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Mónica Hernández-López, Antonio Cepeda-Benito, Pilar Díaz-Pavón, Miguel Rodríguez-Valverde

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Psychological Inflexibility and Mental Health Symptoms during the COVID-19 Lockdown in Spain: A Longitudinal Study.

Mónica Hernández-López (1)*, Antonio Cepeda-Benito (2), Pilar Díaz-Pavón (1), Miguel Rodríguez-Valverde (1)

(1) University of Jaén

(2) The University of Vermont

* Correspondence concerning this article should be addressed to: Mónica Hernández-López, Ph. D.. Psychology Department, University of Jaén, Campus las lagunillas s/n, 23071- Jaén (Spain). mhlopez@ujaen.es Phone: 0034 953213450

Antonio Cepeda-Benito: antonio.cepeda-benito@uvm.edu 358 Dewey Hall. Department of Psychological Science. The University of Vermont (USA).

Pilar Díaz-Pavón: mpdm0004@red.ujaen.es Psychology Department, University of Jaén, Campus las lagunillas s/n, 23071- Jaén (Spain)

Miguel Rodríguez Valverde: mrodrigu@ujaen.es Psychology Department, University of Jaén, Campus las lagunillas s/n, 23071- Jaén (Spain)

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All procedures in the current study received approval from the institutional research committee. The treatment of human participants is in accordance with established ethical guidelines like the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants.

Psychological Inflexibility and Mental Health Symptoms during the COVID-19 Lockdown in Spain: A Longitudinal Study.

Abstract

Spain, one of the European countries most affected by the COVID-19 pandemic, underwent a strict lockdown between March and May 2020. This study examines longitudinally the evolution of both psychological inflexibility and mental health symptoms in a sample of college students from the beginning and throughout the end of the mandated lockdown period. We present the results from 197 participants who responded to an online survey at least at two of three data-collection waves scheduled at the beginning (N = 226), halfway (N = 172), and end (N = 188) of the lockdown. The analyses revealed that psychological inflexibility and symptomatology increased over time, and that inflexibility at the beginning of the lockdown indirectly predicted self-reported symptoms at the end of the lockdown via autoregressive parallel paths that also connected cross-sectionally to reveal that changes in inflexibility were predictive of changes in mental health. These results present a dynamic and robust relationship between psychological inflexibility and mental health symptoms throughout a relatively long and presumably stressful period of time.

Keywords: COVID-19, lockdown, psychological inflexibility, psychological flexibility, mental health.

Highlights

- Mental health symptoms substantively increased over the two-month long mandated lockdown in Spain
- Psychological inflexibility increased marginally during the same period
- Psychological inflexibility indirectly predicts mental health symptoms at 2-month follow up
- Changes in psychological inflexibility over time predict corresponding changes in mental health over the same period
- The pattern of results suggests psychological inflexibility is both malleable but relatively stable

Psychological Inflexibility and Mental Health Symptoms during the COVID-19 Lockdown in Spain: A Longitudinal Study.

COVID-19, the infectious disease caused by the SARS-CoV-2 virus, was declared a global pandemic on March 11, 2020 by the World Health Organization (WHO, 2020). Six months later, there are nearly 27,000,000 confirmed cases worldwide and the disease has caused almost 900,000 deaths (Johns Hopkins University [JHU], 2020). The lethality of the disease and its rapid spread, threatening to collapse healthcare systems, led governments worldwide to adopt social distancing and lockdown measures that have presented unprecedented challenges on their citizens' daily lives. In Spain, one of the countries most affected by the pandemic, with 462,858 officially confirmed cases and 29,094 deaths (August, Ministerio de Sanidad, 2020), the Spanish Government declared a state of alarm on March 14 (RD 463/2020) that included a strict mandatory population lockdown (or at-home confinement). The lockdown restricted free movement in public areas and prohibited all non-essential in-person commercial, educational, work-related, and social activities.

Although the extension and severity of COVID-19 lockdowns are unprecedented, it is well documented that quarantines declared in China and Canada during the SARS outbreak of 2003, as well as in Western Africa during the Ebola crisis of 2014 can cause significant and long-lasting negative effects on a population's mental health (Brooks et al., 2020). The earliest studies related to COVID-19 and its lockdowns yield similar findings. In China, a crossectional study found that the lockdown was associated with increased anxiety, depression and moderate-to-severe perceived stress (Wang et al., 2020). Similar findings have been replicated in a few separate studies conducted in Spain during the first few weeks of the nationwide lockdown (González-Sanguino et al., 2020; Odriozola-González et al., 2020; Ozamiz-Etxebarria et al., 2020).

These negative outcomes are not surprising given the vast evidence and broadly accepted knowledge that unavoidable, uncontrollable, stressful events negatively impact mental and physical health (e.g., Cohen et al., 2007).

