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**High stress levels and trust toward the government are associated with more positive attitudes toward Covid-19 vaccines among youth**

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## Abstract

**Background:** Distrust of COVID-19 vaccines may hamper vaccination campaigns. We focused on the cognitive determinants of intentions to get vaccinated against COVID-19. We were interested in (i) the effects of stress, and (ii) the effects of self-protection systems on attitudes and intentions to get vaccinated with a COVID-19 vaccine.

**Methods:** We conducted an online observational study with 203 French students ( $M_{Age} = 19$ ,  $SD_{Age} = 2.52$ , Women = 173), in which we measured, through self-reported questionnaires, their perceived stress and vulnerability to disease, belief in a dangerous world, pandemic-related stressors living conditions, attitudes and intentions to get vaccinated, and confidence in the government's management of COVID-19. We conducted two multiple linear mediation analyses.

**Results:** Participants who reported higher trust in the government and who reported higher stress levels were more likely to have positive attitudes toward the COVID-19 vaccine, although both these influences seem to be –at least partially - independent.

**Conclusions:** The factor that most robustly predicted both attitudes and intentions to vaccinate was confidence in the information provided by the government and its ability to manage the pandemic in general. Our analyses suggest the existence of two profiles of people likely to have positive attitudes toward vaccination: those who trust the government and are not stressed by vaccination, and those who do not trust the government but would get vaccinated to reduce their stress. We discuss how to improve the effectiveness of COVID-19 vaccine policies through communication.

*Keywords:* Covid-19, Stress, Vaccination, Evolution, Youth, Trust

## **High stress levels and trust toward the government are associated with more positive attitudes toward Covid-19 vaccines among youth**

As of February 3, 2022, 370 572 213 confirmed cases of COVID-19 and 5 649 390 confirmed deaths were reported worldwide by the World Health Organization. Aside from alarming consequences for individual and collective health, researchers also report consequences on emotional and social functioning [1]. However, although several vaccines are available, part of the population remains reluctant to get vaccinated. Indeed, a survey among British adults showed that 64% of participants were very enthusiastic to receive the COVID-19 vaccine, while 27% were unsure and an alarming 9% were very unlikely to receive the vaccine [2]. Another study on French people showed that 35% of the sample was "hesitant" [3]. This goes hand in hand with a decrease in vaccination rates and with an increase in refusal to receive vaccines over the past several years [4]. In 2021, France had the second lowest COVID-19 vaccine acceptance rate in Europe [5,6]. While vaccination against COVID-19 has been very successful in at-risk or elderly populations (e.g., over 84% in the US) [7], it is largely less prevalent in younger populations at lower risk for developing severe forms of Covid-19 [8]. In younger populations, the choice to be vaccinated against Covid-19 may depend on several factors.

Perceived uncertainty around the health risks and benefits associated with a vaccine that is in recent development seems to be the main factor that hampers vaccination. For example, (i) some individuals are fearful and believe that vaccines pose risks of infection; (ii) some people underestimate the benefits of the vaccines and/or the severity of some diseases; (iii) some individuals or populations have difficulty for accessing vaccines [4,6]. While these factors are interesting and useful for understanding intentions to get vaccinated or not, they may not sufficiently consider individual differences in the processing of uncertainty about vaccination, which would predict who would or would not get vaccinated.

Hence, we investigated these individual differences on how distrust toward official, government information that the vaccine is effective and safe affects attitudes toward vaccines. More precisely, we investigated how stress responses induced by the pandemic situation (i.e., living conditions, socioeconomic variables) and individual self-regulatory capacities (i.e., perceived stress and protective systems) will determine vaccination attitudes and intentions in a population of young people.

