

Positive and Negative Peace as Predictors of Pandemic Preparedness: Evidence from a Micro- and Macro-Level Investigation During the Onset of the COVID-19 Pandemic

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The COVID-19 pandemic has generated unprecedented human loss and financial difficulties worldwide. In line with recent calls for social sciences to help collective efforts to address COVID-19, we investigated the link between peace and pandemic preparedness, advancing the literatures on negative (i.e., absence of direct violence) and positive peace (i.e., absence of structural violence and presence of equality) and governments' crisis preparedness as well as crisis relief efforts. Two studies tested whether both positive and negative peace predict pandemic preparedness, operationalized as COVID-19 tests, cases, and positivity rates, during the onset of the pandemic. Study 1 did so at the national level across 155 countries; Study 2 did so at a local level, across 3144 counties within the United States. Even after controlling for population size, population density, GDP, and amount of air travel, higher levels of both negative and positive peace predicted a greater number of COVID-19 tests per one million people, fewer overall COVID-19 cases, and a lower positivity rate. These findings point to the possibility that by promoting peace, governments and the international community could potentially become better prepared to handle future pandemics and other crises.

KEY WORDS: positive peace, negative peace, cross-national, collective threat, COVID-19

As of early 2021, the COVID-19 pandemic has infected more than 100 million people, claiming the lives of more than two million individuals globally (Johns Hopkins University, 2020). The United States leads the world in both the total number of cases (over 25 million) and deaths (over 400,000) (CDC, 2020a). Aside from the incalculable cost resulting from the loss of human life at such a massive scale, COVID-19 has shaken economies and is predicted to continue to do so in the future (Erikson, 2020). In line with recent calls for social sciences to help collective efforts to address COVID-19 (Van Bavel et al., 2020) and calls for psychology to study peace and not just war (Leidner, Tropp, & Lickel, 2013), we investigated across 155 countries (Study 1) and across 3144

Highlights

- By pursuing positive peace (i.e., social justice and equality) governments could increase their future pandemic preparedness.
- By pursuing negative peace (i.e., absence of conflict and violence) governments could increase their future pandemic preparedness.
- Both types of peace were associated with an increased capacity to conduct COVID-19 tests during the early onset of the COVID-19 pandemic.
- Promoting both positive and negative peace could advance the well-being of citizens, not only by promoting social justice and equality but also by allowing governments to be more prepared to handle future crises.

counties within the United States (Study 2) whether positive and negative peace may have an important role to play in society's preparedness to prevent or at least contain a crisis such as the COVID-19 pandemic.

At the theoretical level, the present investigation advances literatures on negative and positive peace as well as their intersection with crisis relief efforts and preparedness for large-scale (existential) threats and crises. Findings from the present research will also provide insight into which sub-indicators of peace are more closely associated with pandemic preparedness and should potentially receive more attention in the future. At the empirical level, our findings contribute to the knowledge base on how society can best prepare for large-scale crises. By integrating data from different public sources, we compiled two large new databases that can be updated and expanded, providing new opportunities for future research, as well as a reexamination of the current hypothesis at a later point (e.g., after the end of the COVID-19 pandemic). In this way, the present research illustrates how publicly available data (i.e., indicators of peace, COVID-19 statistics) can be harnessed to investigate (inter-)national crises. Finally, at the practical-applied level, our results can potentially inform policymaking for crisis response by federal and local governments.

Pandemic Preparedness

Following the Global Preparedness Monitoring Board (2019), we conceptually defined pandemic preparedness as “the ability to anticipate, detect, and coordinate response and recovery.” We operationally defined (1) a society's “ability to anticipate [and] detect” the virus as its ability to conduct a high number of tests (especially a high number of tests relative to the society's population); and (2) a society's recovery as (low) number of cases and (low) positivity rate (number of positive cases relative to the number of tests conducted). These three statistics (i.e., number of *tests* conducted, number of *cases*, and *positivity rates*) have also been relied upon by governments, NGOs, and scientists to track the spread of and response to the COVID-19 pandemic.¹

Our inclusion of COVID-19 cases and positivity rates in addition to testing capacity (wherever these statistics were available) also acknowledged that testing alone is not an entirely satisfactory response to the pandemic and, therefore, cannot fully capture our outcome of pandemic preparedness. Even though our three indicators of pandemic preparedness are arguably related in different ways (e.g., tests precede cases), their inclusion allowed for a more comprehensive investigation of pandemic preparedness and was particularly important for Study 2, at the level of U.S. counties, where the number of tests was not available. Of similar importance to the inclusion of multiple indicators

¹Deaths attributed to COVID-19 is another statistic used to evaluate the spread of the pandemic. However, given the inherent complexity that results from the sequential nature of COVID-19 deaths being linked to a nation's capacity to test for and identify COVID-19 cases, we did not include COVID-19 deaths in our investigation at the same time.

of pandemic preparedness was that we calculated these indicators not only in absolute terms but also *relative to a nation's population size*. Accounting for the proportion of the population that is potentially affected by the virus, these relative scores indicated the extent to which a nation or more local community (i.e., U.S. county in Study 2) was able to provide tests (and exhibited cases and positivity rates) *across all of its residents* (Hasell et al., 2020). This way, relative scores allowed for better comparability.

We also considered potential variables that should be controlled for when examining pandemic preparedness. We expected that at a phenomenological level, a larger population, higher population density, higher Gross Domestic Product (GDP; an indicator of a nation's total monetary value), and amount of air travel would be correlated with our preparedness indicators—especially infections/cases and tests. For instance, countries that have a higher market value, and thus more economic power, have more resources to test more people, and countries with a larger population require a greater number of tests overall. Given that the coronavirus is extremely infectious, the virus also spreads more easily in countries with more air travel. Thus, it was important to control for these variables when testing whether peace predicts pandemic preparedness.

