# BMJ Open

# Prevalence of questionable health behaviours in Serbia and their psychological roots: protocol for a nationally representative survey

Goran Knezevic [ID] , Ljiljana Lazarević, Danka Purić, Zorana Zupan, Iris Žeželj

Department of Psychology, Faculty of Philosophy, University of Belgrade, Belgrade, Serbia

**Correspondence to**
Goran Knezevic;
gknezevic@f.bg.ac.rs

## ABSTRACT

**Introduction** We will launch a national survey in Serbia to document the prevalence of two types of questionable health behaviours: (1) intentional non-adherence to medical recommendations and (2) use of traditional, complementary and alternative medicine practices, as well as the relation between the two. We will also investigate their psychological roots, including (a) 'distal' predictors such as HEXACO personality traits (plus Disintegration) and thinking dispositions (rational/experiential thinking and cognitive reflexivity), and (b) 'proximal' predictors under the umbrella 'irrational mindset' (set of unfounded beliefs consisting of conspiratorial thinking, superstition, magical health beliefs as well as selected cognitive biases), which have more content-wise overlap with the health behaviours.

**Methods and analysis** In this cross-sectional study, a research agency will collect data from a nationally representative sample (n=1043; age 18–75 years; estimated start/end—June/November 2023) recruited online (approximately, 70% of the sample, aged 18–54; 11 years) and face-to-face (approximately, 30% of the sample, aged 55–75 years). Participants will complete a battery of tests assessing questionable health behaviours, basic personality traits, thinking dispositions, irrational mindset, sociopolitical beliefs, sociodemographic and health-related variables. Prevalence rates will be calculated using descriptive statistics. To explore the relation between (psychological) predictors and questionable health behaviours, we will use hierarchical regression and partial mediation models (path analysis or full SEM models).

**Ethics and dissemination** Ethical Committees of the Faculty of Philosophy in Belgrade (#935/1), Faculty of Special Education and Rehabilitation (#139/1) and Faculty of Media and Communications (#228) approved the protocol. Only participants who provide informed consent will participate in the study. A research report based on the study results will be submitted to peer-reviewed journals and results will be made available to stakeholders through reports on the project website https://reasonforhealth.f.bg.ac.rs/en/ and disseminated via social media.

**Trial registration number** NCT05808660

## STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The representative sample enables assessment of traditional, complementary and alternative medicine (TCAM) and intentional non-adherence to medical recommendations (iNAR) prevalence in the general population in Serbia.
⇒ Previous lines of research enabled formulations of precise hypotheses on TCAM and iNAR behaviours and their correlates.
⇒ The comprehensive assessment of irrational mind-set at the level of perception, cognition and beliefs.
⇒ Assessment of TCAM and iNAR retrospective behaviour, rather than attitudes.
⇒ Behaviour will be assessed through retrospective self-report only, not using a multimethod approach.

## INTRODUCTION

To maintain or improve health, people engage in a number of health practices. Some of those are evidence-based and recommended by experts, while others lack support for their effectiveness and may even pose a health risk, thus often labelled 'questionable health behaviours' (by using this term, our intention is not to judge or stigmatise people who adhere to non-evidence-based health practices, but to capture their psychological roots in order to understand them better).

People can deliberately decide not to follow medical recommendations, for example, they can self-medicate, change the dosage or duration of medicine-taking or skip regular check-ups. In previous research, we developed a novel instrument to measure these intentional non-adherence (iNAR) behaviours and gathered empirical evidence that they capture a single underlying tendency.[1] Non-adherence can have severe consequences, such as increased mortality rates,[2] the spread of infectious diseases[3] and increased economic burden on healthcare systems.[4]

Traditional, complementary and alternative medicine (TCAM) encompasses a broad

set of practices, most often not integrated into the official medical system.[5] Use of TCAM practices is associated with several risks, such as adverse events,[6] avoidance or neglect of official treatment[7 8] and interaction with official treatment, for example, see references.[9 10] Despite their growing use, TCAM practices remain insufficiently assessed, with existing evidence showing little to no support for their effectiveness.[6]

The current study will measure the prevalence and structure of these two types of questionable health behaviours on a nationally representative sample, and explore their predictors which we group into sociodemographic and health-related, distal psychological and proximal psychological. While the relations between sociodemographic variables and health behaviours have been extensively studied, for example, see references,[11 12] there is accumulated data suggesting that psychological variables might be of greater importance, especially for TCAM and iNAR[1 13 14]

