Effects of age, psychological distress, and compassion on people's decision-making during the COVID-19 pandemic

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ABSTRACT

If one thinks of the COVID-19 pandemic as a natural experiment, the most important quasi-experimental manipulation for psychologists was the overall increase in people's psychological distress. Notably, however, distress in adults decreased as a function their age, revealing a perhaps unexpected resiliency. That resiliency may reflect the well-established decrease in neuroticism with age, but it was also associated with an age-related increase in compassion. This, in turn, was associated with both more social distancing and a greater likelihood of revaccination if recommended. Taken together, these findings suggest an altruistic motivation for such pandemic decisions, which while they may protect the person doing the distancing or getting the vaccination, also protects those around the person who is engaging in these behaviors. Indeed, social distancing may be the most altruistic because it involves giving up desired activities and doing so repeatedly. Finally, it should be noted that the relations among Neuroticism, Distress, and Compassion as well as with Distancing and Vaccination were hardly diminished by statistically controlling for Age, suggesting that the observed relations, both positive and negative, hold throughout adulthood. An important implication of this finding is that decreasing people's distress may make them more compassionate, regardless of their age. Although a person's acquaintances and political ideology also matter, decreasing anxiety may be key to increasing prosocial attitudes and behavior.

Keywords: Covid-19, pandemic, distancing, mitigation, vaccination, compassion

Introduction

One of the first things that psychologists noted at the beginning of the COVID-19 pandemic was that psychological distress was reaching historically high levels[1], and that adolescents and young adults appeared to be the most affected in this regard. Researchers were naturally quick to blame the pandemic for elevated distress levels based on studies that compared current distress with pre-pandemic levels, but they neglected the possibility that the increase in distress levels was part of a secular trend that also affected younger adults more than older ones[2].

Indeed, subsequent analyses of national surveys in the U.S., Australia, and the U.K. by Hale and colleagues[3] revealed that parallel increases occurred in all three countries over the decade preceding the COVID pandemic, and the increases were age-graded in all three countries: Young adults' distress increased the most, middle-aged adults somewhat less so, with older adults showing the smallest increases. Analyses also revealed clear effects of lockdowns and quarantines, but the contributions to national or local distress levels wore off quickly when social isolation was no longer mandated. Notably, however, distress tended to return to the elevated levels predicted by the secular trends, rather than to the levels observed previously.

When Myerson and colleagues examined the determinants of psychological distress and pandemic mitigation behaviors at the individual level, they found that whereas adults' distress levels decreased with age, the opposite pattern was observed in their mitigation behaviors[4]. Social distancing, for example, tended to increase with age. In fact, the inverse relation between distress and the tendency to engage in mitigation behaviors was observed in adults of all ages. Importantly, concern for oneself was not significantly correlated with mitigation, but concern for the effects of the pandemic on others was a significant predictor of decreases in social contact as well as decreases in actual physical contact with others.

Although we already suspected that differences in personality traits like Neuroticism might play a role in pandemic decisions (such as whether or not to engage in social distancing and/or get vaccinated), this finding inspired us to examine facets of Agreeableness that might be reflected in pandemic-related behaviors that could benefit others. In short, although one might expect the pandemic to cause people to focus on whether behaviors would increase or decrease the risks to themselves, the data suggested that whether one focused on the consequences for oneself or the consequences for others actually depended on one's age[5].

Pandemic decisions from an ethical perspective

Many choices that people had to make during the COVID-19 pandemic (e.g., whether or not to engage in social distancing and whether or not to get vaccinated against the SARS-CoV-19 virus) may be viewed as fundamentally ethical ones; that is, they challenged people not to violate the negative injunction implicit in what has been termed *the Golden Rule*: *Do not do unto others in ways that you would not want them to do unto you.* More specifically, in the present case, the injunction is simply 'do not infect others or put them at risk of infection.'

Of course, the kinds of behavioral choices just described may also benefit the individual making the decisions (e.g., by decreasing their own risk of infection), but it is an empirical question to what degree people's choices in these matters were fundamentally self-serving or whether they were driven, at least in part, by their concern for others. Accordingly, the current study assessed the degree to which participants' responses to survey items were consistent with personality traits like those reflected in specific facets of Agreeableness (i.e., Altruism, Sympathy, and Trust) from the IPIP-NEO (International Personality Item Pool) personality test as well as their responses to items from the Neuroticism (or Emotional Stability) scale of the IPIP-NEO. A secondary goal was to assess possible age differences in the contribution of altruism to pandemic decision-making. It should

be noted that while altruism is operationally defined here in terms of items from the Agreeableness scale of the IPIP-NEO, the conceptual definition implicit in our discussion is more closely related to that of reciprocal altruism in evolutionary biology[6,7] than it is to the selfless decisions and actions in traditional ethics.

