BABEŞ-BOLYAI UNIVERSITY

FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES

DOCTORAL SCHOOL "EVIDENCE-BASED PSYCHOLOGICAL ASSESSMENT AND INTERVENTIONS"

# Ph.D. THESIS SUMMARY

# COGNITIVE VULNERABILITIES AND ADAPTIVE HUMAN FUNCTIONING: A CROSS-CULTURAL INVESTIGATION OF THE COGNITIVE-BEHAVIORAL MODEL

**AUTHOR:** Ph.D. CANDIDATE MONICA BIANCA BARTUCZ

**SCIENTIFIC ADVISOR:** PROFESSOR Ph.D. DANIEL OVIDIU DAVID

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*Notes.*_____

(1) This note is to certify by Monica Bianca Bartucz that:

(a) The thesis includes the original research work of Monica Bianca Bartucz towards the Ph.D.;

(b) Parts of the thesis have been accepted or submitted for publication, or presented as conference papers; appropriate citations for these publications were included in the thesis. Other co-authors have been included in the publications if they contributed to the exposition of the published text, data interpretation etc. (their contribution was clearly explained in the footnotes of the thesis);

(c) The thesis was written according to the academic writing standards. All the text of the thesis and its summary was written by Monica Bianca Bartucz who assumes all the responsibility for the academic writing; also:

- A software was used to check for the academic writing (see at http://www.turnitin.com/); the thesis has passed the critical test;
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Signature for certifying the Notes: Ph.D. candidate Monica Bianca Bartucz.

(2) All the Tables and Figures are numbered within the corresponding chapter or subchapter of the thesis.

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Keywords: cross-cultural psychology; clinical psychology; cognitive vulnerabilities; cognitive-behavioral therapy; rational emotive behavioral therapy.

## CHAPTER I. THEORETICAL BACKGROUND

The structure of the thesis is built around two major directions. The first direction represents the examination of culture as a possible moderator in the link between cognitive vulnerabilities for mood disorders derived from the Cognitive Behavioral Therapy (CBT) model and depressive disorders. CBT represents the current gold standard for evidence-based psychological interventions for various mental health disorders (American Psychiatric Association, 2013). The general CBT model comprises several types of vulnerabilities towards depression and other psychological disorders. We focus on those vulnerabilities expressed as cognitive processes that lack logical, empirical, and pragmatic support, such as automatic thoughts, dysfunctional attitudes, maladaptive schemas, and irrational cognitions. These cognitive structures have been extensively examined in relation to depressive disorders across numerous cultures (Chahar Mahali, Beshai, Feeney & Mishra, 2020). The specific focus on depressive disorders is grounded in the fact that depression represents the first cause of disability worldwide among all physical and psychological conditions (World Health Organization, 2017), and its prevalence continues to grow over time, despite the availability of effective medical and psychological interventions (Proudman, Greenberg & Nellesen, 2021). Moreover, several epidemiological studies have identified systematic variations in the prevalence of depression across cultures (Ferrari et al., 2013; Lim et al., 2018). Previous studies showed that mood disorders, including depression, are less prevalent in cultures with a collectivistic cultural profile (Chiao & Blizinsky, 2010; Li, Well & Palanivel, 2021), although genetic vulnerabilities seem to be higher among populations living in geographical regions characterized by high levels of collectivism (Way, Matthew & Lieberman, 2010). These findings indicate that collectivism could protect vulnerable populations from developing certain types of mental health problems. However, less is known about the relationship between cognitive vulnerabilities and depression in different cultural contexts. A few individual-level studies found higher levels of automatic thoughts, dysfunctional attitudes, and maladaptive schemas in individuals belonging to collectivistic cultures compared to samples from individualistic nations (Beshai, Dobson, Adel & Hanna, 2012; Beshai, Dobson & Adel, 2016). Thus, an important question that emerges from previous findings is whether collectivism could potentially represent a protective factor against developing depressive symptoms among individuals who present cognitive vulnerabilities.

The second direction refers to the cross-cultural extension of the CBT/REBT models at the society/nation/culture level. This line of research is based on previous studies showing that national and/or regional-level aggregated scores of various psychological constructs (i.e., personality, intelligence) are associated with state or regional-level political (i.e., state of democracy), economic (i.e., Gross Domestic Product, income inequality), social (i.e., tolerance, hostility), and health (i.e., healthy life expectancy, mood disorders prevalence) (PESH) indicators. Given the strongly supported relationship between cognitive vulnerabilities and individual-level human functioning, we argue that it's plausible that such vulnerabilities aggregated at a society level could impact that society's collective behavior and functionality (Beck, 1999; David, Matu, David & Terracciano, 2017; David, Ștefan & Terracciano, 2019).

Both directions face similar challenges, namely the current lack of evidence regarding the measurement invariance across cultures of psychological instruments designed to assess the cognitive vulnerabilities derived from the CBT model (David, DiGiuseppe, Dobrean, Păsărelu & Balazsi, 2019). Another challenge is related to the lack of large-scale data across multiple nations, that could facilitate the computation of national or regional-level cognitive vulnerability scores.

## CHAPTER II. RESEARCH OBJECTIVES AND OVERALL METHODOLOGY

The **first main objective** of this thesis was to investigate the role of culture in the relationship between individual-level psychological vulnerabilities and psychopathology. This objective was carried out by testing whether the individualism-collectivism cultural dimension could influence the relationship between cognitive vulnerabilities derived from the Cognitive-Behavioral and the Rational Emotive Behavioral models and depression (**Study 1**). Previous findings suggested that depressive disorders are less prevalent among collectivistic cultures (Li, Wei, Palanivel & Jackson, 2021) and that collectivism represents a protective cultural factor against the onset of depressive disorders, even among populations that present high levels of biological vulnerabilities towards mood disorders (Way, Matthew & Lieberman, 2010). Based on this line of research, our aim was to examine whether cognitive vulnerabilities for depression in collectivistic cultures have significantly lower discrimination power between healthy individuals and individuals diagnosed with Major Depressive Disorder compared to more individualistic cultures. For this purpose, we conducted a three-level culture moderated meta-analysis. We included 63 studies carried out in 13 different countries, each reporting levels of automatic thoughts, dysfunctional attitudes, maladaptive schemas, and irrational cognitions for depressed individuals and healthy controls. We examined whether the difference in levels of cognitive vulnerabilities between these two types of populations was significantly lower in collectivistic cultures. The first objective of the thesis was carried out through an additional empirical study conducted during the lock-down period in Romania related to the outbreak of the COVID-19 pandemic (**Study 5**). This study investigated whether the association between individual-level irrational cognitions and depressive symptoms measured during a nationally shared stressful event (the lock-down) could be moderated by the individualism-collectivism-cultural dimension.

**The second main objective** of the current thesis was to examine the psychometric proprieties of a psychological instrument designed to measure rational and irrational beliefs across multiple cultures. Although many studies focused on exploring the psychometric proprieties of such instruments on different types of populations (David, DiGiuseppe, Dobrean, Pasarelu & Balazsi, 2019), no available research has yet examined whether these instruments could reliably measure analogous concepts across different cultures. The cross-cultural validation of a psychological instrument is an essential step that informs researchers whether the investigated scale can be used to meaningfully compare the measured construct across cultures. The second objective was carried out in **Study 2**, where we examined the measurement invariance of the Attitudes and Beliefs Scale 2 (ABS 2; DiGiuseppe, Leaf, Gorman & Robin, 2018) across ten different countries.

**The third goal** of the thesis was to examine the cross-cultural extension of the CBT/REBT model from an individual-level to a country-level aggregated level of analysis. Previous research in the field of clinical psychology has extensively documented the causal role that cognitive vulnerabilities, such as dysfunctional/irrational cognitions, play in the development of psychopathology. To address this objective, we developed a country-level Irrationality Index for 60 countries based on a public international survey database published by the World Values Survey (Inglehart et al., 2014). We investigated whether aggregated scores of irrational cognitions are associated with several country-level functioning indicators (**Study 3**). In line with our third objective, we further examined the same country-level irrationality index from an evolutionary perspective (**Study 4**). On the one hand, REBT scholars have previously noted that irrational beliefs are deeply embedded in our evolutionary past and that although they are associated with

dysfunctional psychological responses in the contemporary world, irrational cognitions might have increased chances of survival in the Environment of Evolutionary Adaptedness (Ellis, 1987, Pelusi, 2003). On the other hand, recent studies showed that some types of the human cognitive processes served as a psychological defense mechanism against historical environmental threats and that these cognitive processes were further translated into cultural values and practices (Murray & Schaller, 2014). Based on these lines of research, we investigated whether country-level irrational cognitions could mediate the association between the historical pathogen prevalence and collectivistic cultural values. A graphical illustration of the structure of the present doctoral thesis can be consulted below in Figure 1.

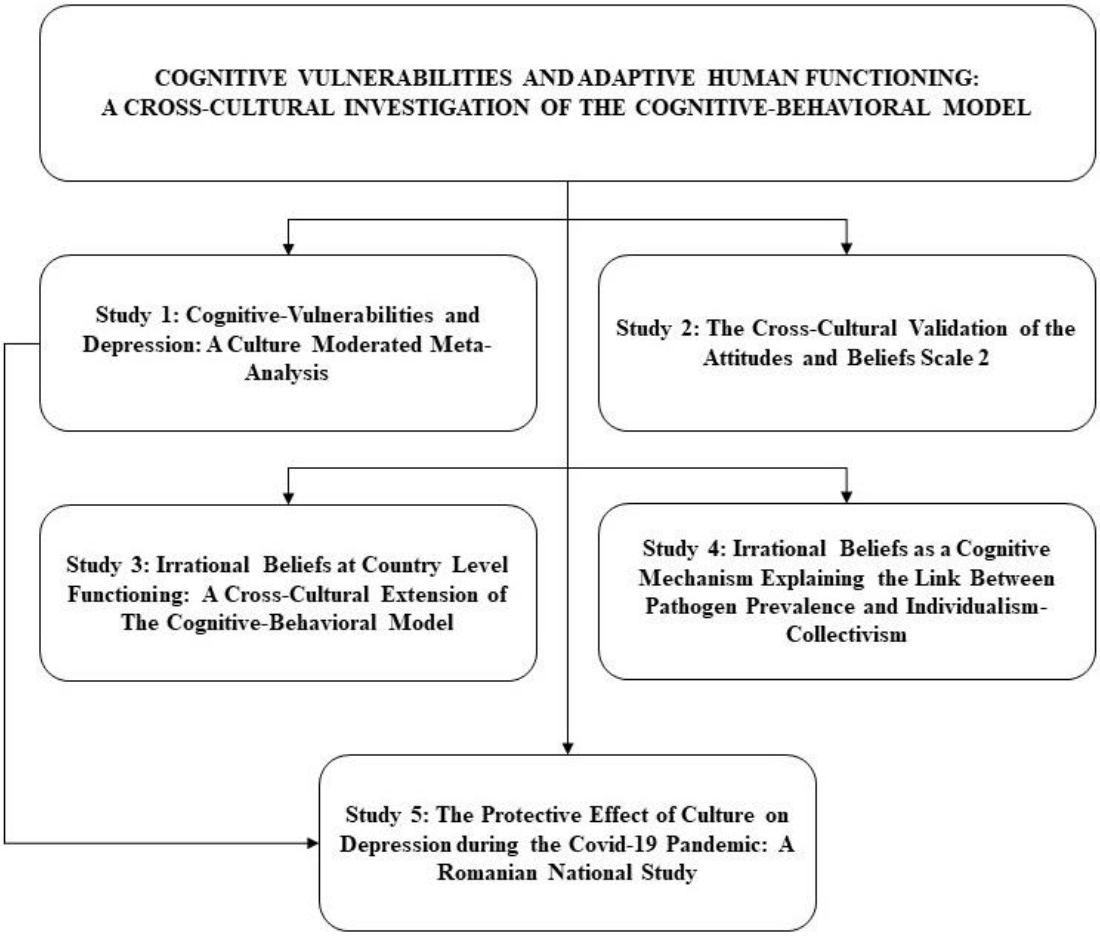


*Figure 1*. The structure of the doctoral thesis.

# CHAPTER III. ORIGINAL RESEARCH

## 3.1. Study 1. Cognitive-Vulnerabilities and Depression: A Culture Moderated Meta-Analysis[1]

### 3.1.1. Introduction

Cognitive-Behavior Therapy (CBT) is currently the leading model in explaining the psychological mechanisms underlying depressive disorders and treatment protocols derived from this model have received strong empirical support (APA Presidential Task Force on Evidence-Based Practice, 2006). According to the general framework of CBT, depressive disorders are generated and maintained by information processing deficits in the form of non-logical, inaccurate, and/or unhelpful beliefs about self, others, and/or life, developed throughout an individuals' learning history and activated by stressful life situations (Beck & Haigh, 2014). Under the general framework of CBT, there are also other approaches, that rather than explaining psychopathology as a function of specific types of cognitions, are more interested in the way individuals relate to their internal psychological processes (i.e., Mindfulness-Based Cognitive Therapy; Acceptance and Commitment Therapy) or the way behavioral patterns influence the development of mental disorders (i.e., Behavioral Activation). We focus our study on those approaches that explicitly address cognitions and their content as the main mechanisms explaining depressive disorders.

Even though depressive disorders can be found on every continent, significant cross-country variations were systematically reported in the point, lifetime, and twelve-month prevalence of MDD and other forms of depressive disorders (Kessler & Bromet, 2013; Ferrari et al., 2012; Lim et al., 2018; Rai, Zitko, Jones, Lynch & Araya, 2013). However, determining systematic patterns in the geographical distribution of depressive disorders and country-level economic and cultural correlates is still a major challenge that epidemiological studies are facing. First, prevalence data are highly sensitive to study characteristics and epidemiological studies differ in terms of methodology, assessment strategy of depressive symptoms, and included countries (Ferrari et al., 2013). Moreover, most of the studies that investigate the prevalence of depressive disorders are conducted in Western, high-income nations, leading to a significant lack of data in the regions of low-income countries (Henrich et al., 2010). Additionally, diagnostic criteria and standardized instruments for capturing the presence and the intensity of depressive symptoms are mainly developed in western nations. Difficulties in identifying reliable cross-cultural variations in the prevalence of depressive disorders are also related to the strong social stigma associated with mental illness in collectivistic cultures. As a growing body of evidence suggests, patients from collectivist countries tend to exhibit less help-seeking behaviors when confronted with mental health problems, express predominantly somatic features of depression, or deny depressive symptoms altogether (Parker, Gladstone, Chee, 2001). However, considering

[1] This study has been published. The current version represents an abbreviated adaptation of the published manuscript.

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Authors' contributions: M.B.B. and D.O.D. designed the study. M.B.B. performed the systematic search and the coding of studies. M.B.B and S.A.M. conducted data analysis. M.B.B. and D.O.D contributed to the academic writing of the article.

various sources of bias in estimating the cross-cultural variation of depression, epidemiological studies systematically report a higher prevalence of depressive disorders in high and middle-income countries compared to low-income nations. (Lim et al., 2018; Ferrari et al., 2013; Rai et al., 2013). Given this pattern of results, there is one important cultural factor that could explain cross-cultural variability of the prevalence of depressive disorders, namely the individualism-collectivism cultural dimension (Hofstede, 2001).

Several authors argue that mood disorders are less prevalent in collectivistic societies due to a set of intrinsic characteristics of the collectivistic cultural fabric that protects individuals from developing psychological disorders. One widespread explanation for this phenomenon is that in collectivistic cultures, individuals tend to acquire a socio-centric and interrelated sense of identity throughout the socialization process. This collective construal of self and others stimulates the preservation of strong social ties between individuals. This results in social structures that ensure interpersonal connectedness and the availability of social support, and mitigate loneliness and isolation (Marsella, 2003). Moreover, a few studies revealed that mood disorders are less prevalent in collectivistic countries, even though the biological/genetic vulnerabilities for emotional disorders are more pronounced in these types of cultures (Chiao & Blizinsky, 2010; Suh et al., 1998). In line with this theoretical model, some authors argue that the collectivistic cultural orientation has a buffering effect against the development of mood disorders in populations with a high prevalence of biological vulnerabilities (Way et al., 2010).

The first objective of this meta-analysis is to estimate the overall difference in cognitive vulnerabilities between clinically depressed and healthy populations. The second objective is to estimate the effect size of the difference between clinical and healthy populations on four types of cognitive vulnerabilities, namely, automatic thoughts, dysfunctional attitudes, core schemas, and irrational beliefs. The third and fourth objectives of the study are to test the moderator effect of individualism-collectivism on the difference between clinically depressed and healthy populations, both on overall cognitions and the four types of cognitive structures.

### 3.1.2. Methods

#### 3.1.2.1. Identification and selection of studies

We conducted a systematic search for studies that compared scores on automatic thoughts, dysfunctional beliefs, schemas, and irrational beliefs between healthy samples and samples diagnosed with MDD. We searched for relevant studies in the PubMed, PsychINFO, Web of Science, and Scopus databases, using the following keywords: (irrational belief* OR schema* OR dysfunctional attitude* OR dysfunctional belief* OR automatic thought* OR automatic negative thought*) AND (depress* OR MDD). The search was conducted in two time points by one reviewer. The first systematic search was carried out through May 2017, for all the available years until 2017 and we updated the search through June 2019.