Psychological flexibility is a transdiagnostic dimension that involves being open to experiencing private events in the present moment as a conscious human being, persisting or changing in behavior in response to situational demands in pursuit of personally valued directions (Hayes et al., 2006). Conversely, psychological inflexibility involves a rigid behavioral pattern characterized by persistent avoidance of aversive internal and external events (experiential avoidance: Hayes et al., 1996; Luciano & Hayes, 2001) that interferes with engagement in personally valued actions. Research shows that psychological flexibility consistently moderates (mitigates) the detrimental impact of stress on wellbeing and mental health (Gloster et al., 2017), buffering the effect of accumulated major life events and their perceived negative impact (Fonseca et al., 2019). More broadly, there is substantial evidence that high psychological flexibility predicts wellbeing while high psychological inflexibility is consistently associated with distress, psychopathology, and poor mental health (Bond et al., 2011; Bluett et al., 2014; Gloster et al., 2011; Kashdan & Rottenberg, 2010; Levin et al., 2014; Marshall & Brockman, 2016; Tyndall et al., 2020).

A growing literature shows that psychological (in)flexibility is malleable and that flexibility can be successfully promoted to help individuals lead a more satisfactory, valued life (e.g., Ciarrochi et al., 2010; Fledderus et al., 2010; Hayes, et al., 2006; Wilson et al., 2014). Notably, the target of intervention in Acceptance and Commitment Therapy (ACT) is to enhance psychological flexibility (Hayes et al., 1999, 2012; Hayes, 2019). Nonetheless, longitudinal studies have reported that psychological (in)flexibility, in the absence of intervention, is rather stable and can prospectively predict psychological distress and mental health up to two years in advance (Spinhoven et al., 2014).

That psychological inflexibility is stable over time and prospectively predicts mental health outcomes (e.g., Spinhoven et al., 2014), and that considerable evidence shows that it is malleable (e.g., Wilson et al., 2014) need not be in conflict. Considering the contextual nature of psychological inflexibility, it can be assumed that it may fluctuate in response to temporary, contextual challenges and life circumstances. We posit that such fluctuations may in turn predict fluctuations in mental health status. Such hypothesis is compatible with both crosssectionally (e.g., Gloster et al., 2017) and prospectively (e.g., Shallcross et al., 2010) found associations between inflexibility and mental health outcomes. The COVID-19 pandemic presents a naturally occurring opportunity to test this hypothesis, given that the challenges imposed by the lockdown and related stress appear to impact inflexibility, as well as mental health outcomes (e.g., Arslan et al., 2020; Dawson et al., 2020; Pakenham et al., 2020). To our knowledge, no study has explored how psychological inflexibility changes along a sustained period of befallen impactful daily life challenges comparable to those derived from the COVID-19 pandemic, and how this may relate to changes in mental health symptoms over time.

Thus, the present study aims to longitudinally analyze the evolution of psychological inflexibility and mental health symptomatology in college students during the two-month long, strict mandatory lockdown period in Spain. Data were collected at three time-waves: beginning, halfway, and end of the lockdown. The study tests whether psychological inflexibility at the beginning of the lockdown predicts concurrent and subsequent mental health symptoms, as well as whether changes in psychological inflexibility during this period influence comparable changes in self-reported mental health symptoms.

METHOD

Participants

A convenience sample of 260 college students enrolled in psychology courses at the University of XXXX completed the survey at least at one of three time-waves. The University of XXXX is a public, research university of about 16,500 students in the autonomous region of XXXXXX, Spain. Like almost all major universities in Spain, the campus of the University of XXXX is located within the boundaries of a major city. Participants were recruited for an online survey through announcements on the institutional webmail and online teaching platform. Inclusion criteria were an age of 18 or older, and being registered as an active student at the University.

Of the 260 participants, 197 completed the survey at any two, and 129 participants did so at all of the three waves. The sample of the present study consists of the 197 participants who completed the survey at any two of the three waves. Missing data from any one of the three waves was imputed using the *Multiple Imputation* method (Lodder, 2013; for more details see the *Data Analyses* section). Analyses of variance (ANOVAs) comparing the participants who completed the survey at one, two, or the three waves revealed no significant differences for age ($F[2, 251] = 1.11$, $p < .33$, $\eta_p^2 = .009$), baseline inflexibility ($F[2, 223] = 0.03$, $p = .970$, $\eta_p^2 = .001$), or baseline symptoms ($F[2, 223] = 1.23$, $p = .294$, $\eta_p^2 = .011$). Likewise, neither the male/female (X^2 [2, N = 259] = 5.00, $p = .082$) nor the undergraduate/graduate breakdowns (X^2 [2, N = 260] = 1.52, $p = .466$) were different across the three levels of participation.

Of the 197 student participants retained for the present analyses, most (90%) were between 18 and 25 years of age (sample's $M = 21.5$; $SD = 5.6$), most self-identified as female (84%), and most were undergraduates (87%). Data collection was anonymized and all procedures were approved by the IRB of the university where the data were collected.

Measures

Acceptance and Action Questionnaire-II (AAQ-II, Bond et al., 2011). The AAQ-II is a 7-item self-report questionnaire of general psychological inflexibility. It measures unwillingness to experience unwanted thoughts and emotions, and inability to be in the present moment and to behave according to values-directed actions when unwanted cognitions and emotions are present. Items are rated on a 7-point Likert scale (1: never true; 7: always true), with higher scores indicative of higher psychological inflexibility. The total score can range from 7 to 49. In the present study we used the Spanish version validated by Ruiz et al. (2013) with a sample of over 700 participants. Ruiz et al. reported high internal consistency for the AAQ-II, which discriminated between clinical and non-clinical groups and correlated substantively and in the expected direction with various measures of psychological symptoms and distress. In the present study we obtained scores with very high internal consistency (Cronbach's $\alpha = .91$).