To understand the literature on decision-making during the COVID-19 pandemic, it is useful to divide that time into at least three periods: Period 1, before the pandemic; Period 2, from the onset of the pandemic until vaccines became available; Period 3, from the onset of vaccine availability in December 2020 until May 2023 when the Public Health Emergency ended in in the U.S.

PERIOD 1.
To understand the psychological effects of the Covid-19 pandemic, one needs a baseline against which to compare them, and researchers turned first to the period immediately preceding the onset of the pandemic. They found that distress had increased in individuals ranging in age from adolescents to the elderly, an increase they naturally attributed to the pandemic, both its dangers and its economic consequences[1]. As already noted, however, most researchers neglected the possibility that the increase in distress levels partly reflected an already increasing secular trend[2]. However, analyses of periodic national surveys in the U.S., Australia, and the U.K. revealed parallel age-graded increases in distress in all three countries over the decade preceding the pandemic[3,8,9]. Although comparisons with other, less economically advanced and/or non-English-speaking nations would have made additional useful comparisons possible, data from the decade prior to 2019-2020 provide clear evidence of an increasing, international secular trend in psychological distress.

PERIOD 2.
The data from Period 2 provided clear evidence that although social deprivation was largely responsible for elevated distress levels during the pandemic, that elevation was temporary[10]. For example, although anxiety levels in the U.S. had more than doubled from 2019 levels by April, 2020 when stay-at-home orders were in effect in most states, anxiety levels immediately dropped when most states ended restrictions in May[11]. Data from two sequential lockdown periods in the UK provide further evidence of the role of social isolation[3]. When the first lockdown period ended, distress levels rapidly returned to the level predicted by the secular trend observed in Period 1, rather than to the lower levels observed previously.

PERIOD 3.
Even after vaccines against SARS-CoV-19 became available, many people continued to engage in social distancing and to avoid enclosed public spaces, and these mitigation behaviors were positively correlated with each other but negatively correlated with psychological distress[12]. In contrast, vaccination was positively correlated with distress. To explain the opposite effects of distress on mitigation and vaccination, Myerson et al. suggested that if social isolation led to distress, then distress might interfere with many mitigation behaviors (e.g., distancing, facemasks) because they might exacerbate isolation; on the other hand, distress might motivate vaccination because it would allow a return to normal levels of social interaction. Consistent with our hypothesis that social deprivation was responsible for much of the distress reported during the pandemic, Loneliness and self-reported chance of infection and/or hospitalization another pandemic stressor) accounted for nearly half of the variance in individual differences in distress.

Digging deeper, we proposed a form of *diasthesis-stress* model in which Neuroticism captured individual differences in vulnerability to pandemic stressors[3]. More specifically, we hypothesized that Emotional Stability (the flip side of Neuroticism) would predict psychological distress during the pandemic because it measures both reactivity to negative events and how prone a person is to negative emotional states (e.g., anxiety, depression[13]. Supporting evidence for the role of Emotional Stability in pandemic-

related distress comes from a study by Zacher and Rudolph[10], who found that greater emotional stability (i.e., a lower level of Neuroticism) was associated with lower perceived stressfulness during the lockdown in Germany in 2020. When Emotional Stability was added to the two significant variables from our previous distress model (i.e., Loneliness and Chance of infection), the three measures together accounted for nearly two-thirds (64.9%) of the variance in psychological distress. Importantly, Age failed to account for any unique variance when added to our three-measure model, consistent with the hypothesis that age-related differences in Stability/Neuroticism underlay our previous finding of a significant association between Age and Distress.

Our findings regarding Emotional Stability led us to examine the roles other personality traits might play in pandemic decision-making. Recalling our early finding that concern for the effects of the COVID-19 pandemic on others was associated with mitigation behaviors whereas concern for its effects on oneself was not, we proceeded to examine several related facets of the Agreeableness component of the Big Five personality model[14]. Specifically, we assessed the contributions of Altruism, Sympathy, and Trust to pandemic decision-making, and the roles they played in the pronounced age-related differences we had observed in mitigation behaviors. Interestingly, Altruism and Sympathy were so strongly correlated ($r=.768$) that we combined them into a single variable (Compassion), and as we had suspected, Compassion proved to be a significant predictor of measures of social distancing, both decreases in physically close interactions and decreases in visits to enclosed public spaces. In fact, when Compassion was included in a logistic regression model, Distress was no longer a significant predictor. Trust, on the other hand, did not significantly predict distancing, although it did predict Vaccination intentions whereas Compassion did not.