### **Stress may hinder intentions to vaccinate**

*Socio-economic variables.* Numerous studies have shown a strong influence of socioeconomic status on stress levels [9], which in turn has an effect on emotional regulation [10]. Chronic stress mediates the influence of childhood poverty on prefrontal activity in adulthood. For example, adults in childhood poverty show lower prefrontal activity and higher amygdala activity during an emotional regulation task [10]. In addition, high socioeconomic disparities promote low subjective socioeconomic status, which in turn is associated with higher stress levels and reductions in prosocial behaviors at the group level [11].

*Stress regulation.* Many theoretical models postulate that, when faced with a threat, every human being will implement strategies to reduce the danger and will adopt rational self-protecting behaviours [12,13]. Indeed, lower self-regulatory capacity is associated with self-focused aversive responses to a stressor and lower prosocial tendencies [14]. The stress response aims at adapting the organism to a threatening situation. However, if this stress is significantly too high, it can also lead to stress regulation strategies based on avoidance or withdrawal [12]. In particular, long-term exposure to this stressful situation, for people who do not have the necessary resources to find or implement protective measures, may lead to

coping strategies centered on discrediting the message or the messenger, or centered on the negative emotions created by the message [15]. In our case, the stress induced by the current pandemic situation, especially because it is prolonged and generalized, may be deleterious for the trust given to information provided by government agencies.

### **How the stress response is modulated by Protective Systems**

Second, we looked at how protective systems (self-protection and disease avoidance systems) [16] will modulate the stress response on intentions to vaccinate. Each system is underpinned by an excess of vigilance toward risk, tending toward self-protective responses even when potentially threatening cues are ambiguous. Each system is highly sensitive to context fluctuations and to individual differences in vulnerability and is more likely to be engaged by those who feel chronically vulnerable to the specific threat. Here we focus on two of these precautionary systems : (i) the self-protection and (ii) the pathogen-avoidance systems. Both are functionally distinct psychological systems. Each system is characterized by a coordinated sequence of mechanisms adapted to the perception of specific types of threat signals.

These two systems have been evolutionarily developed to address two distinct categories of threats. The self-protection system is dedicated to the detection of emotional facial expressions, allowing the detection of the danger that others may represent. It also allows us to differentiate them from ambiguous emotional expressions in terms of their threatening character. Because environmental threats are not only found in other individuals, but also in diseases and epidemics, humans have also developed a pathogen-avoidance system, which has the function of guiding us away from elements that are likely to cause contamination. The pathogen-avoidance system is especially oriented to the detection of

symptoms that pathogens can have on the behavior, as for example, vomiting or diarrhea or, in our case, diseases or pathologies induced by the secondary consequences of vaccination.

While generic stress regulatory processes tend to direct humans toward handling stimuli as threats as the “default” mode [17], protective systems function to modulate this primary stress response by mitigating or augmenting it. The stress response is susceptible to be regulated at two points in time from the initial response. First, there is a primary, automatic response to a relevant stimulus and a secondary, self-regulatory, emotional response to this stimulus. While the automatic stress response may be more or less intense, the secondary response depends on the self-regulatory strategy used by the individual (attenuation, increase or maintenance of the emotional response). Protective systems are automatically engaged and then regulated in a more or less adapted manner. Koole [18] points out that there are important inter-individual differences in psychophysiological traits related to self-regulation: these traits could determine the regulation of the engagement of protective systems.

We first hypothesize that distrust toward the government handling of the COVID-19 situation would lead to more negative attitudes toward COVID-19 vaccination. Second, we hypothesize that the effect of distrust on attitudes will in turn be explained by higher levels of perceived stress, pathogen-avoidance, and self-protection on one hand, and by living condition, environmental stressor and COVID-19 burden on the other hand, due to a greater propensity to perceive vaccines as threatening and a lower propensity to engage in prosocial behaviors in protecting others.