Negative Peace and Pandemic Preparedness

Peace is a complex and at times elusive construct (Davenport, Melander, & Regan, 2018; Diehl, 2016). Its most prominent definition refers to peace as both the absence of direct violence and the presence of social justice and equality (Galtung, 1996). The absence of *direct* violence, often understood as the absence of conflict between groups, is referred to as *negative peace* (Galtung, 1985); “negative” because it is characterized by absence or lack of something (i.e., direct or personal violence) rather than necessarily the presence of a “positively defined outcome” (Galtung, 1969).

To capture negative peace, we utilized the Global Peace Index (GPI). This index consists of three subindicators: militarization (human and economic capital comprising the armed forces of a nation, measured by eight indicators), societal safety and security (how safe conditions are within a country, measured by 10 indicators), and domestic and international conflict (measuring the frequency and severity of conflict a country faces, measured by five indicators). Our choice came with some notable limitations. Davenport and colleagues (2018) suggest that the GPI, in its definition of its subindexes, focuses on interactions between governments and individuals, and on interactions between different individuals, but not on interactions between different groups. Further, the GPI focuses mostly on issues directly relevant to militarization and violence, and rather indirectly relevant to peace. Nevertheless, we chose the GPI over other measures of peace (e.g., Anderson, 2004; Bengtsson, 2000; Diehl & Goertz, 2000; Klein, Goertz, & Diehl, 2008; de Rivera, 2004) because it has been used extensively in reports by the Institute for Economics and Peace and in published empirical research (e.g., Durante et al., 2017; Fischer & Hanke, 2009). Finally, it is publicly available, allowing for practical and transparent use in our analyses.

We hypothesized that a nation would be better prepared to deal with a pandemic to the extent that there is negative peace, for several reasons. First, leading to loss of life and affecting survivors both physically and psychologically, violent conflict directly damages human capital and thus can reduce the “human resources” a nation has available to mobilize efforts to prevent the spread of a pandemic. Second, violent conflict can damage the infrastructure of a nation (e.g., Sidel & Levy, 2003), leaving its facilities in need of repair or complete rebuilding and thus reducing its ability to deal with impending crises. A report published by the Cato Institute suggests that war, aside from the aforementioned destruction of physical and human capital, also negatively influences a nation's per capita GDP (Thies & Baum, 2020). The report also adds that nations embroiled in war perform worse in their production and consumption of goods. Thus, diminished financial and economic power can reduce a nation's ability to purchase or produce the necessary equipment to handle a pandemic.

In addition, a nation's governmental resources are limited, leading to a competition between different governmental initiatives. Evidence for this so-called *crowding-out hypothesis* (Russett, 1969) is mixed, with some scholars finding the relationship between military and public health expenditures to be nonsignificant (e.g., Mintz, 1989) or positive (e.g., Kollias & Paleologou, 2011), whereas others find it to be negative (e.g., Ali, 2011). In an effort to adjudicate this empirical inconsistency, a recent study (Fan, Liu, & Coyte, 2018) using pooled cross-sectional data from 2000 to 2013 from 197 countries found support for a significantly negative association between military expenditures and a nation's capacity to spend funds on health. While this effect held for both lower and upper middle-income countries, it was most pronounced for lower middle-income countries. Nations prioritizing spending on their military and national defense might then have relatively fewer resources left that they can commit to other matters such as health care and social security, which play a crucial role in preventing a pandemic before its onset and effectively managing its impacts once it has afflicted a nation (Levin, Gebbie, & Qureshi, 2007).

Positive Peace and Pandemic Preparedness

Positive peace is defined as “the attitudes, institutions and structures that create and sustain peaceful societies” (Institute for Economics & Peace, 2020a) and characterized by both the absence of *structural* violence and the presence of a positively defined outcome (i.e., social justice reflected in equality, fairness, and egalitarianism; Galtung, 1969). In its measurement of the construct of positive peace, the Institute for Economics and Peace concludes that there are eight pillars of positive peace (as measured in their Positive Peace Index; PPI): (1) a well-functioning government; (2) equitable distribution of resources; (3) free flow of information; (4) good relations with neighboring countries; (5) high levels of human capital; (6) acceptance of the rights of others; (7) low levels of corruption; and (8) a sound business environment. We chose to measure positive peace by using the PPI because this measure was publicly available and because it complements the GPI (as it was created by the same research institute and with a similar methodological approach), allowing us to be more consistent in our analyses involving both types of peace as predictors. Similar to negative peace, we expected that increased positive peace would be associated with increased preparedness for the pandemic.

A recent report titled “COVID-19 and Peace” (Institute for Economics & Peace, 2020b) provides a first glance at the interplay between positive peace and responses to the pandemic. The authors of the report theorize that each of the aforementioned eight pillars have a critical role to play in the pandemic, albeit some more so than others. A well-functioning government defined by low levels of political corruption can offer effective, timely, and high-quality responses to crises while also upholding political stability. This can be achieved through the reduced time that it would take a well-functioning government to respond to adversity. An equitable distribution of resources could guarantee equal access to resources needed to mitigate the effects of the pandemic, ensuring that everyone in need has access to resources deemed essential for efforts to recover from such a crisis. A high free flow of information can ensure that the public is adequately informed about the dangers of the pandemic, leading to more adherence to COVID-19 regulations. High levels of human capital are indicative of a well-functioning economy, which is important for the purchase and production of resources necessary for pandemic preparedness. At a broader level, higher levels of acceptance of others and their rights, as well as better relations with neighboring communities, can increase respect for basic human rights and sociocultural norms, decrease levels of intra- and intergroup conflict, and instill a sense of shared mutuality among groups (Davenport et al., 2018), thereby promoting greater political stability alongside a more effective government.