General health questionnaire-12 (GHQ-12, Goldberg & Williams, 1988). The GHQ-12 is one of the most widely used mental-health screening instruments (Goldberg et al., 1997). It consists of 6-negatively and 6-positively keyed items. The negatively keyed items inquire about the extent to which an individual has felt happy or good about themselves. The positively-keyed items inquire about the severity or frequency of mental-health symptoms or difficulties. Each item is presented with four answer choices that can be scored dichotomously (GHQ and C-GHQ scoring systems) or as a 4-point Likert scale (0-1-2-3). In this study we used the Likert scoring system, which yields a total score that ranges from 0 to 36. We used a Spanish version that was validated with a national sample of nearly 30,000 respondents (Rocha et al., 2011). As in the previous studies (e.g., Rocha et al., 2011) the GHQ-12 scores in the current sample had adequate internal consistency (α= .82).

In addition to the measures described above, participants were asked to complete (as part of a larger project) a survey including descriptive demographics, and measures of positive and negative mood (*Positive and Negative Affect Schedule*, PANAS: Watson et al., 1988), coping strategies (*Coping Orientation to Problems Experienced-28*, Brief-COPE: Carver, 1997), perceived social support (*Multidimensional Scale of Perceived Social Support*, MSPSS: Zimet et al, 1988), and overall feelings of wellbeing (*Satisfaction with Life Scale*, SWLS: Diener et al., 1985). Scores from these measures were used in the multiple imputation of missing data we describe below.

Procedure

Potential participants were contacted just after the state-of-alarm declaration through an institutional webmail message advertising the study, and directed to further information through a link at the University online teaching system. This link gave access to a Google Forms survey that informed participants about the study and required informed consent in order to proceed. Participants were informed that they would be contacted again for further participation (filling out the same survey at a later time) once or twice more, depending on the duration of the lockdown period. Ultimately, data collection was carried out at three time-waves (W1, W2, and W3). W1 took place a few days after the declaration of state-of-alarm (March 18-22). W2 took place approximately one month later (April 15-19). W3 took place just after the beginning of the gradual de-escalation of lockdown measures (May 13-17).

Data Analysis Strategy

Multiple Imputation of Missing Data.

A total of 197 participants returned complete surveys at least at two of three, longitudinally collected data waves (W1, W2, & W3). Of these, 129 participants returned complete surveys at each of the three waves, and 68 participants returned completed surveys at any two of the three waves. The data missing from the 68 participants at one of the three waves was replaced by creating 10 imputed data sets using the *Multiple Imputation* method available in SPSS v26 and as described by van Ginkel (2014).

Taking in consideration all three waves (197 × 3 = 591), the amount of imputed data per data set amounts to 11.5% of the analyzed data set (or 68/591). The missing scores for psychological inflexibility and mental health symptoms at any of the three waves were imputed using the data available from the two non-missing waves and including all of the variables that were used in the larger project (see Measures section above). We would like to note that the analyses we report here were replicated with the smaller sample of 129 participants that participated in the three data waves. The results from the smaller and the imputed data sets yielded findings that were identical with regard to statistical significance patterns, and revealed no more than negligible differences with regard to estimated effect sizes.

Ordinary Least Squares (OLS) ‘Mediation’ Analyses.

Figure 1

Generic Mediation Model with a Single Mediator (M) Using OLS

Although we did not test a mediational model *per se*, our statistical approach is conceptualized from and borrows the techniques of mediation analyses. A mediation analysis allows investigators to test *how* an independent variable *X* exerts a significant indirect effect on a dependent variable *Y* by changing a third variable *M*, which in turn causes changes on *Y* (*X* → *M* → *Y*; see Figure 1). In an Ordinary Least Squares (OLS) mediation analysis, the predictive coefficient *c* resulting from regressing *Y* on *X* (*X* → *Y*), is called the *total effect* of *X* on *Y*; the hypothesized *indirect effect* of *X* on *Y* through a mediator *M* is the coefficient *a* that results from regressing *M* on *X* (*X* → *M*) multiplied by the coefficient *b* that results from regressing *Y* on *M* (*M* → *Y*); and the *direct effect* of *X* on *Y* is the coefficient *c’* resulting from regressing *Y* on *X* while controlling for (keeping constant) the effect *b* of *M* on *Y*. By substituting *M* with its predictive regression equation and factoring for *X*, Figure 1 illustrates how the total effect *c* of X on Y can be interpreted as the sum of the indirect (*ab*) and direct (*c’*) effects of X on Y (for a full and detailed explanation of how mediation analyses can be conducted using OLS regression, see A. F. Hayes, 2018).