## **Method**

### **Sample and Procedure**



We analyzed data from 203 French students ( $MAge = 19$ ,  $SDAge = 2.52$ , Women = 173). Data was collected from 1st December to 16th December 2020 through an online survey. Our study was composed of two sets of variables. On the first hand, we measured intentions to get vaccinated with RNA vaccines and traditional vaccines against COVID-19, the level of confidence in the French government regarding its management of the COVID-19 pandemic, and the level of confidence in the epidemiological data issued by the government. On the other hand, we assessed participants' stress levels over the past month (with the Perceived Stress Scale, PSS) [19], and levels of trait protection and disease-avoidance systems (Belief in a Dangerous World Scale and Perceived Vulnerability to Disease Scale) [20,21]. We also measured several indicators of their living conditions during periods of health restrictions and their concerns about the effects of the pandemic on their social, professional and personal lives [22]. Participants then completed a demographic questionnaire. Participants first completed questionnaires on psychological variables (randomized), followed by questionnaires on their living conditions and concerns (randomized). Participants then completed outcomes related to their trust in government and vaccines.

## **Material<sup>1</sup>**

### **Independent variables**

*Trust toward government policies (TTG)*. Participants were asked to indicate whether, in general, they thought the French government was effective in managing the Covid-19 pandemic on a Visual Analog Scale ranging from 0 - Not at all to 100 - Definitely.

*Perceived Stress Scale (PSS)*. A French version of the 10 items Perceived Stress Scale with a visual analog scale was used. The PSS assesses the degree to which an individual perceives

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<sup>1</sup> All items on self reported measures are available in Appendix A.

life to be unpredictable and difficult for them to manage ( $\omega = .88$ ,  $\alpha = .88$ ,  $M = 59.2$ ,  $SD = 19.1$ ). Participants were asked to respond on a visual analog scale ranging from 0 "Never" to 100 "Often."

*Belief in a Dangerous World (BDW)*. The Dangerous World Belief Scale measures the extent to which individuals tend to be chronically afraid for their safety and perceive the world to be full of dangers. Participants were asked to complete a 5 points 12-item scale ranging from -Strongly Disagree- to -Strongly Agree- ( $\omega = .84$ ,  $\alpha = .84$ ,  $M = 3.22$ ,  $SD = 0.68$ ).

*Perceived Vulnerability to Diseases (PVD)*. The 15-item Perceived Vulnerability to Disease scale measures sensitivity to germ transmission ("Germ Aversion" dimension, 8 items) and the feeling of being personally more sensitive to the risk of being infected ("Pathogen Sensibility" dimension, 7 items). The participants answered on a 7-point scale ranging from "Strongly Disagree" to "Strongly Agree" ( $\omega = .72$ ,  $\alpha = .75$ ,  $M = 4.02$ ,  $SD = 0.85$ ).

*Living conditions*. We assessed data on lockdown conditions similar to the one used in Flaudias et al. [22]. Questions focused on housing conditions and the number of people and children with whom individuals were confined (see Appendix A for more details).

*Pandemic-related stressors*. We used the same scale as Flaudias et al. [22] to measure worries related to the pandemic situation with a specific, 11-item scale of stressors associated with specific lockdown concerns (e.g., "I'm concerned about my finances", "I'm concerned about future employment opportunities").

*Covid-19 Burden.* The degree to which participants were affected by COVID-19 was measured in 3 items (did you have a loved one infected/hospitalized/deceased by COVID-19) on a dichotomous scale (yes vs no).

### **Dependent variable**

*Attitudes Toward COVID-19 vaccines.* Participants were asked two questions regarding their general attitude toward attenuated virus and RNA vaccines (*If an attenuated/RNA virus vaccine against Covid-19 were available now, do you think (i) "It would be safe to administer it to the population, without the risk of unexpected side effects" and (ii) "It would be effective in fighting the COVID-19 pandemic"?*) on a Visual Analog Scale ranging from 0 - Not at all - to 100 - Definitely. Then, participants were asked to indicate whether they would be willing to be vaccinated against COVID-19 if it were a messenger RNA vaccine, or if it were an attenuated virus vaccine (i.e., conventional vaccine, AV) on a Visual Analog Scale ranging from 0 - Not at all - to 100 - Definitely. We computed a mean "Attitudes toward Vaccines" scores based on these six items, which showed extremely high reliability ( $\omega = .93, \alpha = .93, M = 31.9, SD = 24.2$ )