We will examine the relations between basic personality traits and thinking dispositions on the one hand, and questionable health behaviours on the other. We will treat the former as distal predictors as they encompass basic individual differences and do not overlap content-wise with the behavioural outcomes. The basic personality traits are defined via the HEXACO model[15 16] complemented with Disintegration—a recent reconceptualisation of the proneness to psychotic-like experiences as a general dispositional tendency,[17] a basic personality trait separate from Big five[18] and HEXACO traits.[19] It was found that Disintegration predicts both TCAM related to COVID-19 pandemic and non-adherence to COVID-19 guidelines.[20] Additionally, non-adherence to COVID-19 guidelines was predicted by low Honesty, apart from Disintegration. These findings were mostly replicated in a recent study of both types of health-related behaviours not specifically related to the pandemic.[14] Thinking styles capture individual differences in the tendency to rely on reason, process information analytically or to rely on intuition and process information more synthetically, and this is often operationalised as rational/experiential cognitive processing[21] and actively open-minded thinking.[22 23] Higher experiential and lower rational thinking style have been repeatedly linked to greater TCAM—use as well as more positive attitudes towards it.[24–27] While there are no studies relating them to iNAR, scarce evidence suggests that an experiential thinking style is related to more negative attitudes towards evidence-based practices.[25] Cognitive reflection, the ability to inhibit or over-ride intuitive and often incorrect answers by engaging into a more deliberative thinking process,[28] was also found to be related to more frequent TCAM use,[29] while results of its relation with non-adherence behaviours are mixed.[30 31]

Another group of psychological predictors encompasses a set of variables that we named *Irrational mindset*, defined as thinking and beliefs that do not follow standards of normative logic, that lack an evidence base and persist even when confronted with disconfirming evidence. These variables are considered 'proximal' predictors in our design since they overlap in content with questionable health behaviours. Previous studies demonstrated that TCAM use and beliefs are predicted by constructs belonging to the irrational mindset, such as superstition,[13 32] conspiracy mentality,[33 34] medical conspiracies,[13 35] magical beliefs about health,[13 36] endorsement of contradictory beliefs (ie, doublethink[37]), as well as several cognitive biases, such as susceptibility to naturalness bias,[13 38] illusory correlations[13] and belief bias.[14] Although the results are less robust, some studies suggest that certain aspects of an irrational mindset relate to medical non-adherence, such as conspiracy beliefs,[35] personal, irrational beliefs[14] and overconfidence bias.[31 39]

An important set of constructs—sociopolitical beliefs—were also found to be related to questionable health behaviours. Following recommended health behaviours was positively predicted by trust in science, while pseudoscientific beliefs predicted non-adherence.[38] In addition, reports suggest that uncritical scientific reporting about TCAM, and uncritical trust in science and scientists add to widespread TCAM use and beliefs in its effectiveness[40 41] for the analysis of Serbian media landscape, see reference.[42] Finally, although findings are scarce, some evidence suggests that a more conservative political orientation predicts non-adherence (eg, references[43 44] and use of TCAM).[45] Religiosity and spirituality were also found to be related to TCAM use[46–48] as well as non-adherence.[49]

Apart from being predictors of questionable health behaviours, irrational mindset variables have frequently been found to be mutually related,[35 50–52] prompting a question on whether they have a shared common basis. Some authors state that the root of all irrational beliefs lies in illusory pattern perception, that is, the automatic tendency to make sense of the world by identifying meaningful relations between unrelated stimuli.[53] Illusory pattern perception is a central mechanism that accounts for belief in conspiracy theories and supernatural beliefs,[52] and, on the other hand, has been directly linked to the neural mechanisms generating individual differences in disintegrative tendencies.[18] Therefore, one of our major expectations—drawn from the previous findings[20 54]—is that the relation between Disintegration and TCAM will be partially mediated by illusory pattern perception and related irrational beliefs and cognitions. As for basic thinking dispositions, a lack of cognitive reflection was also found to be predictive of various manifestations of an irrational mindset,[55 56] leading us to expect that a similar partial mediation effect will be observed in the case of cognitive reflection–TCAM relation.

## Objectives

1. To investigate the prevalence of TCAM and iNAR use in the general population in Serbia, as well as their mutual relations.
2. To examine the distribution of irrational mindset variables in the general population.

3. To explore the relations between TCAM and iNAR behaviours on the one hand and variables of personality, thinking styles and cognitive reflection (distal psychological predictors) on the other.

4. To explore the relations between TCAM and iNAR behaviours on the one hand and irrational mindset and sociopolitical beliefs (proximal psychological predictors) on the other.

5. To investigate whether the relations between TCAM and iNAR and distal predictors will be mediated by irrational mindset and socio-political attitudes and beliefs.

### Hypotheses

1. We expect that a minimum of 90% of the general population will have used at least some TCAM practices and engaged in at least some iNAR behaviours at some point in their lifetime.