Objectives

Because Compassion and Neuroticism appeared to play opposite roles in pandemic mitigation decisions, and perhaps in ethical decisions more generally, we pitted them against each other in the current study. In order to better understand their contributions to pandemic decisions, we tested models of the associations of both Compassion and Psychological Distress with various other individual characteristics. These models also assessed the growing effects of political attitudes on pandemic decision-making[15] and specifically examined their different roles in mitigation and vaccination decisions. In addition, we hypothesized that a participant's community influenced their pandemic decisions. To test this hypothesis, we asked participant's how many of their acquaintances had been vaccinated against COVID-19 as well as how many had been hospitalized because of a COVID-19 infection. Of interest was not just whether these measures would predict pandemic decisions such as whether or not to engage in social distancing or get vaccinated, but which measures would predict which specific decisions.

Methods

PARTICIPANTS
Volunteers were recruited online from March 31 to April 7, 2022. After indicating their consent online, which initiated the survey, 752 MTurk workers provided their responses and received $2.00 for their participation, which took, on average, 24.7 minutes. The submitted surveys were then screened for age, participation status in our previous vaccination study, valid IP addresses associated with internet providers in the United States of America, and survey completion time so as to exclude those whose times were less than the time a fast, expert reader would require to read the survey questions[16]. Based on these criteria, data from 210 individuals were excluded from our analyses, 5 based on invalid US IP addresses, 126 based on their previous participation in our preceding vaccination study, and 79 based on their completion times, leaving 542 participants ranging in age from 18 to 80 years: 252 females and 287 males, plus 3 participants who did not report their gender. These participants' racial/

ethnic breakdown was 89.7% White, 4.6% Black, 3.5% Asian, and 2.2% other races; 22.3% identified as Hispanic/Latinx.

The average age of participants in the sample was 40.14 years, (SD=14.18). The majority (55.19%) reported household incomes between $30K and $66K; relatively few reported incomes less than $30K (13.3%) or more than 120K (18.6%). Finally, the self-reported political ideology of the sample tended to be slightly conservative: More than half of the participants (53.3%) described themselves as conservative or very conservative, whereas about a quarter (26.0%) described themselves as liberal or very liberal. The study was approved by the Institutional Review Board of Washington University in St. Louis.

Table 1. Participant Characteristics as a Function of Age Group.

Age	N	% Female	% HS	% Uni	% $31-65K	% $66-120K	% Employed
18-29	148	53.38	9.46	56.08	51.35	29.73	92.57
30-39	158	32.30	9.32	44.72	55.28	29.19	95.03
40-49	76	32.90	3.95	55.26	47.37	27.63	93.42
50-59	67	47.76	8.96	46.27	58.21	25.37	95.52
60-69	67	76.71	6.85	36.99	35.62	34.25	64.38
70-80	8	62.50	12.50	37.50	12.50	25.00	12.50

Note. HS and Uni indicate completion of high school and college or university, respectively.

PROCEDURE

The online survey consisted of four parts, beginning with questions about the frequency of three CDC-recommended mitigation behaviors and two mask-related behaviors. Specifically, the three mitigation behaviors included two Social Distancing behaviors and one Hygiene behavior: (1) being less than six feet from a person who was not a member of one's household; (2) being in an enclosed public space with other individuals; and (3) cleaning one's hands with either sanitizer or soap and water. We term these measures Proximity (Prox), Public Space (Public), and Hand Hygiene (Hand), respectively. For each mitigation behavior, participants were asked about its frequency in two separate time frames: *on average this week* and *before the pandemic began*. The two mask-related behaviors were (1) being less than six feet from a person who was not a member of one's household while wearing a mask, and (2) being in an enclosed public space with other individuals while wearing a mask, although the mask data turned out to be confounded by mask mandates and were not analyzed further.