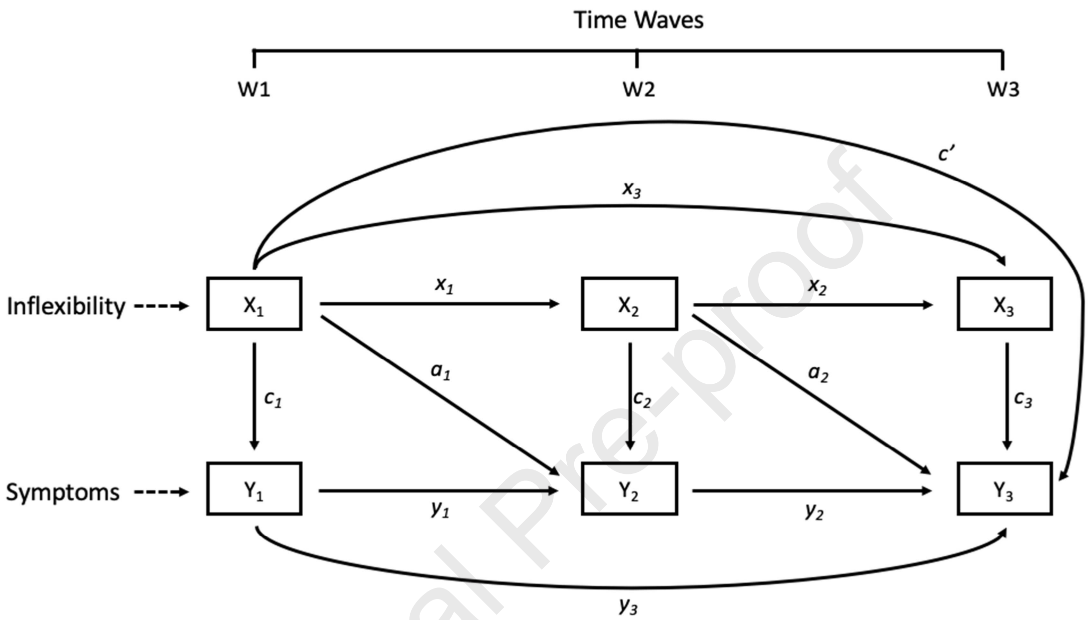
Preacher, A. F. Hayes and their colleagues have provided various “macros” for SPSS, SAS and R that ease the task of carrying out complex mediation analyses (e.g., A. F. Hayes and Matthes, 2009; Preacher & A. F. Hayes, 2004, 2008; Preacher et al., 2007). These tools have been integrated in a comprehensive tool called *PROCESS* that simplifies the testing of complex mediation models (including mediation models where the predictor, mediating variables, and predicted variables are longitudinally, repeatedly assessed) (A. F. Hayes, 2018).

Recognizing that psychological inflexibility is conceptualized as being malleable (e.g., Gloster, et al., 2017), that previous research has found reciprocal relations between psychological inflexibility and stress (Ishizu et al., 2017), and assuming that the COVID-19 pandemic and its associated imposed confinement constitute a naturally occurring and evolving stressor, our main goal was to test whether changes in psychological inflexibility over time were associated with corresponding changes in mental health symptoms. To accomplish our goal, we designed a model where inflexibility scores (as measured by the AAQ-II) at W1 functioned as the focal predictor X_1, mental health symptomatology scores (as measured by the GHQ-12) at W3 was the outcome or predicted variable Y_3, with inflexibility and symptomatology respectively representing autoregressive paths through which Inflexibility at W1 indirectly predicted mental health symptoms at W3 (see Figure 2).

In the model depicted in Figure 2, inflexibility at W1 predicts inflexibility at W2 (through path x_1), as well as at W3 (through path x_3). Inflexibility at W2 predicts inflexibility at W3 (x_2) while controlling for inflexibility at W1 (x_3); which is the equivalent to testing whether inflexibility changes from W1 to W2 predict inflexibility

Figure 2

Model Testing the Association between Inflexibility at Wave 1 (X_1) and Mental Health Symptoms at Wave 3 (Y_3) Directly (c') and Indirectly (product of the connecting paths)



scores at W3 (see A. F. Hayes, 2018, p 541-545).

The model predicts mental health symptoms both cross-sectionally and longitudinally. Cross-sectionally, symptoms at W1 are regressed on inflexibility scores at W1 (c_1); symptoms at W2 are regressed on inflexibility at W2 (c_2) while controlling for symptoms (y_1) and inflexibility (a_1) reported at W1 (i.e., c_2 tests whether inflexibility changes from W1 to W2 predict changes in symptoms from W1 to W2 and represents the within-wave correlated residual change at W2); and symptoms at W3 are regressed on inflexibility at W3 (c_3) while controlling for inflexibility scores at W1 (*c'*) and W2 (a_2), as well as for symptoms reported at W1(y_3) and W2 (y_2) (i.e., c_3 tests whether inflexibility score changes from W1 and W2 predict symptom changes from W1 and W2 to W3 and represents the within-wave correlated residual change at W3).

Longitudinally, path a_1 tests whether inflexibility scores at W1 predict within-wave correlated inflexibiliy-symptom change at W2; whereas path a_2 tests whether inflexibility changes from W1 to W2 predict correlated inflexibility-symptom change at W3 (c_3). The total indirect effect of inflexibility at W1 on symptoms at W3 is the product of all of the coefficients that connect these two variables through all the connecting paths (i.e., all path coefficients except *c'*, the direct effect).

