What you see is what you get?
Association of belief in conspiracy theories and mental health during COVID-19

Livia Priyanka Elek[1], Matyas Szigeti[2,3], Berta Erdelyi-Hamza[4], Daria Smirnova[5,6],
Konstantinos N. Fountoulakis[7], Xenia Gonda[4,6]

[1] Department of Clinical Psychology, Semmelweis University, Budapest, Hungary

[2] Imperial Clinical Trials Unit, Imperial College London, London, UK

[3] Physiological Controls Research Center, Budapest, Hungary

[4] Department of Psychiatry and Psychotherapy, Semmelweis University, Budapest, Hungary

[5] Department of Psychiatry, Narcology, Psychotherapy and Clinical Psychology, Samara State Medical University, Samara, Russia

[6] International Centre for Education and Research in Neuropsychiatry, Samara State Medical University, Samara, Russia

[7] 3rd Department of Psychiatry, AHEPA Hospital, Aristotle University, Thessaloniki, Greece

Background: The COVID-19 pandemic brought about great uncertainty and significant changes in our people's everyday lives. In times of such crises, it is natural to seek explanations to overcome our fears and uncertainties, contributing to an increase to believe in conspiracy theories which, by yielding explanations, decrease uncertainty and ambiguity and may thus have an effect on mental well-being. In spite of this, the majority of research on conspiracy theories focused on their social effects with little attention to psychological effects. Thus, the aim of our present study was to examine the association between belief in conspiracy theories and different aspects of mental health during the COVID-19 pandemic in a general population sample. **Methods:** Our analyses included data from the Hungarian leg of the COMET-G (COVID-19 MEntal health international for the General population) study. The Hungarian sample included participants who completed a detailed questionnaire assessing belief in seven conspiracy theory items, as well as STAI-S and CES-D to measure state anxiety and depression, respectively, and answered questions related to their change in depression, anxiety and suicidal thoughts during the pandemic. Association between the individual beliefs as well as a composite Conspiracy Theory Belief Score (CTBS) and mental health measures was analysed using linear regression models. **Results:** Overall, belief in conspiracy theories was relatively moderate in our sample. Sex and age appeared to have a significant effect on the Overall Conspiracy Theory Belief Score (CTBS), with women having a higher score and scores increasing with age. Some of the individual beliefs also showed associations with age and sex. State anxiety and depression was not significantly associated with CTBS, however in case of depression some individual items were, and symptom clusters within CES-D also showed a pattern of association with some of the individual items. As far as changes in mental health during the pandemic is concerned, no association between overall beliefs and changes in anxiety or depression was found. However, higher overall belief in conspiracy theories was associated with a decrease in suicidal thoughts. **Discussion:** In our study, we explored the association between conspiracy theories and mental well-being as well as its changes during the COVID-19 pandemic. We found a specific pattern of association between belief in distinct theories and some aspects of depression, as well as lower increase in suicidal ideation in association with increased belief in conspiracy theories. Understanding the role of belief in theories can be key to designing mental health interventions when reacting to unforeseen events in the future.
(Neuropsychopharmacol Hung 2022; 24(1): 42–55)

Keywords: COVID-19, conspiracy theories, depression, anxiety, suicide, suicidal thoughts, mental health, mental health change

INTRODUCTION

The appearance of the SARS-CoV-2 virus in 2019 in Wuhan, followed by its rapid spread worldwide has forced the World Health Organization to declare the COVID-19 pandemic and a related global health emergency in March 2020. Since then, the pandemic has evolved into a global crisis contributing to 422 million cases of infection, and causing the death of over 5.87 million people worldwide. While the virus's threat on human life has been the most obvious consequence of the pandemic, the influence of the global crisis has far exceeded that of the infection itself (WHO, 2020). Due to the pandemic and the measures implemented to control it, people suddenly faced an unexpected and never before experienced catastrophe forcing them into social isolation, facing, among other problems, financial difficulties, causing significant disruption in their lifestyles and daily rhythm, and mostly exposing them to an extremely high level of uncertainty, both concerning the virus and their health, and concerning the above effects of the pandemic (Gonda and Tarazi, 2021).

As the human brain has difficulty tolerating uncertainty, especially in times of crises it naturally calls for seeking an explanation and a cause which lifts the fear stemming from the feeling that our fate is subject to unexplainable, unpredictable and uncontrollable phenomena. Seeking a cause and explanation in our modern society is linked to online environments, especially in times of social isolation, where false information and fake news have been shown to outrun real news in terms of engagement (Silverman, 2016), directing focus on conspiracy theories – explanations for important events that involve secret plots by powerful and malevolent groups (Douglas et al., 2017). The spread of conspiracy theories can be expected to increase during times of crisis (Van Prooijen and Douglas, 2017), when psychological needs for certainty, security, control and positive social relations are not met (Douglas, 2021b). It has been suggested that belief in one conspiracy theory is likely to be associated in belief in others (Douglas et al., 2019). Distrust in authorities and experts is positively related to the mental preparedness to believe in conspiracy theories (Imhoff and Bruder, 2014; Pummerer and Sassenberg, 2020) while cultural orientation also seems to influence acceptance (Biddlestone et al., 2020).

While some believe conspiracy theories to be harmless and marginal digital artefacts (De Coninck et al., 2020, 2021) they have been linked to the decline of scientific consensus, denial of climate change (Lewandowsky et al., 2013), rejection of mainstream medicine, i.e. vaccination (Jolley and Douglas, 2014), political and work place apathy, prejudice and violence (Douglas, 2021a; Douglas et al., 2019). A number of studies have focused on the presence of conspiracy theories during the COVID-19 pandemic, and found similarly negative consequences. Conspiracy theories have been shown to be inversely related to taking preventive actions and well as vaccination against the disease (Romer and Jamieson, 2020). A greater extent of belief in conspiracy theories leads to lower institutional trust, lower support of governmental regulations, less adoption of social distancing and less social engagement (Pummerer and Sassenberg, 2020). Interestingly Imhoff and Lamberty (Imhoff and Lamberty, 2020) suggest that different forms of conspiracy theories have different behavioral implications. While conspiracy theories describing the pandemic as a hoax were related to less engagement in containment-related behavior, self-centered prepping behavior has been linked to malevolent forces creating the virus on purpose. Furthermore, belief in conspiracy theories claiming 5G cellular network to be responsible for the virus has been linked to the harassment and attack of UK Telecom workers (Vincent, 2020).