2. The correlation between TCAM and iNAR in the general population will be positive, small to medium in magnitude.

3. Among the three blocks of predictors—(1) sociodemographics and health-related variables such as health status, chronic diseases, BMI, etc, (2) distal psychological, that is, personality, thinking styles and cognitive reflection and (3) proximal psychological, that is, the irrational mindset, as well as sociopolitical beliefs—we expect that psychological predictors (both distal and proximal) will explain considerably more variance in both TCAM and iNAR behaviours than sociodemographic and health-related variables, that is, will have contributions incremental to sociodemographic and health-related variables in predicting both behaviours. Furthermore, in a hierarchical linear model predicting TCAM, we expect that proximal psychological predictors will contribute incrementally over sociodemographics and health-related and distal predictors, while in the case of iNAR, it is expected that distal psychological predictors will contribute incrementally over sociodemographics and health-related variables and proximal psychological predictors.

4. We expect that a portion of the variance in TCAM explained by distal psychological predictors will be mediated via proximal psychological predictors. We expect that the positive effects of Disintegration and negative effects of cognitive reflection test (CRT) will be mediated through the following variables capturing the irrational mindset (which will all positively predict TCAM): apophenia, conspiracies, superstitions and magical health beliefs. Specifically, eight simple partial mediation effects will be tested based on SEM and/or path/regression models: Disintegration, apophenia, TCAM; Disintegration, conspiracies (both general and specific conspiracies, see in the Instruments and variables section) TCAM; Disintegration, superstitions, TCAM; Disintegration, magical health beliefs, TCAM. We expect the same mediation pattern with CRT as the main predictor, however with the opposite direction of

effects on the irrational mindset (another four partial mediation effects, making eight altogether). We will also test more complex mediation models with other variables, but they will be treated as exploratory.

## METHODS
### Sample

A sample of n=1043 enables detecting the correlation of 0.10 with the power of 0.90 (with two-sided alpha level set at 0.05). Moreover, this sample size is adequate for assessing structural equation models (including confirmatory factor analysis) for which a sample size of n>200–500 is typically recommended.[57 58] It should enable us to detect even small indirect (mediated) effects in the path analyses of simple partial mediation models, but is also adequate for an SEM analysis of these models if factor loadings are large enough and the number of latent factor indicators ≥3, according to the simulation analysis recently reported by reference.[59]

The sample will be a probabilistic household one, representative for the general population in Serbia, with participant age range between 18 and 75 years. Approximately, 70% of the sample will be recruited online (18–54;11 years), and 30% face-to-face (55–75 years). The online subsample will be a one-staged stratified quota sample. The primary sampling unit will be the respondent, a member of an online panel database aged 18–50 years who fulfils the criteria based on population quotas. The face-to-face subsample will be a three-stage random representative stratified sample with the statistical circle area as the primary sampling unit, household as the secondary sampling unit and the respondent as the tertiary sampling unit. Areas will be selected with probability proportional to size, households will be selected based on simple random sampling without replacement (random choice of the starting point and equal steps of choice) and the respondents will be selected randomly from listed members of the household aged 55–75 years.

The inclusion criterion is age. Exclusion criteria are as follows: (a) the inability to understand the Serbian language, (b) failure to pass any of the four attention-check questions.

To evaluate whether the sample is indeed representative, we will compare population quotas on gender, age, regional distribution and education from the latest Serbian census data, provided by the Statistical Office of the Republic of Serbia (https://www.stat.gov.rs/en-US/), with those observed in the sample.

### Procedure

Online and door-to-door data collection with the assessment tools will be conducted via a research agency. Data will be collected online and face-to-face via Computer-Assisted Personal Interviews (CAPI), using a standardised case report form. Face-to-face data collection will be performed by trained interviewers specialised in large-sample survey data collection. Participants will provide

a written informed consent. If a respondent is visually impaired or has difficulties reading, the interviewer will read the items and record the responses. Missing data are not expected, because the questionnaire will have a forced response format. Four attention-check items will be dispersed among other items in the questionnaire to exclude participants who fail to provide correct responses to any of them (as recommended for this type of studies, eg),[60–62] thus increasing the quality of collected data without compromising their validity.[63]

## Instruments and variables

To assess health behaviours—that is, TCAM and iNAR—we will use two instruments: *iNAR-12*,[1] a 12-item self-report instrument assessing intentional non-adherence to official medical recommendations and *TCAM-22*,[13] a self-report instrument assessing use of TCAM overall and across four domains (alternative medical systems, natural product-based practices, new age practices and rituals/customs). For both inventories, participants report whether they have engaged in the health behaviours on a binary scale (0—no, 1 —yes). Additionally, we will explore how participants typically use practices from the four TCAM domains (preventive/alternative/complementary use).

The block of sociodemographic and health-related variables will include participants' sex, age, education, place of residence (urban/rural), marital status, number of children/grandchildren, average monthly household income, household size, body mass index (BMI, based on self-reported weight and height), smoking, self-reported health status (on a 1–5 scale) and chronic illness (by indicating responses on a checklist of chronic conditions, eg, cardiovascular gastrointestinal).

