Identifying resilience factors of distress and paranoia during the COVID-19 outbreak in five countries

Martin Jensen Mækelæ^{1*}, Niv Reggev^{2*}, Natalia Dutra³, Ricardo M Tamayo⁴, Renata Felipe⁵, Kristoffer Klevjer¹, Gerit Pfuhl^{1#}

¹Department of Psychology, UiT The Arctic University of Norway, Tromsø, Norway

²Department of Psychology & Zlotowski Center for Neuroscience, Ben Gurion University of the Negev, Israel

³Evolution of Human Behavior Laboratory, Department of Physiology and Behavior, Universidade Federal do Rio Grande do Norte, Brazil

⁴Universidad Nacional de Colombia, Departamento de Psicología, Colombia

⁵Instituto de Psicologia, Universidade de São Paulo, Brazil

*the authors contributed equally

Correspondence:

Gerit Pfuhl
gerit.pfuhl@uit.no

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Abstract

The ongoing COVID-19 pandemic outbreak has affected all countries with more than 100 million confirmed cases and over 2.1 million casualties by the end of January 2021 worldwide. A prolonged pandemic can harm global levels of optimism, regularity, and sense of meaning and belonging of people, yielding adverse effects on individual's mental health as represented by worry, paranoia, and distress. Here we studied resilience, a successful adaptation despite risk and adversity, in five countries: Brazil, Colombia, Germany, Israel and Norway. In April 2020, over 2500 participants were recruited for an observational study measuring protective and obstructive factors for mental health. More than 800 of these participants also completed a follow-up study in July.

We found that thriving, keeping a regular schedule, engaging in physical exercise and less procrastination served as factors protecting mental well-being. Risk factors were financial worries and a more negative mindset, e.g. feeling a lack of control. Longitudinally, we found no increase in distress or paranoia despite an increase in expectation how long the outbreak and the restrictions will last, suggesting respondents engaged in healthy coping and adapting their life to the new circumstances. Thus, our data shines some light on the mostly depressive news during the pandemic. Humans adapt and despite adversity there are protective factors that policy makers should leverage on.

1 Introduction

On 31 December 2019, China informed the World Health Organization (WHO) about cases of pneumonia with unknown etiology, later discovered as resulting from the SARS-CoV-2 virus. The

Coronavirus spread globally and on the 11th of March the WHO classified it as a global pandemic. Even though governments around the world employed various countermeasures in an attempt to contain the virus, the pandemic evolved into a severe global health problem (Adhanom Ghebreyesus, 2020), threatening to lead to a temporary collapse of numerous local healthcare systems (WHO, 2020; Zhu & Peng, 2019).

Designed as protective measures for physical health, these countermeasures drastically changed the lifestyle of most members of present-day societies by recommending and even enforcing social isolation. Such abrupt changes in everyday life inevitably led to a heightened sense of personal and societal uncertainty, detrimentally impacting psychological well-being worldwide (Mækela et al., 2020; Okruszek, Aniszewska-Stańczuk, Piejka, Wiśniewska, & Żurek, 2020; Torales, O'Higgins, Castaldelli-Maia, & Ventriglio, 2020; Xiang et al., 2020). Indeed, a longitudinal study measuring mental health before and at an early stage of the pandemic found a tripling of depression and anxiety among US citizens (Twenge & Joiner, 2020).

Simultaneously, humans can demonstrate remarkable adaptation to adverse events. Traumatic experiences sometimes reveal an incredible resilience possessed by people, resilience that can even lead to adversarial growth (Linley & Joseph, 2004). Recently, in a longitudinal study from Germany, (Bendau et al., 2020) found a reduction in COVID-19 related anxiety over time among those with a positive mindset. In the current investigation we thereby set out to identify psychosocial factors that impact mental well-being for better or for worse. Identifying the significant contributors to mental well-being can assist governments worldwide in reducing the long-term social and economic costs of dealing with a pandemic for society as a whole (Nicola et al., 2020). We briefly describe some protective and risk factors, focusing on those we have assessed with our scales before introducing our study.

1.1 Protective factors for mental health

During trying times, a number of factors can help individuals survive, manage and adapt, while other factors may in addition help them grow and develop. *Thriving* includes a range of dynamic factors that have been linked to well-being and growth, including but not limited to; gratitude (Cheng, Tsui, & Lam, 2015; Emmons, McCullough, & Tsang, 2003; Otto, Szczesny, Soriano, Laurenceau, & Siegel, 2016), sense of belonging (Baumeister & Leary, 1995), meaning (Schueller & Seligman, 2010), pride (Fredrickson, 2013; Tracy & Robins, 2007; Williams & DeSteno, 2008), compassion (Seppala, Rossomando, & Doty, 2013; Saarinen et al., 2020), learning from the situation (Jenkins & Mostafa, 2015). *Trust in government* has been linked to well-being (Helliwell & Huang, 2008), reduced distress (Mækela et al., 2020), and reduced depressive symptoms. Trust might therefore be especially important during pandemics as governments impose behavioral restrictions (O'Hara, Abdul Rahim, & Shi, 2020). Furthermore, *regularity* also has established beneficial effects on mental health (Murray, Gottlieb, & Swartz, 2020; Sano et al., 2017). *Social support* and close caring relationships may both help individuals cope with life's adversaries, as well as foster growth and development (Feeney & Collins, 2014). Social support is well known to be a protective factor for mental disorders (Puschner, 2018), including paranoia (Crush et al., 2018; Freeman et al., 2011) and depression (e.g. Høifødt et al., 2020).