#### 3.1.2.2. Inclusion and exclusion criteria

We included only articles (1) that were written in English, (2) reported primary empirical data, (3) compared cognitive vulnerabilities between clinical samples diagnosed with MDD with healthy samples, (4) subjects in the clinical group were included based on clinical interviews, (5) cognitive vulnerabilities were measured through self-report questionnaires, (6) cognitive vulnerabilities were defined according to the CBT model.

We excluded studies that (1) were conducted on special populations that were not representative of the general population (i.e., samples composed exclusively by hospitalized or incarcerated individuals), (2) comprised samples that were diagnosed with comorbidities, and (3) comprised mixed clinical groups formed by individuals diagnosed with MDD and individuals presenting other types of depressive disorders (i.e., dysthymia, seasonal depressive disorder, etc.).

#### 3.1.2.3. Coding of Studies

Each study was coded using the name of the first author and the publication year. In addition, for each study, we coded two types of moderator variables, internal to the study (study level) and external (country level). The data extraction was performed by one reviewer.

*Study-level moderators.* The internal moderators that we included in the analysis were the year of publication, the sample size, the mean age of the participants, the percentage of females included in the study. We also coded the type of the measured cognitive vulnerability (automatic thoughts, dysfunctional beliefs, schemas, and irrational beliefs).

*Country-level moderators.* Country-level moderators included the country where the study was conducted and the individualism-collectivism cultural dimension. We retrieved country-level individualism scores from two sources, namely from Hofstede, Hofstede & Minkov (2010), and from Beugelsdijk & Welzel (2018).

#### 3.1.2.4. Meta-Analytic Procedures

As an index of effect sizes, we computed between groups standardized mean difference statistic Hedges' *g* (Hedges & Olkin, 1985). We calculated the effect size estimates based on the mean, standard deviation, and sample size for cognitive measures coming from depressed and non-depressed subsamples in each study. We averaged the effect sizes using the random-effect model (Borenstein et al., 2010). To assess heterogeneity, we used Cohens' Q and $I^2$. Publication bias was assessed using fail-safe *N* (Rosenthal, 1991) and Duval and Tweedie's trim and fill procedure. We identified outlier studies and influential cases and conducted a sensitivity analysis to ensure the robustness of the results. Outlier effect sizes were winsorized, by reducing or increasing the values of the outliers to the value of the highest or the lowest data point that is not an outlier. We proceeded by creating five different databases, each containing data for all types of cognitions, automatic thoughts, dysfunctional attitudes, schemas, and irrational beliefs. All the presented analyses were replicated across the five databases. Given that our objective for the current meta-analysis was to identify country-level moderators that could affect the magnitude of the effect sizes, we tested a three-level meta-analytic model, following the recommendations of Harrer, Cuijpers, Furukawa, and Ebert (2021). We started with a two-level model, with effect sizes at level 1, sample at level 2. Then, we added the third level in the model, namely country-level. We calculated the distribution of the total variance across the three levels of analysis, and we evaluated the fit of the three level-model compared to a two-level model (effect size and sample). We employed a 2-level meta-analytic procedure in order to test study-level moderators and a 3-level approach when testing country-level moderators. Meta-regression analysis was performed using maximum likelihood estimates. All the continuous moderators used in meta-regression analyses were centered around their mean. Overall effect size and publication bias were estimated using Comprehensive Meta-Analysis, Version 3.0 (Borenstein et al., 2013). All other analyses were conducted with the R 4.0.5 software (Team, R. C., 2020), using the meta (v4.17-0; Balduzzi et al., 2019) and metaphor (v2.4-0; Viechtbauer,2010) packages.

### 3.1.3. Results

#### 3.1.3.1. Characteristics of includes studies

The first systematic search led to the identification of 7586 studies. After removing the duplicates, we screened 3618 articles based on their abstracts and we proceeded by examining a number of 536 full-text articles, of which 62 studies were included in the meta-analysis. In the second search, we identified 977 articles. After removing the duplicates, we screened 495 abstracts and examined 25 full-text articles, and included one study. In the final database, we included k = 63 studies, with a total of 286 effect sizes.

The total number of participants included in the meta-analysis is N = 6693, with 3072 participants having a clinical diagnosis of MDD and 3621 healthy participants. The data included in the analysis were collected between 1983 and 2017. The mean age of the participants was 34.68 (SD = 6.50) and 67.66% of the total participants were female. We included studies from 13 countries, namely: United Kingdom (k = 15), USA (k = 14), Turkey (k = 7), Norway (k = 6), Canada (k = 4), Australia (k = 4), China (k = 4), Iran (k = 3), India (k = 2), Egypt (k = 1), Germany (k = 1), Romania (k = 1), Switzerland (k = 1). More details about the type of dysfunctional cognition measured in each study, the assessment tools, and country-level individualism scores can be found in supplementary materials Table S1.

#### 3.1.3.2. Overall effect size

The overall difference in levels of all cognitive vulnerabilities between the healthy and the clinically depressed samples was calculated using a random-effects model, and the results showed a significant difference between the two samples, placed in the large interval $g = 1.69$, SE = 0.095, 95%CI [1.48; 1.87]. We obtained high levels of heterogeneity Q (66) = 622.43, $p < .001$ and the percentage of heterogeneity due to variance between studies was estimated at 89.40% ($I^2 = 89.40$).

#### 3.1.3.3. Publication bias

The fail-safe N analysis showed 40,130 missing studies that would turn the overall effect size insignificant. The funnel plot indicates asymmetry, suggesting publication bias. Duval and Tweedie's trim and fill procedure identified 25 studies to the left side of the funnel plot, that would change the overall effect size to $g = 1.16$ $CI = [0.96; 1.37]$, leaving it in the large interval.

#### 3.1.3.5. Effect sizes for each category of cognition

We computed the effect sizes for the difference between healthy and clinically depressed populations, for automatic thoughts, dysfunctional attitudes, schemas, and irrational beliefs. As presented in Table 1, the results pointed to significant differences between the two populations for all four types of cognitions.

**Table 1.** Effect sizes for specific types of beliefs.

| Cognition type | k | g | CI | Q (df) | *p*(Q) |
|---|---|---|---|---|---|
| Automatic thoughts | 24 | 2.38 | 2.17; 2.60 | 58.96 (23) | <.001** |
| Dysfunctional attitudes | 44 | 1.35 | 1.18; 1.52 | 221.18 (43) | <.001** |
| Schemas | 21 | 1.65 | 1.32; 1.98 | 103.28 (20) | <.001** |

| Cognition type | k | g | CI | Q (df) | *p*(Q) |
|---|---|---|---|---|---|
| Irrational beliefs | 7 | 1.02 | .67; 1.37 | 8.99 (6) | .174 |

Note. k = number of samples; g = Hedges's g; CI = 95% Confidence interval; '**' = results significant at .0001

### 3.1.3.7. Moderation analysis

We analysed the moderation effect of individualism-collectivism dimension retrieved Hofstede, Hofstede & Minkov (2010) and Beugelsdijk & Welzel (2018). Results for the meta-regression analyses are presented in Table 3.

**Table 3.** Main effects for meta-regression analyses using external (country-level) moderators.

| Cognition type | Moderator | k | *β* | *b* | *SE* | *p* |
|---|---|---|---|---|---|---|
| Overall cognitions | Individualism[a] | 67 | .144 | .004 | .003 | .178 |
| | Individualism[b] | 67 | .029 | .001 | .004 | .879 |
| Automatic thoughts | Individualism[a] | 24 | .501 | .010 | .004 | .007** |
| | Individualism[b] | 24 | .611 | .017 | .003 | .010* |
| Dysfunctional attitudes | Individualism[a] | 44 | .357 | .009 | .003 | .011* |
| | Individualism[b] | 44 | .127 | .004 | .004 | .421 |
| Schemas | Individualism[a] | 21 | .380 | .013 | .006 | .049* |
| | Individualism[b] | 21 | .207 | .007 | .007 | .332 |
| Irrational beliefs | Individualism[a] | 7 | -.749 | -.011 | .005 | .082 |
| | Individualism[b] | 7 | -.702 | -.013 | .006 | .081 |

Note. k = number of samples; *β* = standardized coefficients; *b* = unstandardized coefficients; *SE* = standard error; '**' = result significant at .001; '*' = result significant at 0.01; method = maximum likelihood; Individualism[a] = Hofstede et al., (2010); Individualism[b] = Beugelsdijk et al., (2009).

### 3.1.4. Discussions and conclusions

Our results indicate that in collectivistic cultures, clinically depressed and healthy individuals share a more similar level of automatic thoughts, dysfunctional beliefs, and schemas compared to individualistic cultures. While both measures of individualism yield a moderating effect for automatic thoughts, only individualism retrieved from Hofstede et al., (2010) replicated the same effect in the case of dysfunctional attitudes and schemas, although the trend was similar for all these categories of cognitions. These results could be attributed to differences in the two indexes and the degree to which they tap into the latent variable underlying the observed scores. Although

the two indexes have a strong correlation, there are still large proportions of variances that do not overlap. This probably stems from the different methodologies used in the estimation of individualism by the authors. Hofstede's index is based on a set of work attitudes, while Beugelsdijk's index is derived from attitudes related to social issues that regularly divide between conservatives and liberals on both social and economic dimensions (e.g., homosexuality/abortion and private ownership). The same results could also be understood in terms of statistical power. The effects for automatic thoughts, no matter which individualism index is used, are larger than for the other cognitive vulnerabilities, and thus are easier to detect. From a conceptual casual model of cognition and depression, automatic thoughts are much closer to depression than dysfunctional attitudes and schemas. If any moderator alters the link between cognition and depression, this effect will be probably more visible on a variable that is more closely related to the outcome that a variable that is more distant.

The current meta-analysis has a series of limitations. First, we observed high levels of heterogeneity that remained significant even after the introduction of the moderators, indicating that there are still unknown sources of variance that could explain the variations in the estimated effect sizes. Second, a substantial country-level variance was identified only in the case of automatic thoughts. However, we kept a three-level structure when testing the moderating effect of individualism for all categories of cognition. This approach was adopted given that individualism is a country-level variable and a three-level structure allowed us to account for the interdependence of the studies within countries. Another important limitation in formulating clear conclusions about the results for specific types of cognitions is the inclusion of only 6 studies that targeted the measurement of irrational beliefs, and thus all the results for this category of cognition should be interpreted cautiously. An additional limitation of the meta-analysis is related to the exclusion of the studies that included participants with comorbidities. As a large body of evidence suggests, MDD shows high rates of comorbidity with both internalizing and externalizing disorders across cultures (Raguram, Weiss, Keval & Channabasavanna, 2001; Bhui, Bhugra, Goldberg, Sauer & Tylee, 2004). Moreover, some studies showed that patterns of comorbidities might differ cross-culturally (Merikangas et al., 1996). Thus, given that the cognitive vulnerabilities that we examined are not specific to depression the relationship between these vulnerabilities and depression, as well as the cross-cultural variation of this relationship, might be different in samples that have comorbidities.

Our findings have three major implications. First, we provide additional evidence for the general Cognitive- Behavioral model of depression, by showing that there are significant and large differences in levels of automatic thoughts, dysfunctional beliefs, schemas, and irrational beliefs between healthy and clinically depressed samples. Second, we found evidence that in collectivistic cultures automatic thoughts, dysfunctional attitudes, and schemas discriminate more poorly between depressed and healthy individuals, suggesting that the relationship between these cognitive vulnerabilities and MDD might be buffered by intrinsic features of the collectivistic cultural structures. Additionally, the results of the present meta-analysis could have further implications for the cultural adaptation of the treatment offered to depressed individuals. Although the CBT model of depression is relatively stable across cultures, mental health practitioners should also assess culturally relevant risk factors for depressed patients and adapt their interventions strategies.

### 3.2. Study 2. The Cross-Cultural Validation of the Attitudes and Beliefs Scale 2[2]

#### 3.2.1. Introduction

Rational Emotive Behavioral Therapy (REBT) represents a variation of Cognitive Behavior Therapy (CBT) that originated in the United States of America by Albert Ellis in the late 1950s (Ellis, 1958). According to the general framework of REBT, psychological distress is generated by a set of cognitions that individuals hold in relation to life events (activating events) and not as a direct consequence of the events themselves. If individuals hold irrational cognitions when confronted with a negative life event, it's more likely that they will experience negative dysfunctional emotions, such as depression or anger. Meanwhile, if an individual holds rational belief when confronted with an activating event, he or she will more likely experience negative functional emotions such as sadness or discontent (David, Montgomery, Macavei & Bovbjerg 2005). Cognitive processes are considered to be irrational if they lack logical, empirical, and/or practical support. The REBT model recognizes four types of irrational cognitive processes, namely demandingness (DEM), awfulizing (AWF), low frustration tolerance (LFT), and global evaluation of the self (self-downing; SD) or others (other-downing; OD), or life. On the other hand, rational cognitions hold a logical, empirical, and pragmatic base. The four categories of rational cognitions described by the REBT model are non-demanding preferences (NDP), realistic negative evaluations (RNE), frustration tolerance (FT), and unconditional acceptance of the self (SA), others (OA) and life.

Although irrational beliefs are investigated in multiple cultures, there are only a limited number of studies that assess whether the questionnaires used for the measurement of these beliefs capture the same constructs across countries. As previous authors have pointed out, more cross-cultural validation studies are needed in order to assess whether individuals from different countries give similar interpretations to items measuring irrational and rational cognition (David, DiGiuseppe, Dobrean, Pasarelu & Balazsi, 2019). Cross-cultural validation studies targeting the measurement of irrational and rational beliefs is an essential step that needs to be undertaken in order to inform meaningful comparisons between countries and to facilitate a more complex

[2] This study is in preparation for publication, with the following collaborators listed below as coauthors.

Authors' contributions: M.B.B. and D.O.D. designed the study. M.B.B. conducted the data analysis. Data collection was carried out by international collaborators affiliated with research institutions and/or universities. M.B.B. conducted the data collection in Romania, the United Kingdom, and the United States of America. Data for seven other countries was collected by Adrian Stanciu Ph.D. ( GESIS-Leibniz Institute for the Social Sciences, Germany), Angela Ramos M.A. (Psicotrec Center for RE & CBT, Lima Perú), Demetris Katsikis Ph.D. (Hellenic Institute for Rational Emotive & Cognitive Behavioral Psychotherapy, Greece), Natalia Ferrero Ph.D., (Psicotrec Center for RE & CBT, Lima Perú), Nazish Awan Ph.D. (University of Sargodha, Pakistan), Peter Holtz, Ph.D. ( Knowledge Construction Lab, Leibniz-Institut für Wissensmedien,Germany), Sofia Esteves Ph.D. (Center for Research and Social Intervention, School of Social and Human Sciences, University Institute of Lisbon, Portugal), Valentina Riaño M.A. (Pontificia Universidad Javeriana, Cali, Colombia), Valerie Hage, (Psicotrec Center for RE & CBT, Lima Perú), Zorica Maric, Ph.D. (Serbian Association for Cognitive and Behavioural Therapies). M.B.B. and D.O.D. contributed to the academic writing of the manuscript.

understanding regarding the role of culture in the association between cognitive vulnerabilities and human functioning.

Taking into account the existing gaps in the literature, our aim is to examine the measurement invariance of the Attitudes and Beliefs Scale 2 (DiGiuseppe, Leaf, Gorman & Robin, 2018) across ten countries. The first objective of the study is to examine the model fit of three different factor structures of the ABS 2. The selection of the examined models was based on (1) their theoretical support derived from the REBT model, and on (2) the findings of previous studies that examined the factor structure of the scale (Hyland, Shelvin, Adamson & Boduszek, 2014; DiGiuseppe, Gorman & Raptis, 2020). All three examined models represented bi-factor solutions, in which all the 72 items loaded on a single latent variable, defined as global irrationality, and with specific factors varying across models. In Model 2ABG, we tested a factor structure with 36 items loading on one latent variable representing irrationality, 36 items loading on one latent variable representing rationality, and 72 items loading on one general factor representing global irrationality. Model 4ABG included 72 items loading on one general factor, 18 rationally and irrationally worded items loading on each of the four specific latent variables representing four cognitive processes (DEM, AFT, LFT, and SD). Model 8ABG comprised 72 items loading on one general factor, 9 sets of irrationally worded items, loading on four irrational cognitive processes, and 9 sets of rationally worded items, loading on four rational cognitive processes. The second and main objective of the study was to test the measurement invariance of the ABS 2 scale across ten nations. Thus, after identifying the best fitting factor structure of the scale, our aim was to investigate whether the instrument shows invariance at the configural, metric, scalar, and residual levels.

### 3.2.2. Method

#### 3.2.2.1. Sample

The sample consisted of 2354 participants from 10 Countries: Columbia (*n* = 202), Germany (*n* = 273), Greece (*n* = 200), Pakistan (*n* = 200), Peru (*n* = 122), Portugal (*n* = 208), Romania (*n* = 378), Serbia (*n* = 276), United Kingdom (*n* = 114) and the United States of America (*n* = 204). The mean age of the participants was 29.08 (SD = 11.30), 64.3% of the sample was represented by female respondents, and 41.3% of the participants were students.