### **Statistical Analyses**

We conducted two multiple linear mediation analyses with Trust in the Government Policies as the predictor on Attitudes Toward Vaccines. The first model included the cognitive variables as mediators (PSS, BDW, PVD, named "Cog") and the second included Environmental variables (i.e., Living Conditions, Covid-19 burden and Stressors scores, named "Env") as mediators. All variables were centered. We expected an indirect effect of Trust in the Government via PSS, BDW and PVD Scores in the "Cog" Model and a mediation via Living Conditions, Covid-19 burden and Stressors scores in the "Env" Model.

Age and Sex were entered as covariates. All descriptive statistics are available in Table 1.

Raw data is available at <https://osf.io/se7gc>.

*Table 1 – Sample Descriptive statistics*

<b>City Population</b>	
Mean (SD)	181304.3 (530011.5)
Range	1.0 - 2148000.0
<b>Housing Area</b>	
Mean (SD)	204.8 (1240.8)
Range	0.0 - 14600.0
<b>How many adults do you live with ?</b>	
Mean (SD)	2.2 (0.8)
Range	1.0 - 5.0
<b>How many children do you live with?</b>	
Mean (SD)	0.3 (0.7)
Range	0.0 - 3.0
<b>Balcony</b>	
Yes	59 (43.1%)
No	78 (56.9%)
<b>Garden</b>	
Yes	69 (50.4%)
No	68 (49.6%)
<b>Inner Courtyard</b>	
Yes	26 (19.0%)
No	111 (81.0%)
<b>Do you know someone infected by the C19 virus ?</b>	
Yes	90 (65.7%)
No	47 (34.3%)
<b>Do you know someone hospitalized because of the C19 virus ?</b>	
Yes	30 (21.9%)
No	107 (78.1%)
<b>Do you know someone deceased because of the C19 virus ?</b>	
Yes	29 (21.2%)
No	108 (78.8%)
<b>COVID-19 Burden</b>	
Mean (SD)	4.9 (0.9)
Range	3.0 - 6.0
<b>Living Conditions</b>	
Mean (SD)	71.5 (247.4)
Range	4.0 - 2925.0
<b>Age</b>	
Mean (SD)	18.8 (1.8)
Range	13.0 - 29.0
<b>Gender</b>	
Female	120 (87.6%)

Male	16 (11.7%)
Other	1 (0.7%)
<b>Scholarship</b>	
Yes	56 (40.9%)
No	81 (59.1%)
<b>Job</b>	
Yes	25 (18.2%)
No	112 (81.8%)
<b>Type of Housing</b>	
Personal Housing	8 (5.8%)
Roommate	4 (2.9%)
Student Residence	1 (0.7%)
Parent's house	124 (90.5%)
<b>Year of study</b>	
1st year	134 (97.8%)
2nd year	1 (0.7%)
3rd year	1 (0.7%)
5th year	1 (0.7%)
<b>Trust in government management of the C19 pandemic</b>	
Mean (SD)	32.7 (23.1)
Range	0.0 - 92.0
<b>Trust in government data relative to the C19 pandemic</b>	
Mean (SD)	38.2 (26.1)
Range	0.0 - 95.0
<b>Trust in government regarding vaccine safety</b>	
Mean (SD)	32.9 (26.1)
Range	0.0 - 100.0
<b>Trust in government regarding vaccine efficacy</b>	
Mean (SD)	33.0 (26.0)
Range	0.0 - 100.0
<b>Perceived Stress Scale (PSS)</b>	
Mean (SD)	59.1 (18.4)
Range	6.8 - 99.5
<b>Perceived Vulnerability to Diseases (PVD)</b>	
Mean (SD)	4.0 (0.8)
Range	1.9 - 5.9
<b>Belief in a Dangerous World Scale (BDW)</b>	
Mean (SD)	3.2 (0.7)
Range	1.8 - 4.8
<b>Pandemic-Related Stressors</b>	
Mean (SD)	20.8 (0.8)
Range	19.1 - 23.2
<b>Attitude toward C19 Vaccine</b>	
Mean (SD)	32.1 (24.5)
Range	0.0 - 92.4