1.2 Risk factors for mental health

Factors having an adverse effect on physical and mental health are low socio-economic status (Link & Phelan, 1995; Reiss, 2013), worrying (Lüdtke et al., 2020; Sun, So, Chan, Chiu, & Leung, 2019), including financial worries (Bareket-Bojmel, Shahar, & Margalit, 2020), and, in the specific context

of the pandemic, perceived risk of COVID-19 infection combined with a low perceived efficacy of actions (Mækela et al., 2020). Low levels of education are also associated with worse mental health outcomes and increased depression (Araya, Lewis, Rojas, & Fritsch, 2003). Furthermore, along with the COVID-19 outbreak there has been an increase in irrational beliefs or conspiracy theories (Uscinski et al., 2020), possibly due to decreased social interactions (Graeupner & Coman, 2017), potentially leading to detrimental outcomes for individuals (Bierwiazek, Kunst, & Pich, 2020) and societies alike (Jolley & Paterson, 2020; Romer & Jamieson, 2020).

Some of the aforementioned factors are more universal than others. Countries vary in their age structure, trust in the local government, level of higher education among citizens, and social equality to name a few parameters. Even though several opinion papers have highlighted the potential contribution of psychological science to coping with the pandemic (Arnot et al., 2020; Garfin, 2020; van Bavel et al., 2020), very few studies to date have assessed the impact of psychosocial factors on mental health across countries. For the five target countries Table 1 provides an overview of the COVID-19 situation at the end of the data collection time points, and general characteristics of their population extracted from OurWorldInData.org (median age, life expectancy, proportion of people older than 70 in the country).

It is evident that psychological and social factors influence the well-being of individuals during a pandemic, and should be studied to inform policymakers. To address this topic, we conducted a two-wave observational study focused on mental well-being across five countries. Specifically, we assessed general distress and feelings of paranoia and examined the influence of both protective factors, e.g. trust in authorities, thriving, exercising, a regular schedule, and risk factors, e.g. perceived risk, financial worries, education. For the first wave of data collection, conducted in April, we recruited over 2200 participants from Brazil, Colombia, Germany, Israel and Norway (see Table 2). Over 700 of these participants also filled out the follow-up survey in July.

Our overarching question was: “Which factors help to maintain mental health during the 2020 COVID-19 outbreak?”. The aim of this work was twofold. First, we wanted to determine whether the prolonged disruption of normal life and imposed social restrictions increased general distress and paranoia. Second, we wanted to determine which factors contribute to maintaining mental health during the pandemic. We hypothesized that the negative effects of social restrictions will be attenuated by high trust in the government, thriving, engaging in actions for own and others wellbeing, maintaining a regular schedule, and having no major financial concerns.

2 Methods

2.1 Participants

In mid-April 2020 we launched a survey in seven languages targeting five countries: Norway (Norwegian), Germany (German), Israel (Hebrew and Arabic), Colombia (South American Spanish), Brazil (Brazil-Portuguese). The survey was also available in English in all countries but Israel. After completing the survey, we asked respondents whether they would volunteer to partake in a follow-up in approximately 2 months later. If they consented they were transferred to a new survey collecting their email addresses.

Participants were recruited in a convenience sample via social media (FB ads) and snowballing. All participants were encouraged to answer all items. Responding took around 15 minutes in April and around 10 minutes in July. All participants provided their informed consent in a manner approved by the local ethics committees. Participants did not receive any compensation.

Table 1: Cases, deaths, and general characteristics of the five countries (OurWorldInData.org)

	Brazil	Colombia	Germany	Israel	Norway
April, 14.-28.4.					
Absolute number of cases	73,235	5,949	159,912	15,672	7,660
Relative number of cases per million inhabitants (rounded)	345	117	1909	1811	1413
Absolute number of deaths	5083	269	6314	213	206
Relative number of deaths per million inhabitants	23.9	5.3	75.4	24.6	38
Reproduction number	1.5	1.3	0.67	0.55	0.7
Stringency index	77.3	90.7	76.9	87	67.6
July, 9.7.-8.8.					
Absolute number of cases	3,012,412	376,870	216,903	824,81	9,599
Relative number of cases per million inhabitants	14,172	7407	2589	9529	1771
Absolute number of deaths	100,477	12,540	9201	659	256
Relative number of deaths per million inhabitants	472.7	246.5	109.8	76.1	47.2
Reproduction number	1.0	1.1	1.22	0.97	1.47
Stringency index	72.7	87.0	56.9	43.5	40.7
General characteristics					
Population Density	25	44	237	403	14
Median Age	33.5	32.2	46.6	30.6	39.7
% aged 70 or older	5.1	4.3	16	7.4	10.8
Life Expectancy	75.9	77.3	81.3	83.0	82.4

2.2 Material April survey (T1)

Our survey included several distinct constructs across four categories: restrictions and reactions, COVID-19-specific psychological measures, general psychological tendencies, and general demographic measures. We describe the measures for each category below.

COVID-19 restrictions, reactions, and reported behavior

Experienced restrictions: We asked what effect the outbreak had on the respondent. Answers included government-issued quarantine, self-determined social quarantine, being an essential worker, and having COVID-19 or have recovered from COVID-19. We measured the experienced restrictions on a nominal scale, with multiple answers possible per participant.

Perceived efficacy of actions: We measured the perceived efficacy of own, others', and governmental actions on a 5-point Likert scale (0 = don't agree, 4 = fully agree). We calculated an average efficacy of action score from these three items. Internal consistency was McDonalds $\omega = .615$ in April and $\omega = .592$ in July.

