The Distinct Associations of Ingroup Attachment and Glorification with Responses to the Coronavirus Pandemic: Evidence from a Multilevel Investigation in 21 Countries

**Supplementary Materials**

**Measurement Invariance**

In cross-cultural/cross-national investigations, tests of measurement equivalence/ invariance are required to ensure that any measures used in an investigation are perceived similarly across participants belonging to different groups. In our investigation, our samples comprised 21 different nations. Thus we tested for measurement invariance (MI) across countries. All tests were conducted with the *lavaan* package in *R* with the robust MLM-estimator. Multivariate invariance is a variation of confirmatory factor analysis (CFA) where the model is tested in several groups of participants at once and where it must hold in most of these groups at once.

*Configural MI* is achieved when the model’s assumed factor structure is plausible enough in all groups. *Metric MI* is achieved when the factors’ loadings onto their items is similar enough for all groups. *Scalar MI* additionally compares the latent intercepts in each group. Since testing of MI is basically a variation of CFA, the interpretation of mathematical results is very similar. In this paper, MI is tested in several ways. Following Kline (2016), some of the most crucial global fit indices are reported: χ², its degrees of freedom and p-value; CFI, RMSEA and SRMR. For the general CFA and the configural MI, these values will be compared to the traditional cutoff values for an acceptable model by Hu and Bentler (1999): CFI ≥ .95, *RMSEA* ≤ .08, *SRMR* ≤ .08. For metric MI, the indices’ difference to the configural model is interpreted in accordance with Chen (2007): A change in < -.010 in CFI, a change of < .015 in RMSEA and a change of < .030 in SRMR is an indication of metric MI. For scalar MI, it’s a change of < -.010 in CFI, a change of <.015 in RMSEA and a change of <.010 in SRMR compared to the metric model’s indices.

**Measurement Invariance for Attachment and Glorification**

In our first model, Attachment and Glorification were conceptualized as two correlated factors, each containing four items. Further analysis showed two major problems. One item from the glorification measure (“One of the important things that we have to teach our children is to respect the values and traditions of our nation.”) had a weak factor loading, also having a high loading on the Attachment measure. Thus, we excluded this item. Further inspection suggested that Attachment was better conceptualized as a two-factor construct: To account for this, *importance* and *commitment* were included as equal factors covarying with glorification (as two sub-factors of attachment)*.* Acknowledging the two-factor-structure of attachment and excluding the problematic item of glorification provided a much better to the data. Both the basic CFA and the configural model satisfy traditional cutoff values. The cutoff criteria for metric MI were mostly met, with the *Δ*CFI criterion being *nearly* fulfilled (*Δ*CFI = .012). Scalar MI was not supported.

**Table S1.**

*Tests of Measurement invariance for the measures of attachment and glorification.*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Starting Model | *𝛘²* | *df* | *CFI* | *Δ CFI* | *RMSEA* | *Δ RMSEA* | *SRMR* | *Δ SRMR* |
| Basic CFA | 7605.99 | 19 | .882 |  | .128 |  | .079 |  |
| Configural | 6912.73 | 399 | .889 |  | .118 |  | .068 |  |
| Metric | 8308.57 | 519 | .867 | .022 | .114 | .005 | .088 | -.020 |
| Scalar | 14754.30 | 639 | .759 | .108 | .138 | -.024 | .122 | -.033 |
| Model with Modifications | *𝛘²* | *df* | *CFI* | *Δ CFI* | *RMSEA* | *Δ RMSEA* | *SRMR* | *Δ SRMR* |
| Basic CFA | 583.27 | 11 | .990 |  | .046 |  | .022 |  |
| Configural | 1081.81 | 231 | .983 |  | .056 |  | .031 |  |
| Metric | 1785.83 | 331 | .971 | .012 | .061 | -.005 | .055 | -.024 |
| Scalar | 3962.70 | 391 | .930 | .042 | .089 | -.027 | .073 | -.018 |

**Metric Invariance for COVID-19 Compliance**

When evaluating whether compliance with COVID-19 outcomes was invariant across the 21 countries, we found evidence for scalar invariance, and partial evidence for metric invariance (2 out of 3 indicators). Scalar invariance was not reached.