Limited observational evidence in support of these claims exists, as 11 out of the 18 most recent and severe epidemics of the 20th century occurred in regions characterized by low or medium levels

of positive peace (Institute for Economics & Peace, 2020b). It is therefore plausible that the inequalities stemming from the absence of positive peace might decrease a government's preparedness to handle the pandemic. Further, a socially unjust society is characterized by health(care) disparities (i.e., not everyone has the same access to health care). During a large-scale crisis, especially a global pandemic, such disparities translate into a government's and society's reduced capacity to detect and therefore prevent poor health outcomes (e.g., infections).

Recently, Ruger (2020) offered a thought-provoking discussion of the foundational role of social justice in establishing the democracy and health of a nation. The researcher highlights their observation that nations characterized by justice, ethical government, and prioritization of their moral obligation to protect their citizens, responded more effectively to the spread of the virus. Empirically, such claims have also received some support, as both cross-national investigations (e.g., Bottan, Hoffmann, & Vera-Cossio, 2020) and case studies (e.g., Abedi et al., 2021) have highlighted that the impact of the COVID-19 pandemic on people depends on their race (Wrigley-Field, 2020), gender (Reichelt, Makovi, & Sargsyan, 2021), and socioeconomic status (Adams-Prassl, Boneva, Golin, & Rauh, 2020). These findings provide insight into the disproportionate impact the COVID-19 pandemic has had on different social groups. Although such findings are important, they do not provide a clear answer to our research question—namely, if, and, if so, how societies that differ in their levels of positive peace also differ in their preparedness to respond to the pandemic.

Overview of the Research

We tested our hypothesis that peace will predict more preparedness for the COVID-19 pandemic across nations, in terms of the responsiveness of federal governments, and across counties within the United States, in terms of the responsiveness of local government. For the test of our hypothesis at the local level of government, we focused on the United States (1) because it is one of the few countries that have received an operationalized peace index (Institute for Economics & Peace, 2020c) and (2) because it offered a large and detailed enough sample to allow for variability in both the predictor (i.e., positive and negative peace) and the outcome (i.e., COVID-19 cases) variables. Thus, we strove to empirically test how the economic power, population size and density, air travel, and positive and negative peace of a country impact how well-prepared it is to handle a crisis at the federal and local level.

STUDY 1: POSITIVE AND NEGATIVE PEACE PREDICTING COVID-19 ACROSS NATIONS

Methods

Cases: Countries

Our sample consisted of 155 countries. To select these 155 countries, we ensured that they had both an index of positive and negative peace available and subsequently that at least one COVID-19 related outcome was available. From the 155 countries, 41 were in Asia, 40 were in Europe, 24 were in the Americas (South, North, and Central), 3 in Oceania, and 47 in Africa. A detailed list of the countries can be found in the online supporting information.

Measures

An overview of all the measures, including their scale, source, and year of data collection, can be found in Table 1.

Table 1. Information About the Measures Included in the Study

Variable	Unit	Year Measure Was Available	Source	Statistical Role
Positive Peace Index	1–5	2019	link	Predictor
Global Peace Index	1–5	2019	link	Predictor
Population Estimate	Millions	2020	link	Covariate
Gross Domestic Product	Millions	2018	link	Covariate
Population Density	People/km ²	2018	link	Covariate
Air travel	Thousands	2014–2018	link	Covariate
COVID-19 statistics	<i>N</i> , <i>N</i> /1 mil.	2020	link	Outcome

Positive Peace

We captured a nation's level of positive peace by utilizing the PPI. This index is included in the annual Positive Peace Report produced by the Institute for Economics and Peace. We utilized 2019's scores, as they constitute the most recently available scores. A list of the most recent reports published by the Institute for Economics and Peace can be found at <http://visionofhumanity.org/reports/>. Countries have a score ranging from 1 to 5, which is produced based on several different indicators of positive peace (i.e., the eight pillars of positive peace mentioned above). Higher scores indicated lower levels of positive peace. We reverse coded the index so that higher scores would reflect higher levels of positive peace to match the direction of our hypothesis and thus ease the interpretation of our results. The average level of positive peace for the 155 countries was: $M = 3.07$, $SD = .88$ ($Min. = 1.35$, $Max. = 4.83$).

Negative Peace

We captured a nation's level of negative peace by utilizing the GPI published in the annual Global Peace Report by the Institute for Economics and Peace. The most recent report was released earlier in 2020; however, to match the scores of the Positive Peace Index, we utilized the scores from the 2019 report. Countries have a score ranging from 1 to 5, which is produced based on several different indicators of negative peace (e.g., deaths from internal and external conflicts, impact of terrorism). Similar to the Positive Peace Index, higher scores indicated lower levels of negative peace. Again, we reverse coded these scores to match the direction of our hypothesis. The average level of negative peace for the 155 countries was: $M = 3.92$, $SD = .51$ ($Min. = 2.43$, $Max. = 4.94$).

COVID-19

We collected COVID-19 statistics from the Worldometer website (2020), which tracks the total number of tests and cases across countries and also provides scores relative to one million people for each country. Based on this data, we estimated the positivity rate of each country (i.e., number of positive cases divided by the number of tests performed) as an additional measure of a nation's preparedness for and response to the pandemic. For the measures obtained from the Worldometer website, we obtained the measures from June 30, 2020. This end date allowed us to examine our variables of interest in a time frame that gave nations sufficient time to respond to the pandemic, thus also allowing for sufficient variability in different nations' responsiveness to the outbreak. Further, this cut-off date allowed us to gauge the initial government response to the pandemic without the potential confounds of subsequent spikes of virus infections in the (late) summer and fall of 2020.