The block of distal predictors will include *basic personality traits* from the HEXACO-60 inventory;[64] Serbian version[65] in assessing the six basic traits (Honesty/Humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness and Openness), with 10 items each. *Disintegration* will be assessed using a 20-item version of the DELTA scale,[19] capturing nine subdimensions of proneness to psychotic-like experiences and behaviours. *Thinking styles* will be assessed with a short, 8-item version[66] of The Rational-Experiential Inventory.[67] The rational and experiential scale consist of four items each. We will also administer the 8-item *Actively Open-Minded Thinking Scale* assessing the tendency to use evidence to revise beliefs. *Cognitive reflection* will be assessed by using a short CRT proposed by Frederick,[28] consisting of three items that cue an intuitive but incorrect response.

The variables within the set of proximal predictors can be tentatively classified into those capturing the irrational mindset and those assessing sociopolitical attitudes and beliefs. Within the irrational mindset, we will assess *Apophenia* with the Snowy Pictures Task.[68] The task consists of 24 stimuli, each containing a grainy image, with half of the stimuli containing an embedded picture that can be perceived and that will be used as distractors, while the other half will not not contain any pattern and are the target stimuli. *Belief in conspiracy theories* will be measured using two scales: the general *Conspiracy Mentality Questionnaire* (CMQ[69]; Serbian version[50] in five items), and a more specific measure of *Belief in medical conspiracy theories* (adapted from references,[35 50 70] five items). We will assess magical health beliefs with 10 items from the general magical beliefs factor of the *Magical Beliefs about Food and Health Scale*.[71] To measure superstition, we will use 10 items from the Superstition scale[72] with the highest loadings on the general factor. We will use six items with the highest loadings from the *Extra-sensory perception belief scale*.[73] Doublethink will be measured via the *Proneness to doublethink scale*,[51] consisting of 11 pairs of contradictory beliefs, the score of which is calculated by counting the number of contradictory pairs where participants indicated both statements in the pair to be true (mark 3 or 4 on a 4-point scale). Personal irrational beliefs will be assessed via the short six-item *General Attitude and Belief Scale* (GABS).[74] *Overconfidence bias* will be expressed as a difference between the CRT confidence score calculated as the mean percentage of confidence judgement across three items and the accuracy score on the same test calculated as the percentage of correct answers. We will use a single item to assess *illusory correlation*,[75] where participants will be presented with data showing no correlation between two variables,[76] and asked to describe the data. Responses indicating a positive correlation between the two variables will be treated as evidence of an illusory correlation. *Naturalness bias* will be measured as a hypothetical preference for a natural drug over a synthetic drug, all other things being equal.[77] *Omission bias* will be assessed by a scenario where refusing a medication is associated with a higher risk of an adverse outcome than accepting the medication.[78] *Belief bias*[79] will be measured using four syllogistic reasoning problems that conflict the empirical and the logical status of the conclusion; the total score is expressed as a proportion of answers indicating that participants based their judgements about the conclusion's validity on the conclusion's believability.[80] *Commitment bias*[81] will be measured as an expressed preference to continue advocating the health benefits of one food product over another despite the information on new evidence showing no difference between them.

Within the subset of sociopolitical beliefs, we will measure trust in the healthcare system and professionals, using gender-neutral items from the *Women's trust and confidence in healthcare system—WITCH scale*.[82] Two items with the highest loadings from the *Particularised (interpersonal) trust* dimension will be used to assess trust in health professionals and two items with the highest loadings from the *Generalised (mis)trust* dimension to assess trust in the healthcare system. We will also measure *Negative experiences with the healthcare system* using five items with high loadings from the experiences with the medical system scale.[83] *Trust in science* will be assessed with two items ($\alpha=0.76$). To assess *Scientism,* we will use three items with the highest loadings from the *Uncritical trust*

*in science* and three items from the *Uncritical trust in scientists* scales of the Scientific Beliefs Questionnaire which uses a Thurston-type scale. We will administer the six item *Digital Literacy Scale* (as adapted in reference)[51] to assess how people search for information online and evaluate it. We will additionally include one multiple-choice item to measure which sources people use to obtain information about health. We will assess *religiosity*, *spirituality* and *political orientation* with a single item each.

### Data analysis plan

Descriptive statistics and correlations of all measured variables will be provided. The prevalence of TCAM and iNAR behaviours will be calculated as the proportion of persons in the sample engaging in these behaviours. Next, we will verify the proposed factor structure of TCAM and iNAR questionnaires through confirmatory factor models. Since TCAM-22 assesses both overall use of TCAM and use within the four TCAM domains, we will test the one-factor, the four-factor and the hierarchical model, while for iNAR-12 we will only test the one-factor model. Finally, we will test several partial mediation models in which distal predictors' effect on TCAM use is mediated by proximal, irrational mindset predictors. These models will be tested as path/regression models and, if adequate measurement models can be established, through SEM. Specifically, we will test eight models, four with Disintegration as the predictor and four with CRT as the predictor of TCAM, using apophenia, belief in co theories, superstition and magical beliefs about health as mediators. More complex models may be tested, depending on observed correlations between variables. We will also explore the relations between predictor variables in further exploratory analyses.