**Table S2.**

*Tests of Measurement invariance for the measures of compliance with COVID-19 guidelines.*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model tested | *𝛘²* | *df* | *CFI* | *Δ CFI* | *RMSEA* | *Δ RMSEA* | *SRMR* | *Δ SRMR* |
| Basic CFA | 233.01 | 2 | .977 |  | .068 |  | .027 |  |
| Configural | 292.61 | 42 | .975 |  | .071 |  | .024 |  |
| Metric | 559.90 | 102 | .955 | .020 | .062 | .009 | .048 | -.024 |
| Scalar | 1914.46 | 162 | .828 | .127 | .096 | -.034 | .077 | -.029 |

**Metric Invariance for Support for Lockdown Restrictions**

The original model including all seven items provided a poor fit to the data. Further inspection suggested that to have a single factor, two items had to be removed (“National borders should be closed to stop the spread of coronavirus.” and “People should be tracked through their mobile phones to make sure that they are adhering to quarantines and lockdowns.”). For this modified model, configural invariance was met, but metric and scalar were not.

**Table S3.**

Measurement invariance tests for the measure of support for lockdown restrictions.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Starting Model | *𝛘²* | *df* | *CFI* | *Δ CFI* | *RMSEA* | *Δ RMSEA* | *SRMR* | *Δ SRMR* |
| Basic CFA | 6145.69 | 14 | .860 |  | .134 |  | .075 |  |
| Configural | 6593.66 | 294 | .834 |  | .135 |  | .069 |  |
| Metric | 8360.72 | 414 | .791 | .043 | .128 | .007 | .093 | -.023 |
| Scalar | 16710.42 | 534 | .574 | .217 | .161 | -.033 | .139 | -.046 |
| Model with Modifications | *𝛘²* | *df* | *CFI* | *Δ CFI* | *RMSEA* | *Δ RMSEA* | *SRMR* | *Δ SRMR* |
| Basic CFA | 398.56 | 5 | .984 |  | .057 |  | .027 |  |
| Configural | 906.24 | 105 | .961 |  | .081 |  | .035 |  |
| Metric | 1595.64 | 185 | .931 | .030 | .081 | .000 | .065 | -.030 |
| Scalar | 6018.85 | 265 | .718 | .213 | .136 | -.055 | .117 | -.051 |

**Correlations Between Types of Trust**

**Table S4.**

Bivariate correlations between trust in the government and trust in science as sources for information regarding COVID-19.

|  |  |  |
| --- | --- | --- |
| Country | N | r |
| United States | 3552 | 0.477 |
| United Kingdom | 900 | 0.409 |
| Turkey | 896 | 0.439 |
| Serbia | 1186 | 0.675 |
| Poland | 890 | 0.325 |
| Philippines | 880 | 0.256 |
| Netherlands | 898 | 0.607 |
| Malaysia | 898 | 0.532 |
| South Korea | 912 | 0.319 |
| Italy | 888 | 0.594 |
| Israel | 1008 | 0.329 |
| Ireland | 893 | 0.640 |
| Indonesia | 883 | 0.373 |
| Hungary | 891 | 0.379 |
| Hong Kong | 919 | 0.207 |
| Germany | 897 | 0.704 |
| France | 892 | 0.399 |
| Spain | 902 | 0.312 |
| China | 3619 | 0.601 |
| Canada | 896 | 0.653 |
| Australia | 875 | 0.544 |

**Note**. All p values are <.001.

**Multilevel Models Controlling for COVID-19 Infection Rates**

To ensure that our results were robust even after accounting for how much COVID-19 spread in each country, we included the average number of new cases per 1 million people across the three waves as an additional covariate at our second level of analysis. Since we were unable to obtain this statistic for Hong Kong, we run these analyses separately. All hypothesized associations remained significant and in the same direction See Table S5). Importantly, we were unable to estimate random slopes for attachment and glorification, as doing so exceeded the number of cluster (i.e., countries) in our samples, resulting in a biased estimation of our model. Thus, to avoid such concerns, we estimated the fixed associations of attachment and glorification. Doing so changed the association at the between level of analysis, although these results were largely in support of our theorization, such that attachment related positively with three out of four outcomes, while glorification related with three out of four outcomes, but exhibited weaker associations with trust in science and support for lockdown restriction compared to attachment.