Covariates

Several measures were included in our analyses to account for their effect on a nation's preparedness for and response to COVID-19. These were: First, a nation's GDP, obtained from the World Bank website, with the most recent estimates from 2018, calculated in millions of dollars; we included this measure because a nation's financial ability would directly impact its COVID-19 testing capacities. Second, a nation's population size in millions of people, obtained from the Worldometer website; we included this measure because population size could increase the need to conduct more tests. Third, a nation's population density, obtained from the World Bank website, with the most recent estimate from 2018, calculated as people per square kilometer of land area; we included this measure because COVID-19 can spread more easily in densely populated countries. Finally, we included a nation's amount of air travel, also obtained via the World Bank website, with the most recent estimate from 2018, calculated as thousands of people carried by country; our rationale for this measure was that the coronavirus can spread more easily in countries with more travel. These measures were expected to correlate with a higher number of COVID-19 tests and cases in absolute terms, but not in relative terms, when these outcomes are adjusted for population size. We expected this pattern as larger countries (which tend to have larger economies) would have to test more people as a result, but that does not necessarily translate to testing a bigger portion of the population. By accounting for the effects of these characteristics of a nation on the number of COVID-19 tests and cases, we made sure that any effects of negative and positive peace could not be reduced to a nation's economic capacity, size, population density, or air travel.

Results*Data Analysis Plan*

Because the measures included in our study used very different scales, we standardized them so that the resulting distributions had $M = 0$, $SD = 1$. Further, the N for each specific analysis differed based on data availability from the public sources. To examine how national indicators of positive and negative peace relate to the total number of COVID-19 tests, cases, and positivity rates (relative to one million people), we conducted bivariate correlations, linear regressions, and indirect effect tests (Hayes, 2013). All analyses were performed in SAS 9.4.

COVID-19 Tests, Cases, and Positivity Rates

Bivariate correlations were estimated to examine the association of positive, negative, and total peace, as well as a nation's GDP and population size, population density, and amount of air travel with COVID-19 tests, cases, and positivity rates in total, as well as relative to one million people. Consistent with our hypotheses, both positive and negative peace were significantly positively correlated with COVID-19 tests and cases relative to one million people, and significantly negatively correlated with positivity rates relative to one million people. As expected, the variables intended to be used as covariates in the regression analyses reported further below also showed relationships with some of the COVID-19 outcomes, but not as consistently as the variables intended to be used as predictors in the regression analyses reported further below (i.e., peace; for details, see Table 2).

To further explore this relationship and control for all covariates, we regressed the six COVID-19 outcomes (tests, cases, and positivity rate, both in absolute numbers and relative to one million people) on a nation's level of peace, GDP, population size, population density, and amount of air travel (see Table 3). Positive and negative peace were strongly correlated with each other: $r = .74$, $p < .001$. To avoid collinearity, we averaged the two indexes into one composite score. This decision

Table 2. Bivariate Correlations Between the Measures of Study 1

	Tests	Cases	Positivity Rate	Tests per 1 Million	Cases per 1 Million	Positivity Rate per Million
Total Peace	.02	.04	-.18*	.49***	.26**	-.18*
(N)	(142)	(155)	(142)	(142)	(155)	(142)
Positive Peace	.06	.12	-.17*	.55***	.30***	-.17*
(N)	(141)	(154)	(141)	(141)	(154)	(141)
Negative Peace	-.06	-.10	-.17*	.31***	.15*	-.17*
(N)	(142)	(155)	(142)	(142)	(155)	(142)
Gross Domestic Product	.78***	.75***	-.03	.13	.11	-.03
(N)	(139)	(152)	(139)	(139)	(152)	(139)
Population size	.75***	.31**	-.01	-.03	-.04	-.01
(N)	(142)	(155)	(142)	(142)	(155)	(142)
Population Density	-.01	-.01	-.03	.23**	.18*	-.03
(N)	(138)	(151)	(138)	(138)	(151)	(138)
Air Travel	.79***	.75***	-.03	.18*	.15	-.03
(N)	(138)	(151)	(138)	(138)	(151)	(138)

Note Numbers in parentheses refer to the sample for each correlation.

* $p < .05$;

** $p < .01$;

*** $p < .001$.

Table 3. Standardized Multiple Linear Regression Models

COVID-19 Outcomes	Total Peace		Gross Domestic Product		Population Size		Population Density		Air Travel	
	β	SE	β	SE	β	SE	β	SE	β	SE
Tests	.00	.05	.39*	.37	.43***	.06	-.01	.04	.15	.15
Cases	-.13*	.07	.27	.24	-.25***	.07	-.01	.06	.66**	.25
Positivity rate	-.35***	.02	.11	.05	-.08	.01	.01	.01	-.08	.05
Tests/1 million	.43***	.08	-.71*	.30	-.11	.09	.17*	.07	.88**	.31
Cases/1 million	.16	.10	-.49	.36	-.17	.11	.14	.09	.68	.37
Positivity/1 million	-.27**	.01	.11	.05	-.04	.01	-.01	.01	-.16	.05

* $p < .05$;

** $p < .01$;

*** $p < .001$.

is supported by extant research, as the Institute for Economics and Peace (2020a) has stated that the PPI and GPI are often correlate strongly but nevertheless constitute distinct constructs. This decision was also supported theoretically, as peace researchers have defined peace as the outcome of both negative and positive peace (e.g., Galtung, 1969, 1996). The average level of total peace for the 155 countries was: $M = 3.50$, $SD = .66$ ($Min. = 2.02$, $Max. = 4.83$). The regression results further supported our hypothesis: Peace was a significant and positive predictor of number of tests relative to one million people, above and beyond other predictors such as air travel. Further, peace, but none of the control variables, served as a (negative) predictor of positivity rates (overall and relative to the population). Interestingly, a nation’s level of peace was also significantly associated with fewer overall COVID-19 cases.