#### 3.2.2.2. Procedure

Data collection took place online in all the included countries. In Columbia, Germany, Greece, Pakistan, Peru, Portugal, Romania, and Serbia, the data collection process was carried out by collaborating university staff or members of research institution, and participants completed the ABS 2 without benefitting from material rewards. Data for the United Kingdom and the United States was collected using Prolific (www.prolific.co) [15 November 2019], an online survey platform that facilitates data collection from participants across the world. Each participant recruited from Prolific was rewarded with £1.25 after the completion of the study. We excluded participants with completion times lower than three minutes.

#### 3.2.2.3. Instruments

##### *3.2.2.3.1. Attitudes and Beliefs Scale-2 (ABS-2)*

The Attitudes and Beliefs Scale-2 (DiGiuseppe, Leaf, Gorman & Robin, 2018) is a self-report questionnaire measuring irrational beliefs as described by REBT (Ellis, 1958) and it comprises 72 items, rated on a 5-point Likert scale, where 0 indicates “strongly disagree” and 4 indicates “strongly agree”. The scale is designed to measure four irrational cognitive processes, namely

demandingness, awfulizing, low frustration tolerance, and self-downing, as well as four types of rational cognitive processes, such as non-demanding preferences, realistic negative evaluations, frustration tolerance, and unconditional self-acceptance. The scale measures the eight cognitive processes across three life domains: (1) achievement, (2) comfort, and (3) approval. The scale has shown excellent construct validity and reliability in previous studies (DiGiuseppe, Leaf, Gorman & Robin, 2018, Macavei, 2006).

**3.2.2.4. Data analysis**

We tested several competing factor structures of the ABS 2 on the total sample, using Confirmatory Factor Analysis (CFA). More specifically, we examined the model fit of three different factor structures described in the introduction section, namely models 2ABG, 4ABG, and 8ABG. We applied the weighted least square mean and variance adjusted (WLSMV) estimation procedure, which is recommended for operating with categorical and ordinal data that display a multivariate non-normal distribution (Muthén & Muthén, 2010). In order to determine the best-fitting model, we examined standard fit indices such as Comparative Fit Index (CFI; Bentler. 1990), Tucker-Lewis Index (TLI; Bentler & Bonett, 1980), Root Mean Square Error Approximation (Browne & Cudeck, 1993), and Standardized Root Mean Square Residual (SRMS; Bentler, 1995) for each model. Following the recommendations of previous studies, we considered a CFI value >.90, together with a TLI value > .90, an RMSEA value <.06, and SRMS value < .8 to indicate an acceptable model fit (Kline, 2015).

After identifying the best fitting model, we proceeded by calculating reliability indices for the total score of the ABS 2 and each of its subscales, using Cronbach's alpha (α; Cronbach, 1951). Next, we calculated the reliability of group-mean ratings for the total score and all the subscales of the questionnaire by using intraclass correlation 2 (ICC2; Bliese, 2000). Following the recommendations of Koo & Li (2016), we considered ICC2 values greater than .90 to indicate excellent reliability.

Subsequently, we performed multigroup confirmatory factor analysis (MGCFA) in order to evaluate configural, metric (week), scalar (strong), and strict (residual) invariance across ten countries. Based on the procedure employed by Rentfrow, Jokela, and Lamb (2015), we compared the factor structure of the ABS 2 in each country with the factor structure of the scale in a group containing the other 9 countries. We conducted a total of 40 invariance tests (10 countries X 4 forms of invariance). Measurement invariance at all levels was conducted using the WLSM estimator and theta parameterization. Following the recommendations of Chen (2007), metric invariance was established based on changes in CFI, RMSEA, and SRMS. Additionally, we reported changes in TLI. We used a criterion of -.01 modification in CFI and TLI, coupled with a change of .015 in RMSEA and a change in SRMS of .030 for weak invariance and of .015 for strong and strict invariance.

We used the IBM SPSS statistical program version 22.0 (IBM, 2013) for computing descriptive statistics, skewness and kurtosis, and Cronbach's alpha. ICC 2 was computed in R version 4.0.5 (R Core Team, 2021) using the 'multilevel' package (Bliese, 2016). CFA and MGCFA were performed in Mplus 8.7. (Muthén & Muthén, 2017).

### 3.2.3. Results

#### 3.2.3.1. Descriptive statistics

The sample consisted of 2354 respondents from 10 countries. All of the countries comprised both a student and a general population, with the exception of Peru which comprised only a general population. The assumption of normality was not met in the current sample, as 15 items displayed Skewness values greater than 1 and lower than -1, while 16 items displayed Kurtosis levels greater than 1 and lower than -1. Skewness and Kurtosis values together with their standard errors are listed for each item of the ABS 2 in the supplementary material Table S1.

#### 3.2.3.2. Confirmatory Factor Analysis

We compared four different factor structures selected based on the findings of previous studies (Hyland, Shelvin, Adamson & Boduszek, 2014; DiGiuseppe, Gorman & Raptis, 2020). Models 2ABG and 8ABG[a] displayed adequate fit indices, with CFI and TLI values greater than .90 and RMSEA and SRMS values lower than .6 and .7, respectively. Model 4ABG displayed inadequate fit indices, with both CFI and TLI values lower than .90. The results indicate that Model 8ABG[a] showed the best model fit. The results for CFA across models can be found in Table 2. In the next step, we examined the loadings of the items on the latent variables for model 8ABG[a]. We found that items 33 and 38 presented negative loadings on the global irrationality factor and item 36 displayed a positive but insignificant loading on the same factor. Moreover, we found errors in determining loadings on the factors for items 9, and 52 in the Colombian sample and for item 54 in the German sample. We opted for the elimination of the six items from the model 8ABG[a]. Two of the excluded items measured demandingness (items 33 and 52), other two items measured realistic negative evaluations (items 36 and 38), one item reflected self-downing (item 9), and finally, one item measured frustration tolerance (item 54). The resulting model, 8ABG[b] comprised 66 items and the results of CFA showed good model fit, with CFA and TLI values greater than .90, a RMSEA value lower than .06 and a SRMS value lower than .08. Results for CFA for all the tested models can be consulted in Table 2 while detailed information about item loadings can be found in supplementary materials, Table S2.

**Table 2.** Results for Confirmatory Factor Analysis.

| MODEL | Chi (df) | CFI | TLI | RMSEA | SRMS |
|---|---|---|---|---|---|
| Model 2ABG | 18702.576* (2697) | .906 | .900 | .054 | .049 |
| Model 4ABG | 19676.874* (2407) | .893 | .886 | .059 | .047 |
| Model 8ABG[a] | 14506.351* (2384) | .925 | .919 | .050 | .042 |
| Model 8ABG[b] | 12590.732* (1985) | .930 | .925 | .051 | .041 |

Note. '*' = result significant at $p < .0001$. Model 8ABG[a] contains all 72 items; Excluded items from model 8ABG[b] = 33, 36, 38, 9, 52, 54.

#### 3.2.3.3. Cronbach's alpha and mean-group reliability

Next, we calculated Cronbach's Alpha and group-mean reliability indices (ICC2) for the ABS 2 and each of its subscales, and the results can be viewed in Table 3

**Table 3.** Results for Cronbach's alpha and group-mean reliability.

| | *N* | *M* | *SD* | *α* | *ICC2* |
|---|---|---|---|---|---|
| Total score | 2079 | 85.948 | 41.461 | .959 | .985 |
| DEM | 2236 | 10.509 | 5.44933 | .778 | .968 |
| AWF | 2231 | 13.247 | 7.80371 | .851 | .941 |
| LFT | 2234 | 14.454 | 7.54030 | .843 | .957 |
| SD | 2235 | 7.004 | 6.88845 | .885 | .968 |
| NDP | 2226 | 11.788 | 7.33982 | .858 | .992 |
| RNE | 2235 | 9.4456 | 5.90154 | .839 | .991 |
| FT | 2243 | 10.4588 | 6.52118 | .860 | .988 |
| UA | 2236 | 9.6252 | 8.62720 | .919 | .994 |

Note. *ICC2* = Intraclass Correlation 2

**3.2.3.4. Measurement invariance**

Results for configural, metric, and scalar invariance for each country are presented in Table 4. Results for the configural model showed that for each country CFI and TLI indicators demonstrated good fit indices (> .90), and RMSEA and SRMS indicators were lower than .06 and .08, respectively. Metric invariance was computed by imposing equal factor loadings in our model and comparing the resulting model against the configural one for each country. Results indicated that changes in CFI, TLI, were above -.01, and RMSEA and SRSM indicators were lower than .015 and .030, respectively, in each country. Scalar invariance was computed by imposing both equal loadings and intercepts and the resulting model was compared against the metric one. The resulting CFI and TLI indices were above -.01, and RMSEA and SRMS indicators were lower than .015 for all countries. Residual invariance was tested by imposing equality constraints on item residuals between the groups while retaining the constraints imposed in the scalar invariance model. As shown in table X, changes in CFI and TLI were above -.01, while RMSEA and SRMS indices were lower than .015 in all groups. These results indicate that the modified ABS 2, comprising 66 items demonstrated measurement invariance across the ten countries included in the analysis.

**Table 4.** Results for configural, metric, scalar, and residual invariance across ten nations.

| Model | $\chi^2$ (df) | CFI | TLI | RMSEA | SRMS | ΔCFI | ΔTLI | ΔRMSEA | ΔSRMS | Decision |
|---|---|---|---|---|---|---|---|---|---|---|
| Columbia | | | | | | | | | | |
| M1: Configural Invariance | 10193.327* (3971) | .962 | .959 | .039 | .044 | - | - | - | - | - |
| M2: Metric Invariance | 446.928* (123) | .969 | .968 | .034 | .051 | .007 | .009 | -.005 | .007 | Accept |
| M3: Scalar Invariance | 788.605* (255) | .969 | .969 | .034 | .051 | .000 | .001 | .000 | .000 | Accept |
| M4: Residual Invariance | 326.009* (66) | .969 | .969 | .034 | .051 | .000 | .000 | .000 | .000 | Accept |
| Germany | | | | | | | | | | |
| M1: Configural Invariance | 11408.544* (3971) | .952 | .948 | .042 | .044 | - | - | - | - | - |
| M2: Metric Invariance | 629.862* (123) | .961 | .959 | .038 | .052 | .009 | .011 | -.004 | .008 | Accept |
| M3: Scalar Invariance | 1463.464* (255) | .958 | .959 | .038 | .053 | -.003 | .000 | .000 | .001 | Accept |
| M4: Residual Invariance | 457.149* (66) | .958 | .959 | .038 | .053 | .000 | .000 | .000 | .000 | Accept |
| Greece | | | | | | | | | | |
| M1: Configural Invariance | 10675.658* (3971) | .950 | .946 | .040 | .046 | - | - | - | - | - |
| M2: Metric Invariance | 431.429* (123) | .961 | .959 | .035 | .051 | .011 | .013 | -.005 | .005 | Accept |
| M3: Scalar Invariance | 1062.369* (255) | .960 | .960 | .035 | .052 | -.001 | .001 | .000 | .001 | Accept |
| M4: Residual Invariance | 336.441* (66) | .960 | .960 | .035 | .052 | .000 | .000 | .000 | .000 | Accept |
| Pakistan | | | | | | | | | | |
| M1: Configural Invariance | 8631.393* (3971) | .970 | .968 | .034 | .046 | - | - | - | - | - |

| Model | $\chi^2$ (df) | CFI | TLI | RMSEA | SRMS | ΔCFI | ΔTLI | ΔRMSEA | ΔSRMS | Decision |
|---|---|---|---|---|---|---|---|---|---|---|
| M2: Metric Invariance | 354.386* (123) | .975 | .974 | .030 | .050 | .005 | .006 | -.004 | .004 | Accept |
| M3: Scalar Invariance | 1083.251* (255) | .974 | .974 | .030 | .051 | -.001 | .000 | .000 | .001 | Accept |
| M4: Residual Invariance | 401.912* (66) | .974 | .974 | .030 | .051 | .000 | .000 | .000 | .000 | Accept |
| Peru | | | | | | | | | | |
| M1: Configural Invariance | 8329.763* (3971) | .969 | .967 | .032 | .046 | - | - | - | - | - |
| M2: Metric Invariance | 297.136* (123) | .976 | .975 | .028 | .050 | .007 | .008 | -.004 | .004 | Accept |
| M3: Scalar Invariance | 575.603* (255) | .976 | .977 | .027 | .050 | .000 | .002 | -.001 | .000 | Accept |
| M4: Residual Invariance | 207.676* (66) | .976 | .977 | .027 | .050 | .000 | .000 | .000 | .000 | Accept |
| Portugal | | | | | | | | | | |
| M1: Configural Invariance | 9844.637* (3971) | .954 | .950 | .038 | .045 | - | - | - | - | - |
| M2: Metric Invariance | 373.007* (123) | .965 | .963 | .032 | .049 | .011 | .013 | -.006 | .004 | Accept |
| M3: Scalar Invariance | 707.536* (255) | .965 | .965 | .032 | .050 | .000 | .002 | .000 | .001 | Accept |
| M4: Residual Invariance | 267.051* (66) | .965 | .965 | .032 | .050 | .000 | .000 | .000 | .000 | Accept |
| Romania | | | | | | | | | | |
| M1: Configural Invariance | 11331.543* (3971) | .950 | .946 | .042 | .044 | - | - | - | - | - |
| M2: Metric Invariance | 583.188* (123) | .957 | .955 | .038 | .051 | .007 | .009 | -.004 | .007 | Accept |
| M3: Scalar Invariance | 1638.305* (255) | .954 | .955 | .039 | .052 | -.003 | .000 | .001 | .001 | Accept |

| Model | $\chi 2$ (df) | CFI | TLI | RMSEA | SRMS | ΔCFI | ΔTLI | ΔRMSEA | ΔSRMS | Decision |
|---|---|---|---|---|---|---|---|---|---|---|
| M4: Residual Invariance | 438.718* (66) | .954 | .955 | .039 | .052 | .000 | .000 | .000 | .000 | Accept |
| Serbia | | | | | | | | | | |
| M1: Configural Invariance | 10870.063* (3971) | .949 | .945 | .041 | .045 | - | - | - | - | - |
| M2: Metric Invariance | 443.306* (123) | .960 | .958 | .036 | .052 | .011 | .013 | -.005 | .007 | Accept |
| M3: Scalar Invariance | 750.605* (255) | .960 | .961 | .035 | .052 | .000 | .003 | -.001 | .000 | Accept |
| M4: Residual Invariance | 345.103* (66) | .960 | .961 | .035 | .052 | .000 | .000 | .000 | .000 | Accept |
| United Kingdom | | | | | | | | | | |
| M1: Configural Invariance | 11201.685* (3971) | .943 | .938 | .042 | .044 | - | - | - | - | - |
| M2: Metric Invariance | 345.504* (123) | .958 | .956 | .035 | .048 | .015 | .018 | -.007 | .004 | Accept |
| M3: Scalar Invariance | 1042.655* (255) | .957 | .957 | .035 | .048 | -.001 | .001 | .000 | .000 | Accept |
| M4: Residual Invariance | 299.622* (66) | .957 | .957 | .035 | .048 | .000 | .000 | .000 | .000 | Accept |
| United States of America | | | | | | | | | | |
| M1: Configural Invariance | 11685.138* (3971) | .936 | .931 | .043 | .043 | - | - | - | - | - |
| M2: Metric Invariance | 357.815* (123) | .956 | .954 | .035 | .047 | .020 | .023 | -.008 | .004 | Accept |
| M3: Scalar Invariance | 665.827* (255) | .956 | .957 | .034 | .047 | .000 | .003 | -.001 | .000 | Accept |
| M4: Residual Invariance | 246.829* (66) | .956 | .957 | .034 | .047 | .000 | .000 | .000 | .000 | Accept |

*Note. N* = 2079; Columbia *n* = 202; Germany *n* = 267*;* Greece *n* = 192*;* Pakistan *n* = 141*;* Peru *n* = 95*;* Portugal *n* = 145*;* Romania *n* = 371*;* Serbia *n* = 238*;* United Kingdom *n* = 224*;* United States of America *n = 204;* '*' = $p \leq .001$

### 3.2.4. Discussions

The first objective of this study was to investigate the factor structure of the ABS 2. In line with previous findings (DiGiuseppe, Gorman & Raptis, 2020) the results indicated that model 8ABG was the best performing model in terms of model fit indices. However, an in-depth analysis of factor loadings revealed that two of the items presented negative loadings on the general factor and one item presented a positive but insignificant loading on the same factor. Moreover, two items presented estimation errors in Colombia, while one additional item presented estimation errors in the German sample. Thus, we opted for the exclusion of six items from the scale. We performed CFA in order to examine the model fit of the ABS 2 scale with 66 items (Model $8ABG^{b}$) and we obtained excellent model fit indicators.