Table 1

OLS Regression Equations Needed to Calculate all Indirect Effects, the Direct Effect (c') and the Total Effect (c)

	Equations
1	$Y_1 = i + c_1X_1 + e$
2	$X_2 = i + x_2X_1 + e$
3	$Y_2 = i + a_1X_1 + y_1Y_1 + c_2X_2 + e$
4	$X_3 = i + x_3X_1 + x_2X_2 + e$
5	$Y_3 = i + c'X_1 + y_3Y_1 + a_2X_2 + y_2Y_2 + c_3X_3 + e$
6	$Y_3 = i_y + cX + e_y$

The various OLS regressions needed to test our hypotheses are presented in Table 1. We predicted *a priori* that within-wave correlated changes in inflexibility and symptoms at W2 (equation 3, c_2) and W3 (equation 5, c_3), would be positive and significantly different from zero (i.e., increases in inflexibility over time would be associated to corresponding increases in symptoms over the same period of time). We also anticipated that higher inflexibility at W1 would longitudinally predict higher symptom changes from W1 to W2 while controlling for inflexibility at W2 (i.e., path a_1 in equation 3 would be statistically significant), as well as that inflexibility changes from W1 to W2 would longitudinally predict symptom changes from W1 and W2 to W3 (equation 5, a_2) (i.e., previously experienced increases in inflexibility would augur future worsening of symptoms at a later time). Finally, we predicted that the total effect *c* from inflexibility at W1 to symptomatology at W3 would be statistically significant (equation 6, *c*), and anticipated that the direct effect of inflexibility from W1 to symptomatology at W3 (equation 5, *c'*) would either be not statistically significant and/or substantively smaller than total effect *c*.

Results

All analyses were run with SPSS v26, which allows for pooling correlation outcomes from multiply imputed data sets. However, for repeated measures ANOVAs and PROCESS analyses, we had to conduct the analyses separately with each the 10 imputed data sets and then pool the results by averaging across data outputs. Table 2 presents the bivariate correlations between all the variables in the model, as well as each variable's mean and standard deviation. Using repeated measures ANOVAs, we tested longidudinal effects for Inflexibility (F [1.97, 387] = 5.48; p = .008; η_p^2 = .027) and Symptomatology (F [1.91, 375] = 72.41; p < .0001; η_p^2 = .269), revealing that both inflexibility and symptom scores significantly increased over time. As expected, the correlations between inflexibility scores at the three wave times were very large (range = .75 to .79), whereas the correlations between symptom scores at the three wave times were more modest, but large nonetheless (range = .43 to .71; see Table 2). The effect-sizes from the repeated measures ANOVAS revealed that the time-dependent changes were large for mental health symptoms (η_p^2 = .269) and between small and medium for inflexibility (η_p^2 = .027). With regard to the cross-sectional correlations between inflexibility and symptomatology at each of the wave periods, we observed medium to large correlations (range = .37 to .61).

Table 2

Means, Standard Deviations (SD), and Bivariate Correlations between and across Psychological Inflexibility (I) and Mental Health Symptoms (S) at Wave 1 (W1), Wave 2 (W2), and Wave 3 (W3)

	Means	*(SD)*	W2 I	W3 I	W1 S	W2 S	W3 S
W1 I	22.14	(8.91)	.78**	.79**	.53**	.37**	.48**
W2 I	22.40	(8.41)	__	.75**	.51**	.49**	.52**
W3 I	23.47	(9.20)		__	.52**	.43**	.61**
W1 S	13.35	(5.13)			__	.56**	56**
W2 S	16.80	(5.75)				__	.71**
W3 S	17.19	(6.14)					__

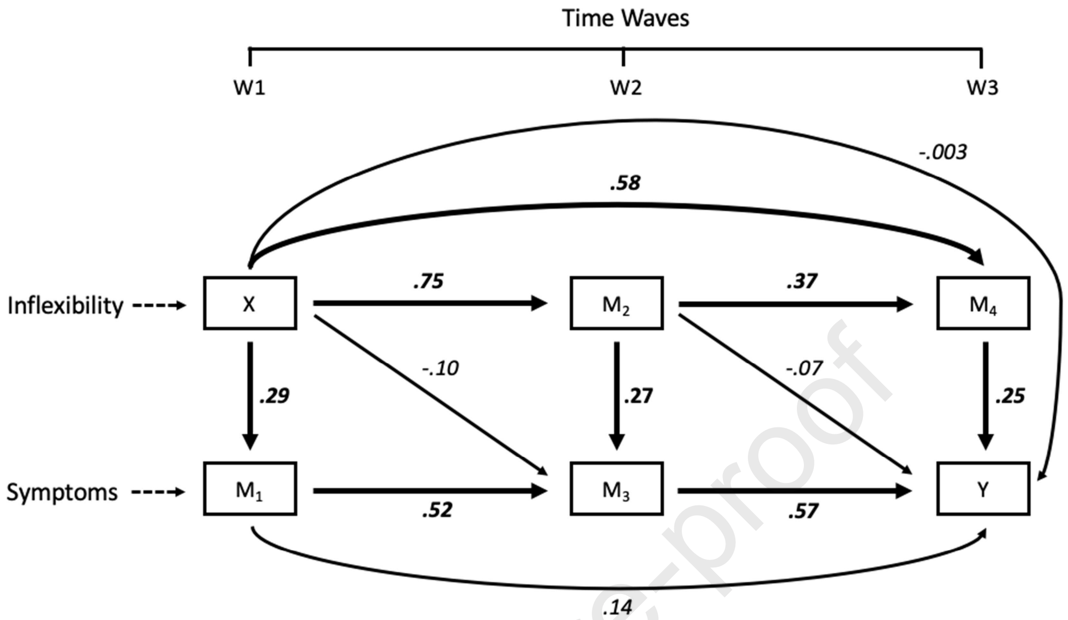
*** Correlations significant at p < .001 (two-tailed test).*