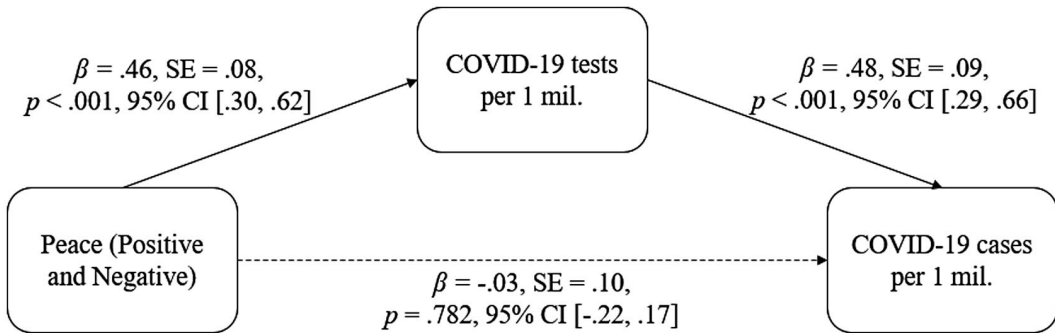


Figure 1. Indirect effect test, Process Macro, Model 4, with 10,000 bootstrapped samples. Standardized weights are presented. Dashed arrows depict nonsignificant effects. ** $p < .01$, *** $p < .001$.

Indirect Effect Test

To examine whether more peaceful nations were better prepared for the COVID-19 pandemic, we placed two out of the three COVID-19 outcomes (relative to one million people) in a sequential order. In particular, we theorized that being able to conduct more tests would predict more COVID-19 cases, as a larger portion of the population would be subjected to testing. We had this expectation because the number of cases is directly dependent on a nation’s ability to conduct COVID-19 tests. To test this hypothesis, we computed an indirect effect test (Hayes, 2013). In this indirect effect, the combined construct of positive and negative peace was the predictor, and the number of COVID-19 cases relative to the population was the outcome. The number of tests (relative to the population) was inserted as the mediator. Further, we included GDP, population size and density, and amount of air travel as covariates in the model. The hypothesized indirect effect was significant: $b = .22$, $SE = .08$, $95\% \text{ CI } [.10, .41]$. All the paths were significant and in the expected direction except for the direct effect of peace on COVID-19 cases, which was also in line with our expectations (i.e., that only the indirect effect and not the direct effect of peace on the outcome would be significant; see Figure 1).

Subindicators of Positive and Negative Peace

To better understand which aspects of positive and negative peace are associated with increased preparedness for the pandemic (defined here as a higher number of tests relative to one million people), we calculated an additional set of bivariate correlations between the eight pillars of positive peace and three major subfactors of negative peace (militarization, safety, and security, domestic and international conflict). Overall, all eight pillars of positive peace, lower rates of domestic and international conflict, and safety and security were all significantly and positively correlated with a higher number of tests per one million people. Less militarization, however, was not associated with more tests per one million people (see Figure 2).²

Discussion

Study 1 utilized publicly available data from 155 different nations to test whether positive and negative peace would predict increased preparedness for the COVID-19 pandemic. Results supported

²Results for the 23 individual indicators of the Global Peace Index (i.e., negative peace) are provided in the online supporting information. Of the 23 subindicators of negative peace, 14 had correlations in the hypothesized direction, 12 for which were significant. Four of the remaining subindicators were not significant, while five were significant in the opposite direction than we had hypothesized.

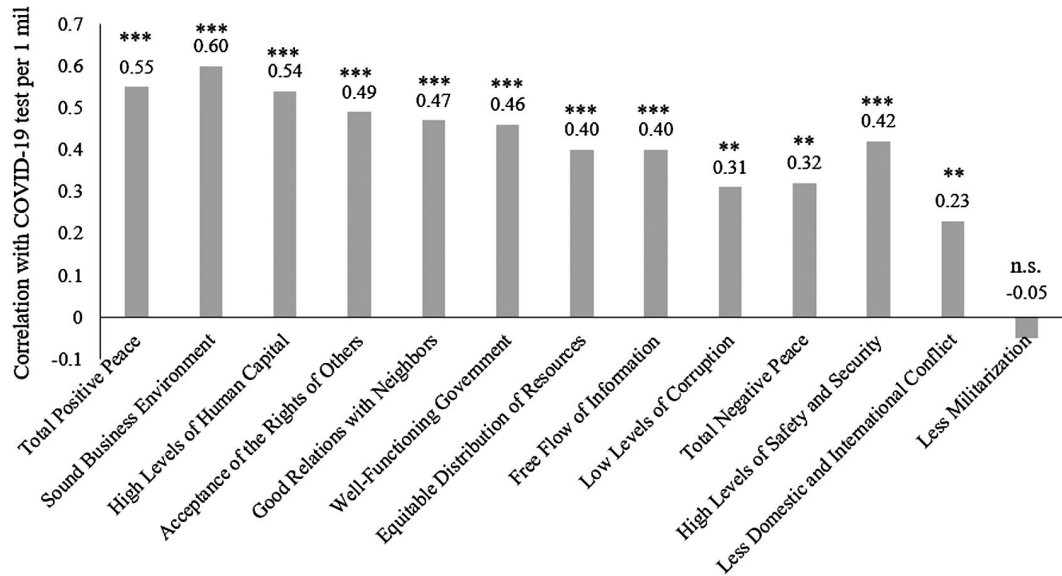


Figure 2. Bivariate correlations between the indicators of positive and negative peace with the number of COVID-19 test per one million people. * $p < .05$, ** $p < .01$, *** $p < .001$, n.s.: $p > .05$.

