Preregistration

Consistency of Idiographic Personality in the Wake of COVID-19: A Longitudinal ESM Study

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Study Information

Title Consistency of Idiographic Personality in the Wake of COVID-19: A Longitudinal ESM Study

Description Personality is a study of persons, but persons exist within contexts. Much evidence suggests that persons and environments bidirectionally influence each other, with persons selecting into and modifying their contexts and situations having long-lasting influences on cognition, emotion, and behavior. From this perspective, environmental change should produce changes in personality, meaning there should be relatively weak consistency in patterns of cognition, emotion, and behavior across environmental change. However, we argue for a consistency paradox in which environmental changes should produce few changes and relatively high consistency in patterns of cognition,

emotion, and behavior (Caspi & Moffitt, 1993). We test this by examining idiographic personality consistency between up to one year before the global COVID-19 pandemic and mid-March 2020 using data from a longitudinal Experience Sampling Method study. We also ask about the antecedents and consequences of consistency, examining both what prospectively predicts consistency as well as what consistency prospectively predicts.

Hypotheses Rather than hypotheses, the present study addresses three key research questions.

1. How much idiographic longitudinal consistency is demonstrated in the wake of a global health crisis?

2. What are the antecedents of consistency (i.e. what prospectively predicts individual differences in idiographic longitudinal consistency of personality)?

3. What are the consequences of consistency (i.e. what do individual differences in idiographic longitudinal consistency of personality prospectively predict)?

Design Plan

Study type **Observational Study**. Data is collected from study subjects that are not randomly assigned to a treatment. This includes surveys, natural experiments, and regression discontinuity designs.

Blinding No blinding is involved in this study.

Study design The present study is a longitudinal study of both trait assessments (3 waves) and ESM assessments (2 waves).

Randomization Item order in both the trait and state measures were randomized.

In addition, state personality was measured using a planned missing data protocol. Participants received 15 out of 60 BFI-2 items at each time point, 3 from each trait

at each time point to assure full covariance matrix coverage as well as equal coverage across traits. More details about the procedure and validity of this method are available on the Open Science Framework (https://osf.io/pj9sy/).

Sampling Plan

Existing data

Registration following analysis of the data. As of the date of submission, you have accessed and analyzed some of the data relevant to the research plan. This includes preliminary analysis of variables, calculation of descriptive statistics, and observation of data distributions. Please see cos.io/prereg for more information.

Preliminary analyses of the data have been conducted using some techniques that will be used in the present study. However, these analyses were written to create automatically generated individual feedback reports for participants. No inferential tests of the data have been conducted.

Explanation of existing data

Although the first author has accessed the data, the second author has not. The introduction, aims, hypotheses, and analysis plan were all written prior to any aggregation of the results. The data cleaning, analysis plan, and inferential tests will detailed carefully and all deviations from the planned analyses will be included the final manuscript.

Data collection procedures

Participants in this study were drawn from a larger study personality study.

Participants responded to two types of surveys: trait and state (Experience Sampling Method; ESM) measures, for which they were paid separately. For the first wave, participants were recruited from the psychology subject pool at Washington University in St. Louis. Participants were told that the study posted on the recruitment website was the first wave of a longer longitudinal study they would be offered the opportunity to take part in.

Participants were brought into the lab between October 2018 and December 2019, where a research assistant or the first author explained the study procedure to them and walked them through the consent procedure. If they consented, participants were led to a room where they could fill out a form to opt into the ESM portion of

the study. They then completed baseline trait measures using the Qualtrics Survey Platform. After, the participants were debriefed, paid $10 in cash and, if they opted into the ESM portion of the study, the ESM survey procedure was explained to them.

Participants then received ESM measures 4 times a day for a two weeks (max n = 56). The survey platform was built by the first author using the jsPsych library. Additional javascript controllers were written for the purpose of this study and are available on the first author's GitHub. Start times were based on times participants indicated they would like to receive their first survey. Surveys were sent every 4 hours, meaning that the surveys spanned a 12 hour period from the first time participants indicated. Participants received their first survey at their chosen time on the Monday following their in-lab session. They were compensated $0.50 for each survey completed for a maximum of $28. To incentivize responding, participants who completed at least 50 surveys received a "bonus" for a total compensation of $30, which was distributed as an Amazon Gift Card.

Additional waves of data were completed remotely online. Participants who completed baseline trait and ESM assessments between March and December 2019 were contacted via email by the first author on March 16. Participants who responded then received an email with a link to a Qualtrics survey on March 20 with which they completed a second set of trait measures for which they were compensated $5. The following Monday, March 23, after being given the opporunity to modify their start time to accomodate different timezones or conditions, these participants then received a second round of ESM surveys. As before, participants received these 4 times per day, 4 hours apart, for 2 weeks (March 23 to April 5) and were compensated $.50 per survey for up 50 surveys, and $30 total for responding to more than that. At the end of the 2 weeks, on April 6, participants received an email link containing a new Qualtrics link to the next round of trait measures, which also included additional measures related to COVID-19 experiences. For completing this survey, paticipants were compensated $10. Each of these later surveys were paid as a single Amazon Gift Card sent to participants at an email of their choice.