To provide a more contextualized illustration of how levels of inflexibility and symptoms changed within subjects from wave to wave, we calculated the percentage of participants showing reliable change over time (see Jacobson & Truax, 1991). Using the internal consistencies and the baseline standard deviations for each scale we estimated the number of points an individual would have had to change on the AAQ-II (7.4 points) and the GHQ-12 (6.0 points) for that change to be statistically significant. We found that 4.1% of respondents experienced significant decreases and 5.1% recorded significant increases in their AAQ-II scores from W1 to W2. Similarly, difference scores between W2 and W3 also revealed that fewer participants experienced significant decreases (6.1%) than increases (9.2%) in AAQ-II scores. Regarding mental health symptoms, participants were also more likely to record increases than decreases in GHQ-12 scores. Change scores revealed that 1.5% of the sample had significant decreases, and 29.6% had significant increases from W1 to W2. From W2 to W3, 6.6% of participants had significant decreases and 8.7% experienced increases. Overall, more participants experienced increases than decreases in inflexibility and symptoms over time, but with increases in symptoms being more pronounced.

Figure 3 presents the coefficients for each of the paths tested in the OLS model. The thicker arrows represent the significant indirect paths through which W1 Inflexibility predicts W3 Symptoms. Table 3 presents the various indirect paths and their associated indirect effects or coefficients. Overall, the total effect of W1 Inflexibility on W3 Symptoms (.345, *se* = .04, $p < .001$;), as well as the total indirect effect (.349, *se* = .06, $p < .001$; see Table 3) were statistically significant. As anticipated, the direct effect of W1 Inflexibility on W3 Symptoms (i.e., after adjusting for the total indirect effect) was not statistically significant (*c'* = -.003, *se* = .06, p = .684). The overall model accounted for almost 70% of the variance of Symptoms at W3 (R^2 = .66). With our sample of 197 participants, we had adequate power (.8), to conduct multiple regression analyses with 2 to 5 predictors and detect statistically significant predictors yielding small effect sizes (Cohen's f-squared = .040 to .068; see Cohen et al., 2003; Soper, 2020).

Figure 3

Model Results with Significant Coefficients in Bold Font and Significant Indirect Effects Highlighted by Thicker Arrows



All significant coefficients had p < .001; all non-significant coefficients had p >. 05

There were four indirect effects that were statistically significant (see Table 3). That is, Inflexibility at W1 was indirectly associated with Symptoms at W3 though:

1. Inflexibility at W3, which in turn predicted higher Symptoms at W3 (indirect effect #4);
2. Symptoms at W1, which predicted higher Symptoms at W2, which in turn predicted higher Symptoms at W3 (indirect effect #5);
3. Inflexibility at W2, which predicted higher Symptoms at W2, which in turn predicted higher symptoms at W3 (indirect effect #6); and
4. Inflexibility at W2, which predicted higher inflexibility at W3, which in turn predicted higher symptoms at W3 (indirect effect #7).

Table 3

Indirect Effect Paths: Their Associated Coefficients, Bootstrapped Standard Errors (BootSE) and Bootstrapped 95% Confidence Intervals (BootCI) (see Figures 2 & 3)

Indirect Path	Effect	BootSE	95% BootCI
1. $X_1 \rightarrow Y_1 \rightarrow Y_3$	.038	.025	-.006 ---- .089
2. $X_1 \rightarrow X_2 \rightarrow Y_3$	-.046	.047	-.144 ---- .045
3. $X_1 \rightarrow Y_2 \rightarrow Y_3$	-.061	.039	-.136 ---- .020
4. $X_1 \rightarrow X_2 \rightarrow Y_3$	**.140***	.042	**.060 ---- .224**
5. $X_1 \rightarrow Y_1 \rightarrow Y_2 \rightarrow Y_3$	**.098***	.022	**.050 ---- .137**
6. $X_1 \rightarrow X_2 \rightarrow Y_2 \rightarrow Y_3$	**.119***	.032	**.058 ---- .184**
7. $X_1 \rightarrow X_2 \rightarrow X_3 \rightarrow Y_3$	**.070***	.031	**.027 ---- .146**
Total Indirect Effect	**.349***	.062	**.227 ---- .472**

X_1 = Wave 1 (W1) Inflexibility; Y_1 = W1 Symptoms; X_2 = W2 Inflexibility; Y_2 = W2 Symptoms; X_3 = W3 Inflexibility; Y_3 = W3 Symptoms

**a 95% CI that does not straddle zero signifies that its associated effect (coefficient) is significantly different from zero.*

Therefore, the results were congruent only with our crossectional predictions in that increases in inflexibility over time were significantly associated to corresponding increases in symptoms over the same period of time (i.e., c_2 = .27, 95%CI = [.14—.38] at W2; c_3 = .25, 95%CI = [.12—.35]). On the other hand, neither inflexibility levels at W1 nor changes in inflexibility from W1 to W2 prospectively predicted changes in symptoms. That is, neither a_1 = -.10 (95%CI = -.22—.05) nor a_2 = -.07 (95%CI = -.20—.06) were statistically significant.