Most of the research has focused on societal effects of conspiracy theories, however, less is known about its consequences on individuals and their mental health. On one hand, people are more likely to believe in such theories when they are feeling anxious or worried (Grzesiak-Feldman, 2013). At the same time, one could expect a higher degree of belief in conspiracy theories to be associated with lower levels of anxiety as a consequence of a decrease in uncertainty and increase in feeling of predictability and control. In line with the second possibility, a recent publication of De Coninck et al. (De Coninck et al., 2021) found that higher levels of anxiety were associated with lower conspiracy beliefs, while higher depression scores (PHQ-9) were associated with higher conspiracy beliefs, although the pattern seems to be specific to some societies but not others. This shows that belief in conspiracy theories may not show a universal association with mental health, with different aspects of mental health being influenced in different ways. Furthermore, it would be interesting to see how the content of such theories may have different implications on mental health as they may influence behavior in alternative ways. Thus, the aim of the present study was to investigate the different

aspects of mental health during the COVID-19 pandemic in association with belief in conspiracy theories in a general population sample.

METHODS

The present analysis has been carried out on the Hungarian data from the COMET-G (COVID-19 MEntal health international for the General population) study, an international initiative to assess the effects of the COVID-19 pandemic and related lockdown measures on mental health including 55 589 self-selected general population participants from 40 countries, recruited online and anonymously between April 2020-March 2021. A more detailed description of the study and the procedure can be found in previously published papers (Elek et al., 2021; Erdelyi-Hamza et al., 2021; Fountoulakis et al., 2022; Kulig et al., 2020). The Hungarian leg of the study was approved by the Regional, Institutional, Scientific and Research Ethics Committee of Semmelweis University.

Participants

763 participants (617 women) with an average age of 41.98 (range 18-80 years) were recruited in the Hungarian population. Inclusion criteria only included willing to participate and capacity to complete the online questionnaire. Exclusion criteria included intellectual disability, acute psychotic state, being under the influence of alcohol or other psychotropic substances. Participation was voluntary and no compensation or reward of any sort followed. Participants were reached on social media platforms via snowball method. All participants provided informed consent before proceeding to participate in the online study.

Procedure

Data were collected online and anonymously between April 2020-Mach 2021 starting after the regulations and measures as a response to the first wave of the pandemic took effect, covering both periods of full implementation of lockdowns as well as of relaxations of measures.

Measures

The COMET-G study focused on assessing various aspects of mental health including depression and anxiety, subjective emotional changes during the pandemic, as well as several lifestyle factors, and factors related to beliefs and conspiracy theories concerning the origin of the pandemic. We describe only those measures and variables that were used in the present analysis.

To assess current levels of anxiety, the Hungarian version of the State anxiety subscale of the State-Trait Anxiety Inventory (STAI-S) was used. The questionnaire consists of 20 statements assessing different aspects of anxiety scored on a Likert-scale from 1-4 (including reverse items), with total scores ranging between 20-80 (Sipos and Sipos, 1983).

To measure current level of depression, the Hungarian version of the Center for Epidemiological Studies Depression Scale (CES-D) was applied. The questionnaire consists of 20 items, each scored on a Likert-scale from 0-3 (including reverse items), with total scores varying between 0-60. CES-D scores were also divided into 3 subscales, focusing on lack of positive affects (CES-D PA) (items: 3,4,8,12,16), irritability and problems with social relationships (CES-D Irr-Soc) (items: 1,11,15,19), and depressed affect and somatic complaints (CES-D Dep-Som) (items: 1,2,3,5,6,7,9,10,11,13,14,17,18,20) to be able to independently grab different manifestations of depression (Fountoulakis et al., 2001).

Subjective changes in different aspects of mental health and well-being were assessed by individual items regarding anxiety (How much has your emotional state changed in relation to the appearance of anxiety and insecurity compared to before the COVID-19 epidemic?), feelings of joy or melancholy (How much has your emotional state related to the experience of joy or melancholy changed in comparison to before the COVID-19 epidemic?) and thoughts about suicidality (How much has your tendency to think about death and/or suicide changed, compared to before the outbreak of COVID-19?). Each question was assessed on a Likert scale from -2 to 2, negative answers referring to a decrease in the frequency/intensity of the given symptom.

We also assessed the presence of different types of beliefs and conspiracy theories concerning the origin of the pandemic. The assessed conspiracy theory items included the following:
1. Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies?
2. Do you believe that COVID-19 was created in a laboratory to be used as a biochemical weapon for

the extermination of the human population?

3. Do you believe that COVID-19 is the result of 5G technology antenna?

4. Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected? (reverse item)

5. Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?

6. Do you believe that COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?

7. Do you believe that COVID-19 is a sign of divine power to destroy our planet?

The degree of belief was measured on a 5-item Likert scale (including a reverse item), ranging from 0=do not believe at all to 4=very much believe. (Note that CT4 was a reverse item that was handled in a reversed form in all analyses; and in all figures and tables results corresponding to its reverse score are shown.) Additionally to measuring the belief in each individual conspiracy theory, we created an overall Conspiracy Theory Belief Score (CTBS) which included all seven theories (considering reverse items), with overall score varying between 0-28.

Statistical analyses

The overall Conspiracy Theory Belief Score (CTBS) including the sum of the 7 conspiracy theory belief items (considering reverse items) was used as the outcome variable for univariate linear regression models where each of the predictors were assessed separately after a general graphical assessment. Mean difference associated for each unit of change for continuous or between group differences for categorical predictors and their 95% Confidence Intervals (CI) were calculated. In the next step, the seven individual conspiracy theory Items of CTBS were assessed one by one for all of the predictors in the same way, using linear regression models. Due to the correlations between the items, only single items or the sum of all items were used in all analyses. Potential confounders were added to the models but this investigation was limited. Missing data was not imputed for any variables used in the analysis. No correction for multiple testing was made and all comparisons were reported. All statistical analyses were performed using STATA version 15.1 (StataCorp, 2017).

RESULTS

General level, and effect of sex and age on belief in conspiracy theories related to the COVID pandemic

Overall, belief in conspiracy theories was moderate in our sample, with most people accepting such explanations to a low degree (Figure 1) when analysing the overall Conspiracy Theory Belief Score (CTBS) comprising scores related to all 7 theories together. Investigating median and interquartile ranges of the individual conspiracy theory items shows more than 75% of respondents rated items CT1 (Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies), CT3 (Do you believe that COVID-19 is the result of 5G technology antenna) and CT7 (Do you believe that COVID-19 is a sign of divine power to destroy our planet) as 0 suggesting no belief in the given theory (Figure 2). The most common conspiracy belief was CT4 (Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected) with a median of 2, reflecting "maybe" believing this item. Note that CT4 was a reverse item.

Sex appeared have a significant effect of the overall Conspiracy Theory Belief Score (CTBS), with men having a -0.91 lower score compared to the average score of 5.03 in women (p=0.036) (Figure 3).