**Table S5.**

*Supplementary multilevel models for the association of national attachment and glorification with the four outcomes controlling for key covariates.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Trust in Science |  | Trust in Government |  | COVID-19 Compliance |  | Support for Lockdown Restrictions |
| Parameter | Estimate | *SE* |  | Estimate | *SE* |  | Estimate | *SE* |  | Estimate | *SE* |
| *Within level* |  |  |  |  |  |  |  |  |  |  |  |
| Interceptij *γ10* | 7.280\*\*\* | .047 |  | 5.875\*\*\* | .096 |  | 7.675\*\*\* | .047 |  | 6.645\*\*\* | .052 |
| Attachmentij *γ10* | .278\*\*\* | .007 |  | .161\*\*\* | .009 |  | .157\*\*\* | .007 |  | .119\*\*\* | .008 |
| Glorificationij *γ20* | -.010 | .006 |  | .370\*\*\* | .007 |  | -.046\*\*\* | .006 |  | .121\*\*\* | .007 |
| Genderij *γ30* | -.051\*\*\* | .009 |  | -.064\*\*\* | .012 |  | -.126\*\*\* | .008 |  | -.042\*\*\* | .010 |
| Ageij *γ40* | .006\*\*\* | .001 |  | -.004\*\*\* | .001 |  | .010\*\*\* | .001 |  | -.006\*\*\* | .001 |
| SESij *γ50* | .041\*\*\* | .005 |  | .072\*\*\* | .006 |  | -.006 | .004 |  | .004 | .005 |
| Wave 2 dummyij *γ60* | -.099\*\*\* | .023 |  | -.077\*\* | .029 |  | -.202\*\*\* | .020 |  | -.284\*\*\* | .024 |
| Wave 3 dummyij *γ70* | -.029 | .023 |  | -.081\*\* | .028 |  | -.243\*\*\* | .020 |  | -.331\*\*\* | .024 |
| Trust in Science *γ80* | -- | -- |  | -- | -- |  | .276\*\*\* | .006 |  | .187\*\*\* | .008 |
| Trust in Government *γ90* | -- | -- |  | -- | -- |  | .030\*\*\* | .005 |  | .128\*\*\* | .006 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| *Between level* |  |  |  |  |  |  |  |  |  |  |  |
| Attachmentj *γ01* | .326\*\* | .122 |  | -.316 | .254 |  | .435\*\* | .129 |  | .805\*\*\* | .139 |
| Glorificationj *γ02* | .274\*\* | .093 |  | .985\*\*\* | .195 |  | -.137 | .272 |  | .376\*\* | .136 |
| GINIj *γ03* | .015 | .018 |  | .039 | .038 |  | .042\* | .017 |  | .027 | .019 |
| Democracyj *γ04* | .005 | .004 |  | .008 | .009 |  | .009 | .004 |  | .009 | .004 |
| Average new COVID-19 cases per 1 million *γ05* | -.326 | .207 |  | -.316\* | .254 |  | -.164 | .200 |  | -.379 | .217 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| *Variances* |  |  |  |  |  |  |  |  |  |  |  |
| Within level *rij* | 2.077\*\*\* | .019 |  | 3.141\*\*\* | .029 |  | 1.583\*\*\* | .015 |  | 2.163\*\*\* | .020 |
| Between level *u0j* | .035\*\* | .012 |  | .159\*\* | .052 |  | .037\*\* | .012 |  | .043\*\* | .015 |