### Ethics and dissemination

Ethical Committees of the Faculty of Philosophy in Belgrade (#935/1), Faculty of Special Education and Rehabilitation (#139/1) and Faculty of Media and Communications (#228) approved the protocol. Only participants who provide informed consent will participate in the study. Participants can withdraw their consent and withdraw from the study with no consequences. Participants will be debriefed. Collected data will be completely anonymous. The anonymised dataset will be uploaded to the OSF repository following all good scientific practices (https://osf.io/gfp4q/).

A research report based on the study results will be submitted to peer-reviewed journals to be considered for publication. Results will be made available to funders, researchers, policymakers, interested laypeople, through reports placed on the project website https://reasonforhealth.f.bg.ac.rs/en/ and further disseminated via social media.

### Patient and public involvement

No patients will be involved in the study. No formal public advisory committee was set up and there was no public involvement in the design and planning of the study. However, our participants will be informed that they can follow all information related to our study via our official website and the social network profiles of the project.

### DISCUSSION

Recent years have witnessed a rise of health behaviours such as TCAM and iNA[84 85] that interfere with evidence-based medical treatment and may lead to adverse health consequences.[2 3 6 7 10] Little is known about the person-related, and especially psychological processes that underlie these types of health behaviours and whether certain psychological dispositions such as personality and thinking styles via irrational beliefs act as barriers to rational health behaviours which follow evidence-based medical recommendations. As they lead individuals astray from effective treatment, understanding the prevalence and psychological precursors of these behaviours is of high relevance for improving public health. This study will examine the prevalence of questionable health behaviours (TCAM and iNAR), their mutual relations, the comparative importance of three sets of individual characteristics: sociodemographics, irrational beliefs and personality traits and thinking styles for these two health-related behaviours, as well as mediatory role of the the irrational mindset and socio-political beliefs in the relations between personality and TCAM and iNAR.

A recent pilot study[1] has shown that trust in the healthcare system in Serbia is related to iNAR behaviours. As it is currently unknown how dire iNAR behaviours are on a national level, the data collected on a nationally representative sample might help signal a call for action. The WHO's Traditional Medicine Strategy (2014–2023) calls out its member states for data collection, greater regulation, research and policy adoption regarding TCAM. As per the data from the Serbian Ministry of Health in 2012, registered alternative providers include acupuncture, ayurvedic medicine, chiropractic, homeopathy, traditional Chinese medicine, quantum medicine, reiki/shiatsu, apitherapy and yoga (WHO, 2019). It is unknown to what extent registered alternative practices are used and what other alternative practices are used in Serbia. This study will contribute to national efforts in better understanding TCAM use and behaviour in Serbia.

As people differ in their vulnerability to these health behaviours, policies would need to be personalised.[86] The insights into the person-level factors related to TCAM and iNAR behaviours can help shape communication strategies (eg, providing accessible information on evidence, or consequences) for individual consumers. The findings from the current study will inform planned experimental studies on how to address questionable health behaviours tailored to sociodemographics, specific personality traits and thinking styles and irrational beliefs.

In conclusion, evidence regarding the prevalence and types of TCAM and iNAR behaviours is currently lacking. While this study will be conducted in Serbia, questionable

health behaviours are a global problem and the methodology and results can highlight areas that can be researched further and cross-culturally. This study will provide the best estimate to date of the personal psychological factors that may underlie such behaviours and pave the way for future interventions.