Figure 1. Distribution of the overall Conspiracy Theory Belief Score (CTBS) in the Hungarian sample of the COMET-G study
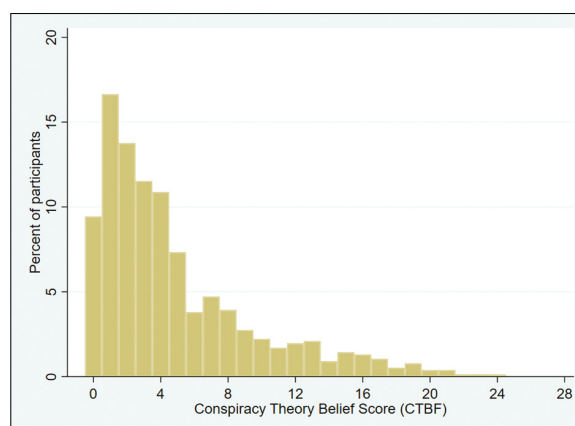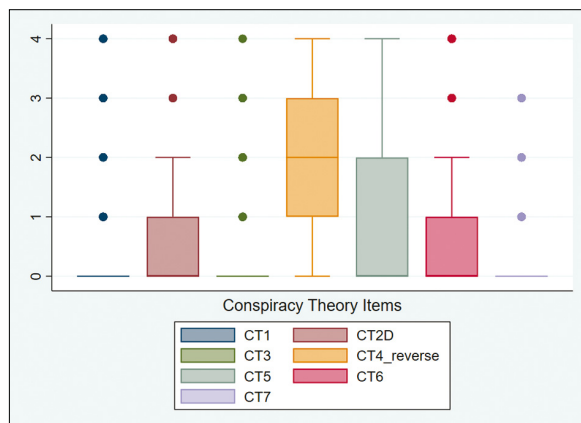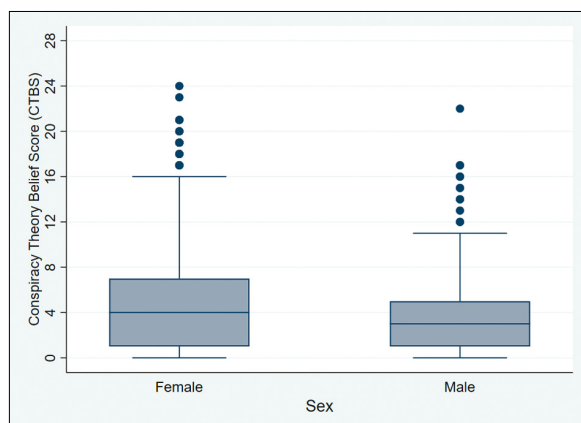
Figure 2. Comparison and distribution of belief in different conspiracy theory items in the Hungarian sample of the COMET-G study


The figure shows median, interquartile range (boxes) and 1.5 IQR whiskers standard deviation of the individual conspiracy theory (CT) belief item scores in case of changes in suicidality *CT1: Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies?; CT2: Do you believe that COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population?; CT3: Do you believe that COVID-19 is the result of 5G technology antenna?; CT4: Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected? (reversed score is shown); CT5: Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?; CT6: Do you believe that COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?; CT7: Do you believe that COVID-19 is a sign of divine power to destroy our planet?*

Figure 3. The comparison of Conspiracy Theory Belief Score (CTBS) in males and females in the Hungarian sample of the COMET-G study

The figure shows median, interquartile range (boxes) and 1.5 IQR whiskers standard deviation of the CTBS score in males and females.

Figure 4. Significant effect of age on overall Conspiracy Theory Belief Score (CTBS) in the Hungarian sample of the COMET-G study
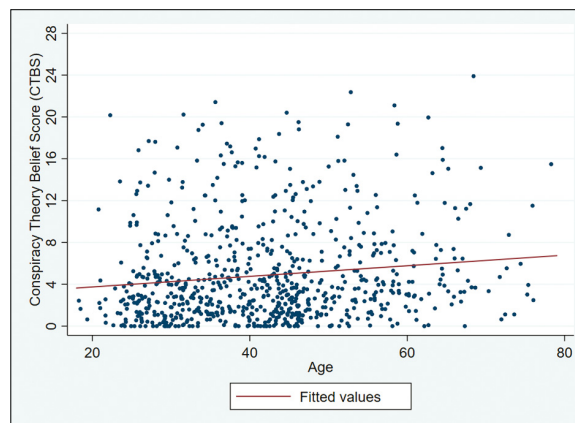
Looking at the seven individual conspiracy theory items, we found significant sex differences in case of item CT2 (COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population) ($p=0.028$) and CT6 (COVID-19 is a creation of the world's powerful leaders to create a global economic crisis) ($p=0.008$), and a strong tendency in case of CT3 (COVID-19 is the result of 5G technology antenna) ($p=0.067$). In all three cases men showed lower belief (Table 1).

Age similarly had a statistically significant effect on overall Conspiracy Theory Belief Score (CTBS) ($p<0.001$), showing an increase in belief with increasing age (0.05 point increase (95% CI: 0.02, 0.08) in CTBS for every year) (Figure 4).

Looking at the seven individual conspiracy theory items, we found significant association with age in case of item CT1 (Do you believe that the COVID-19 vaccine was ready even before the virus broke out?) ($p=0.009$), CT2 (COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population?) ($p=0.010$), CT3 (Do you believe that COVID-19 is the result of 5G technology antenna?) ($p=0.020$), CT4 (Do you believe that COVID-19 appeared accidentally from human contact) ($p<0.0011$), CT6 (COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?) ($p=0.050$), and a strong tendency in case of CT5 (Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?) ($p=0.071$). In all cases belief in the conspiracy item increased with age (Table 2).

Table 1. Effect of sex on belief in individual items related to conspiracy theories
regarding the origin of the virus in the Hungarian sample of COMET-G

	Beta	Std. Err.	t	p	[95% Conf. Interval]	
CT1 Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies?						
Difference in males	-0.10	0.08	-1.37	0.170	-0.25	0.04
Mean in females	0.33	0.03	9.93	0.000	0.27	0.40
CT2 Do you believe that COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population?						
Difference in males	-0.21	0.10	-2.20	0.028*	-0.40	-0.02
Mean in females	0.66	0.04	15.88	0.000	0.58	0.74
CT3 Do you believe that COVID-19 is the result of 5G technology antenna?						
Difference in males	-0.10	0.05	-1.83	0.067#	-0.20	0.01
Mean in females	0.21	0.02	8.89	0.000	0.16	0.25
CT4 Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected? (reverse)						
Difference in males	-0.12	0.12	-0.99	0.324	-0.35	0.12
Mean in females	1.96	0.05	37.26	0.000	1.86	2.06
CT5 Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?						
Difference in males	-0.05	0.12	-0.45	0.651	-0.28	0.18
Mean in females	0.92	0.05	17.96	0.000	0.82	1.02
CT6 Do you believe that COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?						
Difference in males	-0.30	0.11	-2.67	0.008*	-0.52	-0.08
Mean in females	0.83	0.05	16.99	0.000	0.74	0.93
CT7 Do you believe that COVID-19 is a sign of divine power to destroy our planet?						
Difference in males	-0.02	0.04	-0.64	0.521	-0.10	0.05
Mean in females	0.12	0.02	7.33	0.000	0.09	0.15

* indicates a significant effect with a p<0.05; #indicates a strong tendency with a p<0.10

Association between overall belief in conspiracy theories (CTBS) and state anxiety

We did not find a statistically significant association between overall belief in conspiracy theories (CTBS) and state anxiety as measured by STAI-S (p=0.274) (Figure 5, Table 3). There was no significant association between STAI-S and any of the individual beliefs.