## Results

*Model-Cog* : We found a total effect of Trust in the Government on Attitudes toward vaccines,  $b = 0.69$ ,  $z = 9.91$ ,  $p < .001$ , such that a higher trust led to more positive attitudes toward the vaccine. We found a significant indirect effect of Trust in the Government on Attitudes toward vaccines (TTG→PSS→ Vaccine Attitudes),  $b = -2.44$ ,  $z = -1.73$ ,  $p = 0.01$ , a significant “a” component (TTG→PSS),  $b = -0.26$ ,  $z = -4.35$ ,  $p < .001$ , and a marginally significant ‘b’ component (PSS→ Vaccine Attitudes),  $b = 0.22$ ,  $z = 2.94$ ,  $p = 0.003$ . The lower the Trust in the Government, the higher the perceived stress, which turns to more positive attitudes toward the vaccine. No significant mediation effect was found for the Perceived Vulnerability to Disease and Belief in a Dangerous World Scores ( $ps > .14$ ). See Table 2 for all Estimates.

*Table 2 – Mediation Estimates for Model-Cog*

Indirect and Total Effects

Type	Effect	Estimate	SE	95% C.I. (a)		$\beta$	z	p
				Lower	Upper			
Indirect	Trust in Government ⇒ Perceived Stress Scale (PSS) ⇒ Attitudes toward C19 Vaccines	-0.059 81	0.02443	-0.1076 8	-0.0119 3	-0.0558 2	-2.448 3	0.014
	Trust in Government ⇒ Perceived Vulnerability to Diseases (PVD) ⇒ Attitudes toward C19 Vaccines	0.0045 2	0.00676	-0.0087 3	0.0177 7	0.00422	0.6692	0.503
	Trust in Government ⇒ Belief in a Dangerous World Scale (BDW) ⇒	0.0023 1	0.02535	-0.0473 8	0.0519 9	0.00215	0.0910	0.928

		Attitudes toward C19 Vaccines						
Component	Trust in Government ⇒ Perceived Stress Scale (PSS)	-0.26303	0.05982	-0.38028	-0.14578	-0.31065	-4.3969	< .001
	Perceived Stress Scale (PSS) ⇒ Attitudes toward C19 Vaccines	0.22737	0.07714	0.07618	0.37856	0.17967	2.9475	0.003
	Trust in Government ⇒ Perceived Vulnerability to Diseases (PVD)	-0.00332	0.00271	-0.00863	0.00198	-0.09093	-1.2284	0.219
	Perceived Vulnerability to Diseases (PVD) ⇒ Attitudes toward C19 Vaccines	-1.36109	1.70556	-4.70393	1.98174	-0.04643	-0.7980	0.425
	Trust in Government ⇒ Belief in a Dangerous World Scale (BDW)	-0.01128	0.00205	-0.01530	-0.00725	-0.37797	-5.4925	< .001
	Belief in a Dangerous World Scale (BDW) ⇒ Attitudes toward C19 Vaccines	-0.20445	2.24702	-4.60853	4.19964	-0.00569	-0.0910	0.928
	Trust in Government ⇒ Attitudes toward C19 Vaccines	0.69676	0.07029	0.55900	0.83453	0.65028	9.9129	< .001
Total	Trust in Government ⇒	0.64379	0.06366	0.51901	0.76857	0.60191	10.1124	< .001

Attitudes  
toward C19  
Vaccines

Note. Confidence intervals computed with method: Standard (Delta method)

Note. Betas are completely standardized effect sizes

*Model-Env:* We found a total effect of Trust in the Government on RNA Vaccine Attitudes,  $b = 0.70$ ,  $z = 9.7$ ,  $p < .001$ , such that a higher trust led to more positive attitudes toward the vaccine. No significant mediation effect was found ( $ps > .10$ ). See Table 3 for all Estimates.