Timeframe: We asked how long people think the COVID-19 outbreak will last, and how long the governmental-issued restrictions will last. Answer options ranged from 1-2 weeks, 2-4 weeks, 1-3 months, 3-6 months, 6 months to 1 year, 1-2 years, to forever.

Protective behaviour: we asked how often on a usual day each of 17 activities were done. Answer options ranged from less than 30 min, 30 min to 2h, 2-5h, more than 5h, and not applicable. Activities were: 1) working at one's regular workplace, 2) working from home, 3) going out of the house, 4) exercising, 5) DIY activities, 6) doing chores around the house, 7) providing emotional support to somebody, 8) caring for kids, 9) watching news, 10) watching movies, 11) playing, 12) meditating, 13) praying or other religious activities, 14) talking or messaging with friends and family, 15) communicating with friends and family, 16) helping friends and family, 17) procrastinating. Not all activities were applicable when in quarantine, e.g. working outside the house; and not everybody may have to care for children.

Regularity: We measured the extent to which respondents maintained a regular schedule on a three-item scale; a) keeping a regular schedule, b) eating regularly and c) sleeping at a regular time during the outbreak, measured on a 5-point Likert scale (0 = no regularity, to 4 = high regularity). We calculated an average score and the scale's reliability had $\omega = .749$ in April and $\omega = .804$ in July.

Finances: We asked whether the outbreak changed the financial circumstances of the respondent. Answer options were; yes, lost income; No; don't want to answer; and yes, increased income. We also asked about their financial worries, which was measured on a VAS ranging from not worried at all (coded as 0) to extremely worried (coded as 100).

COVID-19 psychological measures

Perceived risk: We included five items to ask about a) risk of contracting COVID-19 within next week, b) within next 2 months, c) getting seriously ill if contracted; d) chance of having COVID-19 and infecting others (asymptomatic spreader), and e) chance of dying during the outbreak. We used a visual analogue scale (VAS) ranging from 0 (no risk) to 100 (certainty). We calculated an average perceived risk score and the scale's reliability had $\omega = .738$ in April and $\omega = .783$ in July.

Trust in authorities:

a) *Overreaction:* We asked whether their country does enough to fight the outbreak. Answer options were: "does enough", "don't know", "does not enough" and "overreacting". Furthermore, if they chose overreacting participants were asked three additional items; a) overreacting because the virus is not that dangerous, b) unreasonable restricting my personal freedom, c) personal and financial costs

are greater than the threat by the virus. This was measured on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

b) Trust: We used 8 items to ask about trust, belief and confidence in government, the healthcare system and researchers/science on a 5-point Likert scale from 0 (don't agree) to 4 (fully agree). We used the average score and the scale's reliability had $\omega = .936$ in April and $\omega = .944$ in July.

Conspiracy score: We asked how much respondents endorsed different conspiracy theories such as "The virus is part of a Chinese biological weapons program". We also presented three factual statements, e.g. "the virus belongs to the SARS family". Responses were scored on a VAS from 0 = not true at all to 100 = absolutely true. We calculated a difference score between belief in conspiracy theories and knowledge. A positive score indicates endorsement of conspiracy theories. McDonald's ω was .734.

Thriving: We measured factors promoting psychological wellbeing and growth (Salutogenesis or Resilience) with eight items on a 5-point Likert scale ranging from 0 (don't agree) to 4 (strongly agree). Items probed finding meaning ("Helping and contributing in this time feels meaningful"), Sense of belonging ("This situation makes me feel like a part of a larger community"), Pride ("I am proud of how my community is responding to this crisis"), Compassion ("I am moved by others suffering and I want to help"), common purpose ("We all need to work together in this situation"), belief in growth ("We can learn a lot from this situation"), and social norms ("I follow the guidelines"). We calculated an average score. McDonalds $\omega = .817$ in April and $\omega = .755$ in July.

Negative mindset: We measured a tendency towards a negative mindset with six items on a 5-point Likert scale. The items were; excessive worry ("I am very worried about the outbreak"), catastrophizing thoughts ("I fear that the infrastructure will break down", "I feel humanity will never be the same after this outbreak"), experiencing a lack of control ("The uncertainty of this time scares me", "I feel we can control the outbreak" (reverse scored), and feeling scared ("I am scared of the outbreak"). We calculated an average score. Internal consistency was $\omega = .777$ in April and $\omega = .775$ in July.

Epistemic belief: We adopted two items from the epistemic-aleatory uncertainty scale (Ülkümen, Fox, & Malle, 2016); a) The COVID-19 outbreak has an element of randomness; b) The COVID-19 outbreak becomes more predictable with additional knowledge or skills. Scoring was on a VAS from 0 = not at all true to 100 = absolutely true. We calculated a difference score of epistemic and aleatory uncertainty, i.e. average VAS score for b) and a). A positive score might indicate a more scientific thinking style.

General distress: we measured global distress with 9 items from the CORE-10 (Connell et al., 2007). As advised by the ethical committee, we omitted the "I made plans to end my life" item as a high score on this item mandates counselling. The scale ranged from not at all (0) to most or all of the time (4). We calculated a sum score. Internal consistency was $\omega = .86$ in April and $\omega = .859$ in July.

Paranoia: We measured paranoid thoughts with 10 items on persecutory and grandiose delusions, and on anomalous perceptions (Stefanis et al., 2002). Answer options were from never (0) to nearly always (3). We calculated an average score. The CAPE-10 score had $\omega = .833$ in April and $\omega = .812$ in July.