our hypothesis, highlighting that more negative peace (absence of violence and conflict between nations and groups) and positive peace (presence of equality, social justice, and social security) predicted better preparedness for the COVID-19 pandemic. This support stemmed from the significant and positive association between a nation's levels of peace and the number of COVID-19 tests relative to the population and the negative association between levels of peace and positivity rates as well as the overall number of COVID-19 cases. Further, we also found that specific indicators of positive and negative peace were more closely related to more tests (relative to the population) than others, suggesting that certain aspects of both types of peace could be more important in efforts to improve pandemic preparedness. Study 2 tested our hypothesis with data from different counties in the United States to illustrate how positive and negative peace can be beneficial in promoting preparedness for the COVID-19 pandemic even at a local (micro) government level.

STUDY 2: POSITIVE AND NEGATIVE PEACE PREDICTING COVID-19 WITHIN THE UNITED STATES

Methods

Cases: U.S. Counties

A total of 3144 U.S. counties across 50 U.S. states and Washington D.C. were included in our investigation. Counties were nested in states.

Measures

Negative Peace

We operationalized negative peace in the United States similarly to the U.S. Peace Index, which was last calculated in 2012 from the Institute for Economics and Peace (2020c). In the 2012 report,

the index consisted of the number of homicides, violent crime, incarceration, the number of police employees per 100,000 people, and a proxy for the availability of small arms. However, we deviated from this operationalization in several ways. First, instead of getting the rate per 100,000 people, we got the raw statistics from the most recent FBI crime report (Federal Bureau of Investigation, 2018). Second, a proxy for firearms was not widely available across counties, and therefore, we removed that aspect from our index. Third, we removed the incarceration rates, as no publicly accessible data source providing statistics about incarceration at the county level was found. Lastly, we expanded the types of crime included in our negative peace index. Thus, our final index was comprised by the average of the total number of police employees per county and of the following types of crimes: violent crime, murder and nonnegligent manslaughter, rape, robbery, aggravated assault, property crime, burglary, larceny-theft, and motor vehicle theft. Since these crimes are committed at very different frequencies, and since these frequencies of occurrence differ considerably by county, we standardized these statistics so that $M = 0$ and $SD = 1$. The resulting construct had very good reliability: $\alpha = .98$. Ultimately, since we wanted our scores to reflect the absence of violence, we multiplied this construct by -1 to match the direction of our hypothesis.

Positive Peace

Since no clear definition of positive peace has been given for the study of this construct in the United States, we operationalized positive peace as the presence of social justice and equality (i.e., absence of structural violence). Thus, we used four separate indexes as proxies of positive peace: (1) income inequality, measured as the ratio of household income in the 80th percentile relative to that of the 20th percentile; (2) neighborhood segregation against BIPOC, measured on a 1–100 scale; (3) the percentage of individuals who graduate from high school; and (4) the percentage of individuals who were unemployed. Each measure except for the percentage of high-school graduation was reverse coded so that higher scores reflect more socially just outcomes (i.e., less inequality, more employment, less segregation). Both measures were obtained from the website County Health Rankings.³

COVID-19

At the level of U.S. counties, we were able to obtain only one COVID-19 statistic that matched Study 1 directly: the total number of confirmed COVID-19 cases. Consistent with Study 1, we collected the data for this statistic until June 30, 2020, from the website USA Facts.⁴ We also calculated the number of cases relative to 1000 people.

Covariates

We included the following measures as covariates in our model given their effect on COVID-19 outcomes: the percentage of people older than 50 years old, as they are considered to be a vulnerable population for COVID-19 (CDC, 2020b). This measure was accessed through the most recent Census Bureau survey conducted in 2019. Similarly, we also included the percentage of BIPOC in a county, defined as: 1—percentage of Whites in a county. This statistic was also taken from the most recent Census Bureau survey (Millet et al., 2020). Population density was calculated as the number of individuals per county divided by the geographic mass of each county. Lastly, we included a measure of how politically Republican a state was, defined as the ratio of the percentage of Republican

³See <https://www.countyhealthrankings.org/>

⁴See <https://usafacts.org/>

votes divided by the percentage of Democrat votes in the 2016 presidential election. This measure was taken from <https://townhall.com/election/2016/president/>. We wanted to control for this statistic because in the United States, in particular, the COVID-19 pandemic has become a partisan issue (e.g., Pew Research Center, 2020).