Table 3 – Mediation Estimates for Model-Env

Indirect and Total Effects

Type	Effect	Estimate	SE	95% C.I. (a)		$\beta$	z	p
				Lower	Upper			
Indirect	Trust in Government $\Rightarrow$ Pandemic-Related Stressors $\Rightarrow$ Attitudes toward C19 Vaccines	-0.03464	0.02126	-0.07631	0.00703	-0.03212	-1.6295	0.103
	Trust in Government $\Rightarrow$ COVID-19 Burden $\Rightarrow$ Attitudes toward C19 Vaccines	-0.00370	0.00704	-0.01750	0.01009	-0.00343	-0.5260	0.599
	Trust in Government $\Rightarrow$ Living Conditions $\Rightarrow$ Attitudes toward C19 Vaccines	1.67e-4	0.00767	-0.01487	0.01520	1.54e-4	0.0217	0.983
Component	Trust in Government $\Rightarrow$	0.00919	0.00297	0.00337	0.01501	0.25071	3.0970	0.002



	Pandemic-Related Stressors							
	Pandemic-Related Stressors ⇒ Attitudes toward C19 Vaccines	-3.768 82	1.9668 6	-7.623 79	0.0861 5	-0.12811	-1.9162	0.055
	Trust in Government ⇒ COVID-19 Burden	0.0034 8	0.0033 5	-0.003 08	0.0100 4	0.08666	1.0402	0.298
	COVID-19 Burden ⇒ Attitudes toward C19 Vaccines	-1.063 11	1.7436 8	-4.480 65	2.3544 3	-0.0396 1	-0.6097	0.542
	Trust in Government ⇒ Living Conditions	-1.151 87	0.8768 1	-2.870 38	0.5666 3	-0.1092 0	-1.3137	0.189
	Living Conditions ⇒ Attitudes toward C19 Vaccines	-1.45e -4	0.0066 6	-0.013 19	0.0129 0	-0.0014 1	-0.0217	0.983
Direct	Trust in Government ⇒ Attitudes toward C19 Vaccines	0.7065 9	0.0727 7	0.5639 6	0.8492 2	0.65510	9.7096	< .001
Total	Trust in Government ⇒ Attitudes toward C19 Vaccines	0.6684 1	0.0711 1	0.5290 4	0.8077 7	0.61934	9.4002	< .001

Note. Confidence intervals computed with method: Standard (Delta method)

Note. Betas are completely standardized effect sizes

### Conclusion

Despite the availability of several vaccines against COVID-19, almost one individual in four remains quite hesitant to get vaccinated [23]. In an effort to understand vaccine hesitancy, we conducted an observational study on 203 French participants. Not surprisingly, the factor that most robustly predicted both attitudes and intentions to vaccinate was confidence in the information provided by the government and its ability to manage the pandemic in general. This lack of trust in government information and action appears to have a "clean" effect on attitudes toward vaccination, as well as an indirect effect, via perceived stress. Thus, individuals who trust the government tend to have - not surprisingly - more positive attitudes toward vaccines, but also tend to feel less stress than those who do not trust the government. At the same time, individuals who are more stressed tend to have more positive attitudes toward vaccination. This is contrary to our hypotheses, where we assumed that individuals experiencing more stress would fall back on defensive, avoidance strategies, and therefore tend to have negative attitudes towards the vaccine.