The second part of the survey consisted of the items from the Hospital Anxiety and Depression Scale (HADS[17]), questions as to participants' degree of concern about the possible effects of the pandemic on themselves and others in their community, and questions regarding participants' current levels of loneliness and social deprivation[19]. Participants then were asked questions regarding personal connections with COVID-19 cases (e.g., number of acquaintances hospitalized with COVID-19 infections) and subjective opinions about vaccines against COVID-19 (e.g., *Do you believe vaccination against COVID-19 is safe?*).

The third part of the survey asked participants about their overall health and the frequency of their attendance at religious gatherings, followed by inquiries concerning current employment status and household income. Participants then were asked about their level of formal education, age, gender, ethnicity, and race, and the number of children and adults in the home. Next, participants were asked to answer items from the Kessler Screening Scale for Psychological Distress, although our analyses

focused on the HADS for consistency with our previous studies.

The fourth part of the survey began with questions regarding participants' current vaccination status (What is your current vaccination status?: Not Vaccinated and unlikely to be, Not Vaccinated but likely to be, Partially Vaccinated, Fully Vaccinated but not Boosted, Fully Vaccinated and Boosted), whether they would get vaccinated if it was recommended to them, and indicating, from a prepared list, what they felt was most important to them regarding COVID-19 vaccination. Participants were also asked to select up to three statements regarding their feelings about COVID-19 vaccination and life before the COVID-19 pandemic. Following this, participants were then asked to answer items from the IPIP-NEO personality test. Finally, participants were asked questions regarding their political ideology, who they voted for in the 2020 United States Presidential Election, and their home zip code.

ANALYSIS
To minimize multicollinearity, five pairs of conceptually related and significantly correlated measures (all $p<.001$) were converted to mean Z-scores. For example, standard scores representing decreases in the frequencies of close proximity encounters and visits to enclosed public spaces were averaged into a single Distancing composite because the correlation between these measures ($rho=.445$) was much larger than their correlations to hand hygiene ($rho=-.091$ and .014). The new composite measures were labelled Distancing (decreases in close proximity interactions and in visits to enclosed public places compared to pre-pandemic levels), Distress (Anxiety and Depression), Compassion (Altruism and Sympathy), VaccAtt (Vaccine attitudes regarding safety and efficacy); and Chance (Estimated chance of infection with COVID-19 and/or hospitalization).

Results

MITIGATION BEHAVIORS
Were people still engaging in mitigation behaviors after two years of the COVID-19 pandemic? Indeed, they were: The frequencies of people's close proximity interactions and of visits to enclosed public spaces were both significantly less than before the pandemic, and the frequency of hand hygiene was significantly greater than before (Table 2).

Table 2. Signed ranks tests of changes in mitigation behaviors

Measure 1	Measure 2	W	Z	p
Proximity Now	Proximity Before	31822.5	-5.370	<.001
Public Space Now	Public Space Before	26387.0	-7.392	<.001
Hand Hygiene Now	Hand Hygiene Before	51307.5	5.590	<.001

Note. Decreases in Proximity and Public Space measure Social Distancing.

PREDICTING DISTANCING
Replicating our previous studies (e.g., Myerson et al., 2021), Distress was negatively correlated both with Age ($r=-.212$) and with Distancing ($r=-.195$), whereas Age was positively correlated with Distancing ($r=.099$). Our primary interest, of course, was in the contributions of psychological traits and states to pandemic decisions. Consistent with the findings of Hale, Myerson, and colleagues[3,5], analysis of the present data revealed significant correlations between Distancing, Compassion, and Neuroticism: Distress and Compassion ($r=-.597$); Distress and Neuroticism ($r=.578$); Compassion and Neuroticism ($r =-.578$). Again, all $p<.001$. Notably, all the signs remained the same and the correlations all remained significant with Age statistically controlled.

Previous studies[4,5,12] found that whereas Distancing increased significantly with Age, it decreased with Distress, and the present study replicated that finding. When Compassion was added to the model, however, it was the only significant predictor of

Distancing, presumably because it accounted for the same variance as the other independent variables as well as some unique variance in individual Distancing scores (Table 3).

Table 3. Regression model predicting Distancing.

	Coefficient	S.E.	t	p
Intercept	–0.280	0.200	–1.404	.161
Age	0.002	0.002	1.014	.311
Distress	–0.051	0.045	–1.124	.262
Neuroticism	–0.006	0.006	–1.058	.291
Compassion	0.124	0.048	2.601	.010

Note. R^2 = .061. S.E. represents Standard Error of the Mean.