Sample size N = 50 participants completed assessments at all time points.

Sample size rationale

Sample size here is based on participants who completed the baseline survey and baseline experience sampling surveys in a prior semester but who had not completed other phases of longer personality intervention study. All participants who met this criteria were emailed on March 16, 2020, asking them to opt into a new study. Participants who gave their consent were then drafted into the new study.

Stopping rule

Participants were included in this study if they responded to the invitation email by two days before experience sampling surveys began on March 23.

Variables

Measured variables

A list of all measured variables are included in two supplementary codebooks included with this preregistration.

All ESM items were chosen before the beginning of the larger study from which this study was drawn. ESM measures from that study inlcuded personality, emotions, situations (binary), situations (DIAMONDS), and a cognitive task (the Remote Associates Test). For the purposes of this study, we will use personality and binary situation items.

Trait measures included in the present study were included 3 times. The baseline wave was collected as part of the same larger study from which participants were drawn. The two additional waves were collected only for participants who participated in the present study. Items were the same across the waves with the exception of a number of items added in the third wave that directly asked questions about COVID-19 related experiences.

Indices

Personality was measured in both the trait surveys and ESM surveys using the full BFI-2 (Soto & John, 2017). For the purposes of the present study, items will be reversed scored and composited into their resulting 15 facets for both trait and state level assessments.

Antecedents and Consequences:

- Depression was measured with the 20-item CES-D scale (Radloff, 1977).

- Loneliness was measured using a 6-item short form of the UCLA Loneliness scale (ULS-6; Nett, 1992) both in general and with reference to their experiences at university.

- Subjective well-being was measured with the 5-item Satisfaction with Life (SWL; Diener, Emmons, Larsen, & Griffin, 1985) scale, a 5-item negative affect scale, and a 5-item positive affect scale.

- Domain satisfaction was measured by asking about satisfaction in nine specific domains, including family, friendships, romantic relationships, community, academics, finances, physical health, psychological health, and hobbies.

- Diligence was measured using 11 items from the Dilligence Inventory-Higher Education (DI-HE; Bernard & Schuttenberg, 1995)

- Goals were measured using 12 items from a larger set of 26 major life goals used in prior studies (e.g. Roberts & Robins, 2000). For the purposes of this study, we are specifically interested in the following: "Have an easy life," "Be in good physical condition," "Devote attention to my spiritual life," "Feel a real purpose in life," and "Have fun." The other 7 items will be included in the supplementary materials.

- Purpose in Life was measured using the Purpose in Life subscale of Ryff's Psychological Well-Being scale (Ryff, 1989).

Analysis Plan

The present study addresses three questions regarding longitudinal idiographic consistency. The analyses will be organized around these.

First, we will estimate idiographic personality structure using the GIMME procedure, which is a procedure for estimating both idiographic estimates of time series data. Using cubic spline interpolated facet time series, we will estimate an idiographic unified structural equation model (uSEM) for each person as well as a group-level uSEM model. The GIMME procedure, which uses a iterative procedure for retaining

pathways in the model using Lagrange multiplier tests, starts by estimating a group-level model. The pathways retained in the group-level model are entirely determined by the idiographic pathways. Starting with a null model, pathways are iteratively added to the group-level model when the largest proportion of individuals (above a chosen threshold, 75% by default) show a better model fit according to the Lagrange multiplier tests. This procedure is continued until no additional pathways improve fit above the threshold. Idiographic models are then built using a similar procedure, with the exception that the results of the Lagrange multiplier test is only based on the target individual and is not informed by the results of other individuals in any way. The iterative procedure continues for each person until the procedure indicates that no pathways improve model fit. This procedure will repeated for each wave of ESM data.

Once the GIMME models are estimated, we will estimate idiographic personality consistency by estimating the profile correlation of all possible pathways for each person. Profile correlations are a measure of longitudinal ipsative consistency. High positive ipsative consistency suggests the profiles are very similar (i.e. parallel) over time. Zero correlations suggest that there is no pattern in how the two profiles differ. Negative correlations mean there is a consistent pattern of reversals (i.e. high estimates at one timepoint are now low and vice versa) and are generally less common. Correlations will be estimated using the `cor.ci()` function in the `psych` package (in order to estimate bootstrapped confidence intervals of the correlations). We will test these both for contemporaneous and lagged associations separately as well as together because our previous research suggests that lagged associations are less consistent than contemporaneous ones. We will also test this for group-level associations, testing whether shared patterns of personality manifestations were consistency over this period.