Demographics: we asked for age, gender, country of residency, education (five steps from less than 8 years of schooling coded as 0 to Master / PhD education coded as 4), SES (asking in five steps from

bottom 10% to top 10%), people (separate children) living in the household, living space (asking from less than 10 square meters to more than 120 square meters). We also asked coarsely for political affiliation, i.e. "In political matters, people often talk of "the left" and "the right". How would you place your views on this scale, generally speaking?" in all but the Norwegian and German survey.

The same items were used in the July survey with the exception of omitting the knowledge about the virus scale, i.e. there was no conspiracy score. We also asked for fewer demographic items in the July survey. Presentation of the order of items within a scale were randomized.

Inclusion / exclusion criteria. Our analyses included all individuals older than 18 years old. We excluded surveys done in less than 3 minutes. Answering fewer than 70% of the items on a scale lead to exclusion for the analysis requiring the scale.

2.3 Statistical Analysis

To test which factors predict general distress (hypothesis 1) we conducted a linear mixed model with the general distress score (CORE-9) as the outcome, country as a random effect and thriving, regularity, trust, financial worry, paranoia, negative mindset, perceived risk, perceived efficacy of actions, gender, and education as the predictors. Survey distribution time (April or July) was entered as a fixed effect.

To address hypothesis 2 we run a linear mixed model for the paranoia score (10 items from CAPE-P), and as fixed effects: thriving, regularity, trust, financial worry, negative mindset, general distress, perceived risk, perceived efficacy of actions, gender and education. Country was entered as a random effect and wave as fixed effect. We also run a linear mixed model with the same predictors complemented with the conspiracy score for the April data.

Since we expected a positive relationship between general distress and paranoia (Mækela et al., 2020; Sun et al., 2019), we applied mediation analysis with general distress being the predictor, paranoia score the outcome and thriving, regularity, trust, negative mindset, perceived risk and perceived efficacy as mediators.

To examine the predictors of satisfaction and dissatisfaction with the actions taken to counteract the outbreak in one's country (hypothesis 3) we conducted a generalized mixed model with satisfaction as the binary outcome variable with the following predictors: thriving, regularity, trust, financial worry, conspiracy score, paranoia, negative mindset, general distress, perceived risk, efficacy of actions, gender and education. Country was included as a random effect. For comparing April and July (fixed effect) the predictor conspiracy score was omitted.

To examine the relationship between usual day activities and general distress we performed correlation analyses and compared April and July correlations using z transformation.

We used frequentist analysis and a significance criterion of $p < .05$ for the two mixed models and for the logistic regression (pre-registered hypotheses). All predictors and outcomes were centered. For the exploratory analysis we corrected for multiple testing.

The analyses in this study were formally pre-registered. However, the analyses presented below deviate from the pre-registration and are only conceptually similar, as our statistical approach focused on longitudinal outcomes and required us to collect over 1000 responses in July. In reality, we were able to collect only 731 valid responses in July.

2.4 Power analysis

There is considerable variation in the recommendation of required samples for multiple and hierarchical regression analysis. We follow a rule of thumb for multiple regression (Brysbaert, 2019), i.e. 100 participants plus another 100 for every predictor. Since we had up to 11 predictors, we aimed to recruit at least N=1200 participants to partake in each survey.

2.5 Ethics

The study was approved by the local ethics board at UiT (2017/2019), by the Norwegian Centre for research data (ref nr.: 287376) covering Europe. The study was also approved by the local ethics committee at Ben Gurion University and by the ethics committee from "Facultad de Ciencias Humanas" Universidad Nacional de Colombia. Sede Bogotá (Ethical approval No. B.VIE-FCH-21-2020).

3 Results

Over 2500 participants answered our April survey. 2214 were from our five target countries (Table 2). The remaining respondents were from Sweden (n=37), the US (n=85), UK (n=21), Canada (n=15), France (n=10), Austria (n=8), Denmark (n=6) and the remaining from over 25 other countries. In July 844 participated in the follow-up survey. 731 were from the five target countries and the remaining respondents were from the US (n=33), Austria (n=7) and over 15 other countries.

Table 2 reports the sample characteristics for the five countries. Our sample was well educated, over 70% female, most identified themselves as belonging to the middle class, and very few had an infection with SARS-CoV-2. The sample in July was similar in age ($F(1, 2932) = 4.94, p = .026, \eta_p^2 = .002$), gender ($\chi^2 = 1.37, p = .504$), education ($F(1, 2655) = .078, p = .78, \eta_p^2 < 0.001$) and wealth ($F(1, 2477) = 1.53, p = .0216, \eta_p^2 = .001$), suggesting no systematic attrition.

The countries differed markedly in the proportion of participants stating that their country overreacted, 46.5% of German respondents said so, followed by 15% of participants from Israel, 4% from Norway, 2% from Brazil and less than 1% from Colombia. Those participants felt that the costs of a lockdown are too high and their personal freedom was too restricted. Only half of them stated that the virus is harmless.