Association between overall belief in conspiracy theories (CTBS) and current depression as measured by CES-D and its subscales

We similarly did not find a statistically significant association between overall belief in conspiracy theories (CTBS) and current depression score as measured by CES-D (p=0.919) (Figure 6, Table 3).

However, analysing conspiracy theory items separately, we found significant associations between CES-D score and items CT4 (-0.02 change (95% CI: -0.04, -0.01) on CES-D associated with a +1 increase in the degree of belief, p=0.006) and CT7 (0.01 change (95% CI: 0.00, 0.01) associated with +1 increase in the degree of belief, p=0.040) (Table 4).
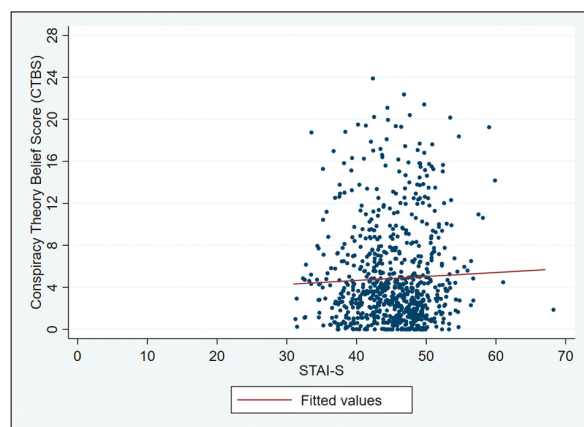
Analysis of the association between overall belief in conspiracy theories (CTBS) and CES-D subscales yielded a strong tendency in case of CES-D Irritability and problems with social relationships (CES-D Irr-Soc) (p=0.079) but not in case of CES-D Lack of positive affects (CES-D PA) (p=0.281) or CES-D Depressed affect and somatic complaints (CES-D Dep-Som) (p=0.823). An increase in the degree of belief in conspiracy theories can be linked to a decrease in the Lack of positive affect score as well as increase in the irritability and problems with social relationships score (Figure 7, Table 3).

Analysing association between individual conspiracy theory items and CES-D Lack of positive affect (CES-D PA), we found statistically significant associations in case of item CT2 (-0.03 (95% CI: -0.06 , -0.01) change on CES-D PA associated with a +1 increase in the degree of belief, p=0.020) (Table 5).

Table 2. Association between age and belief in individual items related to conspiracy theories
regarding the origin of the virus in the Hungarian sample of COMET-G

	Beta	Std. Err.	t	p	[95% Conf. Interval]	
CT1 Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies?						
age	0.01	0.00	2.62	0.009*	0.00	0.01
CT2 Do you believe that COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population?						
age	0.01	0.00	2.57	0.010#	0.00	0.01
CT3 Do you believe that COVID-19 is the result of 5G technology antenna?						
age	0.00	0.00	2.33	0.020	0.00	0.01
CT4 Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected? (reverse)						
age	0.02	0.00	4.72	0.000*	0.01	0.03
CT5 Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?						
age	0.01	0.00	1.81	0.071#	-0.00	0.01
CT6 Do you believe that COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?						
age	0.01	0.00	1.97	0.050*	0.00	0.01
CT7 Do you believe that COVID-19 is a sign of divine power to destroy our planet?						
age	-0.00	0.00	-0.30	0.764	-0.00	0.00

* indicates a significant effect with a $p<0.05$; #indicates a strong tendency with a $p<0.10$

Figure 5. No association between overall belief in
conspiracy theories (CTBS) and state anxiety as measured
by STAI-S in the Hungarian sample of the COMET-G study

STAI-S: State anxiety subscale of the Spielberger State-Trait Anxiety Inventory

Figure 6. No association between overall belief in
conspiracy theories (CTBS) and current depression as measured
by CES-D in the Hungarian sample of the COMET-G study
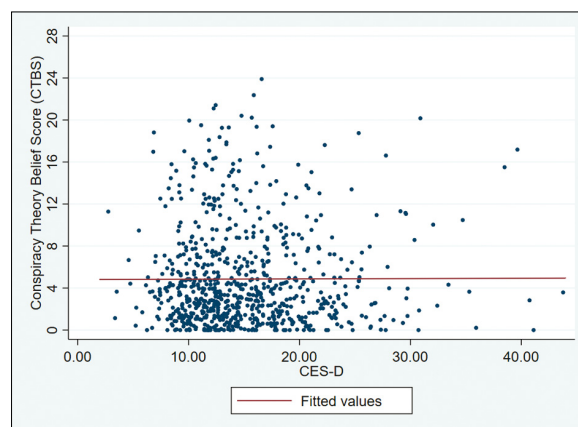
CES-D: Center for Epidemiological Studies Depression Scale

Analysing association between individual conspiracy theory items and CES-D Irritability and problems with social relationships (CES-D Irr-Soc), we found significant associations between CES-D Irr-Soc score and items CT2 (COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population) (p<0.001), CT3 (Do you believe that COVID-19 is the result of

5G technology antenna?) (p=0.045), and CT7 (Do you believe that COVID-19 is a sign of divine power to destroy our planet?) (p=0.019), and a strong tendency in case of CT6 (COVID-19 is a creation of the world's powerful leaders to create a global economic crisis) (p<0.050), and a strong tendency in case of CT5 (Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing

Table 3. Association between outcome variables and overall Conspiracy Theory Belief Score (CTBS)
regarding the origin of the virus in the Hungarian sample of COMET-G

	Beta	Std. Err.	t	p	[95% Conf. Interval]	
STAI-S	0.04	0.03	1.10	0.274	-0.03	0.11
CES-D	0.00	0.03	0.10	0.919	-0.06	0.06
CES-D PA	-0.07	0.07	-1.08	0.281	-0.20	0.06
CES-D Irr-Soc	0.15	0.09	1.76	0.079#	-0.02	0.33
CES-D Dep-Som	-0.01	0.03	-0.22	0.823	-0.06	0.05
Change in suicidal thoughts	-0.92	0.22	-4.09	0.000*	-1.36	-0.48
Change in anxiety	0.12	0.20	0.62	0.534	-0.26	0.51
Change in emotion	-0.30	0.20	-1.47	0.143	-0.69	0.10