**Note**. *\* p* < .05, \*\* *p* < .01, \*\*\* *p* < .001.

|  |
| --- |
| **Multilevel Mediation Models by Wave****Table S6.**Multilevel mediation models for each wave separately. In these models, age, socioeconomic status, and gender were inserted as control variables at level 1, and the GINI index, Freedom House Democracy Index, and new COVID-19 cases per 1 million people were included as covariates in level 2. |
| Model parameter | Wave 1 | Wave 2 | Wave 3 |
| b | SE | 95 Cr.I. | b | SE | 95% Cr.I. | b | SE | 95% Cr.I. |
| Mediators |  |  |  |  |  |  |  |  |  |
| Attachment 🡪 Trust in Science | 0.304 | 0.013 | .280, .329 | 0.281 | 0.014 | .252, .307 | 0.267 | 0.013 | .243, .294 |
| Attachment 🡪 Trust in Government | 0.156 | 0.016 | .123, 1.86 | 0.128 | 0.017 | .090, .161 | 0.124 | 0.012 | .094, .145 |
| Glorification 🡪 Trust in Science | 0.035 | 0.01 | .018, .054 | 0.032 | 0.01 | .012, .049 | 0.039 | 0.01 | .023, .057 |
| Glorification 🡪 Trust in Government | 0.431 | 0.014 | .405, .459 | 0.451 | 0.012 | .431, .476 | 0.491 | 0.012 | .470, .514 |
| Outcomes |  |  |  |  |  |  |  |  |  |
| Attachment 🡪 Compliance | 0.177 | 0.011 | .157, .198 | 0.139 | 0.011 | .119, .160 | 0.158 | 0.013 | .133, .185 |
| Attachment 🡪 Lockdown Restrictions | 0.148 | 0.014 | .120, .173 | 0.085 | 0.015 | .056, .115 | 0.13 | 0.011 | .110, .150 |
| Glorification 🡪 Compliance | -0.068 | 0.009 | -.085, -.053 | -0.045 | 0.010 | -.062, -.022 | -0.031 | 0.01 | -.050, -.013 |
| Glorification 🡪 Lockdown Restrictions | 0.102 | 0.012 | .081, .128 | 0.14 | 0.012 | .112, .166 | 0.123 | 0.01 | .104, .145 |
| Trust in Science 🡪 Compliance | 0.271 | 0.011 | .252, .292 | 0.277 | 0.012 | .259, .308 | 0.277 | 0.011 | .258, .297 |
| Trust in Science 🡪 Lockdown Restrictions | 0.207 | 0.012 | .182, .231 | 0.179 | 0.013 | .160, .202 | 0.175 | 0.013 | .151, .199 |
| Trust in Government 🡪 Compliance | 0.02 | 0.009 | .000, .035 | 0.05 | 0.009 | .033, .070 | 0.024 | 0.009 | .007, .040 |
| Trust in Government 🡪 Lockdown Restrictions | 0.132 | 0.01 | .113, .151 | 0.135 | 0.012 | .113, .156 | 0.112 | 0.01 | .093, .132 |
| Covariances |  |  |  |  |  |  |  |  |  |
| Attachment 🡨🡪 Glorification | 1.954 | 0.046 | 1.864, 2.038 | 2.021 | 0.044 | 1.937, 2.103 | 1.877 | 0.042 | 1.799, 1.970 |
| Trust in Science 🡨🡪 Trust in Government | 1.237 | 0.035 | 1.168, 1.309 | 1.303 | 0.037 | 1.233, 1.385 | 1.251 | 0.035 | 1.189, 1.328 |
| Compliance 🡨🡪 Lockdown Restrictions | 0.552 | 0.021 | .514, .593 | 0.649 | 0.021 | .607, .696 | 0.676 | 0.024 | .627, .724 |
| Residual variances (Country level) |  |  |  |  |  |  |  |  |  |
| Compliance | 0.094 | 0.059 | .049, .259 | 0.130 | 0.053 | .066, .284 | 0.096 | 0.046 | .049, .177 |
| Lockdown Restrictions | 0.285 | 0.182 | .118, .750 | 0.233 | 0.109 | .111, .554 | 0.262 | 0.174 | .131, .786 |
| Indirect effects |  |  |  |  |  |  |  |  |  |
| Attachment 🡪Trust in Science 🡪 Lockdown Restrictions | 0.063 | 0.005 | .054, .072 | 0.050 | 0.004 | .042, .059 | 0.047 | 0.004 | .039, .054 |
| Attachment 🡪 Trust in Science 🡪 Compliance | 0.083 | 0.005 | .073, .092 | 0.078 | 0.005 | .070, .089 | 0.074 | 0.004 | .065, .083 |
| Attachment 🡪 Trust in Government 🡪 Lockdown Restrictions | 0.021 | 0.003 | .016, .025 | 0.017 | 0.003 | .012, .022 | 0.014 | 0.002 | .010, .018 |
| Attachment 🡪 Trust in Government 🡪 Compliance | 0.003 | 0.001 | .000, .006 | 0.006 | 0.001 | .004, .009 | 0.003 | 0.001 | .001, .005 |
| Glorification 🡪 Trust in Science 🡪 Lockdown Restrictions | 0.007 | 0.002 | .004, .011 | 0.006 | 0.002 | .002, .009 | 0.007 | 0.002 | .004, .011 |
| Glorification 🡪 Trust in Science 🡪 Compliance | 0.009 | 0.003 | .005, .015 | 0.009 | 0.003 | .003, .014 | 0.011 | 0.003 | .006, .016 |
| Glorification 🡪 Trust in Government 🡪 Lockdown Restrictions | 0.057 | 0.005 | .048, .067 | 0.061 | 0.006 | .051, .073 | 0.055 | 0.005 | .046, .065 |
| Glorification 🡪 Trust in Government 🡪 Compliance | 0.009 | 0.004 | .000, .015 | 0.023 | 0.004 | .015, .031 | 0.012 | 0.004 | .003, .019 |