Table 2: Sample demographics, affection and selected daily activities in April

	Brazil	Colombia	Germany	Israel	Norway
N_April / N_July	384 / 86	353 / 118	273 / 61	372 / 77	832 / 389
Mean Age (range)	44 (18-72)	25 (18-72)	46 (19-74)	37 (18-73)	40 (18-74)
Female / male / other	303 / 80 / 1	228 / 122 / 3	214 / 58 / 1	255 / 116 / 1	617 / 213 / 2
female% / male %	79% / 21%	65% / 35%	78% / 22%	69% / 31%	74% / 26%
Urban vs rural	361 vs 23	333 vs 19	155 vs 113	308 vs 57	593 vs 230
In %	94%	94%	57%	83%	71%
Single households (%)	60 (16%)	11 (3%)	60 (22%)	38 (10%)	165 (20%)
Wealth (low-middle-upper)	16-153-202 4% / 40%	108-235-8 31% / 67%	74-186-7 27% / 68%	61-262-37 16% / 70%	90-696-31 11% / 84%
% Higher Education	87%	76%	58%	52%	85%

Affected					
Governmental Qu.	58%	93%	7%	63%	9%
Self-chosen Qu.	35%	15%	18%	36%	24%
Social Distancing	82%	97%	52%	30%	64%
Has/had COVID-19	3 / 2	0 / 0	1 / 5	1 / 1	1 / 4
Family COVID-19	2	10	4	6	6
Essential worker (%)	23 (6%)	4 (1%)	57 (21%)	69 (19%)	174 (21%)
Daily activities					
home office (>2h) vs N/A	65% vs 12%	80% vs 3%	41% v 39%	62% vs 15%	59% vs 22%
office (>2h) vs N/A	14% vs 68%	6% vs 85%	31% v 48%	18% vs 68%	27% vs 52%
Childcare	34%	15%	37%	45%	51%
Exercising	75%	78%	86%	87%	89%
At least 30min outside	53%	38%	83%	63%	75%
Watch News > 2h	39%	13%	27%	25%	22%
Communicating > 2h	35%	29%	11%	26%	12%

Legend. Wealth is grouped into low by pooling the lowest two self-ratings (belonging to the bottom 10% and 11%-30%), middle by pooling the self-rating belonging to 31-60% and 61-90%, upper is self-rated top 10%.

As can be seen in figure 1 (statistical details, reporting difference between the countries are reported in the SOM) from April to July there was no change in general distress and paranoia. Thriving decreased in four of the five countries from April to July. Regularity, on the other hand, increased slightly from April to July. As for trust in their authorities overall trust did not change from April to July. On average there was a reduction in negative mindset from April to July whereas the rating of the pandemic as more predictable slightly increased from April to July. Across all five countries, perceived risk of COVID-19 did not change from April to July. Financial worries, on average, reduced from April to July. Regarding how long they think the restrictions will last, across all countries participants expected longer lasting restrictions when asked again in July.

Figure 1: Boxplots indicating the median, second and third quartiles and outliers for the dependent and independent measures included in our study. Red = April data, Blue = July data. No data are available for conspiracy theories in July as we omitted this scale. For statistical details see SOM.

3.1 Protective and obstructive factors for general distress

The linear mixed model testing our first hypothesis explained 44.7% of the variance. There was no significant change in distress from April (Mean= 9.73, SD = .291) to July (Mean = 10.11, SD = .395). Perceived efficacy of governmental reactions and trust in authorities were not significant predictors of general distress. Thriving and maintaining a regular schedule demonstrated protective qualities, i.e. higher scores yielded lower general distress. A negative mindset, paranoia, high perceived COVID-19 infection risk, financial worries and being female predicted more distress. The

random effect of country was significant ($LRT^1 = 9.27, p = .002$). Table 3 reports the estimates of the mixed model and figure 2 and 3 shows the estimates per country and for the April and July survey, respectively.

Table 3: Fixed Effects Parameter Estimates for general distress

Predictor	Estimate	SE	95% Confidence Interval		df	t	p
			Lower	Upper			
(Intercept)	9.918	0.311	9.309	10.527	4.86	31.929	< .001
Thriving	-2.071	0.206	-2.474	-1.667	1386.07	-10.05	< .001
Regular Schedules	-1.5	0.119	-1.733	-1.267	2496.67	-12.643	< .001
Trust in Authorities	-0.225	0.151	-0.521	0.07	567.56	-1.494	0.136
Financial Worry	0.034	0.004	0.027	0.042	2464.44	8.772	< .001
Paranoia	4.69	0.35	4.003	5.376	2349.32	13.394	< .001
Negative Mindset	2.103	0.167	1.777	2.429	2391.18	12.629	< .001
COVID-19 Risk	0.031	0.008	0.016	0.047	2497.91	3.990	< .001
Perceived Efficacy	-0.032	0.178	-0.382	0.317	2349.51	-0.182	0.855
Gender	1.303	0.238	0.837	1.769	2491.69	5.478	< .001
Education	-0.221	0.126	-0.469	0.026	1890.57	-1.753	0.080
T2July - T1April	0.38	0.308	-0.224	0.984	2418.79	1.234	0.217

¹ LRT ... Loglikelihood ratio

Figure 2 (April) and 3 (July) show the estimates for the 10 predictors of general distress per country. As can be seen, the difference between the months and between the countries is smaller than between the predictors. Gender is coded as male = 0, 1 = female, 2 = other.

3.2 Protective and obstructive factors for paranoia

The linear mixed model for paranoia and for April and July explained 25.5% of the variance. The fixed effect of wave was small, $F(1,2498) = 4.042$, $p = .045$. We therefore report the model for April only but including the conspiracy score as predictor. The mixed model for paranoia in April explained 24.5% of the variance. The paranoia score differed by country ($LRT = 75.4$, $p < .001$). The less regularity, trust and lower education the more paranoia. Being male was also associated with paranoia, so was a higher conspiracy score and general distress. Financial worries, negative mindset, perceived risk, perceived efficacy and trust were not associated with more paranoia. Table 4 reports the estimates and figure 4 shows that there is more variation between the indices than the countries.