* indicates a significant effect with a p<0.05; #indicates a strong tendency with a p<0.10
*STAI-S: Spielberger State-Trait Anxiety Inventory; CES-D: Center for Epidemiological Studies Depression Scale; CES-D PA: CES-D Lack of positive affect; CES-D Irr-Soc: CES-D Irritability and problems with social relationships; CES-D Dep-Som: CES-D Depressed affect and somatic complaints*

Table 4. Association between current depression as measured by CES-D and belief in individual items
related to conspiracy theories regarding the origin of the virus in the Hungarian sample of COMET-G

|	Beta	Std. Err.	t	p	[95% Conf. Interval]	
CT1 Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies?						
CES-D	0.00	0.01	0.30	0.765	-0.01	0.01
CT2 Do you believe that COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population?						
CES-D	0.01	0.01	1.39	0.164	-0.00	0.02
CT3 Do you believe that COVID-19 is the result of 5G technology antenna?						
CES-D	0.00	0.00	1.33	0.185	-0.00	0.01
CT4 Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected?						
CES-D	-0.02	0.01	-2.73	0.006	-0.04	-0.01
CT5 Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?						
CES-D	0.00	0.01	0.01	0.994	-0.02	0.02
CT6 Do you believe that COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?						
CES-D	0.00	0.01	0.60	0.552	-0.01	0.02
CT7 Do you believe that COVID-19 is a sign of divine power to destroy our planet?						
CES-D	0.01	0.00	2.05	0.040	0.00	0.01

* indicates a significant effect with a p<0.05; #indicates a strong tendency with a p<0.10
CES-D: Center for Epidemiological Studies Depression Scale

Figure 7. Association between overall belief in conspiracy theories (CTBS)
and CES-D subscales in the Hungarian sample of the COMET-G study
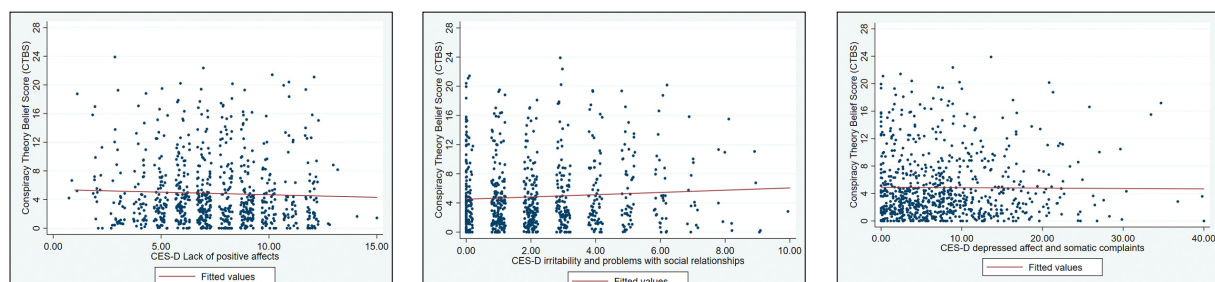
CES-D: Center for Epidemiological Studies Depression Scale

Figure 8. Association between overall belief in conspiracy theories score (CTBS) and subjective changes in anxiety (A) and depression (B) in the Hungarian sample of the COMET-G study
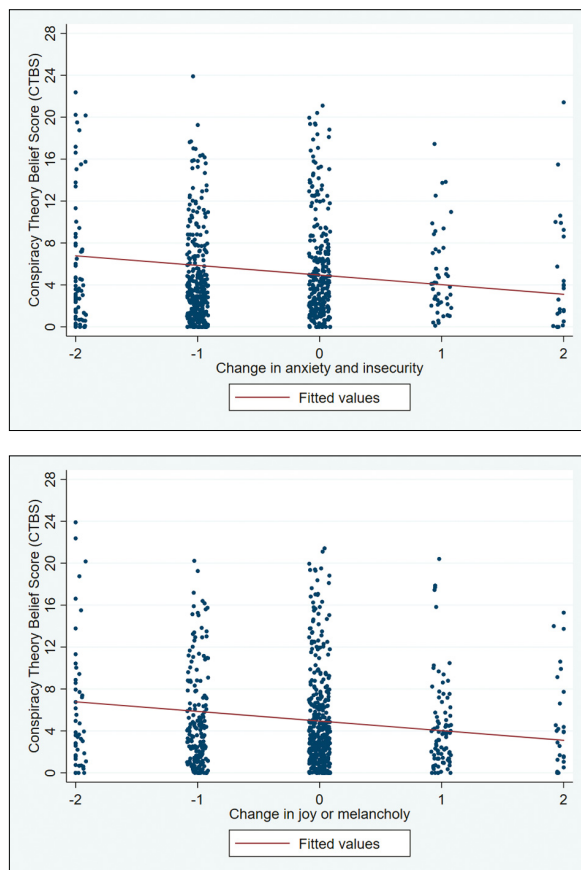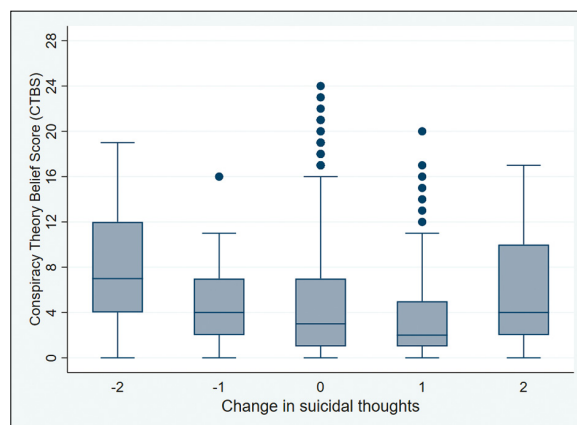

Change in anxiety (A) and depression (B) ranges between -2 and 2, where negative values denote a decrease and positive values denote and increase

Figure 9. Significant association between overall belief in conspiracy theories (CTBS) and suicidal thoughts in the Hungarian sample of the COMET-G study
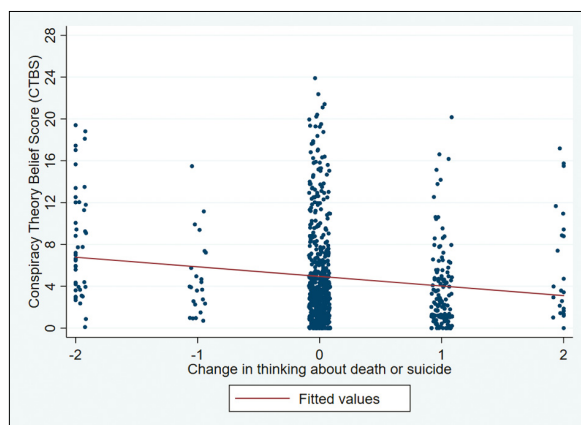
Change in suicidal thoughts ranges between -2 and 2, where negative values denote a decrease and positive values denote and increase