**ORCID iD**
Goran Knezevic http://orcid.org/0000-0001-8951-3774

## REFERENCES

1 Purić D, Petrović MB, Živanović M. Intentional non-adherence to official medical recommendations: an irrational choice or negative experience with the healthcare system. PsyArXiv 2022.
2 Christensen AJ, Ehlers SL. Psychological factors in end-stage renal disease: an emerging context for behavioral medicine research. *J Consult Clin Psychol* 2002;70:712–24.
3 Benecke O, DeYoung SE. Anti-vaccine decision-making and measles resurgence in the United States. *Glob Pediatr Health* 2019;6:2333794X19862949.
4 Cutler RL, Fernandez-Llimos F, Frommer M, et al. Economic impact of medication non-adherence by disease groups: A systematic review. *BMJ Open* 2018;8:e016982.
5 World Health organization. who global report on traditional and complementary medicine 2019. World Health Organization 2019 https://apps.who.int/iris/handle/10665/312342
6 Ernst E. Alternative medicine. In: *Alternative Medicine: A Critical Assessment of 150 Modalities*. Cham: Springer Cham, 2019.
7 Johnson SB, Park HS, Gross CP, et al. Use of alternative medicine for cancer and its impact on survival. *J Natl Cancer Inst* 2018;110:121–4.
8 Lim A, Cranswick N, South M. Adverse events associated with the use of complementary and alternative medicine in children. *Archives of Disease in Childhood* 2011;96:297–300.
9 Ladenheim D, Horn O, Werneke U, et al. Potential health risks of complementary alternative medicines in HIV patients. *HIV Med* 2008;9:653–9.
10 Werneke U, Earl J, Seydel C, et al. Potential health risks of complementary alternative medicines in cancer patients. *Br J Cancer* 2004;90:408–13.
11 Conboy L, Patel S, Kaptchuk TJ, et al. Sociodemographic determinants of the utilization of specific types of complementary and alternative medicine: an analysis based on a nationally representative survey sample. *J Altern Complement Med* 2005;11:977–94.
12 Van den Bulck J, Custers K. Belief in complementary and alternative medicine is related to age and paranormal beliefs in adults. *Eur J Public Health* 2010;20:227–30.
13 Purić D, Živanović M, Petrović MB. Something old, something new, something borrowed, something green: how different domains of traditional, alternative, and complementary medicine use are rooted in an irrational mindset. PsyArXiv 2022.
14 Lazarevic LB, Knezevic G, Purić D. Tracking variations in daily questionable health behaviors and their psychological roots: a Preregistered experience sampling study. *PsyArXiv* 2023.
15 Ashton MC, Lee K, Perugini M, et al. A six-factor structure of personality-descriptive adjectives: solutions from Psycholexical studies in seven languages. *J Pers Soc Psychol* 2004;86:356–66.
16 Thielmann I, Akrami N, Babarović T, et al. The HEXACO–100 across 16 languages: A large-scale test of measurement Invariance. *J Pers Assess* 2020;102:714–26.
17 Ristić I, Knežević G, Ristić DI, et al. Do people diagnosed with psychosis spectrum disorders share the same personality space as the general population? big five complemented by the proneness to Psychotic-Like Experiences/ behaviors. *J Pers* January 19, 2023.
18 Knezevic G, Savic D, Kutlesic V, et al. Disintegration: a reconceptualization of psychosis proneness as a personality trait separate from the big five. *Journal of Research in Personality* 2017;70:187–201.
19 Knežević G, Lazarević LB, Bosnjak M, et al. Proneness to psychotic-like experiences as a basic personality trait Complementing the HEXACO model-A Preregistered cross-national study. *Personal Ment Health* 2022;16:244–62.
20 Lazarević LB, Purić D, Teovanović P, et al. What drives us to be (ir) responsible for our health during the COVID-19 pandemic? The role of personality, thinking styles, and conspiracy mentality. *Pers Individ Dif* 2021;176:110771.
21 Epstein S, Pacini R, Denes-Raj V, et al. Individual differences in intuitive-experiential and Analytical-rational thinking styles. *J Pers Soc Psychol* 1996;71:390–405.
22 Baron J, Isler O, Yilmaz O. Actively open-minded thinking and the political effects of its absence. In: Ottati V, Stern C, eds. Divided: Open-Mindedness and Dogmatism in a polarized world. Oxford: Oxford University Press, 2023.
23 Stanovich KE, West RF. Reasoning independently of prior belief and individual differences in actively open-minded thinking. *Journal of Educational Psychology* 1997;89:342–57.
24 Wheeler P, Hyland ME. Dispositional predictors of complementary medicine and vitamin use in students. *J Health Psychol* 2008;13:516–9.
25 Gaudiano BA, Brown LA, Miller IW. Let your intuition be your guide? individual differences in the evidence-based practice attitudes of psychotherapists. *J Eval Clin Pract* 2011;17:628–34.
26 Lindeman M. Biases in intuitive reasoning and belief in complementary and alternative medicine. *Psychology & Health* 2011;26:371–82. 10.1080/08870440903440707 Available: https://doi.org/10.1080/ 08870440903440707
27 Saher M, Lindeman M. Alternative medicine: a psychological perspective. *Personality and Individual Differences* 2005;39:1169–78.
28 Frederick S. Cognitive reflection and decision making. *Journal of Economic Perspectives* 2005;19:25–42.
29 Browne M, Thomson P, Rockloff MJ, et al. Going against the herd: psychological and cultural factors underlying the 'vaccination confidence gap.' *PLoS One* 2015;10:e0132562.
30 Pennycook G, McPhetres J, Bago B, et al. Beliefs about COVID-19 in Canada, the United kingdom, and the United States: A novel test of political polarization and motivated reasoning. *Pers Soc Psychol Bull* 2022;48:750–65.
31 Teovanović P, Lukić P, Zupan Z, et al. Irrational beliefs Differentially predict adherence to guidelines and Pseudoscientific practices during the COVID-19 pandemic. *Appl Cogn Psychol* 2021;35:486–96.
32 Lourenco MT, Walsh A, Boon H, et al. Superstition but not distrust in the medical system predicts the use of complementary and alternative medicine in a group of patients with acute leukemia. *Leuk Lymphoma* 2008;49:339–41.
33 Galliford N, Furnham A. Individual difference factors and beliefs in medical and political conspiracy theories. *Scand J Psychol* 2017;58:422–8.
34 Lamberty P, Imhoff R. Powerful pharma and its marginalized alternatives? effects of individual differences in conspiracy mentality on attitudes toward medical approaches. Soc Psychol 2018;49:255–70.
35 Oliver JE, Wood T. Medical conspiracy theories and health behaviors in the United States. *JAMA Intern Med* 2014;174:817–8.
36 Aarnio K, Lindeman M. Magical food and health beliefs: a portrait of believers and functions of the beliefs. *Appetite* 2004;43:65–74.