Table 4: Fixed Effects Parameter Estimates for paranoia

Predictor	Estimate	SE	95% Confidence Interval		df	t	p
			Lower	Upper			
(Intercept)	0.415	0.044	0.329	0.500	4.09	9.478	< .001
Thriving	0.008	0.012	-0.015	0.031	2475.05	0.699	0.485
Regular Schedules	-0.024	0.007	-0.037	-0.011	2495.66	-3.572	< .001
Trust in Authorities	-0.012	0.009	-0.029	0.005	2348.30	-1.410	0.159
Financial Worry	0.0004	0.0002	-0.0001	0.001	2497.58	1.633	0.103

Table 4: Fixed Effects Parameter Estimates for paranoia

Predictor	Estimate	SE	95% Confidence Interval		df	t	p
			Lower	Upper			
Negative Mindset	-0.008	0.009	-0.027	0.011	2497.99	-0.850	0.396
General distress	0.014	0.001	0.012	0.016	2495.58	13.299	<.001
COVID-19 Risk	0.001	0.0004	0.0002	0.002	2495.19	2.490	0.013
Perceived Efficacy	-0.020	0.01	-0.04	-0.001	2497.99	-2.063	0.039
Gender	-0.053	0.013	-0.079	-0.027	2496.78	-4.055	<.001
Education	-0.032	0.007	-0.046	-0.019	2493.36	-4.612	<.001
T2July - T1April	0.034	0.017	8.55e-4	0.067	2497.64	2.010	0.045

Figure 4 shows the estimates for paranoia per country, April data.

We found the same pattern of results when analyzing data from April and July separately, using all data irrespective of country. Thriving and regularity were protective whereas paranoia, negative mindset, financial worry and being female were risk factors for general distress (see SOM for details). Similarly, general distress was a significant predictor for paranoia. The overall pattern for general distress and paranoia emerged also when using the longitudinal subset ($n=525$), i.e. participants who took part both in April and July (see SOM for details).

3.3 Which factors mediate the relationship between distress and paranoia?

As figures 2-4 show there is a positive relationship between general distress and paranoia. We therefore investigated (April data) whether any of the protective and risk factors could mediate the relationship, i.e. would there be a significant indirect effect. Mediators were thriving, regularity, trust, negative mindset, perceived risk and perceived efficacy. The direct effect between distress and paranoia explained 98% whereas the indirect effect of thriving explained only 2%, $Z = 1.75$, $p = .079$. Similarly a negative mindset did not mediate the relationship, 2.68%, $Z = 1.65$, $p = .1$. On the other hand regularity significantly mediated the relationship between distress and paranoia, 9.27%, $Z = 5.03$, $p < .001$, so did trust: 17.1%, $Z = 9.27$, $p < .001$, perceived risk: 2.51%, $Z = 2.62$, $p = .009$ and perceived efficacy: 7.46%, $Z = 5.86$, $p < .001$. Thus, a more regular schedule, higher trust in authorities, lower perceived risk and higher perceived efficacy of actions reduces the association between distress and paranoia.

3.4 What characterizes those who think their country overreacted?

Finally, our third hypothesis that predicted more distress and paranoia among those who think that their country overreacted was not confirmed. Firstly, the relative number of participants stating that their country overreacted was lower in July than in April (estimate = -4.42, $\exp(B) = .012$, $z = -4.84$, $p < .001$). Secondly, applying logistic regression for the April data (Table 5), dissatisfied participants had a significant lower score on thriving ($\chi^2 = 21.05$, $p < .001$), trust in authorities ($\chi^2 = 17.11$, $p < .001$) and perceived efficacy ($\chi^2 = 10.09$, $p < .001$), but also demonstrated less characteristics of a negative mindset ($\chi^2 = 27.35$, $p < .001$) and endorsed conspiracy theories more ($\chi^2 = 36.73$, $p < .001$). They showed no differences in general distress, financial worries, regularity, education, gender or paranoia. Their perceived risk was somewhat higher but not significantly so. Overall the model explained 68.5% of the variance (R^2 conditional). Applying a similar model without the conspiracy score but with wave as fixed effect yielded very similar results, i.e. thriving, trust in authorities, perceived efficacy and negative mindset were significant predictors. In addition, perceived risk was a significant predictor (estimate = -.02, $\exp(B) = .978$, $z = -3.102$, $p = .002$) where lower risk means more likely to be dissatisfied.

Table 5: Fixed Effects Parameter Estimates for satisfaction

Predictor	Estimate	SE	exp(B)	95% Exp(B) Confidence Interval		z	p
				Lower	Upper		
(Intercept)	-3.786	0.895	0.023	0.004	0.131	-4.229	< .001
Thriving	-0.830	0.181	0.436	0.306	0.621	-4.587	< .001
Regular Schedules	-0.032	0.115	0.968	0.774	1.212	-0.281	0.778
Trust in Authorities	-0.59	0.143	0.555	0.419	0.733	-4.137	< .001
Financial Worry	0.003	0.004	1.003	0.996	1.010	0.824	0.410
Conspiracy Score	-0.019	0.003	0.982	0.976	0.988	-6.061	< .001
Paranoia	0.245	0.348	1.278	0.647	2.526	0.705	0.481
Negative Mindset	-0.881	0.168	0.415	0.298	0.577	-5.230	< .001
General distress	-0.019	0.019	0.981	0.945	1.018	-1.009	0.313