The second and the main objective of the study was to examine the measurement invariance of the ABS 2 across ten nations. Following the methodology employed by Rentfrow, Jokela, and Lamb (2015) we compared the factor structure of each country against the factor structure of all the other countries grouped together. First, we found that the patterns of free loadings of the scale were similar across countries and that the unrestructured structure of the scales was invariant across groups. CFI and TLI values were > .90 in each country, while RMSEA and SRMS values were below .06 and .08, respectively. These results indicate that configural invariance was achieved across the examined countries. Second, we found that the loadings of the items on the latent constructs were similar across groups. After imposing equality constraints on factor loadings, differences in CFI and TLI did not exceed the -.01 threshold in either country, while changes in RMSEA and SRMS indices were lower than .015 and .030, respectively, in each group. These results indicate that weak or metric invariance was achieved across countries. Additionally, we found evidence for strong or scalar invariance. After imposing additional equality constraints on loading intercepts, $\Delta$CFI and $\Delta$TLI values were > - .01, while changes in RMSEA and SRMS were lower than .015. Finally, we further imposed equality constraints on item residuals while retaining the constraints applied to the scalar model in order to test residual invariance. We found that the ABS 2 scale showed residual invariance across the ten countries.

The present study has a series of limitations. First, data collection procedures differed across countries. Data for the United Kingdom and the United States of America, respondents were recruited using the Prolific survey platform, while data for all the other countries were collected online, through university collaborators. The second limitation is related to the exclusion of 6 items from the final model on which we tested measurement invariance. DiGiuseppe, Gorman, and Raptis (2020) found excellent model fit indices on the original version of the ABS 2, with all 72 items loading accurately on the general and the eight specific factors. However, we did not replicate the same results. Although the original scale, comprising 72 items demonstrated good model fit indices, the in-depth analysis of the factor loadings showed that 6 items presented either negative, non-significant loadings on the general factor or estimation errors in two countries. It is not clear whether these results are related to the characteristics of the examined samples or if they accurately capture valid measurement issues of the six items. Future studies should replicate the investigation of the factor loadings of the ABS 2 scale on different samples.

In conclusion, we found strong support for the model fit of the modified version of the ABS 2. Based on the results of the current study, the modified version of the ABS 2 can be used further in cross-cultural studies, either in order to meaningfully compare levels of cognitive vulnerabilities between countries or in order to investigate the association between irrational and rational beliefs and desired outcomes across cultures.

### 3.3. Study 3. Irrational Beliefs at Country Level Functioning: A Cross-Cultural Extension of The Cognitive-Behavioral Model[3]

#### 3.3.1. Introduction

Despite its well-established scientific status in relation to individual functioning, the cognitive-behavioral model has not been investigated enough for its generalizability across various cultures. One of the founders of CBT, A. T. Beck (1999), has postulated almost two decades ago that society/country level aggressive and violent behaviors can be explained by looking at the beliefs held by the members of that society/country. However, this idea has drawn little to no attention of cross-cultural researchers. Based on the individual level CBT model, it can be argued that irrational/dysfunctional beliefs, endorsed by a large number of individuals belonging to a group, could have dysfunctional consequences for that group. For example, a large-scale negative event, such as a financial crisis, will represent a negative life event for a great number of citizens from a country affected by the crisis. If many of these individuals affected by the negative turn of events endorse irrational beliefs then they will likely experience dysfunctional emotions (e.g., anxiety) and behaviors (e.g., protesting behaviors). The larger the number of individuals that express such consequences, the greater the probability that these consequences will be reflected in the economic, social, and health indicators of a country. Beck (1999), for example, explained that aggressive behavior towards people outside a certain group, might be caused by a common irrational/dysfunctional belief of the group members, that the outsiders are bad or evil (in this case a global evaluation). In a similar manner, the residents of a single country might consider that the inhabitants of one of their neighboring states are dangerous and therefore have a hostile attitude which overtime could evolve into a conflict. Moreover, based on group processes documented by social psychology (e.g., conformism to group norms), irrational/dysfunctional beliefs might be spread within the group.

Aggregating psychological characteristics in order to describe a large group or a country is not very common in psychology, however, such an endeavor has been carried out in cross-cultural psychology and has broadened our understanding of many psychological, social, and economic differences between countries or regions within a country. Hence, moving CBT from individual level analysis to country/culture level analysis is rooted in modern cross-cultural research. For example, McCrae and Terracciano (McCrae & Terracciano, 2005) correlated the aggregated scores of personality traits (the average scores for all respondents in a country) with the dimensions of well-known cultural models, such as Schwartz's (Schwartz, 1994) and Hofstede's (Hofstede, 2001) models. They found that the theoretical predictions from the individual level analysis were confirmed by country/culture level analysis, hence, neuroticism was correlated with uncertainty

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[3] This study has been published. The current version represents an abbreviated adaptation of the published manuscript.

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avoidance, both reflecting a form of anxiety and extraversion, openness, and agreeableness were negatively correlated with power distance and positively correlated with individualism. Regarding the associations with the values from Schwartz's model, they found that openness to experiences and agreeableness were both positively correlated to autonomy and egalitarian values and negatively correlated with conservatism. Both these traits, together with extraversion, were positively correlated with economic indicators, namely Gross Domestic Product (GDP) and the Human Development Index (HDI). Rentfrow and his collaborators continued this type of research, but this time they looked at the distribution of personality traits and profiles across the regions of a country. They found that differences in the distribution of the five personality traits in Great Britain were associated with PESH and other indicators (Rentfrow et al., 2015).

Conceptualized in a cross-cultural framework, the role of irrational beliefs in CBT can be examined in two important ways: (1) for its generalizability across various countries/cultures and (2) for its validity at group level (e.g., country/culture level). In the current study, we aim to investigate point 2, namely if irrational beliefs, derived from the CBT/REBT model, are associated with country-level functioning, following the theoretical prediction from individual level analysis. To do so, we looked at the available international databases and searched for measures and items that reflect the rational vs. irrational contrast. We correlated these measures with relevant indicators of country level functioning used in previous research and that can mirror indicators used at individual level in relationship with irrational beliefs. We identified two items reflecting the distinction between rational and irrational beliefs in the 6$^{th}$ wave of the World Values Survey (WVS) (Inglehart et. al., 2014). We proceeded by computing an Irrationality Index for each available country by aggregating the scores of all individual respondents. Similarly, we calculated aggregated scores for indicators of human functioning from the same database such as autonomy, happiness, life satisfaction, cultural values and extracted other country level indicators from other sets of data, such as country-level healthy life expectancy, human development, peacefulness, and state of democracy. Based on data from individual level analysis showing that irrational beliefs affect the functionality of human behaviors, we hypothesize that at country level analysis, irrational beliefs will be inversely related to autonomy, healthy life expectancy, human development, peacefulness, and state of democracy. Also, considering that irrationality is conceptualized in CBT as part of the individual's culture, we expect a negative association between irrationality at country level and the dominant cultural values from Inglehart and Welzel's cultural model, namely secular and emancipative values (Inglehart & Welzel, 2008). Given that at individual level analysis irrational beliefs are not mainly related to the valence of our emotions, the relationship of irrational beliefs with happiness and life satisfaction at country/culture level analysis is investigated only exploratory. Taking into account that we analyze representative samples for each investigated country, this is the most comprehensive study about irrationality and its relationships at country-level analysis.

### 3.3.2. Methods

#### 3.3.2.1. Sample

The sample for this study was composed of $n1 = 60$ countries for which the irrationality measures were available in the 6th wave of the WVS. The total number of subjects for all the countries was $N = 86{,}272$ with an average of $M = 1{,}437.87$ of respondents per country. The age across all countries varied between 16 and 99 years, with an average of $M = 42.09$ years ($SD = 16.57$) and a total ratio of 52.3% female respondents. Additional variables for the same countries were also

extracted from the WVS and were measured on the same subjects. All the questions extracted from the WVS and used in the secondary analysis were addressed in all 60 countries. Additional data came from: the Global Health Observatory data, provided by the World Health Organization ("Global Health Observatory (GHO) data", 2015), where *n*3 = 57 countries were extracted (excepting Palestine, Hong Kong and Taiwan), the United Nations Development Programme (2015), where *n*4 = 59 countries were included in our analysis (except for Taiwan), the Institute for Economics and Peace (2014), where *n*5 = 58 countries were available (with exception of Hong Kong and Palestine) and from The Economist Intelligence Unit (2015), where data was available for all *n6* = 60 countries. As all data was retrieved from publicly available international databases, no ethical approval was required for conducting this study as per institutional regulations.

### 3.3.2.2. Measures

#### *3.3.2.2.1. Measures of irrationality*

For measuring irrationality, we first screened the questions from the 6th wave of WVS and identified four items that had an irrational phrasing. These items were then analyzed by two independent REBT supervisors from Albert Ellis Institute, New York, USA (the original site of the CBT/REBT). The experts had a 100% agreement over the content of these items, and they validated two of the items as reflecting an irrational content. We further used these items as measures of irrationality. The first question was "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" (question V24 in the 6th wave of the WVS), for which respondents were asked to answer by choosing between "Most people can be trusted" and "Need to be very careful". Answering by choosing the second option ("Need to be very careful") was considered to reflect an irrational belief due to its phrasing which suggested the idea of an inflexible demand or need in relation to how much other people can be trusted. For this question, the percentage of individuals that endorsed the irrational answering option was used as the index of irrationality for each of the countries taken into analysis. The second question was extracted from Schwartz's universal values group, where respondents were asked to indicate how much they identify to a fictional third person holding certain values or beliefs. The general instruction for this group of questions was: "Now I will briefly describe some people. Using this card, would you please indicate for each description whether that person is very much like you, like you, somewhat like you, not like you or not at all like you?" The specific question that we used for the present study was phrased as "It is important to this person to always behave properly; to avoid doing anything people would say is wrong" (question V77 in the 6th wave of the WVS). The answer options are coded on a Likert scale from 1 (very much like me) to 7 (not at all like me). A stronger affirmation of the similarity with the fictional person was considered to indicate an endorsement of an irrational belief that an individual should always behave properly, an absolutistic demand, in order to get other people's approval. The Likert scale was reversed so that a higher score indicates a higher level of endorsement of the irrational belief, and the average score of all respondents in a country was considered as the index of irrationality for that country. The two indexes of irrationality were highly inter-correlated, with $r(60) = .73$, $p < .001$, suggesting that both are reflecting the same construct. Given that the two items are highly correlated, we combined them into a single Irrationality Index. All the correlational analysis described below were performed using this index.

#### *3.3.2.2.2. Autonomy*

This variable was measured through the Autonomy Index (AI), extracted from the 6th wave of the WVS. The index is based on four items asking respondents to report whether or not they consider that children should be encouraged to endorse values related to autonomy, namely independence, determination/perseverance, obedience and religious faith (the answers for obedience and religiousness are reversed in the final score). This index is considered to indicate the degree to which one endorses autonomy as a personal value. In the final analysis, we included for each country the average score for all the participants in that country.

#### *3.3.2.2.3. Healthy life expectancy at birth*

Healthy life expectancy (HALE) is a measure conducted by the Global Health Observatory (GHO) ("Global Health Observatory (GHO) data", 2015), a World Health Organization (WHO) project that indicates the average years that a person is expected to live in full health, considering the years lost to disability.

#### *3.3.2.2.4. Human development*

To assess country level development, we used The Human Development Index (HDI) published by United Nations Development Programme (2015). This index includes economic, social and health indicators in order to quantify the development of a country. We included in our analysis the total score for each country as well as the four sub-scores that compose it: 1) gross national income per capita (GPI; in the total score, this indicator is transposed on a logarithmic scale in order to weigh down the relevance of economic differences), educational level and prospect, quantified as 2) average years of schooling of adults and as 3) average expectancy for years of schooling in the case of children reaching school age, and 4) life expectancy, as a health related indicator. Higher scores on the total index and sub-indexes indicates higher development in a given country.

#### *3.3.2.2.5. Country peacefulness*

For quantifying country-level peacefulness we used the Global Peace Index (GPI) reported by the Institute for Economics and Peace (2014). This index is calculated based on 22 qualitative and quantitative indicators of violence, such as the presence of domestic conflicts and involvement in international conflicts (e.g., number of conflicts and deaths from both types of conflicts), objective (e.g., number of homicides) and subjective (perceived criminality) measures of societal safety, and militarization (e.g., yearly military expenditure, imported and exported weaponry). The data for the 22 indicators comes from other international databases, for example, the Uppsala Conflict Data Program from the University of Uppsala, International Institute for Strategic Studies Armed Conflict Database, Stockholm International Peace Research Institute Arms Transfers Database, etc. A lower score on the GPI for a given country indicates higher peacefulness for that country.

#### *3.3.2.2.6. State of democracy*

In order to measure the state of democracy of the countries included in this study, we used data from the Economist Intelligence Unit's Index of Democracy (DI) (The Economist Intelligence Unit, 2015). This index was calculated using 60 indicators rated on a 0 to 10 scale and classified in five categories: (1) electoral process and pluralism, (2) civic freedom, (3) government performance, (4) political engagement, and (5) political culture. The index for each category is

calculated using the sum of all the indicators included in the category, converted to a scale ranging from 0 to 10. The index is obtained by calculating the average scores of the five categories previously listed. Data for measuring the state of democracy was extracted from three major sources: public opinion surveys, such as the World Values Survey, Gallup polls and other national surveys, voter turnout and the legislative power. A higher overall score indicates a higher state of democracy in a certain country.

#### *3.3.2.2.7. Self-reported feeling of happiness*

The measure for happiness was extracted from the 6th wave of the WVS. It was assessed through a single item (V10) for which respondents were asked to rate their overall feeling of happiness on a Likert scale from 1 (very happy) to 4 (not happy at all). For each country, we calculated an average score of all the respondents from that country.

#### *3.3.2.2.8. Self-reported life satisfaction*

The measure for life satisfaction was also extracted from the 6th wave of the WVS. Respondents were asked to answer to a single item (V23) by rating their satisfaction with life on a Likert scale from 1 (completely dissatisfied) to 6 (completely satisfied). We adopted the same strategy as for happiness, and for each country we computed an average score for all the participants in that country.

#### *3.3.2.2.9. Secular and emancipative values*

Data for the two types of values were extracted from the 6th wave of the World Values Survey. To measure the overall score of secular values, the authors used 12 items, grouped into 4 categories, based on which they calculated the distance of individuals from four types of authority: religious (whether respondents consider themselves religious, they value faith and the frequency of attending religious services) patrimonial (whether respondents feel pride of their nationality, consider it important to make their parents proud and think that a greater respect for authority is needed in their countries), state (trust in courts, police and army) and authority of conformity norms (the extent to which respondents' answers are socially desirable). Secular values indicating an increased distance from these areas of authority were called agnosticism (increased distance from religious authority), defiance (increased distance from patrimonial authority), skepticism (increased distance from state authority) and relativism (increased distance from the authority of conformity norms).

### 3.3.3. Results

We performed Pearson's zero order correlations between the Irrationality Index and all other indicators of human functioning. In order to control for Type I error, we applied the Bonferroni correction. A *p* value of .007 was required to reach he significance threshold. Results for the correlations of the irrationality with the main country-level human functioning indicators are presented in Table 1.

**Table 1.** Results for the correlations between irrationality and country-level indicators

| PESH indicators | Irrationality Index | | |
|---|---|---|---|
| | $r^a$ | $p^b$ | $n^c$ |
| Autonomy Index (AI) | -.637* | <.001 | 60 |
| Healthy Life Expectancy at Birth (HALE) | -.457* | <.001 | 57 |
| Human Development Index (HDI) | -.473* | <.001 | 59 |
| Global Peace Index (GPI) | .337 | .010 | 58 |
| Democracy Index (DI) | -.361* | .005 | 60 |
| Happiness | .034 | .797 | 60 |
| Life satisfaction | -.088 | .502 | 60 |

*Note.* * Statistically significant correlation; [a]Pearson correlation; [b]Statistical significance; [c]Number of countries.

Given the human development viewed as economic prosperity and education is strongly related to the endorsement of emancipative and secular values (Welzel, 2013) we performed partial correlations between the irrationality index and these cultural values, controlling for HDI. We also applied Bonferroni correction, setting the significance threshold at .005. The partial correlational analysis showed that irrationality was significantly and negatively associated with both overall secular $r(54) = -.63$, $p < .001$ and emancipative values $r(54) = -.381$, $p = .004$, even when controlling for measures of human development.

### 3.3.4. Discussion

Overall, the results supported the idea that irrational/dysfunctional beliefs are associated with indicators of country-level functioning. As hypothesized, we found negative and significant correlations between the irrationality index and country-level autonomy, healthy life expectancy, human development, and democracy. We did not find any significant association with country peacefulness, contrary to what we expected. The magnitude of these associations was in the medium ($r > .30$) or large interval ($r > .50$). The largest effect size was present for the association between irrationality and Autonomy Index, crossing the $r = .50$ point ($r > .50$).