Figure 10. Distribution of the overall Conspiracy Theory Belief Score (CTBS) in association with change in suicidal thoughts (medians are shown) in the Hungarian sample of the COMET-G study

The figure shows median, interquartile range (boxes) and 1.5 IQR whiskers standard deviation of the CTBS score in case of changes in suicidality. Change in suicidal thoughts ranges between -2 and 2, where negative values denote a decrease and positive values denote and increase

propaganda) (p<0.054). In all cases increased belief in the conspiracy item was associated with increased CES-D Irr-Soc score (Table 6).

Analysing association between individual conspiracy theory items and CES-D Depressed affect and somatic complaints (CES-D Dep-Som) we found significant associations between CES-D Irr-Soc score and items CT4 (Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected?) (p=0.015), and CT7 (Do you believe that COVID-19 is a sign of divine power to destroy our planet?) (p=0.026) In both cases belief in the conspiracy item was associated with increased CES-D Dep-Som score (Table 7).

Association between overall belief in conspiracy theories (CTBS) and changes in mental health and well-being: anxiety, depression and suicidal thoughts

We did not find a statistically significant association between the overall belief in conspiracy theories score (CTBS) and subjective change in anxiety (p=0.534) or between the overall belief in conspiracy theories score (CTBS) and subjective change in depressive feelings (p=0.143) (Figure 8, Table 3).

We observed a significant association between overall belief in conspiracy theories (CTBS) and change in

Table 5. Association between CES-D Lack of positive affect and belief in individual items related
to conspiracy theories regarding the origin of the virus in the Hungarian sample of COMET-G

	Beta	Std. Err.	t	p	[95% Conf. Interval]	
CT1 Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies?						
CES-D	0.01	0.01	0.58	0.561	-0.02	-0.03
CT2 Do you believe that COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population?						
CES-D	-0.03	0.01	-2.34	0.020	-0.06	-0.01
CT3 Do you believe that COVID-19 is the result of 5G technology antenna?						
CES-D	-0.01	0.01	-1.23	0.219	-0.03	0.01
CT4 Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected?						
CES-D	-0.02	0.02	-0.89	0.373	-0.05	0.02
CT5 Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?						
CES-D	-0.01	0.02	-0.30	0.766	-0.04	0.03
CT6 Do you believe that COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?						
CES-D	-0.01	0.02	-0.42	0.673	-0.04	0.03
CT7 Do you believe that COVID-19 is a sign of divine power to destroy our planet?						
CES-D	-0.01	0.01	-0.92	0.360	-0.02	0.01

* indicates a significant effect with a p<0.05; #indicates a strong tendency with a p<0.10
CES-D: Center for Epidemiological Studies Depression Scale

Table 6. Association between current depression as measured by CES-D Irritability and problems with social relationships (CES-D Irr-Soc)
and belief in individual items related to conspiracy theories regarding the origin of the virus in the Hungarian sample of COMET-G

	Beta	Std. Err.	t	p	[95% Conf. Interval]	
CT1 Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies?						
CES-D Irr-Soc	0.01	0.02	0.61	0.541	-0.02	0.04
CT2 Do you believe that COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population?						
CES-D Irr-Soc	0.08	0.02	3.93	0.000*	0.04	0.11
CT3 Do you believe that COVID-19 is the result of 5G technology antenna?						
CES-D Irr-Soc	0.02	0.01	2.01	0.045*	0.00	0.04
CT4 Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected?						
CES-D Irr-Soc	-0.03	0.02	-1.31	0.191	-0.08	0.02
CT5 Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?						
CES-D Irr-Soc	0.02	0.02	0.77	0.442	-0.03	0.06
CT6 Do you believe that COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?						
CES-D Irr-Soc	0.04	0.02	1.93	0.054#	-0.00	0.09
CT7 Do you believe that COVID-19 is a sign of divine power to destroy our planet?						
CES-D Irr-Soc	0.02	0.01	2.34	0.019*	0.00	0.03

* indicates a significant effect with a p<0.05; #indicates a strong tendency with a p<0.10
CES-D Irr-Soc: CES-D Irritability and problems with social relationships

suicidal thoughts, with a one score increase in CTBS resulting in a -0.92 (95% CI: -1.36 , -0.48) change in suicidal thoughts score, meaning that a stronger belief in conspiracy theories is associated with a decrease in suicidal thoughts (p=0.0001) (Figure 9, Table 3).

Investigating the distribution of overall conspiracy theory belief scores (CTBS) in association with changes in suicidal thoughts a U-shaped association was observable, with the highest decrease in suicidality observable in association with the highest overall the overall Conspiracy Theory Belief Score (CTBS) (Figure 10).

Table 7. Association between current depression as measured by CES-D Depressed affect and somatic complaints (CES-D Dep-Som) and belief in individual items related to conspiracy theories regarding the origin of the virus in the Hungarian sample of COMET-G

	Beta	Std. Err.	t	p	[95% Conf. Interval]	
CT1 Do you believe that the COVID-19 vaccine was ready even before the virus broke out and they conceal it from us for the benefit of pharmaceutical companies?						
CES-D Dep-Som	-0.00	0.00	-0.53	0.598	-0.01	0.01
CT2 Do you believe that COVID-19 was created in a laboratory to be used as a biochemical weapon for the extermination of the human population?						
CES-D Dep-Som	0.01	0.01	1.35	0.177	-0.00	0.02
CT3 Do you believe that COVID-19 is the result of 5G technology antenna?						
CES-D Dep-Som	0.00	0.00	1.35	0.176	-0.00	0.01
CT4 Do you believe that COVID-19 appeared accidentally from human contact with animals and it was something that generally happens and was generally expected?						
CES-D Dep-Som	-0.02	0.01	-2.45	0.015*	-0.03	-0.00
CT5 Do you believe that COVID-19 has much lower mortality rate but there is misinformation and terror-inducing propaganda?						
CES-D Dep-Som	-0.00	0.01	-0.44	0.661	-0.02	0.01
CT6 Do you believe that COVID-19 is a creation of the world's powerful leaders to create a global economic crisis?						
CES-D Dep-Som	0.00	0.01	0.03	0.979	-0.01	0.01
CT7 Do you believe that COVID-19 is a sign of divine power to destroy our planet?						
CES-D Dep-Som	0.00	0.00	2.24	0.026*	0.00	0.01

* indicates a significant effect with a p<0.05; #indicates a strong tendency with a p<0.10
CES-D Dep-Som: CES-D Depressed affect and somatic complaints

DISCUSSION

Our research focusing on the relationship between various aspects of mental health and belief in conspiracy theories during COVID-19 revealed a complex pattern of association.