Table 5: Fixed Effects Parameter Estimates for satisfaction

Predictor	Estimate	SE	exp(B)	95% Exp(B) Confidence Interval		z	p
				Lower	Upper		
Risk	-0.015	0.007	0.985	0.971	0.999	-2.050	0.040
Perceived Efficacy	-0.545	0.171	0.58	0.415	0.812	-3.177	0.001
Gender	-0.335	0.227	0.716	0.459	1.116	-1.477	0.140
Education	0.028	0.112	1.028	0.826	1.280	0.248	0.804

3.5 Comparison to March data

In addition to the data described so far, we have also collected data in March 2020, investigating the perceived efficacy of COVID-19 restrictions and how those affect mental health (Mækela et al., 2020; Sun et al., 2019). The following will capitalize on similarities in the collected measures to cross-sectionally compare general distress, paranoia, conspiracy score and perceived risk, four measures that were identical (distress and paranoia) or had overlapping items (conspiracy score, perceived risk) in all three surveys, see Fig 5.

Figure 5: Comparison to our March data. Paranoia and perceived risk declined from March to July. For more details, please see the SOM.

Distress increased from March to April, $F(2, 4671) = 11.851$, $p < .001$, $\eta_p^2 = .004$. Paranoia, on the other hand, decreased in all countries from March to April, $F(2, 4677) = 16.189$, $p < .001$, $\eta_p^2 = .006$. There was a large reduction in perceived risk from March to April and an even greater reduction in July, $F(2, 4656) = 359.994$, $p < .001$, $\eta_p^2 = .129$. Finally, we compared the conspiracy score in March with April, and this score increased, $F(1, 3891) = 11.981$, $p < .001$, $\eta_p^2 = .003$, indicating that in April participants were more likely to endorse Covid-19 related conspiracy theories. Details by country and the interactions can be found in the SOM.

3.6 Exploratory analysis of usual day activities

Among 17 activities participants were asked to indicate how much time on a usual day they engage in these activities. Apart from procrastination we assumed that all other activities are either neutral (e.g. child care) or beneficial for mental health (being outdoors). Briefly, we found that procrastinators had a higher score on general distress than participants who spent no or little time procrastinating ($p = .249$, $p < .001$). General distress was also lower among those who exercised ($p = -.131$, $p < .001$) and could and did go outdoors ($p = -.107$, $p < .001$). Details are reported in the SOM.

4 Discussion

This study aimed to identify factors contributing to the psychological well-being of individuals during the 2020 COVID-19 outbreak. We collected data from more than 2,000 participants in 5 countries (Norway, Germany, Brazil, Columbia and Israel) in two waves in April and July. We found that the prolonged disruption of normal life and imposed social restrictions did not lead to a gradual increase in general distress and paranoia. Compared to pandemic-onset levels in March, paranoia decreased, though distress in April was higher than in March. Furthermore, we identified several factors that contributed to maintaining mental health during the pandemic. Our data show a beneficial effect of thriving and maintaining a regular schedule, with little to no influence of demographic factors such as gender, age and education. As predicted, financial concerns negatively impacted mental health. In what follows we provide a detailed overview of our main findings and their potential implications.

As far as distress and paranoia are concerned, we found no change between April and July. The prolonged disruption of normal life did not gradually increase distress nor paranoia. In fact, paranoia levels even decreased compared to data collected in March (Mækela et al., 2020). Rather, our results indicate that the majority of our sample grew accustomed to the changed circumstances and people may perceive them as “The new normal”. Supporting this interpretation, our participants indicated in July (compared to April) higher ability to maintain a regular schedule (regularity), rated the pandemic as more predictable, and predicted it will last longer. In addition, both protective and risk factors for distress exerted decreased influence in July compared to April. It is possible that regularity, predictability and reduced uncertainty had offset the negative impact of the demanding situation involved in dealing with a pandemic. In other words, our data show that people may adapt to a demanding situation once it becomes predictable.

Adaptation is a core tenet of human behavior. Within the field of happiness economics it is known that individuals adapt to both prosperity and to adversity and return to their natural levels of happiness (Carol, 2009). There is also evidence that people are better able to adapt to unpleasant certainty than they are to uncertainty. A long-term study found a reduction or return to normal levels of anxiety among people in isolation during MERS (Jeong et al., 2016). Similarly, a political loss in a participatory democracy (the United States of America) led to a very short-lived spike in depression that quickly returned to pre-election levels (Simchon et al., 2020). Our investigation joins these and similar studies showing that as far as explicit manifestations of mental well-being go, humans display high adaptability to adverse events.

Evidence for functional adaptation also arrives from studies showing reductions in worry (Bendau et al., 2020; Varga et al., 2021) and a slight increase in happiness during the late phase of the lockdown in April (Stieger, Lewetz, & Swami, 2021). However, (Martínez, Valencia, & Trofimoff, 2020) found a decrease in self-reported happiness and increase in depression and anxiety after one month of enforced lockdown in Colombia. In our sample, participants from Colombia were mostly students. A previous study on undergraduates found no mental health differences among those in quarantine and

those not during the 2009 H1N1 epidemic (Wang et al., 2011), suggesting that students display a unique temporal trajectory of mental health outcomes.

At the beginning of the pandemic the perceived risk of contagion was higher in the five countries we studied here compared to the perceived risk in April (Mækela et al., 2020). Notably, perceived risk of contagion across all five countries did not change from April to July and the perceived risk in July was lower than the perceived risk from March. As perceived risk mediated the relationship between distress and paranoia, fostering valid rather than inflated estimations of perceived risk might assist in attenuating detrimental mental health-related outcomes.