The association between the Irrationality Index and country peacefulness was insignificant. Several studies showed that anger and aggression at individual level are predicted by a specific

type of irrational beliefs, namely frustration intolerance (Fives, Kong, Fuller & DiGiuseppe, 2011; Vîslă et. al., 2016). In the present study, we only included items that reflect the construct of demandingness, as we did not have the means to measure other forms of irrational beliefs. Future studies should employ a frustration intolerance index as the main predictor of country-level peacefulness.The associations between the Irrationality index and happiness and life satisfaction did not reach the significance threshold. This is not surprising, as irrational beliefs are supposed to be related to functional-dysfunctional dimension of emotions, not to the positive-negative dimension of emotions. Moreover, the CBT/REBT theory generally predicts that irrational / dysfunctional beliefs can lead to positive emotional experiences in the presence of positive life events. As we did not measure the occurrence of various positive and negative events, it is hard to definitively argue that irrationality is not related to happiness and/or life satisfaction. Hence, future studies that investigate the relation between irrationality and happiness/life satisfaction should consider the activating events and the functionality of the generated positive emotions. Irrationality was negatively correlated with overall secular and emancipative values. These results indicate that lower levels of irrationality among the citizens of a country are associated with a higher tendency towards people's disjunction from external sources of authority and their assertion for freedom.

Our study has several limitations. First, its correlational and cross-sectional nature does not allow us to make any causal or temporal predictions about the relationship between irrationality and different indicators of country level functioning. Yet, following the theoretical model of CBT at individual level, we suggested that irrational beliefs might actually have a causal role in relation to these indicators. Future studies should determine if this prediction is accurate. Secondly, an important limitation is the fact that the measures of irrationality that we used in this study were extracted from available databases, namely the WVS, and were not directly built to assess rational and irrational beliefs. In their original forms, the two items that we coded as irrational were designed to measure generalized trust and Schwartz's conformity cultural value. Our choice for these items was based on the correspondence between their content and CBT/REBT theory, based on experts' evaluation and agreement. Finally, the relationship between irrationality and various outcomes at country level analysis should take into account the activating events and the functionality of the outcomes. Moreover, including rational beliefs in such analyses is fundamental.

As a general conclusion, these results support the idea that irrational beliefs endorsed by citizens of a given country may be used to understand several PESH indicators of that country. This study opens the door for a new field of research related to the cross-national applications of the CBT model of human functioning and mental health. Future studies, using dedicated reliable and valid instruments, as well as other research designs, could investigate other relevant indicators of country level functioning and have a more detailed analysis of the role played by irrational/dysfunctional beliefs in explaining these indicators.

### 3.4. Study 4. Irrational Beliefs as a Cognitive Mechanism Explaining the Link Between Pathogen Prevalence and Individualism-Collectivism[4]

#### 3.4.1. Introduction

Although there is a well-established link between pathogen prevalence and the individualism-collectivism cultural dimension, the mechanisms by which pathogens lead to the formation of collectivistic cultures are still unclear for the scientific community. Possible mechanisms include (1) the cultural transmission of attitudes, behavioral patterns, and practices, (2) epigenetic mechanisms which imply that genetic predispositions towards collectivism are more likely to be expressed in highly threatening environments, and (3) differentiated selection of alleles associated with traits and behaviors relevant for the inhibition of pathogen contamination. In this regard, Chiao and Blizinsky (2010) showed that at national level, the frequency of the short (S) allele of the serotonin transporter functional polymorphism (5-HTTLPR), which is associated with higher sensitivity to threat, is a significant mediator of the relation between pathogen prevalence and individualism-collectivism. However, another possible mediator through which historical pathogens might have influenced cultural organization is related to (4) cognitive mechanisms (Murray & Schaller, 2014; Schaller, 2011). From this perspective, empirical studies have indicated that humans possess cognitive mechanisms aimed to reduce chances of pathogen transmission (Fincher et al., 2008). Schaller (2011) proposed the construct of behavioral immune system which refers to the ability of human agents to actively engage in pathogen inhibitory behaviors, firstly by detecting infection risks and consequently by mobilizing cognitive and emotional defense responses. This antipathogen psychological defense system it has shown to be involved in socially relevant behaviors such as outgroup discrimination, ethnocentrism (Navarrete & Fessler, 2006), stigmatization (Park et al., 2007), and mating behaviors (Duncan et al., 2009; Murray et al., 2017).

In accordance with this line of research, we argue that one possible cognitive mechanism through which historical pathogens may have influenced cultural organization is related to irrational beliefs. Irrational cognitions are universally present in our species across cultures, they are learned in our very early developmental stages, and are highly resistant to change (Ellis, 1979, 1987). REBT scholars have argued that the human tendency to engage in distorted thinking processes is due to the evolutionary bases of cognitive development (Pelusi, 2003). Modern research in the genetic field has offered evidence for this clinical insight. Podina et al. (2015) have shown that the activation of irrational beliefs in stressful situations is more frequent in individuals presenting the Catechol-O-methyltransferase val158met polymorphism (Chen et al., 2004). Ellis (1979, 1987) argued that, viewed from an evolutionary perspective, the human tendency to nurture irrational thinking patterns is associated to maladaptive emotional and behavioral consequences in contemporary societies but it may have facilitated survival chances, increased access to resources,

[4] This study has been published. The current version represents an abbreviated adaptation of the published manuscript.
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and enhanced reproductive success in the Environment of Evolutionary Adaptedness (EEA; Barkow et al., 1995).

Given the similar evolutionary explanation for their development, the similar psychological content and the rigidity of both irrational beliefs and many of the cultural attitudes that are specific to collectivistic cultures, we argue that irrational beliefs might be one of the underlying cognitive mechanisms that helped shape this type of cultural configuration. We hypothesize that increased pathogen prevalence shaped information processing tendencies among human populations, reinforcing psychological rigidity, expressed as absolutistic and inflexible demands. Thinking in terms of "must", "should" and "need" may have, in turn, facilitated a cultural organization system characterized by conformity pressure, a stricter psychological separation between ingroup and outgroup individuals, and more rigid social norms regarding deviant behaviors. If irrational beliefs were adaptive in EEA and their frequency has increased as a consequence of their adaptive value, we expect that geopolitical regions that display increased levels of historical existential pressure (quantified as the prevalence of historical pathogens) would comprise more individuals who endorse them. Moreover, we hypothesize that demandingness will mediate the association between pathogen prevalence and individualism-collectivism cultural dimension.

#### 3.4.1.1. Objectives and Hypothesis

The main objective of this study is to investigate whether country-level irrational beliefs could as a mechanism that explains the relationship between the geographical distribution of historical pathogen prevalence and the individualism cultural dimension, both measured at national level. To attain this objective, we will test the following hypothesis:

H1 Country-level pathogen prevalence is positively and significantly associated with country-level aggregated scores of irrational beliefs.

H2 Country-level irrational beliefs is positively and significantly associated with country-level individualism.

H3 Country-level irrational beliefs will mediate the relationship between country-level historical pathogen prevalence and individualism.

### 3.4.2. Methods

#### 3.4.2.1. Sample

The sample used in this study consists of a total of N = 41 countries for which we could compute an irrationality score and had available data on individualism and pathogen prevalence. We excluded from the analysis countries for which we had individualism-collectivism and pathogen prevalence scores but for which we were unable to calculate an irrationality score (which is the focal variable in our study). The 41 countries for which we computed the irrationality index comprised a total of 62,223 individuals. The average number of participants per country was 1,519. The mean age of the sample was 41.64 (SD = 14.78) and 49.84% of the population was represented by female participants. Detailed information regarding the number of participants, mean age and the proportion of female respondents for each country can be found in Table 1.

### 3.4.2.2. Measures

#### *3.4.2.2.1. Pathogen Prevalence*

As an indicator of pathogen prevalence across the 41 countries, we used the 9-item Disease Prevalence Score estimated by Murray and Schaller (2010). The authors rated the historical prevalence of nine infectious diseases in 230 geopolitical regions. The nine diseases included in their study were tuberculosis, leishmanias, schistosomes, trypanosomes, leprosy, malaria, typhus, filariae, and dengue. The prevalence of the nine infectious diseases was estimated based on information retrieved from multiple old epidemiological atlases. For tuberculosis, the authors estimated country-level prevalence based on the Atlas of the World, provided by the National Geographic Society (2005). This source contained information regarding the incidence of tuberculosis for every 100,000 individuals in a geographical area. The prevalence for each region was coded on a three-point scale, where 1 indicated an incidence rate between 3 and 49, 2 indicated an incidence rate between 50 and 99, and 3 indicated an incidence rate of 100 and above. The prevalence the remaining eight diseases was estimated based on two major epidemiological maps, namely the World-Atlas of Epidemic Diseases (Rodenwaldt & Jusatz, 1952–1961) and Global Epidemiology (Simmons et al., 1944). The authors used a 4-point scale to rate the prevalence of the diseases in each country, where 0 indicated the targeted disease was "completely absent or never reported" and 3 indicated that the disease was "present at severe levels or epidemic levels at least once". The resulting scores for each of the nine diseases were summed and standardized in order to compute the historical pathogen prevalence for each region. The resulting index showed good internal reliability (Cronbach's $\alpha = 0.84$) and demonstrated construct validity and reliability in two different studies (Schaller & Murray, 2008; Murray & Schaller, 2010). The authors found a positive correlation between the current index and previous estimations of historical pathogen prevalence ($r = 0.89$) provided by Gangestad and Buss (1993), absolute latitude ($r = -0.80$), and a corresponding index of the contemporary prevalence of pathogens computed based on recent epidemiological data, retrieved from the Global Infectious Disease and Epidemiology Online Network ($r = 0.77$).

#### *3.4.2.2.2. Individualism-Collectivism*

For each country, we used individualism-collectivism scores from Hofstede (2001). We used a country level aggregated score for 41 countries in our dataset. Individualism-collectivism was estimated based on six questions from the IBM Attitude Survey, which asked respondents to rate the importance of six work goals, on a 5-point Likert scale, where 1 indicated "of utmost importance" and 5 indicated "of very little to no importance". Respondents were asked to rate the importance of several attributes of a job, namely personal time, freedom, challenge, training opportunities, physical working conditions and the use skills in work-related activities. Individualism scores were computed at country-level using a mathematical formula described in Hofstede (2001, p. 492), and they ranged between 0 and 100, with higher scores indicating higher levels of individualism. The measurement of country-level individualism was replicated across multiple studies, with results indicating a strong correlation with the original country-level individualism scores (Hofstede et al., 2010; Hoppe, 1990; Shane, 1995; van Nimwegen, 2002).

#### *3.4.2.2.3. Irrationality Index*

We computed an estimation of country-level irrational beliefs, using the methodology described by Bartucz and David (2019). The irrationality index comprised two items derived from the World Values Survey (Inglehart et al., 2014) that contained irrational formulations in the form of demandingness. The first item was "Generally speaking, would you say that most people can be

trusted or that you need to be very careful in dealing with people?" The respondents had three response options: "Most people can be trusted", "Need to be very careful" and "Don't know". We indexed as country level irrationality the percentage of people that responded by choosing the option that contained the word "need" which is in line with formulating absolutistic and unconditional needs and demands. The second item was "It is important to this person to always behave properly; to avoid doing anything people would say is wrong". Respondents had to indicate how much they identify with this description on a 7-points Likert scale. This item was considered to be irrational as it reflects a general and inflexible rule about one's behavior (i.e., "always"), which is also a core characteristic of irrational beliefs. As an indicator of country level irrationality, we used the mean value of the responses for each country. The two items were retrieved from the 5th wave of WVS for 8 countries and from the 6th wave for 33 countries (see Table 1). We combined the two items calculating their mean z score for each country as a single index of irrationality. In addition, we rescaled the scores so that the range of scores varied between 0 and 100.

### 3.4.3. Results

As a first step, we analyzed the association between the irrationality index, individualism, and pathogen prevalence. As presented in Table 2, countries that endorse higher levels of irrational beliefs are significantly more likely to have lower levels of individualism and pathogen prevalence. Furthermore, collectivistic countries are significantly more likely to report higher levels of pathogens. The magnitude of the association between all the variables are in the large interval ($r > 0.50$). The largest effect size was found between individualism and pathogen prevalence ($r = -0.74$).

**Table 2.** Pearson *r* correlations between pathogen prevalence, individualism – collectivism and irrationality index (N = 41)

| Variables | 1 | 2 | 3 |
|---|---|---|---|
| 1. Pathogen prevalence | - | | |
| 2. Individualism | -.74** | - | |
| 3. Irrationality index | .58** | -.64** | - |

**. Correlation is significant at the 0.01 level (2 tailed).

*. Correlation is significant at the 0.05 level (2 tailed).

Next, in order to test our mediation model using the causal inference approach (Baron & Kenny, 1986), we performed a regression analysis where we included both pathogen prevalence and the irrationality index as predictors of individualism-collectivism. As presented in Table 3, the association between pathogen prevalence and individualism-collectivism cultural dimension is still significant ($\beta = -0.55$, $p \leq 0.001$) when we add the irrationality index to the model. However, irrationality remains a significant predictor ($\beta = -32$, $p = 0.014$). Thus, the irrationality index partially mediated the relationship between pathogen prevalence and individualism collectivism (Fig. 1).

**Table 3.** Results for the multiple regression analysis between irrationality, individualism – collectivism and pathogen prevalence.

| Independent variables | Individualism | | | |
|---|---|---|---|---|
| | *β* | *t* | df | *p* |
| Pathogen prevalence | -.55 | -4.41 | 39 | <.001 |
| Irrational beliefs | -.32 | -2.59 | 39 | .014 |

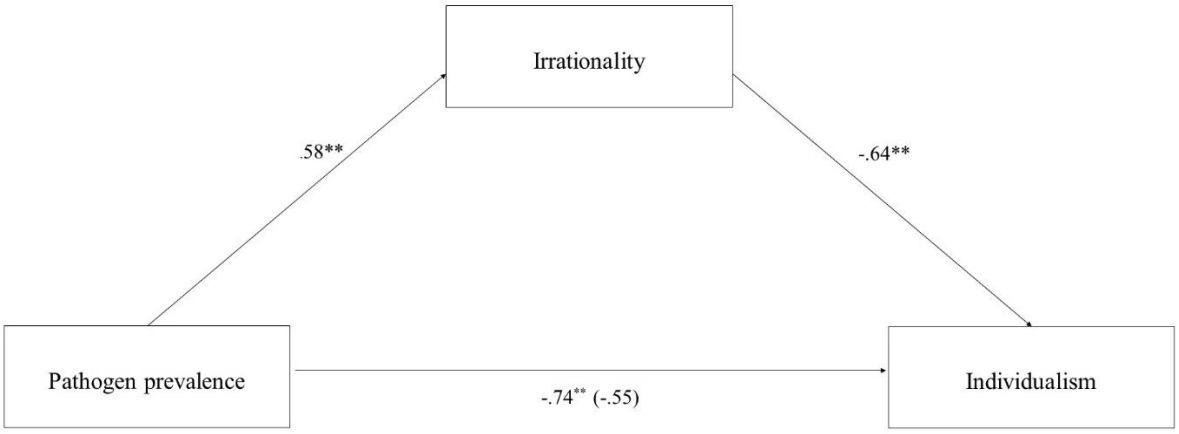


*Fig 1.* Standardized regression coefficients for the relationship between country level pathogen prevalence and individualism as mediated by irrationality. The standardised regression coefficient between pathogen prevalence and individualism controlling for irrationality is indicated in parentheses. *Note.* ** p < .001

In order to test the statistical significance of the indirect effect of pathogen prevalence on individualism we also performed a bootstrap mediation analysis using the PROCESS macro developed by Hayes (2013). The indirect effect of pathogen prevalence on individualism and the 95% confidence intervals (CI) were estimated based on 10,000 resamples. The average bootstrapped unstandardized indirect effect was − 0.07 (SE = 0.28), and the 95% bootstrap CI was [− 0.13, – 0.02], which did not include 0. Hence, the indirect effect was statistically significant.

**3.4.4. Discussions**

Our results provide empirical validation for the mediating effect of cognitive mechanisms in the relation between pathogen prevalence and collectivism. The historical prevalence of disease-causing pathogens significantly predicted country-level irrational beliefs, which partially mediated the association between pathogen prevalence and individualism-collectivism cultural dimension. These results point to the following pathway in evolution: given that the geographical variation in irrationality is predicted by geographical differences in pathogen prevalence, we infer that prolonged exposure to increased prevalence of disease-causing pathogens has reinforced rigid and inflexible information processing strategies among human populations. In line with the behavioral immune system theory (Schaller, 2011), we argue that this kind of cognitive mechanism has

evolved as an anti-pathogen defense function. In turn, this psychological characteristic had partially shaped the cultural configuration of human groups, contributing to the formation of the more rigid collectivistic values, social norms, and practices. Although a causal pathway was inferred in our reasoning about these variables, one should be cautious in following this type of interpretation, as our data is correlational.

Within the REBT framework, distorted information processing can be described in terms of irrational beliefs, such as demandingness, awfulizing, low frustration tolerance and global evaluations of self, other and life. However, the irrational beliefs that we measured in the study reflect demandingness in relation to social relations and social norms of behaviors. Analyzing the content of the specific items, the idea that one needs to be careful in dealing with other people suggests an absolutistic demand which urges individuals to exhibit distrust in relation to other members of the species. As previous research shows, low levels of social trust, especially oriented towards out-group individuals, is part of the collectivistic cultural syndrome (Van Hoorn, 2015). It may have been the case that holding such an inflexible belief regarding the interaction with other individuals have provided an adaptive advantage in the struggle of competing for resources and mating success in the EEA. Moreover, having an increased level of distrust towards out-group individuals and manifesting vigilance in relation to them may have promoted safety within the group.