37 Jovchelovitch S, Priego-Hernández J. Cognitive polyphasia, knowledge encounters and public spheres. In: Sammut G, Andreouli E, Gaskell G, et al, eds. The Cambridge Handbook of social representations. Cambridge University Press, 2015: 163–78.

38 Žeželj I, Petrović M, Ivanović A, et al. "I trust my immunity more than your vaccines: "appeal to nature" bias strongly predicts questionable health behaviors in the COVID-19 pandemic". *PLOS ONE* 2023;18:e0279122.

39 Light N, Fernbach PM, Rabb N, et al. Knowledge overconfidence is associated with anti-consensus views on controversial scientific issues. *Sci Adv* 2022;8:eabo0038eabo0038.

40 Lewis M, Orrock P, Myers S. Uncritical reverence in cm reporting: assessing the scientific quality of Australian news media reports. *Health Sociology Review* 2010;19:57–72.

41 Lilienfeld SO. Why scientists shouldn't be surprised by the popularity of intelligent design. Skeptical Inquirer 2006;30:46–9.

42 Lazić A, Petrović M, Branković M, et al. Quick natural cure-ALLS: portrayal of traditional, complementary, and alternative medicine in Serbian online media. *OSF* [Preprint] 2022.

43 Baumgaertner B, Carlisle JE, Justwan F. The influence of political ideology and trust on willingness to vaccinate. *PLoS One* 2018;13:e0191728.

44 Stroebe W, vanDellen MR, Abakoumkin G, et al. Politicization of COVID-19 health-protective behaviors in the United States: longitudinal and cross-national evidence. *PLoS One* 2021;16:e0256740.

45 Imhoff R, Lamberty P. A Bioweapon or a hoax? the link between distinct conspiracy beliefs about the coronavirus disease (COVID-19) outbreak and pandemic behavior. *Social Psychological and Personality Science* 2020;11:1110–8.

46 Hsiao A-F, Wong MD, Miller MF, et al. Role of religiosity and spirituality in complementary and alternative medicine use among cancer survivors in California. *Integr Cancer Ther* 2008;7:139–46.

47 McCurdy EA, Spangler JG, Wofford MM, et al. Religiosity is associated with the use of complementary medical therapies by pediatric oncology patients. *J Pediatr Hematol Oncol* 2003;25:125–9.

48 Powers-James C, Alvarez A, Milbury K, et al. The influence of spirituality and religiosity on us Oncologists' personal use of and clinical practices regarding complementary and alternative medicine. *Integr Cancer Ther* 2020;19:1534735420945769.

49 Silva AN, Moratelli L, Tavares PL, et al. Self-Efficacy beliefs, locus of control, religiosity and Non-Adherence to immunosuppressive medications in kidney transplant patients. *Nephrology (Carlton)* 2016;21:938–43.

50 Lukić P, Žeželj I, Stanković B. How (Ir)Rational is it to believe in contradictory conspiracy theories *Eur J Psychol* 2019;15:94–107.

51 Petrović MB, Žeželj I. Thinking inconsistently: development and validation of an instrument for assessing proneness to doublethink. Eur J Psychol Assess 2022;38:463–75.

52 van Prooijen J-W, Douglas KM. Belief in conspiracy theories: basic principles of an emerging research domain. *Eur J Soc Psychol* 2018;48:897–908.

53 Zhao J, Hahn U, Osherson D. Perception and identification of random events. *J Exp Psychol Hum Percept Perform* 2014;40:1358–71.

54 Stanković S, Lazarević LB, Knežević G. The role of personality, conspiracy mentality, REBT irrational beliefs, and adult attachment in COVID-19 related health behaviors. *Stud Psychol* 2022;64:26–44.

55 Teovanović P, Knežević G, Stankov L. Individual differences in cognitive biases: evidence against one-factor theory of rationality. *Intelligence* 2015;50:75–86.

56 Toplak ME, West RF, Stanovich KE. Assessing miserly information processing: an expansion of the cognitive reflection test. *Think Reason* 2014;20:147–68.