### **Limitations**

There are notable limitations in this study. In particular, as stated above, the environmental variables did not seem to have an influence on their intention to get vaccinated. This could be attributed to the fact that the environmental effect may be attributable to other variables that we did not consider in this study, which should be investigated in the future. It could also be due to the " global " character of the pandemic which could flatten the effect of the environmental variables on attitudes as everyone is, more or less, equally affected. This may also partly be explained by the study's main limitation: the study was conducted exclusively on first-year psychology students, a kind of sample for which homogeneity is high [24]. As our study was conducted on French participants, they may have a particular relationship with politics or current events, particularly in terms of

distrust of the government. Other data from other countries would be necessary to generalize our results.

### **Practice Implications**

Thus, we have two different, but related, sources of impact on attitudes toward vaccination. This suggests that there are two types of "profiles" of individuals who are likely to have positive attitudes toward vaccination. First, those who trust official information and do not feel stress about the uncertainty surrounding vaccines. Second, individuals who do not necessarily trust government information but who would be willing to trust the vaccine to reduce their stress (although this remains speculative). The profile of individuals who would report having negative attitudes toward vaccination would include the following two characteristics: (i) low trust in government and (ii) low stress. The latter may result from the fact that individuals may choose to cut themselves off from sources generating stress when it becomes too difficult to manage [13,25]. From a theoretical perspective, one might think that individuals choose to be vaccinated to reduce a level of stress that becomes difficult to bear. This suggests that measures to increase vaccination rates should be based on fear appeals, although this raises major ethical issues and may result in deleterious health effects that would outweigh that of vaccines. One solution would be to bolster individuals' sense of self-efficacy while highlighting the real risks of not getting vaccinated [26].

On the two sources of variation that explain the intention to get vaccinated: the stressful nature of the environment (i.e., an external variable), and the individual traits (i.e., an internal variable), we did not observe any mediating influence of the living and housing conditions, as well as the COVID-19 burden or environmental stressors on the attitude toward vaccination. It would therefore seem that it is not directly the living conditions and

"objective" environmental elements that influence attitudes towards the vaccine, but the potential impact they may have on individual variables that regulate behavior. Although we have not obtained clear results on this set of environmental variables, the way in which they interact and may have a causal impact on individual, cognitive variables remain an open question that can be answered by experimental (where possible) or longitudinal designs. Finally, we did not take into account inter-individual differences in the way individuals evaluate the relevance of the environmental stimulus, nor of their own resources to cope with it. This point is crucial since it is at this point that the adaptation of the individual's reaction will be determined. Future research should focus more on understanding the mechanisms of the antecedents of the stress response (i.e., the appraisal of the stimulus) in order to better design strategies on the stress response. However, we hope our results may be a gateway to more comprehensive and experimental studies of the factors affecting youth's, and the general population in general, attitudes and intentions to get vaccinated during this pandemic.

### **Declarations**

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### **Ethical approval and consent to participate**

Studies on human subjects that are not part of a medical protocol are not subject (in France) to the Jardé law. There is no obligation to have recourse to an ethics committee for studies in psychology under French law. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. We cannot provide a name of the ethical committee that approved this study since no ethical committee existed at Université Paris Nanterre when the

studies were conducted. However, ethical procedures typical to the Université Paris Nanterre were followed. Informed consent was obtained from all participants and none choose to withdraw from the procedure.

We confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

### **Consent for publication**

Not applicable.

### **Availability of data and material – Data Availability Statement**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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### **Authors's contribution**

The study was designed by CB, OZ, LH and AA. The experiment was performed by JB and CAJ. The data were analyzed by OZ, LH and AA. This article was drafted and critically revised by CB, OZ, LH and AA.