The second item („It is important to this person to always behave properly; to avoid doing anything people would say is wrong") is related to social conformity, reflecting an inflexible demand towards oneself to always manifest socially acceptable behaviors in order to avoid negative judgement from others. This might suggest the idea that individuals living in harsh environments had to develop psychological and cultural mechanisms, which pushed them to value and to pursue inclusion in their social group in order to have better chances of survival. Indeed, the potentially harmful consequences of social exclusion are deeply hardwired in the human brain, with neuroimaging studies showing that being ostracized activates the same neural mechanisms as experiencing physical pain (Eisenberg & Lieberman, 2004).

One major limitation of this study is related to the measurement of irrational beliefs. The two items derived from the WVS were not purposely designed to measure this construct. However, there is still no available data on irrational beliefs across multiple cultures based on validated and reliable instruments. These items are also used to measure other country-level cultural characteristics, namely generalized trust in the case of the first item (Letki & Evans, 2005), while the second is used to measure conformity within Schwartz's cultural values taxonomy (Schwartz, 2012). Although we used expert's decision in considering these two items as also reflecting irrational beliefs (i.e., rigid/inflexible thinking), future studies should use more complex and specific measures about irrational beliefs.

In conclusion, clinical theories such as the REBT model can be successfully integrated within evolutionary and cross-cultural approaches in order to offer a better understanding of the cognitive mechanisms involved in the process of cultural development. We have offered a specific example of the interaction between environment, culture, and such a psychological mechanism, by pointing that irrational beliefs towards social relations and social norms, in the forms of absolutistic demands, have developed as a response to threatening environments and they subsequently contribute to the formation of collectivistic cultures.

## 3.5. Study 5. The Protective Effect of Culture on Depression During Covid-19 Pandemic: A Romanian National Study[5]

### 3.5.1. Introduction

The rise of the COVID-19 pandemic in 2020 has been a significant source of burden across nations and has raised serious concerns regarding its short and long-term consequences on individuals' physical and mental health status. As a systematic review published by Santomauro et al. (2021) showed, the emergence of the pandemic led to an increase in the prevalence of major depressive disorder and anxiety disorders across countries, with a 27.6% global increment of depressive symptoms and a 25.6% increment of anxiety-related symptoms worldwide. Other reviews suggest somewhat a lower impact (Robinson, Sutin, Daly & Jones, 2022); however, the results converge on the idea that the impact was most intense during the debut of the pandemic when many countries imposed strict lockdowns.

Even though the presence of adverse life events is an important factor that must be taken into consideration when examining mental health disorders, our current understanding of psychological suffering in humans states that emotional reactions to a stressor are not directly caused by the stressor itself but rather by the transaction between the demands imposed by the stressor and the motivation and the resources of the individual, in the form automatic and involuntary cognitive appraisal (Lazarus, 1966). The cognitive-mediation theory of Lazarus received overwhelming scientifical support, and it's placed at the heart of Cognitive Behavior Therapy (CBT; Beck, 1976; Beck & Beck 1995), a family of psychological interventions that share this cognitive mediation hypothesis. One such particular type of intervention is Rational-Emotive and Behavioral Therapy (REBT; Ellis, 1962). According to the REBT model, depressive symptoms are generated by the interaction between negative life events (activating events) and psychological vulnerabilities in the form of irrational beliefs (David, Lynn & Ellis, 2010).

Moving from the individual to the cultural level of analysis, previous studies found that the prevalence of mood disorders varies across cultures, with high and middle-income countries systematically displaying a higher prevalence of depressive disorders compared to low-income nations (Ferrari et al., 2012; Lim et al., 2017). Given this pattern of results, several authors argued that the geographical variation in the prevalence of depressive disorders might reflect the cross-national variations of the individualism-collectivism cultural dimension (Hofstede, 1984), with depressive disorders being more prevalent among individualistic nations (Chiao & Blizinsky, 2010; Li, Wei, Palanivel & Jackson, 2021). Furthermore, a number of studies found that, although collectivism negatively predicts the prevalence of depressive disorders, the populations living in collectivistic societies present higher rates of both biological and psychological vulnerabilities towards mood disorders, such as depression or anxiety (Bartucz & David, 2019; Beshai, Dobson & Adel, 2012; Beshai, Dobson, Adel & Hanna, 2016; Chiao & Blizinsky, 2009; David, Matu,

[5] This study was accepted for publication. The current version represents an abbreviated adaptation of the published manuscript.
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David & Terracciano 2017). For biological vulnerabilities, Chiao & Blizinsky (2009) found a lower prevalence of mood disorders among populations where genotypes that are more vulnerable to emotional problems were more frequent, and this was explained by a higher country-level score on the collectivism dimension for the vulnerable populations. It seems that collectivism also influences the relationship between psychological vulnerabilities and mood disorders. A recent meta-analysis investigated if healthy and clinically depressed samples display greater differences in levels of cognitive vulnerabilities in collectivistic cultures compared to individualistic ones (Bartucz, David & Matu, 2022). The results indicated that relevant cognitions from the CBT model, such as negative automatic thoughts, dysfunctional attitudes, and maladaptive schemas, had significantly less discriminative power between healthy and depressed samples in nations characterized by high levels of collectivism compared to those with an individualistic profile. These results suggest that the individualism-collectivism cultural dimension plays a moderating role in the relationship between cognitive vulnerabilities and depression, indicating that collectivism might protect vulnerable individuals from developing depression. The meta-analysis did not find the same effect in the case of irrational cognitions; however, the authors cast doubt on the validity of this result, given that the number of included studies that measured these particular types of cognitions was insufficient to draw a meaningful conclusion ($k = 7$).

Currently, one of the most widespread theoretical explanations for the protective effect of collectivism is related to the fact that the availability of social support from ingroup members, characteristic of collectivistic societies, protects individuals from developing emotional disorders (Way & Lieberman, 2010). However, although at the individual level, social support is a protective factor against the onset and maintenance of emotional disorders (Cohen & Wills, 1985; Lakey & Cohen, 2000), it has not yet been demonstrated that social support is the mechanism through which collectivistic cultures offer protection to vulnerable individuals. Moreover, several studies comparing support seeking behaviors between individualistic and collectivistic cultures have shown that subjects with a collectivistic cultural background are less prone to seek support, feel high levels of stress when asking for help, and hold significantly more negative attitudes towards individuals who solicit social support compared to individuals belonging to individualistic cultures (Taylor, Sherman, Kim, Jarcho, Takagi & Dunagan, 2004; Kim, Sherman, Ko & Taylor, 2008). It is important to note that the studies mentioned above examined cultural differences in explicit social support seeking, defined as the direct request for some form of assistance from the social networks of the individual. Explicit social support involves asking overtly for instrumental help, advice, or emotional support. More research shows that this form of social support is more common among individuals from individualistic cultures (Kim, Sherman, Ko & Taylor, 2008). Several studies have shown that people with a collectivistic cultural background use social support as a coping mechanism in stressful situations in a culturally appropriate way (Taylor, Welch, Kim, & Sherman, 2007). Since the explicit request for social support can cause the destabilization of social harmony, individuals in collectivistic environments were found to seek predominantly an implicit type of social support. Implicit social support refers to the emotional comfort that can be obtained from social networks without directly revealing and discussing personal issues (Taylor, Welch, Kim & Sherman, 2007).

Our first objective is to test the general REBT hypothesis in the unique context generated by the COVID-19 pandemic, namely that cognitive vulnerability in terms of irrational beliefs is associated with depressive symptoms. We will investigate this relationship on a large sample that reported irrational beliefs and depressive symptoms during the lockdown period within the

Romanian territory. The second objective is to determine whether the geographical variation in regional/county-level individualism-collectivism, measured in the Romanian population before the COVID-19 pandemic, is associated with depressive symptoms. Moreover, we want to investigate whether county-level collectivism acts as a moderator in the relationship between irrational beliefs and depressive symptoms. The last objective of this study is to determine whether the association between individualism and depressive symptoms is mediated by implicit and/or explicit social support. To reach these objectives, we will test the following hypotheses:

H1: Individual-level irrationality will be positively associated with individual-level depressive symptoms.

H2: County-level collectivism will be negatively associated with depressive symptoms.

H3: County-level collectivism will moderate the relationship between individual-level irrationality and individual-level depressive symptoms, meaning that for higher levels of collectivism, the relationship between irrationality and depressive symptoms will be weaker.

H4: The relationship between county-level collectivism and individual-level depressive symptoms is mediated by individual-level implicit social support and explicit social support.

### 3.5.2. Methods

#### 3.5.2.1. Sample and procedure

*Sample 1.* Data regarding the individualism-collectivism cultural dimension in Romania was collected between 9th November 2019 and 16th February 2020. The data was collected as part of a large national research project which aimed at mapping regional differences in the Romanian territory in terms of cultural dimensions and other psychological and social constructs. The objectives for which this data was collected were not affected by the COVID-19 pandemic, as the data collection process terminated before the rise of the pandemic in Romania. Data regarding the individualism-collectivism cultural dimension was not published in previous scientific papers. The data was collected in collaboration with Mercury Research (https://www.mercury.ro/), an independent market research company, together with CCSAS (http://www.ccsas.ro/), a research institute in the field of social research and marketing studies, using the Computer-Assisted Personal Interviewing (CAPI) methodology. The interviewers addressed all the questions and recorded the participant's answers on a tablet. Participants were recruited using the random route sampling method (Bauer, 2016), and they were stratified according to their development region, based on the standard territorial subdivision established by the Nomenclature of Territorial Units for Statistics (NUTS) codes for Romania. Stratification was based on NUTS 2 (8 development regions). Participants did not receive any material compensation following the completion of the survey. This sample comprised $n$ = 2882 individuals with a mean age of 43.73 (SD = 16.32), out of which female respondents represented 53.2%, and 94.2% of participants reported having Romanian ethnicity. Few participants reported having Hungarian (3.7%), German (.03%), and Roma (1.5%) ethnicities. Just 0.6% of the respondents reported another ethnicity, such as Arab, Bulgarian, Moldavian, Russian, Serbian, and Ukrainian. For analysis rationale, we created a variable re-coded ethnicity as a variable with two categories, namely Romanian and others. Regarding education, 18.3% of the respondents reported following ten years of education or less, 57.0% reported 12 years of education (equivalent to graduating high school), and 24.5% reported 15 years of education or more (equivalent to graduating from a bachelor program). Regarding income, 24.4% of the participants reported having low incomes, 66.7% reported medium revenues,

and 24.4% reported earning high incomes. Following the recommendations of Hofstede & Minkov (2013), individualism scores were computed at the group level. We grouped respondents within 42 regions reflecting the counties in Romania and the Municipality of Bucharest (NUTS 3). This has been the administrative structure of Romanian governance over the last 50 years. According to the authors (Hofstede & Minkov, 2013), the ideal sample size that can be used for aggregating individualism scores is 50, while aggregation should not take place based on sample sizes smaller than 20. For three counties (Calarasi, Olt, and Teleorman), the number of participants was insufficient in order to compute aggregated individualism scores ($n < 20$) thus, we approximated their level of individualism by calculating the mean scores of their neighboring counties.

*Sample 2.* Data regarding irrational beliefs, depressive symptoms, and social support were collected during the COVID -19 pandemic. All data were collected online, between 16th March and 14th May 2021, which coincides with the lock-down period on the Romanian territory. Participants in this sample were recruited via social media platforms. For this purpose, we carried out an online advertising campaign, targeting adult individuals from all 41 counties and the Municipality of Bucharest. Respondents had to fill out a consent form before participating in the study, and they received an automated psychological report based on their answers after completing the questionnaires. Participants did not receive any material compensation following the completion of the survey. The survey was available in Romanian and Hungarian languages. This sample consisted of 5310 participants recruited online. The mean age of the participants was 34.10 (SD = 12.60), 72.3% of the sample were represented by female respondents, and 94.4% of the participants declared having Romania ethnicity. Other respondents reported having Hungarian (4.5%), German (0.3%), and Roma (0.3%) ethnicities. Just 0.5% of the respondents reported having other ethnicities (i.e., Armenian, British, Hebrew, Moldavian, Russian, Slovenian, Ukrainian, and Turkish). Ethnicity was again recoded into a variable with just two categories, namely Romanian and other. Most respondents (59.7%) reported having 15 years of education or more, while 36.2% and 4.1% reported having 12 years and ten or fewer years of education, respectively. A total of 14.4% of the participants declared having low incomes, 68.8% reported medium incomes, while 17.0% reported high incomes.

#### 3.5.2.2. Instruments

*Individualism-collectivism.* To measure county-level individualism-collectivism, we used the individualism subscale from Value Survey Module 13 (VSM - 13; Hofstede & Minkov, 2013). The subscale included four items, measuring how important are specific characteristics in an ideal job. More specifically, respondents were asked to rate the importance of free personal time, engaging in exciting work, having job security, and having a respected job. The items were rated on a 5-point Likert scale where 1 indicated that a characteristic is "of utmost importance" and 5 indicated that a characteristic is "of very little or no importance." County-level scores were estimated using the index formula provided by the authors (Hofstede & Minkov, 2013). The index scores can usually range between 0 and 100, where 0 indicates high collectivism, whereas 100 indicates a high level of individualism. For the purpose of this study, we inverted the individualism-collectivism sores so that a score of 0 reflects high individualism and a score of 100 reflects high collectivism. Previous studies obtained acceptable reliability indices for the individualism-collectivism subscale ($\alpha$=.77; Hofstede, 1980).

*Irrational cognitions.* We measured irrational beliefs with the Attitudes and Beliefs Scale – Short Version (ABS – SV), an abbreviated adaptation of the Attitudes and Beliefs Scale (DiGiuseppe, Leaf, Gorman & Robin, 2018). The advantage of this scale is that it doesn't measure irrational

cognitions related to predefined life domains or situations but allows researchers to evaluate these cognitions in situations or conditions of interest. For the purpose of this study, we specifically asked participants to indicate to what extent they endorse a series of personal attitudes related to the COVID-19 pandemic. The questionnaire comprises eight items measuring irrational and rational beliefs, as conceptualized by the REBT framework. For this study, we used the irrationality subscale, which contained four items measuring irrational cognitions related to the pandemic, on a 5-point Likert scale, where 0 indicated strong disagreement with the content of the items, while 4 indicated strong agreement. The scale evaluated demandingness, awfulizing, low frustration tolerance, and negative global evaluation of the self.

*Depressive symptoms*. We evaluated depressive symptoms using the depression subscale of the Depression, Anxiety and Stress Scale (DASS 21; Lovibond & Lovibond, 1995). The subscale consisted of 7 items, rated on a 4-point Likert scale, ranging from 0 ("did not apply to me at all") to 3 ("applied to me very much or most of the time"). The scale demonstrated internal (Clara, Cox & Enns, 2001) and convergent validity (Daza, Novy, Stanley & Averill, 2002) and a good reliability of the depression subscale in the Romanian population (α=.88; Zanon et al., 2021).

*Explicit and implicit social support*. Perceived social support was measured with the Modified Social Support Survey (MOS SSS; Sherbourne & Stewart, 1991). The scale consists of 18 items evaluating to what extent respondents received various forms of social support in the last month. The items are rated on a 5-point Likert scale, where 1 indicates "none of the time" and 5 indicates "all the time." The questionnaire measures four types of social support: tangible (the perceived availability of someone who will assist the respondent with concrete actions, such as helping out with chores, preparing meals, or taking the respondent to the doctor in case of sickness), emotional/informational (the perceived availability of someone who will assist the respondent by listening to their problems and landing advice), affectionate (the perceived availability of someone who will assist the respondent by displaying loving and affectionate behaviors), and positive social interaction (the perceived availability of someone with whom the respondent can spend time and engage in pleasant or relaxing activities). The scale presents good reliability (α < .91; Sherbourne & Stewart, 1991), and its psychometric proprieties were demonstrated across multiple samples and cultures (Din, Adnan & Minhat, 2020; Giangrasso & Casale, 2014). Following the example of Yang, Leu, Simoni, Chen, Shiu & Zhao (2015), we considered the tangible and emotional/informational support subscales as reflecting explicit social support and conceptualized the affectionate support and positive interaction subscales as implicit types of support.

**3.5.2.3. Data analysis**

First, we performed descriptive statistics for each variable included in the study. We proceeded by investigating configural, metric, and scalar invariance across 41 counties and the municipality of Bucharest by performing Multigroup Confirmatory Factor Analysis (MGCFA) following the foreword method (Dimitrov, 2010). Next, we investigated the reliability of each scale or subscale included in the study by estimating Alpha Cronbach, and we performed zero-order correlations between all the individual-level variables included in the study. Multilevel regression analysis was used to investigate the relationship between county-level individualism, individual-level irrational beliefs, and depressive symptoms, controlling for demographic variables such as gender, income, education, and age. The decision to include demographic control variables in the mixed model analysis was based on three main factors. First, sample one is a convenience sample, and its demographic characteristics are not representative of the general population of the counties included in the analysis. Second, the above-mentioned demographic variables were previously

related to our outcome variable, namely depression. For example, gender and age have been shown to be associated with depressive symptoms, with depression prevalence and burden being higher among female and young populations (Salk, Hyde & Abramson, 2017). Moreover, depressive symptoms were shown to be more prevalent among individuals with lower levels of socioeconomic status (Lorant, Deliege, Robert, Philippot & Ansseau, 2003) and fewer years of education (Chang-Quan, Zheng-Rong, Yong-Hong, Yi-Zhou & Qing-Xiu, 2010). Third, we selected control variables based on the examination of their association with our outcome variable, namely depressive symptoms, across our sample. The cross-level interaction implied by H3 was also tested using multilevel regression (linear mixed models). We considered a fixed intercept and fixed slopes for the predictors and a variance (random component) of the intercept across counties. We used Bayesian Information Criterion (BIC) parsimony indicator to check if adding the random component improves the model. Finally, we tested a multilevel 2-1-1 mediation model using structural equation modeling (SEM; Preacher, Zhang, & Zyphur, 2011) with county-level individualism as the independent variable, implicit and explicit social support as parallel mediators, and depressive symptoms as the dependent variable. EFA, Cronbach Alpha, Pearson correlations, and multi-level regression analyses were performed in SPSS 27 (IBM, 2013), MGCFA was performed using AMOS 27, and the multi-level 2-1-1 mediation model was tested in Mplus 8.6 (Muthén & Muthén, 2017).