When additional variables were added to the model to assess the contributions of political ideology, social influences, and demographic factors (i.e., income, education, and religiosity, measured as the frequency of attending religious services), Compassion remained significant. It may be noted that the contributions of social influences were selective: The more acquaintances one had who had been hospitalized with COVID, the lower the level of distancing, although the number of one's acquaintances who had been vaccinated was not significant.

PREDICTING DISTRESS
Distress is of interest, of course, for multiple reasons, including its obvious effects on quality of life and the roles it plays motivating and/or interfering with health behaviors, not to mention its well-established effects on immune function[18]. Accordingly, we tested a model originally proposed by Hale et al.[3], which posited that Neuroticism captured individual differences in vulnerability to pandemic stressors. The results strongly supported the model, which explained much of the distress observed during the pandemic as being the result of two stressors, social deprivation and anxiety about possible infection with COVID-19. These stressors were instantiated in the model by two measures, Loneliness and self-reported estimates of the likelihood of infection and/or hospitalization (Chance), although it should be noted that whereas Hale et al. measured Emotional

Stability, here we simply changed the sign and called it Neuroticism, a term which we believe better reflects the role it plays in psychological distress.

Hale et al.'s model[3] accounted for 44.1% of the variance in distress reported by the present sample (Table 4A) and provided a basis for assessing the role played by individual differences in Compassion. When Compassion was added to the model (Table 4B), it significantly increased the variance accounted for to 50.2% and provided more evidence of the opposing roles played by Compassion and Neuroticism, similar to the opposing roles these trait measures play in predicting Distancing. Again, Age and Compassion appear to work together as they did with respect to distancing and reveal again that while advancing Age is associated with increased Compassion, Age also accounts for its own unique variance.

PREDICTING COMPASSION
While our previous research had focused on the contributions that Compassion might make to mitigation and vaccination decisions, as with Distress it seemed useful to turn the scope around and see what it was that contributed to Compassion. This approach represented an opportunity to validate our measure of Compassion as well as to assess the possible sources of individual differences in Compassion. This analysis provided further evidence of the opposing roles played by Age, on the one

hand, and Distress and Neuroticism, on the one hand. It should be noted that, as predicted, concern for possible effects of the pandemic on oneself (Self) and concern for its effects on others one judged close to oneself (Close) played what appear to be analogous opposing roles here (Table 5).

Table 4. Two regression models predicting Psychological Distress.

A. Model from Hale et al. (2023) [3].

	Coefficient	S.E.	t	p
Intercept	-0.497	0.159	-3.117	.002
Age	-0.007	0.002	-2.875	.004
Loneliness	0.143	0.024	5.870	<.001
Chance	0.256	0.037	6.876	<.001
Neuroticism	0.371	0.039	9.430	<.001

Note. $R^2 = .441$.

B. Hale et al. model with Compassion added.

	Coefficient	S.E.	t	p
Intercept	-0.500	0.151	-3.323	<.001
Age	-0.005	0.002	-2.120	.034
Loneliness	0.128	0.023	5.544	<.001
Chance	0.152	0.038	4.046	<.001
Neuroticism	0.254	0.040	6.361	<.001
Compassion	-0.347	0.043	-8.067	<.001

Note. $R^2 = .502$.

Table 5. Regression model predicting Compassion.

	Coefficient	S.E.	t	p
Intercept	-0.446	0.145	-3.069	.002
Age	0.007	0.002	2.993	.003
Distress	-0.323	0.045	-7.132	<.001
Neuroticism	-0.352	0.036	-9.695	<.001
Self	-0.091	0.027	-3.355	<.001
Close	0.122	0.029	4.204	<.001

Note. $R^2 = .390$.

Interestingly, when Education and Religiosity were added to the regression model, neither was significant. Indeed, correlational analyses revealed that while Religiosity was weakly correlated with Compassion, the correlation was negative – more frequent attendance at religious services was associated with lower scores on Compassion (r=-.113, p=.009). Moreover, neither education nor income was significantly correlated with Compassion, so that while Compassion increases with Age, our analyses have as yet yielded little insight into why it increases, although we have been able to assess some of the positive consequences of that increase.

PREDICTING VACCINATION
It was not until April 19, 2021, that all U.S. states had opened vaccine eligibility to residents aged 16 and older, and when the present sample was recruited approximately one year later almost all of them (92.6%) had been vaccinated. In fact, a little

over half (56.3%) reported having received a second, 'booster' shot as recommended by the CDC. As a result, we were able to assess what measures predicted who had chosen to be boosted and to compare and contrast the determinants of that decision with what public health researchers refer to as 'vaccination intentions' - self-reports of the likelihood of getting (re)vaccinated in the future.