**Note.** Cr.I. = Credible Interval. 🡪 highlight one-directional association. 🡨🡪 denote a covariance.

**Intercept-only Models and Models without Covariates**

The first two models tested in the manuscript for each of the four outcomes (i.e., intercept only model, and model without covariates) are reported below in Table S7.

 **Table S7.**

Intercepts-only models (Model 1) and multilevel models with the random slopes of each outcome on attachment and glorification without any covariates included (Model 2).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | Trust in Science | Trust in Government | COVID-19 Compliance | Support for Lockdown Restrictions |
|  | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 |
| Parameter | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) | Estimate (SE) |
| Within level |  |  |  |  |  |  |  |  |
| Interceptij γ10 | 7.16\*\*\* (.08) | 7.13\*\*\* (.05) | 5.64\*\*\* (.17) | 5.71\*\*\* (.12) | 7.48\*\*\* (.08) | 7.45\*\*\* (.07) | 6.32\*\*\* (.15) | 6.35\*\*\* (.10) |
| Attachmentij γ10 |  | .32\*\*\* (.02) |  | .17\*\*\* (.03) |  | .28\*\*\* (.02) |  | .20\*\*\* (.02) |
| Glorificationij γ20 |  | .03 (.02) |  | .39\*\*\* (.03) |  | -.01 (.01) |  | .19\*\*\* (.02) |
| Variances |  |  |  |  |  |  |  |  |
| Within level rij | 2.31\*\*\* (.02) | 2.04\*\*\* (.02) | 3.97\*\*\* (.04) | 3.08\*\*\* (.03) | 1.96\*\*\* (.02) | 1.78\*\*\* (.02) | 2.65\*\*\* (.02) | 2.32\*\*\* (.02) |
| Between level u0j | .13\*\* (.04) | .05\*\* (.01) | .62\*\* (.19) | .29\*\* (.09) | .127\*\* (.04) | .09\*\* (.03) | .49\*\* (.15) | .21\*\* (.07) |

