CCWS questionnaire

We decided to analyze the underlying structure of the measure with exploratory factor analysis (GLS method; $KMO = .80$, $\chi^2(435) = 4749.90$, $p < .001$). The correlation patterns did not correspond to the original two-factor solution, and several items out of the total 30 barely correlated with any of the remaining items. Our attempt with a fixed number of factors failed to fit at all (in terms of total variance explained, number of items, as well as factor loadings, reliability, and content coherence). Therefore, we decided to employ Exploratory factor analysis (EFA) with extraction based on eigenvalues, which resulted in a four-factor solution. While the first three factors were coherent in content, with good or acceptable reliability ($\alpha_{F1} = .86$, $\alpha_{F2} = .76$, $\alpha_{F3} = .68$), this was not true for the last factor ($\alpha_{F4} = .46$; items concerning private profit, enjoying one's wealth, importance of laws in society, and independence of society members). Here are the factor loadings and item wording for the three factors:

Factor 1: STATE INTERVENTIONS

1. *If the government spent less time trying to fix everyone's problems, we'd all be a lot better off. (R, -.76)*
2. *The government interferes far too much in our everyday lives. (R, -.72)*
3. *Government regulations are almost always a waste of everyone's time and money. (R, -.65)*
4. *The government should stop telling people how to live their lives. (R, -.64)*
5. *Our government tries to do too many things for too many people. We should just let people take care of themselves. (R, -.60)*
6. *Free markets--not government programs--are the best way to supply people with the things they need. (R, -.53)*

Factor 2: FUNDAMENTALISM

1. *Society as a whole has become too soft and feminine. (.63)*

2. *The women's rights movement has gone too far. (.63)*
3. *The government should do more to advance society's goals, even if that means limiting the freedom and choices of individuals. (.61)*
4. *A lot of problems in our society today come from the decline in the traditional family, where the man works and the woman stays home. (.52)*
5. *We have gone too far in pushing for equal rights in this country. (.47)*
6. *It seems like people of color, women, homosexuals and other groups don't want equal rights, they want special rights just for them. (.45)*
7. *Government should put limits on the choices individuals can make so they don't get in the way of what's good for society. (.42)*

Factor 3: SOLIDARITY

1. *It's society's responsibility to make sure everyone's basic needs are met. (.61)*
2. *People should be able to rely on the government for help when they need it. (.60)*
3. *Our government tries to do too many things for too many people. We should just let people take care of themselves. (R, -.53)*
4. *We need to dramatically reduce inequalities between the rich and the poor, whites and people of color, and men and women. (.50)*
5. *Our society would be better off if the distribution of wealth was more equal. (.50)*
6. *It's a mistake to ask society to help every person in need. (R, -.50)*

In addition to the CCWS, we also used a more widely known Individualism and Collectivism scale by Triandis and Gelfland (1998) as a reference. The 16-item scale was translated into Slovak by a professional translator and then back to English by a bilingual Slovak-English speaker. However, the pattern of correlations between the two questionnaires was inconsistent and we excluded the Individualism/Collectivism scale from further analyses.

V. Actively open-minded thinking

1. *People should take into consideration evidence that goes against their beliefs. (.76)*
2. *Allowing oneself to be convinced by an opposing argument is a sign of good character. (.72)*
3. *People should revise their beliefs in response to new information or evidence. (.72)*

VI. Arguments

MMR VACCINATION

Please, carefully read the arguments of the proponents of two opposing views on vaccinating children with the MMR vaccine:

[Pro-arguments]

Even though mumps, measles and rubella are just common childhood illnesses for most children, they can have serious complications. For example, one in 1000 children with measles will get encephalitis (inflammation of the brain) and approximately the same number of children will die of measles. In some children, mumps results in complications that bring about hearing loss and one in 10 children gets meningitis. Rubella is especially risky early in the pregnancy where there is a high risk that the child will be born deaf, blind or with brain damage. The vaccine against these illnesses is low-risk and the majority of side effects are mild, such as redness at the injection site or fever. If a vaccinated child contracts mumps, measles or rubella, they will only have minor symptoms. One of the important advantages of MMR vaccination is that it helps to protect the populations which cannot be vaccinated, such as babies younger than twelve months or persons with compromised immunity. There has been no link found between the MMR vaccine and autism in numerous peer-reviewed scientific studies.