Logistic regression was used to determine what measures were significantly associated with having received a Booster, beginning with a model that we previously used to predict vaccination[12]. However, whereas all six predictors in the model had previously been significant, now only half of them were: Age, VaccAttt, and OtherHosp. Neither Distress, Chance, nor Religiosity were significant (Table 6). It should be noted, however, that not only were we now trying to predict decisions by a different sample made at a different point in the pandemic, but we now were also trying to predict who had been Boosted, whereas before we had been predicting first-time vaccinations.

Table 6. Logistic regression model predicting *Boosted*.

	Estimate	S.E.	Z	Wald Statistic	p
Intercept	-0.235	0.433	-0.543	0.294	.587
Age	0.015	0.008	1.962	3.851	.050
OtherHosp	-0.204	0.079	-2.571	6.611	.010
VaccAtt	1.003	0.138	7.265	52.782	<.001
Religiosity	-0.002	0.012	-0.159	0.025	.874
Chance	0.157	0.136	1.157	1.338	.247
Distress	0.135	0.146	0.920	0.846	.358
Ideology	0.224	0.083	2.678	7.172	.007
Trust	0.278	0.123	2.256	5.091	.024
Compassion	0.141	0.156	0.908	0.825	.364

Note. $X^2 = 102.351$, df = 491, $p<.001$; McFadden $R^2=.150$.

Of course, another thing that had changed was that vaccination had become increasingly politicized, and indeed, when Ideology was added to the model, it was significant, although the results had not changed in other respects. Notably, a more liberal ideology was associated with an increased likelihood of having received a booster vaccination although the strongest predictor was VaccAtt, which assessed how positively participants' felt about the safety and efficacy of COVID-19 vaccines. Also, those who had more acquaintances hospitalized with COVID-19, which we suspect meant that more of their acquaintances had not been vaccinated, were also less likely to have gotten a booster shot themselves. Finally, Trust was a significant predictor, whereas Compassion was not.

Would the same variables that predicted being Boosted predict whether people said that they would get revaccinated if it were recommended? A comparison of Tables 6 and 7 reveals multiple differences, perhaps most surprising (and perhaps even hopefully), Ideology, which had been significantly associated with being boosted, was not predictive of whether people were likely to be revaccinated in the future. In addition, Age was no longer significant when participants were predicting their future vaccination decisions. Another difference was that whereas Compassion was not a significant predictor of vaccination intentions when predicting Boosted, Compassion was a significant predictor of Likely, our measure of participants intentions regarding future revaccination.

Taken together, these differences highlight ways in which people actual vaccination decisions differently from decisions regarding hypothetical future vaccinations. Perhaps more importantly, however, the strongest predictor of vaccination in both cases was the same (i.e., VaccAtt, the extent to which people considered vaccination safe and effective). This finding, in turn, suggests that whether one got Boosted and whether one would get vaccinated yet again in the future should be relatively strongly correlated.

Table 7. Linear regression model predicting *Likely*.

	Coefficient	S.E.	*t*	*p*
Intercept	3.705	0.174	21.339	<.001
Age	0.000	0.003	0.068	.946
OtherHosp	0.029	0.031	0.916	.360
VaccAtt	0.596	0.047	12.667	<.001
Religiosity	0.000	0.005	0.022	.983
Chance	0.103	0.051	2.032	.043
Distress	0.060	0.061	0.982	.327
Ideology	0.046	0.033	1.388	.166
Trust	0.091	0.045	2.005	.045
Compassion	0.148	0.058	2.560	.011

Note. R^2=.310.

Our final analyses focused on the correlations among our principal measures (Table 8). Regression models, like those presented above, identify sources of variance that are uniquely associated with the dependent variable after controlling for all the other variables in the model. In contrast, correlation measures address the question of associations between a pair of variables regardless of their relations to other measures. Moreover, correlation can be used to quantify associations between binary and continuous measures (e.g., whether one got a booster vaccination and one's estimate of how likely it is one will get another if it is medically recommended). As predicted based on the importance of vaccine safety and efficacy for people's decisions on both of our vaccination measures (Boosted and Likely), the correlation between them was relatively strong (*r*=.455). Perhaps the other finding that stands out is that our two vaccination measures were not significantly correlated with either Age, Distress, or Neuroticism, whereas both vaccination measures were positively correlated with Compassion, Trust, and having a more liberal Ideology, as well as with Distancing.