Results

Data Analysis Plan

Since our outcome measure (i.e., confirmed COVID-19 cases in each county) was nested in U.S. states, we first wanted to make sure that there was significant variability across states that would necessitate a multilevel approach. To this end, we examined the variability and Intraclass Correlation Coefficient (ICC) in two unconditional models where only the two COVID-19 case statistics were inserted. For total COVID-19 cases, there was significant variability across states, $\tau_{00} = .15$, $SE = .04$, $p < .001$, and a large ICC ($\rho = .135$); similar results were observed for the number of COVID-19 cases per 1000 people: $\tau_{00} = .17$, $SE = .04$, $p < .001$, $\rho = .158$. Thus, we decided to conduct multilevel analyses to account for this variability (Raudenbush & Bryk, 2002). All the predictors were group mean centered. All variables were standardized, as they were captured at vastly different scales and ranges. We employed two multilevel regression models. For both, the following equation was used, with a county i nested in a state j .

$$\begin{aligned} \text{COVID - 19 Cases} = & \gamma_{00} + \gamma_{10} * \text{negative peace}_{ij} + \gamma_{20} * \text{desegregation}_{ij} + \gamma_{30} * \text{income equality}_{ij} \\ & + \gamma_{40} * \text{employment} + \gamma_{50} * \text{graduation} + \gamma_{60} * \text{Older adults percentage}_{ij} + \gamma_{70} * \text{BIPOC percentage}_{ij} \\ & + \gamma_{80} * \text{Republican/Democrat ratio}_{ij} + \gamma_{90} * \text{Population density}_{ij} + u_{0j} + r_{ij} \end{aligned}$$

COVID-19 Cases

Total Number of COVID-19 Cases

Controlling for all potential covariates, negative peace predicted significantly lower number of COVID-19 cases: $\gamma_{10} = -.57$, $SE = .02$, $p < .001$, replicating the pattern observed in Study 1. Similarly, but to a lesser extent, from the positive peace indicators, only neighborhood desegregation ($\gamma_{20} = -.07$, $SE = .02$, $p < .001$) and income equality ($\gamma_{30} = -.05$, $SE = .02$, $p = .018$) predicted a significantly lower number of cases.

Number of COVID-19 Cases per 1000 People

Controlling for all covariates, no significant effect of negative peace on COVID-19 cases per 1000 people was observed: $\gamma_{10} = .02$, $SE = .03$, $p = .217$. The only aspect of positive peace that predicted fewer COVID-19 cases relative to the population of a county was neighborhood desegregation: $\gamma_{20} = -.10$, $SE = .02$, $p < .001$. Importantly, in both multilevel regression models, the percentage of BIPOC individuals predicted significantly more cases, suggesting that there is a disparity in the number of cases based on the demographic make-up of the population. Further, the degree to which a county was Republican also significantly predicted more COVID-19 cases in both models, suggesting that partisanship is another important predictor (Table 4).

Table 4. Hierarchical Linear Regression Models

	Total Number of COVID-19 Cases		COVID-19 Cases per 1000 People	
	Effect	SE	Effect	SE
<i>Fixed Effects (Level 1)</i>				
Intercept (Outcome variable) γ_{00}	.09	.06	.05	.06
Negative peace γ_{10}	-.57***	.02	.03	.02
Neighborhood desegregation γ_{20}	-.08***	.02	-.10***	.02
Income equality γ_{30}	-.05*	.02	.01	.02
Employment γ_{40}	.05	.02	-.04	.03
High-school Graduation γ_{50}	-.01	.02	-.04	.02
Percentage of people over 50 γ_{60}	.07**	.02	-.03	.02
Percentage of BIPOC γ_{70}	.20***	.03	.44***	.03
Republican/Democrat ratio γ_{80}	.11***	.01	.05***	.01
Population density γ_{90}	.01*	.01	.01	.01
<i>Residual Variances</i>				
Variance _{County}	.72***	.02	.85***	.02
Variance _{State}	.17***	.04	.17***	.04
Intraclass correlation (ρ)	.13		.16	
<i>Model Fit Comparisons</i>				
2 Log Likelihood (<i>df</i>)	1619.20 (3)***		1004.48 (3)***	

Note All model fit comparisons are relative to the unconditional model. All predictors were group mean centered.

* $p < .05$;

** $p < .01$;

*** $p < .005$.

Discussion

Our analyses further supported our hypothesis that negative and positive peace are associated with increased pandemic preparedness. Negative peace was associated with fewer overall COVID-19 cases, and despite the limitation of lacking a direct measure of positive peace, neighborhood desegregation emerged as a negative predictor of the overall number of cases and the number relative to 1000 residents. Thus, our investigation across U.S. counties yielded partial evidence for the important role that levels of peace play in pandemic preparedness at the local level.

GENERAL DISCUSSION

The present research tested whether indicators of positive and negative peace would be related to increased preparedness for the pandemic. The test utilized publicly available data, allowing us to investigate some of the aspects that have been deemed very important for characterizing how well-prepared local and national governments are for the COVID-19 pandemic (expressed in COVID-19 tests, cases, and positivity rates). Further, even when examining our hypothesis within the United States, focusing on local governments in all U.S. counties, we found support for our hypothesis, with negative peace being associated with fewer overall COVID-19 cases, while positive peace also related to a lower total number of COVID-19 cases and relative to 1000 people. Given that the data included in both studies are operated by reputable research institutes and national/federal governments, their credibility and quality further supports our theoretical claims and provides generalizability for our results.

Our results highlight the importance of both types of peace. When lacking negative peace (i.e., being at war or experiencing social unrest within the country), nations spend more resources on matters of national security. Further, a nation that lacks negative peace is by definition embroiled

in direct violence, either on its soil or in an international conflict, and as a consequence has less resources available to deal with a national crisis such as the COVID-19 pandemic. Seeking peace in the international arena is not only directly beneficial for governments and nations as it prevents bloodshed and upholds humanitarianism. Importantly, it also allows a government to focus more on positive peace and matters pertaining to social justice and welfare. During a pandemic, providing access to health care for all members of society, for example, is extremely important, as it can help prevent the spread of the pandemic and also provide care to those afflicted by the pandemic.