In this study we used a newly created thriving scale based on research into optimal human functioning and positive psychology (Donaldson, Dollwet, & Rao, 2015) by not measuring the minimization of loss but instead a positive response to challenges (O'Leary & Ickovics, 1995). The scale had good reliability. Participants who scored high on thriving reported less general distress, and were more often satisfied with how their country reacted to the outbreak. Our finding suggests that an individual's ability to create meaning and a sense of belonging in a challenging situation, as well as finding opportunities for growth and learning, can act as a buffer against distress. This process may be facilitated and enhanced through pro-social emotions such as gratitude, compassion, and pride (Cheng et al., 2015; Otto et al., 2016; Schueller & Seligman, 2010; Tracy & Robins, 2007; Williams & DeSteno, 2008). We note that all items of the thriving scale included a social component, and the interpersonal aspect of thriving may be substantial and could act as a catalyst for thriving (Feeney & Collins, 2014).

Regularity of sleep, eating and daily schedule was greatly beneficial for both general distress and reducing paranoia. These findings are consistent with previous work showing that regularity of sleep, exercise and social rhythm is linked to improved mental health and well-being (Boland et al., 2019; Grandin, Alloy, & Abramson, 2006; Logan & McClung, 2019; Margraf, Lavalley, Zhang, & Schneider, 2016). Maintaining regularity is especially important if circadian rhythms and related routine social cues (zeitgebers) are hampered during the pandemic, and can be a potential target for intervention (Murray et al., 2020).

We did not find that trust in government was a protective factor against general distress and paranoia. Notably, previous investigations have highlighted trust as an important factor in preserving mental well-being (Helliwell & Huang, 2008). This is true also in the specific context of the early phase of the Covid-19 pandemic (Bäuerle et al., 2020; Harris & Sandal, 2020; Jovančević & Milićević, 2020; Mækela et al., 2020; Paolini, Maricchiolo, Pacilli, & Pagliaro, 2020). The present results might reflect the specific countries included in the present study. Interestingly, these countries differed significantly on mean levels of trust in authorities (see Figure 1 and SOM), potentially indicating the specific socio-political circumstances in each country that might have led to different contributions of trust across these countries.

In the domain of risk factors, we found that excessive worry, catastrophizing thoughts, feeling scared and experiencing a lack of control, all components of the negative mindset scale, were consistently related to increased general distress. This is in line with a breadth of recent research on worry and mental health (Bendau et al., 2020; Freeman & Garety, 1999; Lüdtke et al., 2020; Sun et al., 2019). Similarly, the similar levels of general distress compared to March accompanied by the reduced estimates for risk of contagion suggest that financial worries and other more general worries (as measured in our negative mindset scale) contribute to general distress after the initial uncertain phase of the pandemic has passed.

Our results are also in line with previously reported strong relationships between irrational beliefs and distress (Višlā, Flückiger, Grosse Holtforth, & David, 2016). Indeed, recent research links paranoia and delusions to heightened perceived volatility (Deserno et al., 2017; Kreis et al., 2021). A reduced feeling of control, in combination with reduced regularity and less trust, might explain why a small proportion of respondents endorse conspiracy theories and paranoid ideations (Bierwiazek et al., 2020; Graeupner & Coman, 2017; Jolley & Paterson, 2020; Jovančević & Milićević, 2020; Romer & Jamieson, 2020; Uscinski et al., 2020).

4.1 Limitations

Our study is a convenience sample, biased towards educated and female respondents and only very few have had a SARS-CoV-2 infection or a close family member who have had it. Particularly in Brazil, a country with high social inequality and unequal access to the internet (Silva, Coelho, Ehrl, & Tabak, 2020), our sample is mostly from the middle class.

To ensure a high completion rate of the survey we limited the number of protective and risk factors. We did not ask about sleep quality, though sleep quality is beneficial for mental health, e.g. (Lüdtke et al., 2020). We used an abbreviated version of the CAPE positive scale and the short form of the clinical outcome (CORE) measure. We also did not ask about protective behavior, or used scales to measure anxiety.

The selection of the five countries is due to the researcher's location and access to those data. Our focus was not in comparing those five countries, quite the opposite. We set out to find similarities despite known economic and cultural differences.

4.2 Conclusions

Our study exploited the unprecedented opportunity to measure general distress and paranoia in the general population across five countries varying in their socio-economy during the early phase of the COVID-19 outbreak. Despite large differences in the countries' welfare system and handling of the pandemic, we found the same psychological factors being associated with mental well-being. Maintaining a regular schedule was greatly beneficial for both general distress and retaining low paranoia. Across all countries, thriving was highly beneficial for reducing general distress, whereas financial worries and a negative mindset were associated with increased general distress. In summary, our data show the remarkably adaptive and resilient nature of human beings as they grow accustomed to new situations when they have a supportive community and a sense of meaning in life. We hope that by shedding light on the factors contributing to adversarial growth our society will be better prepared for the upcoming events in this pandemic and in future prolonged negative society-level experiences.

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6 Author Contributions

GP, MM conceived and designed the study. KK, ND, NR, RP, RT recruited participants and translated the material. GP performed the statistical analysis. GP, MM, NR wrote the first draft of the manuscript. All authors contributed to manuscript revisions, read and approved the submitted version.

Data Availability Statement

The datasets for this study can be found on the Open Science Framework [<https://osf.io/cx4yg/>].