Discussion

One striking revelation from the data reported early in the pandemic was the finding that although distress levels were high overall, degree of distress decreased with age, revealing a perhaps unexpected resiliency in older adults[20]. Notably, for some years prior to the pandemic, older adults had been reporting less distress than younger adults in a number of countries that conducted regular national surveys[3]. What was surprising was that during the pandemic, older adults were consistently reporting lower levels of distress despite the fact that they were probably aware early on that they were at much greater risk of serious illness and even death than younger adults[21]. To understand these findings and their implications, we began a series of studies of pandemic decision-making initially focused on just age, distress, and social distancing, and subsequently examined vaccination decisions as well[4,5,12].

Table 8. Correlations among personal characteristics, personality measures, and pandemic decision measures (distancing and vaccinations).

Variable	1.	2.	3.	4.	5.	6.	7.	8.
1. Age	—							
2. Distress	-.212***							
3. Neuroticism	-.166***	.578***						
4. Compassion	.221***	-.597***	-.532***					
5. Trust	.130**	-.498***	-.373***	.388***				
6. Ideology	.054	-.108*	.013	.228***	.092*			
7. Distancing	.148***	-.249***	-.215***	.317***	.202***	.120**		
8. Likely	-.034	-.025	.029	.100*	.135**	.103*	.099*	
9. Boosted	.054	-.068	-.017	.105*	.150***	.152***	.150**	.455***

Importantly, our first study found that participants' concerns regarding the effects of the pandemic on close acquaintances were significantly associated with social distancing, whereas their concerns for the effects of the pandemic on themselves were not. In addition, we were surprised to find that distress was repeatedly associated with lower levels of distancing while age was associated with higher levels of distancing, a finding we subsequently discovered was linked to lower levels of Neuroticism in older adults[3]. That finding inspired us to take a closer look at personality measures and assess both Neuroticism and three of the most prosocial facets of Agreeableness from the NEO (i.e., Trust plus Altruism and Sympathy, which we combined into a single measure of Compassion because of their strong correlation).

Accordingly, the present investigation directly compared the relations among Compassion, Neuroticism, and pandemic decisions. In a previous study[5], we had tried adding Compassion to a model that predicted Distancing from Age and Distress and found that with Compassion in the model, it accounted for all the variance in Distancing previously attributable to the other two variables. For the present study, we added Neuroticism to the model as well and found that Compassion still accounted for all the variance otherwise attributable to the other measures.

Given the multicollinearity among our measures, more detailed analyses of individual characteristics associated with both Distress and Compassion were called for. Previously, we had hypothesized that Neuroticism assessed one's vulnerability to stressors, and posited that it modulated their effects. Accordingly, we modelled the Distress observed during the COVID-19 pandemic as the combined effects of Age, Loneliness, Chance, and Neuroticism, all of which were significant (R^2=.441). When Compassion was added to the model (R^2=.502), it, too, was significant, indicating that each of these variables accounted for a significant proportion of unique variance. Importantly, it suggested further that when Distress was used to predict other measures (e.g., Distancing), Distress likely represented effects of all five of these measures.

A more detailed analysis of Compassion revealed that it, too, was associated with Distress, Age, and Neuroticism. In addition, this analysis validated our Compassion measure: The association of Compassion with concerns regarding the effects of the pandemic on others with whom one was close was positive, whereas the relation to concerns regarding the

effects of the pandemic on oneself was negative. Taken together, these findings are consistent with the view that the age-related decline in Neuroticism is responsible, at least in part, for the observed increase in Compassion with age.

A cascade model of age-related changes in Neuroticism, Distress, and Compassion

The decline in Neuroticism as people get older is well established, as is the increase in the trait of Agreeableness[14] on which our Compassion measure is based. Consistent with these findings, a meta-analysis found that older adults were significantly more altruistic than younger adults, although the authors suggested that the level of altruism was limited by one's resources, including health, finances, and social networks, as well as cognitive resources [22,23]. Taken together with the present results, these findings suggest that distress leaves people with less resources for Compassion. Thus, the causal chain may begin with higher levels of Neuroticism in younger adults, which leads to greater vulnerability to stressors, and thus to greater psychological distress[13] that, in turn, leaves one with fewer resources needed for compassionate inclinations and decisions. Taken together, this chain leads to the observed pattern of increases and decreases in various psychological measures (Neuroticism, Distress, and Compassion) and their covariation with Age. It should be noted, however, that the correlations among these measures remain strong (all $r > .500$) when Age is statistically controlled, suggesting that although Age affects all three measures, the mechanisms underlying the interrelations among them are quite general and not age-specific.