Next, we will address aim 2, asking are the antecedents of consistency (i.e. what prospectively predicts individual differences in idiographic longitudinal consistency of personality). To do so, we will use the consistency estimates from aim 1 as well as baseline estimates from the first two waves of trait estimates, both of which were collected prior to the second wave of experience sampling data. Consistency will be transformed to z-scores using Fisher's r-to-z transformation to control for the non-normality of correlations. A full list of measures whose consistency we will predict can be seen in the table below. For each of these, we will test whether

wave 1 or 2 baseline measures predict consistency using bayesian multiple regression using the `brms` package in `R`. In addition, we will test whether a linear combination of the 2 (i.e. an interaction) between the estimates at each wave outpredict the estimates alone. Because participants have different measurement intervals between ESM survey periods, we will control for the ellapsed time. In other words, we will ask whether any of the tested indices predict consistency above and beyond time alone. We will use weakly regularizing priors for all analyses and 5000 samples (2000 warmup samples). Model fit and convergence will be tested by looking at rhat values.

The basic form of the tested models will be as follows.

Model 1, predicting consistency from baseline: $Consistency_{i3} = b_0 + b_1 X_{i1} + b_2 Interval_{i3}$, where the second subscript is a marker of time.
Model 2, predicting consistency from concurrent measures: $Consistency_{i3} = b_0 + b_1 X_{i1} + b_2 Interval_{i3} + b_3 X_{i2}$
Model 3, predicting consistency from change since baseline: $Consistency_{i3} = b_0 + b_1 X_{i1} + b_2 Interval_{i3} + b_3 X_{i2} + b_4 X_{i1} * X_{i2}$

In a final step, we will address aim 3, asking what are the consequences of consistency (i.e. what do individual differences in idiographic longitudinal consistency of personality prospectively predict) for well-being and COVID-19 related experiences (measured at wave 3, which was collected after the second wave of experience sampling), including average positive and negative affect, satisfaction with life, domain satisfaction, CESD depression, loneliness, dilligence, procrastination, and time spent with others during quarantine. These will be tested using multiple regression in the `brms` package in `R` using the same model conditions as aim 2. For these analyses we will control for baseline (wave 1) measures of each target outcome as well as the interval between ESM waves.

Model 1, predicting consistency from baseline: $X_{i3} = b_0 + b_1 Consistency_{i3} + b_2 Interval_{i3} + b_3 X_{i1}$, where the second subscript is a marker of time.

We will also include a number descriptives of the sample, including age, gender, COVID-19 diagnoses, tests, symptoms, and pre-existing conditions.

Statistical models

Aim 1 will be tested using unified SEM (uSEM) and the gimme procedure as implemented in the `gimme` package in `R`. Consistency will be tested using profile correlations with bootstrapped confidence intervals.

Aims 2 and 3 will be tested using bayesian multiple regression in R with weakly regularizing priors to regularize the results.

Transformations

Because the proposed analytic procedure (GIMME) uses lags by default, which assume equal intervals of times, we will time normalize the observations using cubic spline interpolation (Fisher et al., 2018). This has the benefit both of controlling for the unequal intervals as well as spacing out observations to control for overnight periods.

Inference criteria

Aim 1: How much idiographic longitudinal consistency is demonstrated in the wake of a global health crisis?

- GIMME model estimation: The GIMME procedure, as implemented in the `gimme` package, uses unified structural equation models, which uses a stepwise model selection procedure for both individual- and group-level models. By default all pathways are tested and pathways are retained using an iterative Legrange multiplier test.
- Consistency estimates: Because the intent of the present study is to estimate idiographic consistency, inferences about consistency will be made at person-by-person basis, by examining bootstrapped confidence intervals from the `cor.ci()` function in the `psych` package.

2. What are the antecedents of consistency (i.e. what prospectively predicts individual differences in idiographic longitudinal consistency of personality)?

- Bayesian mutliple regression: 89% Bayesian Credibility Intervals from 5000 samples (2000 warmup samples).

3. What are the consequences of consistency (i.e. what do individual differences in idiographic longitudinal consistency of personality prospectively predict)?

- Bayesian mutliple regression: 89% Bayesian Credibility Intervals from 5000 samples (2000 warmup samples).

Data exclusion Participants with too little data at an ESM wave (N $<$ 20) or missing a wave of trait or ESM data will be excluded.

Missing data Because planned missing data meet missing at random (MAR) criterion, we will use multiple imputation as implemented in the `amelia` package in `R`. Previous work indicates that these imputed data show good between-person structure and strong convergence with both raw data and trait data (https://osf.io/pj9sy/).

References