Discussion

We examined the relationship between psychological inflexibility and mental health symptomatology throughout the first, highly-restictive, COVID-19 lockdown in Spain. We hypothesized that psychological inflexibility at the beginning of the lockdown would predict concurrent levels of self-reported mental health symptoms, and that changes in psychological inflexibility over time would be associated with concurrent changes in mental health symptoms midway and at the end of the lockdown. In addition, we anticipated that initial inflexibility would predict beginning-to-midway changes in mental health, and that beginning-to-midway inflexibility changes would predict midway-to-end of the lockdown mental health changes.

In our formulation of hypotheses we assumed that the lockdown constituted a substantive and novel contextual stressor during which both inflexibility and mental health would worsen over time. Our findings largely corroborated these two outcome expectations. With regard to psychological inflexibility, average AAQ-II scores increased significantly but modestly over time. Although AAQ-II scores were somewhat higher towards the end of the confinement than those previously reported for college samples, our sample's AAQ-II scores were never near the levels other researchers have found in clinical samples (see Ruiz et al., 2013).

Self-reported mental health symptom scores also increased over time and, unlike with psychological inflexibility, the worsening of mental health symptoms was very substantive and reached rather high levels. That is, in comparison to Spanish normative data, our sample's mean score at the beginning of the the lockdown was above the 75^{th} percentile of GHQ-12 scores and surpassed the 90^{th} percentile as the lockdown progressed (see Rocha et al., 2011).

The magnitude of the worsening of mental health symptoms throughout the confinement suggests the lockdown period was indeed distressing. This finding is in line with previously reported negative impacts of the COVID-19 pandemic in the general population (e.g. González-Sanguino et al., 2020; Wang et al., 2020) and with college students (Cao et al., 2020; Odriozola-González et al., 2020). In addition, our results also suggest that psychological inflexibility, as measured by the AAQ-II, might be affected by contextual stressors, such as the physical isolation and uncertainty that characterized the COVID-19 confinment.

Our hypotheses that inflexibility and mental health, as well as synchronous, time-dependent inflexibility changes and mental health changes, would be crossectionally associated were supported by the OLS results. That is, AAQ-II scores crossectionally predicted GHQ-12 scores at the beginning of the lockdown, and residual shifts or changes in AAQ-II within specific follow-up waves predicted corresponding residual shifts in GHQ-12 changes within those same waves. Thus, after controlling for levels of the variables in the previous waves of assessment, relative spikes in inflexibility within wave 2 or 3 predicted corresponding spikes in symptoms within that same wave. Although these results do not demonstrate a cause-effect relationship between changes in psychological inflexibility and changes in mental health symptoms because the associations are crossectional (see Cole & Maxwell, 2003), our results are nonetheless congruent with the theory that psychological inflexibility likely interferes with effective coping under distress and leads to poor mental health (e.g., Dawson & Golijani-Moghaddam, 2020; Karekla & Panayiotou, 2011). The results are also akin to the finding that lack of psychological flexibility may diminish resilience to accumulated major life events and their perceived negative impact (Fonseca et al., 2019).

However, our results did not support the hypotheses that respectively predicted that higher initial psychological inflexibility, and higher increases in psychological inflexibility, would positively and prospectively predict changes in mental health symptoms. That is, initial AAQ-II scores did not significantly predict GHQ-12 scores reported midway through the lockdown (while controlling for initial GHQ-12 scores and midway AAQ-II scores); and AAQ-II scores reported midway through the lockdown failed to predict GHQ-12 scores at the end of the lockdown (while controlling for initial and final AAQ-II scores and for initial and midway GHQ-12 scores). Not only these longitudinal predictions were statistically not significant, but they were negative in direction (see Figure 3). Noting that larger increases in inflexibility predicted larger increases in symptoms, significant but negative prospective paths between inflexibility and symptoms would have indicated that inflexibility increased over time significantly more among those with lower than higher preceding inflexibility scores. However, since our model had adequate power, and these prospective paths from inflexibility to symptoms were not statistically significant, the most parsimonious explanation is that these negative, nonsignificant, small effect-size paths are most likely reflecting a trivial, regression to the mean artifact.

A unique contribution of our research stems from its longitudinal modeling of inflexibility and mental health changes over an imposed and extended physical confinement period. To date, most published studies on the effects of the COVID-19 pandemic on mental health are cross-sectional, collecting data at the initial stages of lockdown (Cao et al., 2020; González-Sanguino et al., 2020; Odriozola-González et al., 2020; Ozamiz-Etxebarria et al., 2020; Wang et al., 2020), and as such they provide a snapshot of the immediate or short-term psychological impact of the pandemic. As already noted, we can report that mental health symptoms significantly increased throughout the full length of the lockdown, and suggest that the mental health impact of the pandemic may be larger than initially estimated (Pierce et al., 2020; Twenge & Joiner, 2020).