In our general population sample we found moderate levels of overall belief in conspiracy theories. There was a significant gender effect, with women showing a higher level of beliefs. Interestingly, a marked gender effect, which contributed to approximately one third of the whole gender effect in case of conspiracy theories, was observable in case of a single belief, related to COVID-19 being the creation of the world's powerful leaders to create a global economic crisis. Women were also more likely to specifically believe that COVID-19 was created in a laboratory to be used as a biochemical weapon to exterminate the human population, and that COVID-19 is the result of 5G technology.

We also observed a significant association between increasing age and increasing overall beliefs in conspiracy theories, as well as increasing belief in all individual conspiracy items except for the belief about COVID-19 being a sign of divine power to destroy the planet.

Specifically focusing on the association between overall conspiracy beliefs and mental health variables we found significant associations between overall belief in conspiracy theories and change in suicidal thoughts, and a strong tendency for an association with a depressive symptom cluster related to irritability and problems with social relationships; but no associations with anxiety or change in anxiety, overall depression score, depressive symptom cluster related to lack of positive affect, depressed affects and somatic complaints, or change in depression during the COVID-19 pandemic. Specifically, increased belief in conspiracy theories was associated with a decrease in suicidal thoughts suggesting a protective relationship, but increased irritability and disturbed social relationships. In face of the other negative findings, our results suggest that conspiracy theories only affect specific psychological symptoms rather than mental health in general. Thus, our results, in line with that of previous studies (De Coninck et al., 2021), show a complex pattern and differential effects between conspiracy theories and mental health variables.

We also looked at how individual conspiracy beliefs were related to aspects of mental health during COVID-19, separately analysing seven distinct beliefs

concerning the origin of the virus and management of the pandemic. Interestingly, generally individual beliefs separated according to mental health outcomes with little overlap, with lack of positive affects (anhedonia) associated with beliefs that COVID-19 was created as a biochemical weapon; increased irritability and disturbed social relationships were also associated with increased beliefs that COVID was created as a biochemical weapon, but also with beliefs that it was created by world leaders to create a global economic crises, or is the result of 5G technology; while increased depressed affect and somatic complaints showed an association with believing that COVID appeared accidentally, but expectably from contact with animals or that COVID is a sign of some divine power. This segregation of individual beliefs with depressive symptom clusters surprisingly suggests that attributing COVID-19 to malevolent or artificial human intervention, or attributing it to natural or supernatural causes shows an association with different symptoms of low mood.

In summary, the COVID pandemic bought about a turmoil both in terms of effects on the world, and also in terms of our psychological processes and mental well-being. Just as measures taken to control the virus and the pandemic are of key important to restore our life as it normally is, equally crucial is understanding how our mind tries to control our exposure to the unpredictability brought about this situation. Understanding the role of belief in conspiracy theories in that process and also their effect in shaping our behaviour in response to the pandemic and measures taken to control it may prove increasingly useful in the future when such situations are expected to become more frequent.

Corresponding author: Xenia Gonda
Department of Psychiatry and Psychotherapy,
St. Rokus Clinical Centre,
Gyulai Pál utca 2., Budapest, 1085 Hungary
E-mail: gonda.xenia@med.semmelweis-univ.hu

REFERENCES

1. Biddlestone, M., Green, R., Douglas, K.M., 2020. Cultural orientation, power, belief in conspiracy theories, and intentions to reduce the spread of COVID-19. British Journal of Social Psychology 59, 663-673.
2. De Coninck, D., d'Haenens, L., Matthijs, K., 2020. Forgotten key players in public health: news media as agents of information and persuasion during the COVID-19 pandemic. Public Health 183, 65.
3. De Coninck, D., Frissen, T., Matthijs, K., d'Haenens, L., Lits, G., Champagne-Poirier, O., Carignan, M.E., David, M.D., Pignard-Cheynel, N., Salerno, S., Genereux, M., 2021. Beliefs in Conspiracy Theories and Misinformation About COVID-19: Comparative Perspectives on the Role of Anxiety, Depression and Exposure to and Trust in Information Sources. Front Psychol 12, 646394.
4. Douglas, K.M., 2021a. Are conspiracy theories harmless? The Spanish journal of psychology 24.
5. Douglas, K.M., 2021b. COVID-19 conspiracy theories. Group Processes & Intergroup Relations 24, 270-275.
6. Douglas, K.M., Sutton, R.M., Cichocka, A., 2017. The psychology of conspiracy theories. Current directions in psychological science 26, 538-542.
7. Douglas, K.M., Uscinski, J.E., Sutton, R.M., Cichocka, A., Nefes, T., Ang, C.S., Deravi, F., 2019. Understanding Conspiracy Theories. Political Psychology 40, 1-33.
8. Elek, L., Erdelyi-Hamza, B., Kulig, B., Kovács, I., Fountoulakis, K., Smirnova, D., Gonda, X., 2021. P. 0413 Modifiable risk and protective factors influencing changes in subjective depression during the COVID-19-lockdown: identifying targets for prevention and intervention. European Neuropsychopharmacology: the Journal of the European College of Neuropsychopharmacology 53, S299-S300.
9. Erdelyi-Hamza, B., Elek, L., Kulig, B., Kovács, I., Fountoulakis, K., Smirnova, D., Gonda, X., 2021. P. 0640 Factors influencing changes in anxiety during the COVID-19 related lockdown: modifiable targets for prevention and intervention. European Neuropsychopharmacology: the Journal of the European College of Neuropsychopharmacology 53, S471-S471.
10. Fountoulakis, K., Iacovides, A., Kleanthous, S., Samolis, S., Kaprinis, S.G., Sitzoglou, K., St Kaprinis, G., Bech, P., 2001. Reliability, validity and psychometric properties of the Greek translation of the Center for Epidemiological Studies-Depression (CES-D) Scale. BMC psychiatry 1, 1-10.
11. Fountoulakis, K.N., Karakatsoulis, G., Abraham, S., Adorjan, K., Ahmed, H.U., Alarcón, R.D., Arai, K., Auwal, S.S., Berk, M., Bjedov, S., 2022. Results of the COVID-19 mental health international for the general population (COMET-G) study. European Neuropsychopharmacology 54, 21-40.
12. Gonda, X., Tarazi, F.I., 2021. Well-being, resilience and post-traumatic growth in the era of Covid-19 pandemic. Eur Neuropsychopharmacol.
13. Grzesiak-Feldman, M., 2013. The effect of high-anxiety situations on conspiracy thinking. Diverse Perspectives on Diverse Psychological Issues 32, 100-118.
14. Imhoff, R., Bruder, M., 2014. Speaking (un-)truth to power: Conspiracy mentality as a generalised political attitude. European Journal of Personality 28, 25-43.
15. Imhoff, R., Lamberty, P., 2020. A bioweapon or a hoax? The link between distinct conspiracy beliefs about the Coronavirus disease (COVID-19) outbreak and pandemic behavior. Social Psychological and Personality Science 11, 1110-1118.