As for why Neuroticism declines with age, initiating this causal chain, Costa and McCrea [14] have long interpreted such trends as representing normative developmental changes in adults' personality traits, and as such to be the result of biological mechanisms presumably associated with evolutionary advantages. This attribution is not really an explanation, but it does

suggest that in search of a deeper understanding, it may be useful to borrow aspects of life course theory from evolutionary biologists[24]. Taking such an evolutionary perspective suggests a role for mechanisms like reciprocal altruism (i.e., behaviors with mutual benefits that emphasize the possible delayed benefits of prosocial behaviors[6,7].

Indeed, the current results exemplify the kind of age differences and their consequences that are the focus of life course theory. We refer to the intergenerational conflict inherent in the differential timing of changes in Neuroticism and Compassion pointed out by Myerson and colleagues[5]. Neuroticism tends to be associated with individualism[25] and is more likely to characterize younger adults, whereas Compassion tends to be associated with a more prosocial, communitarian perspective that tends to characterize older adults. Thus, younger adults, perhaps because they were less susceptible to COVID-19's most serious consequences (as well as their being more likely to be in search of reproductive partners), were also less likely to engage in some behaviors (e.g., social distancing) that could affect the spread of the disease. Older adults, in contrast, were more likely to suffer severe consequences from the disease that younger adults may have been more likely to infect them with.

We are not suggesting that people were actually thinking about infection in these terms during the height of the pandemic. Rather, what we are suggesting is that people's age-specific behavioral tendencies were perhaps shaped by these contingencies, which may have characterized age differences in susceptibility to infectious diseases and age-related declines in reproductive potential for many generations. It may be noted that life course theory, with its many examples from animal behavior, offers explanations in terms of delayed benefits that are independent of individuals' conscious intentions. As a result, it represents a fundament contrast with traditional ethical views that emphasize intentions and selfless acts. However, our focus here is on what evolutionary biologists

might call proximate causes rather than ultimate causes like a behavior's evolutionary advantages[26].

Conclusions

We believe the present findings have important implications for public health communication strategies although, unfortunately, perhaps the most general implication is that the communication problem is a complicated one. To begin with, the characteristics that best predicted a person's decisions, and that one would therefore want to influence, depended on the specific nature of the decision. For example, measures were differentially predictive depending on whether decisions involved distancing or vaccination: Compassion was only weakly (albeit significantly) associated with past and future vaccination decisions, but it was a reliably good predictor of distancing. Even with vaccination, it made a difference as to whether the decisions had actual or hypothetical (future) consequences. The final straw, however, is that not only do people and kinds of decisions differ, but so do pandemics [27,28]. Pandemics differ in which segments of the population are most susceptible to infection as well as in how those infections are transmitted. The good news is that despite all this specificity, the internet has greatly facilitated the ability to take advantage of market segmentation in public health[29], making it possible to target different messages at different groups in different situations.

Nevertheless, some discoveries provide information that is likely to be of general use, and we hope that is the case for our cascade model. For example, our findings concerning age and distress and its effects on mitigation behaviors appear to be of general applicability. While social deprivation produces psychological distress[3,30], distress also appears to interfere with hygienic practices that either involve some degree of social deprivation themselves or that are reminiscent of such deprivation[4]. It is possible that during the COVID-19 pandemic this occurred because these practices exacerbated the distress-inducing effects of quarantines and social distancing. Regardless of the mechanism, however,

what is clear is that young adults are particularly susceptible, and that as a result, the use of so-called 'fear messages' is problematic, and especially so for that audience. Although creating anxiety about not engaging in a particular hygienic practice is a common approach to motivating that practice[31], it may be self-defeating in light of the present findings that suggest that fear messages have the potential to create resistance to the very behavior they are promulgating. Moreover, because regardless of age, psychological distress appears to interfere with compassion, reducing distress would appear to be desirable not just during pandemics, but whenever one wants people to make compassionate decisions.

Conflicts of Interest Statement:

The authors have no conflicts of interest to declare.

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