**Confirmatory Factor Analyses Distinguishing Mode of National Identification from Collectivism**

**Table S8.**

Confirmatory factor analyses examining whether national attachment and glorification are independent constructs from horizontal and vertical collectivism.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Single-Factor Model (National Identity are one construct) |  | Two-Factor Model (National Identity is independent from collectivism) |  | Model Comparison |
|  | χ2 | df | CFI | RMSEA | SRMR |  | χ2 | df | CFI | RMSEA | SRMR |  | Δχ2 | df |
| Glorification vs. Horizontal Collectivism | 605.61 | 8 | 0.98 | 0.05 | 0.04 |  | 18656.79 | 11 | 0.53 | 0.26 | 0.19 |  | 18051.18 | 3 |
| Glorification vs. Vertical Collectivism | 680.25 | 8 | 0.98 | 0.06 | 0.03 |  | 16836.65 | 11 | 0.60 | 0.25 | 0.16 |  | 16156.40 | 3 |
| Attachment vs. Horizontal Collectivism | 379.38 | 3 | 0.99 | 0.07 | 0.03 |  | 10272.31 | 6 | 0.72 | 0.26 | 0.12 |  | 9892.93 | 3 |
| Attachment vs. Vertical Collectivism | 162.6 | 3 | 0.99 | 0.05 | 0.01 |  | 9322.24 | 6 | 0.76 | 0.225 | 0.09 |  | 9159.64 | 3 |

**Note.** For χ2 ­values, all ps < .001.

**Post-Hoc Power Analysis for Multilevel Models**

Even though we did not run an a-priori power analysis for our multilevel model, we sought to provide an estimate of power for our results post-hoc. To do so, we took the estimates from our models, and imputed them in a Monte Carlo simulation, conducted via Mplus. Such an approach is recommended for estimating power for multilevel models (e.g., Lane & Hennes, 2018; Muthén & Muthén, 2002) Each of the four models (one per outcome), was estimated so that each group had a sample size of *N* = 900, which was a stricter test of power, since some of our groups had considerably larger sample sizes. We set our simulation so that it would be drawn from 5000 randomly drawn samples. Such techniques. It is important to note that such simulations are often used for a-priori power analyses.

Importantly, for each significant hypothesized association (i.e., each significant random slope) in our model (i.e., our main predictors), our results suggested that our models were highly powered to test for each specific association, as indicated below (syntax and output files for this simulation can be found online in the associated OSF page for this manuscript):

* Outcome: Trust in Government
	+ (Significant) Attachment random slope: .995 power
	+ (Significant) Glorification random slope: .999 power
* Outcome: Trust in Science
	+ (Significant) Attachment random slope: .999 power
	+ (Non-Significant) Glorification random slope: .072 power
* Outcome: Compliance
	+ (Significant) Attachment random slope: .999 power
	+ (Significant) Glorification random slope: .745 power
* Outcome: Support for Lockdown Restriction
	+ Attachment random slope: .999 power
	+ Glorification random slope: .999 power

**Changes in Variables of Interest Across the Three Waves**

 **Figure S1.**

*Changes in trust in scientific sources for information about COVID-19 across the 21 countries for the three waves of data collection.*

**Note**. Scores on the y axis ranged from 1-9.

**Figure S2.**

*Changes in trust in government sources for information about COVID-19 across the 21 countries for the three waves of data collection.*

**Note**. Scores on the y axis ranged from 1-9.

**Figure S3.**

*Changes in support for lockdown restrictions across the 21 countries for the three waves of data collection.*

**Note**. Scores on the y axis ranged from 1-9.

**Figure S4.**

*Changes in national attachment across the 21 countries for the three waves of data collection.*

**Note**. Scores on the y axis ranged from 1-9.

**Figure S5.**

*Changes in national glorification across the 21 countries for the three waves of data collection.*

 **Note**. Scores on the y axis ranged from 1-9.

**Figure S6.**

*Changes in compliance with COVID-19 guidelines across the 21 countries for the three waves of data collection.*

**Note**. For the x-axis 1 = May, 2020; 2 = June 2020, 3 = July, 2020. Scores range from 1-9.

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