**Competing interests:** The authors declare that they have no competing interests.

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## **APPENDIX A – Self-reported questionnaires**

### **Pandemic related stressors**

*Instructions: We're going to ask you a few things that can be stressful during Lockdown.*

*Again, there is no right or wrong answer, we are only interested in your sincere answer.*

*Participants had to answer on a scale from 1 (Strongly Agrees) to 7 (Strongly Disagrees)*

1. My daily income

2. Being able to do my job well enough

3. Future employment prospects

4. Access to basic necessities such as food

Factor 1

Factor In review

5. Not being able to participate in group social activities

6. Dealing with the behavior of adults with whom I isolate myself

7. Dealing with the behavior of children with whom I isolate myself
8. The national economy
9. The risk that I or others I know will catch COVID-19
10. The risk of myself or others I know being hospitalized or dying because of COVID-19
11. Adapting your work to digital platforms
12. Having to adapt one's social life to digital platforms
13. Being ashamed to act differently from others (e.g. at work, shopping)

### **Living conditions**

*Instructions: Indicate what best describes your current situation*

- If you are locked down, how many other adults live together in the same place as you?
- How many people live in the city where you live?
- What is the size of the place where you live during Lockdown (in m<sup>2</sup>)?
- Does your living location have an exterior?
  - Yes
  - No
- If yes, do you have access to a:
  - Balcony
  - Garden
  - Inner courtyard

If you are locked down, how many children under the age of 12 live together in the

same place as you?

- Do you know of anyone infected with Covid-19?

- Yes

- No

- Do you know anyone who's been hospitalized because of Covid-19?

- Yes

- No

- Do you know people who died because of Covid-19?

- Yes

- No

### **Belief in a dangerous world scale**

*Instructions : For each of the following statements, please indicate how much you agree with the statement : 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree*

- It seems that every year there are fewer and fewer truly respectable people, and more and more persons with no morals at all who threaten everyone else.

- Although it may appear that things are constantly getting more dangerous and chaotic, it really is not so. Every era has its problems, and a person's chances of living a safe, untroubled life are better today than ever before.

- If our society keeps degenerating the way it has been lately, it's liable to collapse like a rotten log and everything will be in chaos.

- Our society is not full of immoral and degenerate people who prey on decent people. News

reports of such cases are grossly exaggerating and misleading.

- The "end" is not near. People who think that earthquakes, wars and famines mean God might be about to destroy the world are being foolish.
- There are many dangerous people in our society who will attack someone out of pure meanness, for no reason at all.
- Despite what one hears about "crime in the street," there probably is not any more now than there ever has been.
- Any day now, chaos and anarchy could erupt around us. All the signs are pointing to it.
- If a person takes a few sensible precautions, nothing bad will happen to him. We do not live in a dangerous world.
- Every day, as our society becomes more lawless, a person's chances of being robbed, assaulted, and even murdered go up and up.
- Things are getting so bad, even a decent law-abiding person who takes sensible precautions can still become a victim of violence and crime.
- Our country is not falling apart or rotting from within.

### **Perceived Vulnerability to Disease scale**

*Instructions : For each of the following statements, please indicate how much you agree with the statement : 1 = Strongly disagree, 2 = Somewhat disagree, 3 = Slightly disagree, 4 = Neutral, 5 = Slightly agree, 6 = Somewhat agree, 7 = Strongly agree*

- It really bothers me when people sneeze without covering their mouths.
- If an illness is 'going around', I will get it.
- I am comfortable sharing a water bottle with a friend.
- I do not like to write with a pencil someone else has obviously chewed on.

- My past experiences make me believe I am not likely to get sick even when my friends are sick.
- I have a history of susceptibility to infectious disease.
- I prefer to wash my hands pretty soon after shaking someone's hand.
- In general, I am very susceptible to colds, flu and other infectious diseases.
- I dislike wearing used clothes because you do not know what the last person who wore it was like.
- I am more likely than the people around me to catch an infectious disease.
- My hands do not feel dirty after touching money.
- I am unlikely to catch a cold, flu or other illness, even if it is 'going around'.
- It does not make me anxious to be around sick people.
- My immune system protects me from most illnesses that other people get.
- I avoid using public telephones because of the risk that I may catch something from the previous user.