57 Brown TA. Confirmatory factor analysis for applied research. New York, NY, US: The Guilford Press, 2006.

58 Kline RB. Principles and practice of structural equation modeling. 2nd ed. Guilford Press, 2005.

59 Sim M, Kim S-Y, Suh Y. Sample size requirements for simple and complex mediation models. *Educ Psychol Meas* 2022;82:76–106.

60 Abbey JD, Meloy MG. Attention by design: using attention checks to detect inattentive respondents and improve data quality. *J of Ops Management* 2017;53-56:63–70.

61 Berinsky AJ, Margolis MF, Sances MW, et al. Using screeners to measure respondent attention on self-administered surveys: which items and how many? *Political Sci Res Methods* 2021;9:430–7.

62 Curran PG. Methods for the detection of carelessly invalid responses in survey data. *Journal of Experimental Social Psychology* 2016;66:4–19.

63 Kung FYH, Kwok N, Brown DJ. Are attention check questions a threat to scale validity? *Applied Psychology* 2018;67:264–83. Available https://iaap-journals.onlinelibrary.wiley.com/toc/14640597/67/2

64 Ashton MC, Lee K. The HEXACO–60: A short measure of the major dimensions of personality. *J Pers Assess* 2009;91:340–5.

65 Međedović J, Čolović P, Dinić BM, et al. The HEXACO personality inventory: validation and Psychometric properties in the Serbian language. *J Pers Assess* 2019;101:25–31.

66 Jokić B, Purić D, Knežević G. REI-8: development of a very brief version of rational-experiential inventory using ant colony optimization procedure. Book of Abstracts. XXIX scientific conference Empirical studies in psychology 2023;

67 Pacini R, Epstein S. The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *J Pers Soc Psychol* 1999;76:972–87.

68 Ekstrom RB, French JW, Harman HH, et al. Manual for kit of factor-referenced cognitive tests. Educational Testing Service, 1976.

69 Bruder M, Haffke P, Neave N, et al. Measuring individual differences in generic beliefs in conspiracy theories across cultures: conspiracy mentality questionnaire. *Front Psychol* 2013;4:225.

70 Shapiro GK, Holding A, Perez S, et al. Validation of the vaccine conspiracy beliefs scale. *Papillomavirus Res* 2016;2:S2405-8521(16)30032-5:167–72.:.

71 Lindeman M, Keskivaara P, Roschier M. Assessment of magical beliefs about food and health. *J Health Psychol* 2000;5:195–209.

72 Zezelj I, Pavlovic M, Vladisavljevic M, et al. Construction and behavioral validation of superstition scale. *Psihologija* 2009;42:141–58.

73 Branković M. Who believes in ESP: cognitive and motivational determinants of the belief in extra-sensory perception. *Eur J Psychol* 2019;15:120–39.

74 Owings LR, Thorpe GL, McMillan ES. Scaling irrational beliefs in the general attitude and belief scale: an analysis using item response theory methodology. *SAGE Open* 2013;3.

75 Smedslund J. The concept of correlation in adults. *Scand J Psychol* 1963;4:165–73.

76 Redelmeier DA, Tversky A. On the belief that arthritis pain is related to the weather. *Proc Natl Acad Sci U S A* 1996;93:2895–6.

77 Meier BP, Lappas CM. The influence of safety, efficacy, and medical condition severity on natural versus synthetic drug preference. *Med Decis Making* 2016;36:1011–9.

78 DiBonaventura M daCosta, Chapman GB. The effect of barrier Underestimation on weight management and exercise change. *Psychol Health Med* 2008;13:111–22.

79 Evans JSBT, Barston JL, Pollard P. On the conflict between logic and belief in syllogistic Reasoning. *Mem Cognit* 1983;11:295–306.

80 Teovanović P. Dual processing in syllogistic Reasoning: an individual differences perspective. Psihologijske teme 2019;28:125–45.

81 Staw BM. Knee-deep in the big muddy: a study of escalating commitment to a chosen course of action. *Organizational Behavior and Human Performance* 1976;16:27–44.

82 Ninković M, Damnjanović K, Ilić S. Structure and misuse of women's trust in the healthcare system in serbia. *PsyArXiv*. 2022. Preprint.

83 Ninković M, Ilić S, Pavlović S. The role of past physician-patient communication in passivity normalization during childbirth. In: *Current Trends in Psychology*. Novi Sad, 2021.

84 Posadzki P, Watson LK, Alotaibi A, et al. Prevalence of use of complementary and alternative medicine (CAM) by patients/consumers in the UK: systematic review of surveys. *Clin Med (Lond)* 2013;13:126–31.

85 World Health organization. adherence to long-term therapies: evidence for action. World Health Organization 2003.

86 Ruggeri KAI, Benzerga A, Verra S, et al. A behavioral approach to personalizing public health. *Behav Public Policy* 2023;7:457–69.