In order to establish positive peace, a nation has to combat social inequalities. Such inequalities include income inequality, segregation and discrimination, governmental corruption, freedom of expression, and procedural and distributive justice. Since a nation characterized by greater levels of positive peace has relatively fewer major social issues to grapple with, and as a consequence has fewer other issues impeding or compounding its efforts to address a public health crisis such as the COVID-19 pandemic, it should be better prepared to address the pandemic. The results of Study 1 suggest that the two strongest correlates of a nation's capacity to conduct COVID-19 tests relative to its population are (1) a nation's economic development (i.e., the "sound business environment" pillar of the PPI) and (2) a nation's human capital (i.e., the "human capital" pillar of the PPI). However, it is important to note that all the other pillars of positive peace were also significantly correlated with a higher number of tests. This pattern of correlations suggests that since positive peace is mostly focusing on the internal affairs of a nation (i.e., combatting inequalities, pursuing social justice), governments that are more effective at addressing these affairs will also be better prepared to deal with crises such as the COVID-19 pandemic.

In our second study, we investigated our hypothesis in the United States. In this context, the negative effects of the politicization of the pandemic became evident, as our measure of how Republican a county was correlated with higher numbers of COVID-19 cases—both in total and relative to the population. Perhaps the most straightforward findings are the association of neighborhood desegregation and percentages of BIPOC individuals in a community with decreased and increased number of cases, respectively. These findings speak clearly to the inherent inequalities and health disparities that systemic racism in the United States has generated, which have only been exacerbated during the pandemic.

Implications

From a theoretical standpoint, this investigation provides a firsthand account of the importance of studying both negative and positive peace. Calls have been made for science to bear on peace and not solely on war (Leidner et al., 2013), and the current studies highlight the importance of such recommendations. First, as the Institute for Economics and Peace has suggested, and as we have found in our current research, positive and negative peace are strongly related, and one can consequently influence the other. Second, scholars tend to prioritize work on negative peace and the study of intergroup conflict and direct violence rather than the study of positive peace and social justice (Coleman, 2012; Goertz, Diehl, & Balas, 2016). When we consider that violence among nations has significantly declined (Pinker, 2011), but social inequalities have increased (United Nations Department of Economic and Social Affairs, 2020), the study of positive peace becomes even more important. Within the United States in particular, the Black Lives Matter Movement, together with calls to defund the police and relocate local funding to education and other avenues (e.g., Lowrey, 2020), further highlights the public's call to turn the spotlight on matters of positive peace.

Our studies speak to the need to rethink racial inequalities, as the percentage of BIPOC individuals and levels of neighborhood desegregation consistently predict more and less COVID-19 cases, respectively. Such a racial disparity in the impact of COVID-19 could also be considered as the product of the absence of positive peace in the United States. In addition, this research emphasizes the need for the social sciences to engage in interdisciplinary efforts to offer solutions for social issues such

as COVID-19, which is still currently ongoing at the time of this research (Van Bavel et al., 2020). Our study additionally serves as a reminder that publicly available data can be harnessed to inform political and social issues that are of great importance to the state of the world, as our investigation shows that maintaining both positive and negative peace can help local and federal governments be better prepared for the pandemic.

Limitations

Our studies are not without limitations. There have been several spikes in COVID-19 cases across nations and time, especially after the end of the time window that we compiled data for. It is possible that our findings will not generalize beyond the early stages of the pandemic. Upon the eventual global recovery from the pandemic, our findings should therefore be reevaluated with additional data and time points. Another limitation is that due to our use of secondary data sources, it was not possible for us to discern (1) which types of COVID-19 tests were employed, (2) how reliable the tests were, (3) and whether they were reported accurately by governments and research institutes. Perhaps the biggest limitation is that in Study 2, we were only able to locate four proxy indexes of positive peace in publicly available databases (i.e., neighborhood segregation of Whites and BIPOC, income inequality, graduation rates, employment rates).

Despite these limitations, we believe that the consistency of the results with regard to the eight pillars of positive peace as well as the subindicators of negative peace (see Figure 2 and Figure S1) provides some reassurance that indeed greater levels of peace relate to better preparedness for the pandemic during the onset of COVID-19. Further, the development of a new database which integrates COVID-19 outcomes, indicators of peace, as well as various key measures (i.e., economic output, population estimates) from different sources for 155 nations as well as all 3144 U.S. counties is by itself a noteworthy contribution.⁵ We also wish to emphasize that the field can greatly benefit from the development of indexes of peace that address the aforementioned limitations, a call for action also voiced by other scholars (e.g., Davenport et al., 2018). Aside from the clear benefit of having more well-defined indexes of positive and negative peace, generating such measures would allow the use of positive and negative peace in multilevel analyses, allowing researchers to understand the direct influence of national or regional levels of peace on the psychology of the populace. Future research can utilize and update the data we compiled with more recent and additional measures (e.g., environmental outcomes, measures of how democratic local and national governments are) to further explore how different governmental mechanisms influence responses to COVID-19.

Conclusion

Ultimately, the current investigation advances the theory on positive and negative peace by linking both types of peace with increased pandemic preparedness for COVID-19. These findings emerged both at a micro (local government) and macro (national government) level. Promoting both positive and negative peace could advance the well-being of citizens, not only by promoting social justice and equality, but also by allowing governments to be more prepared to handle future crises.

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⁵These materials are available on OSF at <https://osf.io/umsvz/>.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher’s web site:

Table S1. List of the 155 Countries Included in the Investigation

Table S2. Number of Counties/Borough for Each U.S. State (Including Washington, DC)

Figure S1. Bivariate Correlations between the Indicators Negative Peace with the Number of COVID-19 Test per 1 Million People. * $p < .05$, ** $p < .01$, *** $p < .001$, n.s.: $p > .05$.