The finding that psychological inflexibility increased over time, presumably as a consequence of contextually accumulated stress, as well as the finding that inflexibility changes predicted changes in mental health, also represent a unique contribution to the COVID-19 literature. We can only speculate that our findings could be explained in light of previous relevant research sugesting a reciprocal relation between psychological inflexibility and stress, such that higher psychological inflexibility predicts later increases in felt stress, which in turn predict later increases in inflexibility (Ishizu et al., 2017). However, the merits of our speculation are limited by the absence of a no-lockdown, control condition, as well as by the limitations of our analytic approach. That is, we did not test more complex dynamics, including bidirectional effects or the simultaneous treatment of both inflexibility and symptoms as outcome variables. Thus, directions for future longitudinal research include the advisability of using Structural Equation Modeling and explicitly estimating the potential reciprocal relationship between psychological flexibility and stress, in general, or within the context of a health pandemic, in particular.

The results from our OLS model nonetheless provide support for the idea that psychological inflexibility is contextually sensitive and dynamic in nature, so that changes in inflexibility over time predict changes in symptoms over the same period of time. Overall, the prospective effect of inflexibility on symptoms over a two-month period was supported only via autoregressive inflexibility paths that connected crossectionally with parallel autoregressive symptom paths. However, prior levels of inflexibility did not predict symptoms at a later point in time, which may indicate that inflexibility affects mental health outcomes dynamically and proximally. This is consistent with research showing a close temporal relationship between daily psychological inflexibility and distress (Shahar & Herr, 2011), where inflexibility at one day predicts negative affect the same day, but not the next. According to our model, scoring low on the AAQ-II at the beginning of a presumably challenging period would be protective for subsequent mental health only if this tendency to be open to experiencing aversive private events in the present moment could be maintained over time. These results attest to the malleability of psychological (in)flexibility and its tight relationship with mental health symptoms, and highlight its potential as an intervention target.

Our findings do not necessarily contradict the notion that psychological inflexibility is relatively stable and could prospectively predict mental health status in the long run (e.g., Spinhoven, 2014). That is, not only the changes in inflexibility observed throughout the 2-month long period were relatively modest, but the auto-regressive inflexibility paths were statistically significant and more substantive than their corresponding autoregressive symptom paths. In addition, the total effect of initial inflexibility on mental health scores at the end of the lockdown period was relatively large and significant (i.e., symptoms at the third wave regressed just onto initial inflexibility).

In addition to the methodological limitations already noted, the small, convenience, mostly female, college student sample is a clear limit to the findings' generalizability. Also, both inflexibility and mental health were assessed using global, unidimensional self-report instruments, and we cannot speak to which specific processes of psychological inflexibility may have differentially impacted various aspects of mental health. Related to this limitation, recent Item Response Theory (IRT) research (see Rogge et al., 2019) suggests that multidimensional scales of psychological flexibility like the Comprehensive Assessment of ACT processes (CompACT: Francis et al., 2016) and the Multidimensional Psychological Flexibility Inventory (MPFI:

Rolffs et al., 2016) may offer more complete and nuanced information regarding psychological flexibility processes than the AAQ-II. In addition, recent research has put into question the construct validity of the AAQ-II, suggesting it might function more as a measure of distress (see Wolgast, 2014) or negative affect (Rochefort et al., 2018). Nonetheless, our results suggest that inflexibility as measured by the AAQ-II and symptoms as measured by the GHQ-12 seem to track separate constructs. That is, we found that GHQ-12 scores were considerably less stable (increased more) than their corresponding AAQ-II scores. It is also worth noting that other IRT-based research (Ong et al., 2020) suggests that no single psychological flexibility measure has proved to be superior to the rest. In addition, in defense of our choice of measures, we would like to note that both focal measures are brief, easily accessible for a timely implementation, and have been psychometrically validated and amply tested with Spanish-speaking populations. Nonetheless, given the apparent controversy surrounding the validity of the AAQ-II and its unidimensionality, future investigations should consider the benefits of incorporating other multidimensional self-report measures of psychological inflexibility instead of, or in addition to, the AAQ-II.

In terms of additional future directions, we believe that research on the pandemic effects on psychological inflexibility and mental health would also benefit from more recent approaches to the study of inflexibility. For instance, ecological momentary analysis procedures (e.g. Levin et al., 2018) have examined how momentary inflexibility interacts with global, trait-like measures like the AAQ-II. Similarly, recent studies have employed the Implicit Relational Assessment Procedure (IRAP) in order to examine the verbal relations involved in psychological inflexibility as an alternative to traditional self-report measures (e.g. Drake et al., 2016). Future studies might integrate these more nuanced methodologies within longitudinal and experimental approaches.

To conclude, our findings suggest that psychological flexibility is malleable and robustly associated with mental health. Thus, we submit that interventions targeting psychological inflexibility to improve coping during times of uncertainty and social isolation could be beneficial. If small changes in inflexibility were to some extent responsible for the substantive changes we observed in mental-health symptoms, public health initiatives aimed to increase psychological flexibility in the population could be highly impactful (Gloster et al., 2017).

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