### 3.5.3. Results

#### 3.5.3.2. Measurement invariance across counties

We performed multigroup CFA for each scale or subscales included in the analysis and measured individual-level variables. We tested configural, metric (week), and scalar (strong) invariance across 41 counties and the municipality of Bucharest. For MOS SSS, the model that we tested was a solution comprising four-level 1 latent factors (the original factors) grouped in second order 2 latent factors (implicit and explicit social support). The results for MGCFA can be found in Table 2.

**Table 2.** Results for configural, metric and scalar invariance across 41 Romanian Counties and the Municipality of Bucharest

| Model | $\chi 2$ (df) | CFI | RMSEA | ΔCFI | ΔRMSEA | Decision |
|---|---|---|---|---|---|---|
| Attitudes and Beliefs Scale (SV) – Irrationality Subscale | | | | | | |
| M1: Configural Invariance | 47.120 (42) | .999 | .005 | - | - | - |
| M2: Metric Invariance | 217.711** (165) | .989 | .008 | .010 | .008 | Reject |
| M2a: Partial Metric Invariance | 159.397* (124) | .992 | .007 | .007 | .002 | Accept |
| M3: Scalar Invariance | 489.321** (287) | .957 | .012 | .035 | .005 | Reject |
| M4: Partial Scalar Invariance | 283.321** (205) | .983 | .009 | .009 | .002 | Accept |
| Depression, Anxiety and Stress Scale 21 - Depression Subscale | | | | | | |
| M1: Configural Invariance | 954.892** (420) | .971 | .016 | - | - | - |

| Model | $\chi 2$ (df) | CFI | RMSEA | ΔCFI | ΔRMSEA | Decision |
|---|---|---|---|---|---|---|
| M2: Metric Invariance | 1360.288** (666) | .963 | .014 | .008 | .002 | Accept |
| M3: Scalar Invariance | 1800.052** (952) | 955 | .013 | .008 | .003 | Accept |
| Modified Social Support Survey | | | | | | |
| M1: Configural Invariance | 12837.512** (5418) | .916 | .015 | - | - | - |
| M2: Metric Invariance | 13642.104** (6074) | .915 | .015 | .001 | .000 | Accept |
| M2a: Scalar Invariance | 14528.605** (6812) | .913 | .015 | .002 | .000 | Accept |

*Note. N* = 5310; group 1 *n* = 101 ; group 2 *n* = 100*;* group 3 *n* = 91*;* group 4 *n* = 124*;* group 5 *n* = 119*;* group 6 *n* = 89*;* group 7 *n* = 91*;* group 8 *n* = 129*;* group 9 *n* = 99*;* group 10 *n* = 727*;* group 11 *n* = 95*;* group 12 *n* = 65*;* group 13 *n* = 135*;* group 14 *n* = 381*;* group 15 *n* = 152*;* group 16 *n* = 61*;* group 17 *n* = 96*;* group 18 *n* = 71*;* group 19 *n* = 141*;* group 20 *n* = 69*;* group 21 *n* = 100*;* group 22 *n* = 74*;* group 23 *n* = 68*;* group 24 *n* = 73*;* group 25 *n* = 117*;* group 26 *n* = 106*;* group 27 *n* = 127*;* group 28 *n* = 76*;* group 29 *n* = 144*;* group 30 *n* = 110*;* group 31 *n* = 81*;* group 32 *n* = 163*;* group 33 *n* = 95*;* group 34 *n* = 106*;* group 35 *n* = 142*;* group 36 *n* = 196*;* group 37 *n* = 64*;* group 38 *n* = 120*;* group 39 *n* = 94*;* group 40 *n* =44*;* group 41 *n* = 126*;* group 42 *n* = 88.

* $p < .05$. ** $p \leq .001$

**3.5.3.3. Descriptive statistics and correlation analysis**

Descriptive statistics of the main individual-level variables included in the study, as well as reliability indices and the results for individual-level correlation analyses, are presented in Table 3. The alpha Cronbach estimates indicated excellent reliability for implicit (α = .92) and explicit (α = .94) social support subscales, and good reliability for depression (α = .86). We obtained a Cronbach alpha value of .68 for the irrationality subscale.

**Table 3.** Descriptive statistics and correlations at individual-level analysis

| Variable | N | M | SD | α | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|
| 1. Irrational cognitions | 5310 | 7.88 | 3.19 | .684 | - | | | |
| 2. Depression | 5310 | 4.96 | 4.41 | .857 | .360** | - | | |
| 3. Implicit support | 5310 | 23.93 | 5.72 | .922 | -.054** | -.361** | - | |
| 4. Explicit support | 5310 | 47.58 | 10.13 | .938 | -.058** | -.307** | .815** | - |

*Note.* * $p < .05$. ** $p \leq .001$

### 3.5.3.4. Multilevel regression analyses

We build a multiple regression model of depression regressed to demographics, irrational beliefs, county-level collectivism, and the interaction between the former two variables. Results for the final regression model are presented below in Table 4.

**Table 4.** Multilevel regression analysis results using depression as the criterion

| | | | | | | | 95% CI | |
|---|---|---|---|---|---|---|---|---|
| Parameter | *b* | SE | *β* | *t* | *df* | *p* | LL | UL |
| (Intercept) | 3.842 | .170 | - | 22.545 | 953 | <.001 | 3.508 | 4.177 |
| Gender | | | | | | | | |
| Female | .249 | .124 | .025 | 2.012 | 5124 | .004 | .006 | .492 |
| Male (ref) | - | - | - | - | - | - | - | - |
| Education | | | | | | | | |
| Low | .712 | .295 | .032 | 2.412 | 5127 | .016 | .133 | 1.291 |
| Medium | .499 | .124 | .054 | 4.022 | 4562 | <.001 | .256 | .743 |
| High (ref) | - | - | - | - | - | | - | - |
| Income | | | | | | | | |
| Low | 1.750 | .201 | .139 | 8.732 | 5170 | <.001 | 1.357 | 2.143 |
| Medium | .570 | .149 | .060 | 3.831 | 5173 | <.001 | .278 | .862 |
| High (ref) | - | - | - | - | - | | - | - |
| Age | -.067 | .005 | -.192 | -14.326 | 4077 | <.001 | -.076 | -.058 |
| Irrational cognitions | .474 | .018 | .342 | 25.892 | 5087 | <.001 | .438 | .510 |
| Collectivism | -.032 | .006 | -.069 | -5.017 | 23 | <.001 | -.045 | -.019 |
| Irrational cognitions*Collectivism | -.004 | .002 | -.028 | -2.066 | 5078 | .039 | -.008 | -.000 |

*Note.* method = REML; *b* = unstandardized estimates. *β* was calculated based on the formula indicated by Hox, Moerbeek, & Van de Schoot (2010).

### 3.5.3.5. Multilevel mediation analysis

Given that individualism-collectivism is a level 2 variable, its indirect effect on depression can also be considered at level 2 (Preacher, Zyphur, & Zhang, 2010). To obtain the asymmetric confidence intervals of the indirect effects, we estimated the model using Bayes estimator (Fang, Wen, & Hau, 2019) with no priors and various numbers of iterations (20,000 or more). The results for the SEM model indicated that the confidence intervals for the difference between the observed and the replicated chi-square values did include 0 (95% CI [-18.795; 21.572]) and that the posterior predictive p-value was $p = .451$, which suggests that the model has an adequate fit. Looking at the individual coefficients in the model, neither explicit nor implicit types of social support mediated the relationship between collectivism and depressive symptoms (see Fig 1; unstandardized coefficients are reported in the text, and standardized coefficients are reported in Figure 1). The between-county indirect effects of collectivism on depressive symptoms, via explicit, $b = -.003$, 95%CI [-.121; .076], and implicit social support, $b = .001$, 95%CI [-.180; .140], were not significant. Collectivism had a significant negative between-county effect on explicit social support, $b = -.043$, 95%CI [-.074; -.012]. Both explicit, $b = -.019$, 95%CI [-.038; -.001], and implicit social support, $b = -.251$, 95%CI [-.285; -.218], had significant and negative within-county effects on depressive symptoms.

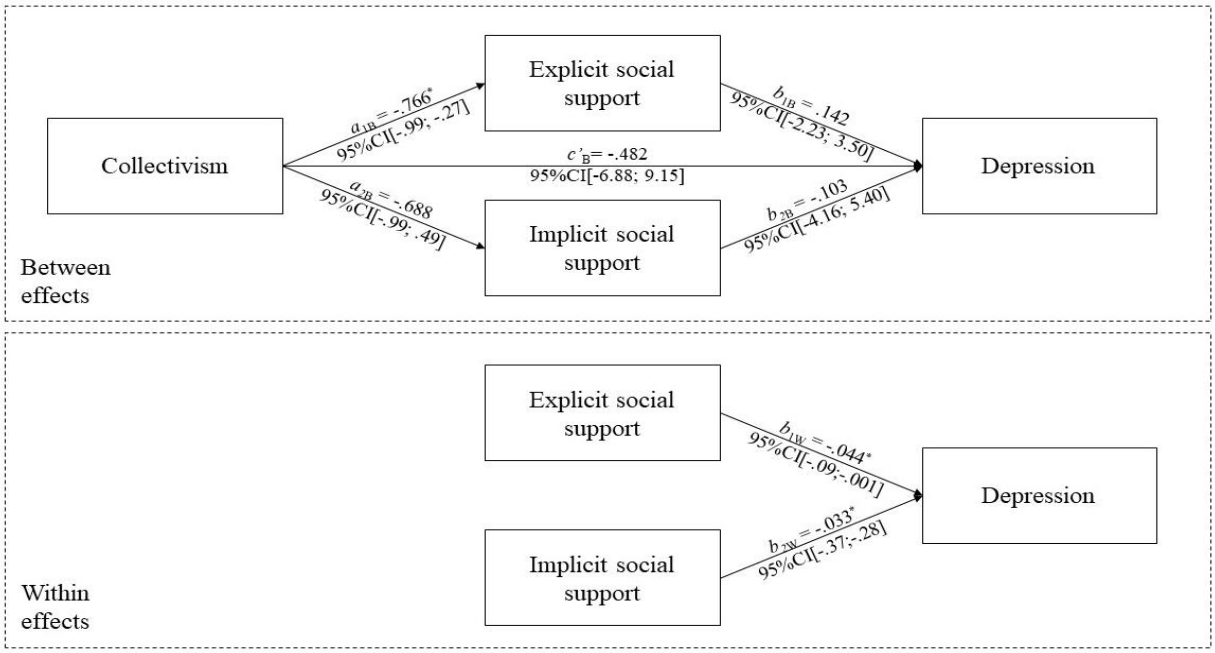


*Fig 1*. Multilevel mediation model (2-1-1) for the effect of collectivism on depression trough explicit and implicit social support. The values in the figure represent standardized coefficients.

### 3.5.4. Discussions

Our first objective was to test whether psychological vulnerabilities in the form of irrational cognitions are associated with depression. In accordance with our first hypothesis, we found that irrational cognitions positively and significantly predicted depressive symptoms ($\beta$ = .342, $p$ <.001). This result represents a confirmation of the REBT theory on a large sample in an ecologically relevant context. The second objective of this study was to test the *protective effect* of collectivism in relation to depressive symptoms. As expected, we found that individuals living in counties characterized by high levels of collectivism displayed lower levels of depression ($\beta$ = -.069, $p$ <.001). These results are also in line with previous findings, which suggest that mood disorders in general, and depressive disorders in particular, are less prevalent in populations characterized by high levels of collectivism (Chiao & Blizinsky, 2009; Li, Wei, Palanivel & Jackson, 2021). To our best knowledge, this is the first study that tested and proved this hypothesis by looking at within country variations in individualism-collectivism and depressive symptoms. Our third objective was to test whether county-level collectivism moderates the relationship between individual-level irrational cognitions and depressive symptoms. The results indicated that within more collectivistic counties, the association between psychological vulnerabilities in the form of irrational cognitions and depression is significantly weaker ($\beta$ = -.028, $p$ = .039). These findings offer support for another type of effect that collectivism has on the development of mental health problems. To differentiate it from the one described under the second objective, we will call it the *buffering effect*, which is expressed by reducing the impact of psychological vulnerabilities on mental health.

The protective effect of collectivism tested under the second objective is commonly attributed to the availability of social support systems, embedded in collectivistic cultural structures. We tested a multiple mediation model, using both explicit and implicit support as

mediator variables. Our results indicated that neither type of social support was a significant mechanism that could explain the relationship between collectivism and depression across counties. However, we found that participants living in counties characterized by higher levels of collectivism were significantly less prone to seek explicit social support when confronted with stressors ($\beta$ = -.766, 95%CI[-.99; -.27]). An important question that emerges in the light of these findings is what other mechanisms could explain the protective effect of collectivism in relation to depressive disorders. Previous studies offered a series of alternative explanations regarding the lower prevalence of depression in collectivistic cultures. First, the diagnostic criteria used to assess the presence of depression might be culturally bound to western, industrialized cultures, where these criteria were first developed (Marsella, 2003). Indeed, some studies found that individuals belonging to more collectivistic cultures express predominantly somatic symptoms of depression (i.e., headache, stomachache), while individuals from individualistic cultures present predominantly emotional symptoms of depression, such as sadness and/or guilt (Parker, Gladstone, Chee, 2001). Moreover, some authors argue that intrapersonal markers of depression (i.e., anhedonia, or depressed mood) that are frequently used for measuring depressive symptoms across cultures might be more relevant for individuals belonging to individualistic societies, while interpersonal symptoms (i.e., social isolation) could represent more important markers of depression among individuals with a collectivistic cultural background (Chentsova-Dutton & Tsai, 2009). Additionally, the stigmatization of mental health problems in collectivistic cultures might cause individuals to underreport symptoms of depression or their severity (Parker, Gladstone, Chee, 2001).

The present study has a series of limitations that should be taken into consideration. The first limitation is related to the survey methodology applied to the second sample of this study. As data for irrational cognitions, depression, and social support were collected during the lockdown period in Romania, we employed a single-mode web survey strategy, using a nonprobability sample which could affect sample representativeness (Cornesse & Bosnjak, 2018). Another major limitation of this study is related to its cross-sectional design, as data measuring irrational cognitions, depressive symptoms, and perceived social support were collected simultaneously. The cross-sectional nature of these data imposes serious limitations in determining causality relations between the examined variables. The following limitation is related to the low variability in county-level collectivism scores. According to Hofstede, Hofstede & Minkov (2010), Romania is a collectivistic country, having an estimated score of 30 on the individualism dimension. The maximum individualism score that we obtained across all counties is 49 (see Table S1 in Supplementary materials). Increasing the variability of individualism scores might affect the relationship between the examined variables and future studies should explore the generalizability of the current results to other nations that display higher levels of individualism. Additionally, the MOS SSS was not explicitly developed for measuring implicit and explicit support, and we used this instrument based on previous approaches from the literature. Future studies should further investigate the mediating role of social support between individualism and depression using instruments that are especially suited for distinguishing between these two types of support. Another important limitation is related to the number of clusters. Finally, another important limitation is that the COVID pandemic was just the ecological context in which the study was conducted, but it was not a variable in our study. Based on our data, we cannot meaningfully infer that the observed effects are due to the pandemic. However, based on previous research, we can state that the pandemic, particularly the lockdown period, generated global increases in psychological distress (Robinson, Sutin, Daly & Jones, 2022; Santomauro et al., 2021).