[Con-arguments]

Mumps, measles and rubella are common childhood illnesses that most children used to withstand without any problems. Just as with every illness, they can have complications. However, those are very rare and manageable given today's medicine and hygiene standards. In rare cases, children with measles get encephalitis; however, this only concerns one in 1000 children. The death rate from measles is equally low. With mumps, one in 10 children is at risk of meningitis and rarely, the illness can lead to a complete hearing loss. Rubella is especially dangerous for women in early pregnancy if they have not already had it in childhood. In such cases, the child can be born with sensory or brain damage. Children vaccinated with the MMR shot are at risk for serious complications, for example, meningitis or an allergic reaction. Another argument against vaccination is that there are studies which associate the MMR vaccine with autism. At the same time, vaccination does not guarantee a hundred per cent protection, even a vaccinated child can contract these illnesses. Even a hundred per cent vaccination rate will not stop the diseases from spreading, so it is not reasonable to place one's child at risk of the vaccines' side effects.

REFUGEES

There are opposing views on whether we should help refugees and enable some of them to get asylum in Europe, including Slovakia. Please, carefully read the following arguments of two proponents of opposing views on this issue:

[Pro-arguments]

The refugees are victims of a complicated political situation in their home countries which Slovakia is partly responsible for. In the past, our country also indirectly supported regimes that are now killing their citizens. Even though it is necessary to resolve the causes of this complicated situation in their home country, people on the run need our help now and here, in Europe. In the past, when our people were fleeing from the oppressive Communist regime, people from other countries showed solidarity towards them. Now it is time to pay it back. In addition,

we have mostly been the beneficiaries of help from the rest of the EU so far, and therefore we should now start giving. Let us not forget that foreign cultures can enrich the Slovak citizens and teach them to be tolerant. Many refugees are educated and hard-working and they could be beneficial for our economy. At the same time, it is they who can be the solution to the declining population in European countries. Many people argue that refugees are acting in a self-serving manner and choose the richer countries when applying for asylum. However, it is only natural that they are looking for countries where they have a better perspective and family or cultural attachments. If by not taking action, we allow the refugee crisis to get worse, the situation can destabilize even further and create a breeding ground for ever more extreme acts.

[Con-arguments]

We are simply not able to grant asylum to a large number of people. It would be wrong to invite entire families and then struggle with accommodating them. Refugees themselves are maybe not responsible for their difficult situation, but our country is not responsible, either. The main culprits are the world powers who contributed towards the destabilization of the respective regimes. They should take responsibility and solve problems where they have originated. Supporting refugees in coming to Europe is risky because it can hinder improving the political situation in their home countries. We also feel the threat of refugees disproportionately taxing our already stretched social system. In addition, Slovakia belongs to the poorer EU countries and it would be fair if refugees would be helped by countries which can afford it. There are hundreds of thousands of refugees and we have no idea what kind of people they are. Terrorists and other dangerous individuals can easily hide among the masses. Also, many of the “refugees” are actually economic migrants because they are choosing the richer EU countries. This is not how people running from war behave. We believe that refugees do not fit in here from a cultural perspective, either. We are a Christian country and people with such strong foreign religious beliefs are threatening to us. Moreover, there are legitimate worries about whether Islam is even compatible with democracy.

VII. Zero-order correlation tables

Table S2

Refugees – Whole sample

	2	3	4	5	6	7	8	9
1 Risk Refugees	.630**	.013	.005	.254**	.065*	-.066*	.307**	-.028
2 Fear Refugees		-.016	-.084**	.260**	.119**	-.106**	.287**	-.109**
3 Arguments			-.023	-.064*	< .001	.018	-.019	-.023
4 State interven.				-.155**	-.022	.101**	-.095**	.120**
5 Fundamentalism					.041	-.269**	.127**	-.058
6 Solidarity						.028	.077*	-.121**
7 AOT							.130**	.227**
8 Knowledge								.067*
9 Education								

*Note. ** Correlation is significant at the .01 level, * Correlation is significant at the .05 level
This applies to all the remaining tables.*

Table S6*Vaccination – Control group*

	2	3	4	5	6	7	8	9	10	11
1 Risk Vaccination	.447**	-.075	.097*	-.116**	-.226**	-.328**	-.097*	.025	-.153**	-.186**
2 Fear Vaccination		-.085	.132**	.005	-.166**	-.015	-.056	.146**	.091*	.271**
3 State interven.			-.172**	-.006	.085	-.024	.152**	-.009	-.003	.007
4 Fundamentalism				.040	-.211**	.057	-.066	-.014	.142**	.060
5 Solidarity					.050	.046	-.063	.068	.024	.065
6 AOT						.107*	.240**	-.189**	-.123**	.023
7 Knowledge							.115**	.065	.276**	.332**
8 Education								-.189**	.045	.030
9 Gender									.114**	.081
10 Having children										.328**
11 Relevance										