16. Jolley, D., Douglas, K.M., 2014. The effects of anti-vaccine conspiracy theories on vaccination intentions. PloS one 9, e89177.

17. Kulig, B., Erdelyi-Hamza, B., Elek, L.P., Kovacs, I., Smirnova, D., Fountoulakis, K., Gonda, X., 2020. [Effects of COVID-19 on psychological well-being, lifestyle and attitudes towards the origins of the pandemic in psychiatric patients and mentally healthy subjects: fi rst Hungarian descriptive results from a large international online study]. Neuropsychopharmacol Hung 22, 154-165.

18. Lewandowsky, S., Gignac, G.E., Oberauer, K., 2013. The role of conspiracist ideation and worldviews in predicting rejection of science. PloS one 8, e75637.

19. WHO, 2020. Mental health and psychosocial considerations during the COVID-19 outbreak, 18 March 2020. World Health Organization.

20. Pummerer, L., Sassenberg, K., 2020. Conspiracy theories in times of crisis and their societal effects: Case "corona". SOCIETAL EFFECTS OF CORONA CONSPIRACY THEORIES.

21. Romer, D., Jamieson, K.H., 2020. Conspiracy theories as barriers to controlling the spread of COVID-19 in the US. Soc Sci Med 263, 113356.

22. Silverman, C., 2016. Viral fake election news outperformed real news on facebook in final months of the us election. BuzzFeed News 16.

23. Sipos, K., Sipos, M., 1983. The development and validation of the Hungarian Form of the State-Trait Anxiety Inventory. Series in Clinical & Community Psychology: Stress & Anxiety.

24. StataCorp, 2017. Stata Statistical Software: Release 15. StataCorp LLC, College Station, TX.

25. Van Prooijen, J.-W., Douglas, K.M., 2017. Conspiracy theories as part of history: The role of societal crisis situations. Memory studies 10, 323-333.

26. Vincent, J., 2020. Something in the air: Conspiracy theorists say 5G causes novel coronavirus, so now they're harrassing and attacking UK telecoms engineers. The Verge, June 3 2020, https://www.theverge.com/2020/6/3/21276912/5g-conspiracy-theories-coronavirus-uk-telecoms-engineers-attacks-abuse

A mentális egészség és az összeesküvés-elméletekben való hit összefüggése a COVID-19 járvány idején

Bevezetés: A COVID-19 járvány világszerte nagymértékű változásokat és bizonytalanságot hozott a lakosság mindennapi életébe. Az ilyen jelentős válságok idején természetes, hogy félelmeink és bizonytalanságaink leküzdésére magyarázatokat keresünk, ami hozzájárul ahhoz, hogy egyre többen hisznek az összeesküvés-elméletekben. Ezek azáltal, hogy magyarázatot és válaszokat adnak kérdéseinkre, csökkentik a bizonytalanságot, kételyeket, és hatással lehetnek a mentális jóllétre. Ennek ellenére az összeesküvés-elméletekkel kapcsolatos kutatások többsége leginkább azok társadalmi hatásaira összpontosított, kevés figyelmet fordítva a pszichológiai hatásokra. Jelen tanulmányunk célja, hogy átlagpopulációs mintán megvizsgáljuk az összeesküvés-elméletekben való hit és a mentális egészség különböző aspektusai közötti összefüggést a COVID-19 világjárvány idején. **Módszerek:** Elemzéseinkben a COMET-G (COVID-19 MEntal health international for the General population) tanulmány magyarországi mintán kapott adatait használtuk. A részvétel önkéntes és anonim volt. A kutatás során többek között hét összeesküvés-elméletbe vetett hitet vizsgáltunk. Az aktuális állapotszorongást és depressziót a STAI-S és CES-D kérdőívekkel mértük, emellett a vizsgálati személyek információkat adtak a depresszió, szorongás és öngyilkossági gondolatok változásával kapcsolatos kérdésekre a világjárvány lezárások alatti időszakában. Az összeesküvés-elméletekkel kapcsolatos általános hit (Conspiarcy theory belief score – CTBS) és az egyes hiedelmek, illetve a mentális egészség valamint annak változása közti összefüggést lineáris regressziós modellek segítségével elemeztük. **Eredmények:** Összességében az összeesküvés-elméletekben való hit viszonylag mérsékelt volt a mintánkban. A nem és az életkor szignifikáns összefüggést mutatott az összeesküvés-elméletbe vetett hit összpontszámával (CTBS), a nők pontszáma magasabb volt és a pontszámok az életkorral növekedtek. Az egyes hiedelmek némelyike szintén összefüggést mutatott az életkorral és a nemmel. Nem találtunk szignifikáns összefüggést az általános összeesküvés-elmélet hiedelem (CTBS) valamint az állapotszorongás és a depresszió között, azonban egyes depressziós tünetcsoportok esetében szignifikáns volt az összefüggés, illetve a depresszió összpontszám is szignifikánsan összefüggött egyes konkrét hiedelmekkel. Szintén nem volt szignifikáns összefüggés a depresszió és szorongás COVID-19 alatti változása és az általános összeesküvés-elmélet hit (CTBS) között, azonban az erőteljesebb hit szignifikáns összefüggésben állt az öngyilkossági gondolatok COVID-19 alatti csökkenésével. **Következtetések:** Tanulmányunkban az összeesküvés-elméletek és a mentális jóllét illetve annak változása közötti kapcsolatot vizsgáltuk a COVID-19 világjárvány során. A különböző elméletekben való hit és a depresszió egyes aspektusai közötti kapcsolat sajátos mintázatát találtuk, valamint az összeesküvés-elméletekben való hit növekedésével összefüggésben az öngyilkossági gondolatok csökkenését. Az összeesküvés-elméletekben való hit szerepének alaposabb megértése hosszútávon kulcsfontosságú lehet az olyan intézkedések és mentális egészségügyi beavatkozások megtervezésében, melyekkel az előre nem látható eseményekre reagálunk majd a jövőben.

Kulcsszavak: COVID-19, összeesküvés-elmélet, depresszió, szorongás, öngyilkosság, öngyilkossági gondolatok, mentális egészség, mentális egészség változása