## CHAPTER IV. GENERAL DISCUSSIONS: CONCLUSIONS AND IMPLICATIONS

### 4.1. General Conclusions

The **first main objective** of this thesis was to investigate the role of culture in the relationship between individual-level psychological vulnerabilities and psychopathology. To address this objective, we carried out a three-level meta-analysis (Study 1), in which we tested whether the difference in cognitive vulnerabilities between healthy and clinically depressed individuals is higher among samples belonging to individualistic cultures. We examined four categories of cognitive vulnerabilities derived from the CBT/REBT models, namely automatic thoughts, dysfunctional attitudes, maladaptive schemas, and irrational cognitions. First, we found that all categories of cognitive vulnerabilities were significantly higher among individuals diagnosed with MDD, compared to healthy individuals. Second, we found that in individualistic cultures, the differences between healthy and depressed samples in levels of automatic thoughts, dysfunctional attitudes, and maladaptive schemas were higher, compared to collectivistic cultures. The results suggested that these categories of cognitive structures had lower discriminatory power between healthy and clinically depressed individuals in collectivistic cultures. We argued that these findings offer preliminary evidence for the idea that collectivism works as a protective factor against the development of depressive disorders among vulnerable individuals. No moderation effect was found in the case of irrational beliefs, however, the number of studies included in the meta-analysis was not sufficient ($k = 7$) in order to draw meaningful conclusions about this result. Consequently, in another study, we examined the moderating effect of individualism-collectivism on the relationship between irrational cognitions and depressive symptoms across 42 Romanian counties, using a mixed model approach (Study 5). In the same study, we tested whether the protective effect of collectivism in relation to depressive symptoms could be explained through the mechanism of social support. As expected, we found that the relationship between irrational cognitions and depression was significantly weaker in counties characterized by higher collectivism scores. However, our results showed that social support was not a significant mediator between collectivism and depressive symptoms. Moreover, we found that individuals belonging to more individualistic regions were significantly more likely to access explicit social support, compared to individuals from more collectivistic counties. This finding was in line with previous individual-level studies that showed that individuals with collectivistic cultural settings are less inclined to openly solicit social support due to concerns regarding the destabilization of social harmony (Kim, Sherman, Ko & Taylor, 2008)..

**The second main objective** of this thesis was to assess the psychometric properties of a psychological instrument used to assess rational and irrational cognitions across various cultures. For this purpose, we examined the measurement invariance of the Attitudes and Beliefs Scale 2 (DiGiuseppe, Leaf, Gorman & Robin, 2018) across 10 countries, namely Columbia, Germany, Pakistan, Peru, Portugal, Romania, Serbia, the United Kingdom, and the United States of America (Study 2). We found evidence for configural, metric, scalar, and intercept invariance across all the examined nations. These results indicate that individuals from different cultural backgrounds ascribe similar meanings to the items of the ABS 2 and the scale can be further used to meaningfully compare levels of irrational cognitions across cultures, or to investigate national-level aggregated scores reflecting irrational beliefs in relation to relevant PESH indicators.

**The third goal** of the thesis was to examine the cross-cultural extension of the CBT/REBT model from an individual-level to a country-level aggregated level of analysis. For this purpose, we created a country-level Irrationality Index across 60 countries based on available large-scale

data retrieved from the World Values Survey (Inglehart et al., 2014) and we investigated this index in relation to national-level PESH indicators (Study 3). We showed that country-level irrationality scores were negatively associated with human development, democracy, autonomy, peacefulness, and healthy life expectancy. Aggregated levels of irrational cognitions were also negatively associated with secular and emancipative cultural values (Welzel, 2013). In Study 4, we examined the same Irrationality Index from an evolutionary perspective. More specifically, we tested whether national-level irrationality scores could be the mechanism explaining the negative association between the prevalence of historical pathogens and individualism. Our results showed that higher levels of historical pathogen prevalence were associated with higher levels of irrational cognitions and that these cognitions partially mediated the negative association between pathogen prevalence and individualism. The current findings offer evidence for the idea that populations living in geographical areas characterized by high levels of pathogenic threats were more prone to develop inflexible cognitive processing expressed as rigid demands towards themselves and others. In turn, these cognitive processes contributed to the development of collectivistic cultural structures, characterized by strict social regulations concerning human behavior

### 4.2. Theoretical and Conceptual Implications

The first aim of this thesis was to investigate the role of culture in the well-established relationship between individual-level cognitive vulnerabilities and depressive disorders. Previous studies found that cognitive distortions derived from the CBT/REBT models represent etiopathogenetic mechanisms explaining the onset of various forms of mental health disorders, including depression. Although at an individual-level, cognitive vulnerabilities can explain interindividual variations in depressive symptomatology, they cannot explain cross-cultural variations in the prevalence of depressive disorders. The vast majority of epidemiological studies indicate that depressive disorders are significantly more prevalent in Western, industrialized, wealthy countries (Ferrari, 2012; Lim et al., 2018), and more recent studies showed that the geographical variation of depression prevalence is deeply connected to the geographical distribution of the individualism-collectivism cultural dimension, even after controlling for national-level economic, ecological and social factors (Li, Well & Palanivel, 2021). Findings from another line of research, relevant to the current thesis, showed that country-level variations of genetic vulnerabilities toward mood disorders are negatively associated with anxiety and depressive disorders and that this phenomenon can be explained by the protective effect of collectivism (Chiao & Blizinsky, 2009). Indeed, many authors argue that collectivism has the potential to protect vulnerable individuals from developing mood disorders and that one of the mechanisms that can explain the protective effect of individualism is related to social support (Li, Well & Palanivel, 2021; Way, Matthew & Lieberman, 2010). In the context of these findings, the first study of this thesis aimed to investigate whether collectivism could show similar protective effects against depression taking into account the presence of cognitive vulnerabilities towards mood disorders. We conducted a three-level culture-moderated meta-analysis, in which we included 63 studies from 13 nations reporting differences in automatic thoughts, dysfunctional attitudes, maladaptive schemas, and irrational beliefs between healthy individuals and samples with a diagnosis of major depressive disorder. We tested whether the differences in cognitive vulnerabilities could be moderated by the individualism-collectivism cultural dimension. Our results indicate that within collectivistic nations, automatic thoughts, dysfunctional attitudes, and schemas discriminate less efficiently between healthy and depressed samples. We argue that this finding represents a major theoretical advancement since to our knowledge this was the first study showing that collectivism displays protective effects toward mood disorders in the presence of well-established cognitive

vulnerabilities. Considering that the number of included studies examining irrational beliefs was not sufficient in order to draw relevant conclusions, in Study 5 we investigated the moderating effect of county-level collectivism in the relationship between irrational cognitions and depressive symptoms in the Romanian population, during a collectively shared activating event, namely the lock-down period associated with the COVID-19 Pandemic. In a mixed models analysis, we found that collectivism was negatively correlated with depression while irrational cognitions were positive predictors of depressive symptoms. Moreover, our results indicated that the association between irrational cognitions and depressive symptoms was weaker in counties characterized by high levels of collectivism. These results are in line with the findings of the meta-analysis, and they offer additional support to the protective effect of collectivism in the presence of cognitive vulnerabilities. Another major theoretical advancement stems from the fifth study, through which we additionally tested the hypothesis stating that collectivism represents a protective factor against depressive disorders through the mechanism of social support. Although many authors adopted this explanation regarding the protective effect of collectivism (Li, Well & Palanivel, 2021; Way, Matthew & Lieberman, 2010), no study had explicitly tested this hypothesis. Moreover, several individual-level studies had critically challenged this idea, showing that individuals living in collectivistic cultures (1) are less likely to seek social support when confronted with stressful tasks compared to individuals with an individualistic cultural background, and (2) they experience an increase in cortisol levels when exposed to situations in which they have to overtly seek social support (Taylor, Welch, Kim & Sherman, 2007). Taylor et al., (2004) found that this phenomenon can be explained by relational concerns imposed by expressing personal difficulties and asking for help since these manifestations could lead to a destabilization of social harmony. Several authors argue that individuals living in collectivistic societies could seek an implicit form of social support which implies being in the presence of close people or even thinking about them, but without overtly expressing feelings of distress or need for help (Taylor et al., 2004; Kim, Sherman, Ko & Taylor, 2008). In line with these findings, our results showed that individuals living in more collectivistic Romanian counties reported significantly lower levels of perceived explicit social support. No relationship was found between collectivism and implicit social support, and overall social support was not a significant mediator between collectivism and depressive symptoms.

Another major conceptual implication of the thesis is related to the cross-cultural extension of the CBT/REBT model. Previous studies in the field of cross-cultural psychology showed that several psychological constructs usually examined at the individual-level of analysis, such as personality traits or IQ, can be aggregated at the country/region level and examined in relation to country or regional-level indicators of adaptiveness, such as economic development, inequality, democracy and health related outcomes (Rentfrow et al., 2013; McCrae & Terracciano, 2008; Lynn & Meisenberg, 2010). Although Beck (1999) stated that the study of society-level cognitive vulnerabilities derived from the CBT model could explain society-level behavioral and emotional outcomes, scarcely any study has investigated this possibility since then. In recent years, however, David, Matu, David, and Terracciano (2017) explored this line of research and their findings indicated that national-level scores of cognitive distortions, measured as discrepancy scores between actual and perceived national character, were significant predictors of state-level functionality and adaptiveness indicators. One major challenge that this field of research is facing is related to the lack of large-scale data collected through dedicated psychological instruments, that could facilitate the computation of national-level dysfunctional beliefs. In the present thesis, we computed a country-level Irrationality Index and our findings suggested that this index was significantly correlated with multiple PESH indicators, such as human development, democracy,

and healthy life expectancy. We argue that these results, together with previous findings (David, Matu, David & Terracciano, 2017) open the door for a new field of research that aims to study the relationship between clinically relevant psychological processes and national/regional level indicators of human adaptiveness (David, Ștefan & Terracciano 2019). Finally, we investigated the Irrationality Index in relation to individualism-collectivism from an evolutionary perspective. Previous studies showed that populations living in geographical regions with an evolutionary history characterized by high levels of disease-causing pathogens were more likely to have developed a collectivistic cultural profile (Fincher, Thornhill, Murray& Schaller, 2008). Based on these findings, several authors argue that collectivism might reflect an anti-pathogenic defense system, which protects individuals from contacting contagious pathogens through strict social norms, obedience and conformity, and low trust towards outgroup members. Murray & Schaller (2014) argue that in environments characterized by high levels of existential threats it is possible that human populations could have developed defensive cognitive and behavioral mechanisms later translated into a collectivist cultural orientation. On the other hand, REBT scholars hypothesized decades ago that, given their universal nature, early development, and resistance to change, irrational beliefs might have been adaptive cognitive processes throughout the EEA (Ellis, 1987; Pelusi, 2003). Corroborating these theories, we investigated whether irrational beliefs could be one of the cognitive mechanisms that could explain the relationship between pathogen prevalence and collectivism at the country-level of analysis. Our findings showed that irrationality represented a partial mediator explaining the link between historical pathogen prevalence and collectivism.

### 4.3. Clinical and Practical Implications

The results of the current thesis highlight the importance of the cultural adaptation of psychological assessment strategies and evidence-based interventions. As discussed in study 1, even though CBT interventions are effective in treating mood disorders across cultures, cognitive vulnerabilities seem to discriminate less efficiently between clinically depressed and healthy individuals in collectivistic societies. Moreover, it is not yet clear whether specific cognitive vulnerabilities (i.e., individualistic dysfunctional attitudes versus sociotropic attitudes) hold the same relevance for individuals across cultures. Thus, practitioners should examine and adjust their therapeutic approach to culturally relevant risk factors for psychopathology in a specific population. Recent studies have already shown that culturally adapted psychological interventions seem to be more effective for treating mental health problems compared to standard interventions (Griner & Smith, 2006; Hall, Ibaraki, Huang, Marti & Stice, 2016). Although this line of research has made significant progress, more studies are needed to understand which cultural mechanisms could contribute to the improvement of mental health services and outcomes in various societies. Finally, the extension of the CBT/REBT model at the cultural level could have important implications for the improvement of state-level education strategies and evidence-based public policy development (David, Ștefan & Terracciano, 2019).

### 4.4. Methodological Innovations

The current thesis encompasses a series of methodological innovations applied to the study of dysfunctional/irrational beliefs in a cross-cultural context. First, we conducted a culture-moderated meta-analysis in which we examined whether differences in levels of cognitive vulnerabilities between healthy and clinically depressed individuals were significantly different across individualistic and collectivistic cultures (Study 1). For this purpose, we employed a three-level meta-analytic approach, with individual effect sizes (level 1), nested into samples/subgroups (level

2), and with samples nested into countries (level 3). Following this approach, we tested the moderating effect of individualism-collectivism (country-level moderator) while taking into account the dependency between the three levels of analysis (Harrer, Cuijpers, Furukawa & Ebert, 2021). Second, in Study 2 we showed that the Attitudes and Beliefs Scale 2 (DiGiuseppe, Leaf, Gorman & Robin, 2018) was invariant across 10 nations. First, we examined the factor structure of the scale and results showed that the best fitting model was a bifactor model, with one general factor of irrationality, four factors reflecting irrational cognitions, and four rational cognitive processes. Next, we showed that the scale displayed configural, metric (weak), scalar (strong), and intercept (strict) invariance across 10 nations. Third, throughout the thesis, we constructed a country-level Irrationality Index (Study 3, and 4) across 60 nations, based on data retrieved from the World Values Survey (Inglehart et al., 2014). The Index was computed based on two items measuring demanding attitudes regarding trust in other people ("I need to be very careful in dealing with other people") and conformity ("I always need to behave properly; avoid doing anything people would say is wrong"). The index was created by aggregating at the national level the percentage of the respondents who indicated that they need to be very careful, and the mean scores reflecting the degree to which respondents in each nation perceived themselves as someone who needs to always behave properly. The Irrationality Index was computed based on the standardized mean scores of the two items in each nation. Fourth, we analyzed the relationship between individualism-collectivism, irrational cognitions, and depressive disorders (Study 5) across 42 Romanian regions, using a mixed model approach. More specifically, we investigated whether county-level collectivism is associated with individual-level depression, and we examined the interaction effect that county-level collectivism and individual-level irrational cognitions have upon individual-level depressive symptoms. Lastly, we tested the mediation effect of social support on the relationship between collectivism and depressive symptoms through a multilevel 2-1-1 model using Structural Equation Modeling (Preacher, Zhang, & Zyphur, 2011).

### 4.5. Limitations and Future Directions

The present thesis has a number of general limitations that should be considered when interpreting our results and may serve as a guide for future research. First, the cross-sectional character of our studies places a significant constraint on our capacity to extrapolate causal and temporary links between the variables under investigation. Although the manipulation of psychological variables across several countries or regions is hardly conceivable, future studies could employ longitudinal designs in order to address this limitation. Another major limitation is related to the methodology used for the computation of the country-level Irrationality Index. As described throughout Studies 3 and 4, the index was based on two items retrieved from the World Values Survey, measuring trust and conformity, and was investigated in relation to several country-level outcomes such as PESH indicators, secular and emancipative values, pathogen prevalence, and individualism-collectivism. Previous studies showed that low levels of generalized trust and high conformity are collectivistic cultural syndromes (Letki & Evans, 2005; Schwartz, 2012). In the absence of other country-level scores of irrational cognitions, we could not verify the construct validity of the Irrationality Index. Future studies should focus on measuring irrational cognitions and other types of cognitive vulnerabilities across multiple countries and regions, using a dedicated instrument with adequate psychometric proprieties. The next limitation is related to the use of convenience samples in the second and fifth studies. In the second study, we investigated the measurement invariance of the Attitudes and Beliefs Scale 2 (DiGiuseppe, Leaf, Gorman & Robin, 2018) and we recruited participants from 10 different countries. We collected data online, via social media platforms and Prolific (www.prolific.co). In study 5, we measured irrational cognitions, depressive

symptoms, and social support across 42 Romanian counties exclusively via social media platforms. As a result, the majority of our sample was represented by young, female respondents with high levels of education. As previous studies showed, the use of convenience samples recruited online imposes serious limitations regarding the generalizability of the results (Cornesse & Bosnjak, 2018). Future studies should investigate the replicability of our findings on nationally and regionally representative samples.

Throughout the thesis, we investigated cognitive vulnerabilities in relation to the individualism-collectivism cultural dimension, as measured by Hofstede, Hofstede, and Minkov (2010) and Beugelsdijk and Welzel (2009). Despite the fact that this measurement approach has been extensively used in the scientific literature, several authors recommend using an alternative measure of this cultural dimension, in which individualism and collectivism represent orthogonal dimensions (Oyserman, Coon & Kemmelmeier, 2002). Thus, future studies could investigate the role of culture in the association between cognitive vulnerabilities and mood disorders using alternative measures of cultural dimensions and/or more nuanced facets of individualism-collectivism (i.e., vertical versus horizontal collectivism).

In two studies we showed that collectivism represents a protective factor against developing depressive disorders in the presence of cognitive vulnerabilities, such as automatic thoughts, dysfunctional attitudes, maladaptive schemas, and irrational cognitions. However, our findings suggest that perceived social support does not represent a mechanism in the relationship between collectivism and depressive symptoms. Future studies should clarify two crucial aspects that could contribute to a better understanding of the interplay between individualism-collectivism, cognitive vulnerabilities, and depressive disorders. First, future research should investigate whether similar cognitive vulnerabilities derived from the CBT/REBT models have the same relevance for mood disorders across cultures, or as some authors suggest, sociotropic dysfunctional cognitions are more salient vulnerabilities in the case of individuals living in collectivistic societies (Sahin & Sahin, 1992). On a similar note, future studies should clarify whether depressive disorders are indeed less prevalent in collectivistic societies due to cultural protective mechanisms. Alternatively, cultural dimensions may shape the way individuals experience and/or express symptoms of depression, which could result in artificial discrepancies in depression prevalence across cultures.

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