Table S7*Vaccination – Experimental group*

	2	3	4	5	6	7	8	9	10	11
1 Risk Vaccination	.425**	-.099*	.062	.012	-.144**	-.297**	-.148**	.090*	-.128**	-.148**
2 Fear Vaccination		-.043	.140**	.039	-.113*	-.022	-.056	.164**	.057	.171**
3 State interven.			-.133**	-.042	.117*	-.005	.085	.099*	.041	-.025
4 Fundamentalism				.039	-.332**	.029	-.054	-.148**	.092*	-.034
5 Solidarity					.001	-.013	-.189**	.077	.033	.046
6 AOT						.030	.212**	-.112*	-.101*	-.019
7 Knowledge							.204**	.008	.340**	.376**
8 Education								-.177**	.059	.095*
9 Gender									.070	.073
10 Having children										.271**
11 Relevance										

VIII. Other potentially relevant predictors

There are other value orientations or inter-individual differences, not explored in this study, that could potentially explain the differences in risk perception among our participants. One is Social-Dominance Orientation (SDO), or the differing desire of individuals to dominate groups that are considered inferior (Pratto et al., 1994). Differences in SDO explain several attitudinal tendencies towards minorities, including immigrants or refugees, in particular in terms of perceived threat, either realistic or symbolic (for example, Danso et al., 2007; Leong, 2008). High SDO results in higher perceived threat, likely because the minority group is perceived as competition for valuable and limited, resources (Esses et al., 1998, 2001).

Another interindividual difference that comes to mind is Right-Wing Authoritarianism (RWA) or the tendency of an individual to submit to authorities and engage in authoritarian aggression, as well as to rigidly adhere to social conventions (Adorno et al., 1950; Duckitt, 1989). People high on RWA tend to be overly sensitive to threats

to existing social order and the resulting perceived lack of control (Russo et al., 2020). It is an open question whether our participants who scored highly on fundamentalism and preference for a strong State, would also score high on SDO and RWA. Future research should address the relative contributions of these inter-individual tendencies and cultural orientations, identified in CCWS.

IX. Fear as a dependent variable

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. There is a body of literature on whether and how negative affect influences how people evaluate risks. Interestingly, the “Risk as Feelings” theory by Loewenstein et al. (2021) suggests that risk assessment and negative emotions are positively related and have a very similar predictor set – a prediction that closely resembles our results. Fear itself, whether natural or experimentally induced, can have consequences in terms of the perception of unrelated risks – for example, a seminal study by Lerner and Keltner (2001) showed that fearful people made more pessimistic risk estimates (this pattern, however, failed to be replicated in a non-Western sample by She et al., 2017). A recent meta-analysis (Ferrer & Ellis, 2021) compared negative emotions related and unrelated to the domain of risk perception, and found integral anger – i.e., anger that was specific to the domain involved in the decision making – increases risk perception, with a higher magnitude of effect than incidental anger. It would be interesting to replicate our research now when the situation is not as emotionally laden as it was at the height of the refugee crisis in Europe.

X. Limitations of the CCWS questionnaire in the Central European context

Lastly, we want to discuss the CCWS questionnaire. It has been frequently used in Kahan’s research in the USA, but increasingly also in Northern Europe and other countries (e.g., Hagman et al., 2015 in Sweden), although many studies using translated versions do not report its psychometric properties. We have also successfully used it with student populations in Slovakia in the past (Kostovičová & Bašňáková, 2016; Kostovičová et al., 2017). However, we had to considerably shorten it for the present study after exploratory factor analysis, as the general population in the present sample turned out to have a different underlying structure than in the original Kahan’s studies. Instead of the dimensions of Hierarchism – Egalitarianism and Individualism – Communitarianism, we identified three factors, each spanning questions from more than one of the original dimensions.

One reason for this could be that the scale items were too challenging for the general population, as they were fairly long and complex. The other is that the Slovak population is simply divided along different cultural and political lines than the US or Northern European population. For example, in questions about minorities, the CCWS routinely includes African-Americans (which we changed to “people of color”), women, homosexuals, etc. However, the prominent minorities in Slovakia are different and - both culturally and historically -, do not have the same status as African-Americans in the US. The largest minority are the Roma people, who tend to live in socially excluded communities. Other minorities, such as homosexuals, are also likely to be seen differently than in the US, as Slovakia is predominantly a Catholic country, and LGBTI individuals are viewed through the lens of

this religion (Šimko & Šlosár, 2019). Also, the political spectrum is vastly different from the one in the USA, where the CCWS was designed, as Slovakia's political landscape is not partitioned into "conservatives" and "liberals" (Bútorová et al., 2012). Because of doubts about the Slovak CCWS version displaying the same underlying factor structure as the original version, we rather relied on exploratory factor analysis.

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