Be Yourself and Behave Appropriately: Exploring Associations Between Incongruent Personality States and Positive Affect, Tiredness, and Cognitive Performance

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The study was preregistered on [OSF](#). Study materials, data, analysis scripts, and supplementary materials can be retrieved from the [OSF project page](#).

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Abstract

Personality traits describe how people typically think, feel, and behave, and personality states describe how people think, feel, and behave in a given moment. In their daily lives, people often behave the way they typically do (they enact trait-congruent personality states), but occasionally behave differently from how they typically do (trait-incongruent personality states). Several theories propose that such incongruent personality states should be associated with undesirable outcomes such as less positive affect or more tiredness, but the current state of evidence is inconclusive and mostly based on one only personality dimension: extraversion. In this study, we contribute to filling important gaps in the literature by examining congruence of personality dimensions other than extraversion, considering characteristics of the situation, and modeling congruence with state-of-the-art response surface analyses. We aimed to manipulate perceived adversity and deception of the situation as well as state honesty-humility and state agreeableness in a prisoner's dilemma paradigm. However, the manipulations had unexpected effects and were therefore considered unsuccessful. The study thus emphasized the difficulty of manipulating personality states, situation characteristics, and congruence in general. In pre-registered cross-sectional response surface analyses and specification curve analyses, we then examined how trait–state congruence and state–situation congruence were associated with cognitive performance in a numerical Stroop task, positive affect, and tiredness. Neither trait–state congruence nor state–situation congruence were associated with positive affect, tiredness, or cognitive performance. Overall, we therefore concluded that congruence may—if at all—only play a minor role in the associations between personality states and relevant outcomes.

Keywords: personality states, congruence, personality traits, situation characteristics, person-environment fit

Be Yourself and Behave Appropriately: Exploring Associations Between Incongruent Personality States and Positive Affect, Tiredness, and Cognitive Performance

Personality traits describe how people *typically* feel, think, and behave (Diener & Lucas, 2020). However, the way people think, feel, and behave in a given moment—their personality *states*—can change from moment to moment and from situation to situation. People most often enact personality states at or close to their trait level (Fleeson, 2001). These personality states are called *trait-congruent personality states*. However, because people enact personality states across the whole spectrum of a given trait on a regular basis, their personality states occasionally differ from their trait level (Fleeson, 2001). These personality states are called *trait-incongruent personality states*. For example, people who are characterized by high levels on the personality trait extraversion nevertheless occasionally spend time alone (introverted personality state), people who are characterized by high levels on the personality trait agreeableness occasionally argue with others (disagreeable personality state), and people who are characterized by low levels on the personality trait conscientiousness occasionally complete their to-do list (conscientious personality state).

But does it matter whether a personality state is congruent or incongruent with one's trait? Several theories (e.g., Gallagher et al., 2011; Moskowitz & Côté, 1995; Tett & Burnett, 2003) propose that people should experience more positive affect, less negative affect, and less tiredness when enacting trait-congruent personality states. However, the current state of evidence regarding this question is rather inconclusive and previous research on the congruence of personality states has several gaps: First, almost all studies focused on extraversion (e.g., Fleeson et al., 2002; McNiel & Fleeson, 2006; Zelenski et al., 2012), whereas little is known about the other personality dimensions. Second, previous studies have examined a variety of outcomes of

trait-incongruent personality states including positive affect, negative affect, effort, vitality, performance in cognitive tasks, and handgrip strength, making it difficult to compare the findings (Gallagher et al., 2011; McNiel et al., 2010; Pickett, Hofmans, Feldt, et al., 2020; Zelenski et al., 2012). Third, most studies modeled interactions between personality trait and personality state to examine whether the association between extraverted personality states and positive affect, for example, depends on the trait extraversion level (e.g., Gallagher et al., 2011; Jacques-Hamilton et al., 2018; Zelenski et al., 2012). However, interactions may not be the most adequate operationalization of congruence (J. R. Edwards, 2002; Humberg, Nestler, et al., 2019). Finally, although there is initial evidence that the situational context is relevant to the association between congruence and relevant outcomes (Gallagher et al., 2011; Whelan, 2013), characteristics of the situation were usually not considered.

The present study contributes to filling these gaps by (1) examining congruence of trait and state agreeableness and trait and state honesty-humility, (2) including and comparing three different outcome measures, (3) modeling congruence with state-of-the-art response surface analyses (Cronbach, 1958; J. R. Edwards, 2002, 2007; Humberg, Nestler, et al., 2019), and (4) considering characteristics of the situation.

Consequences of Trait-Incongruent Personality States

Different theories have argued that trait-congruent personality states should be associated with more desirable outcomes than trait-incongruent personality states. The behavioral concordance model (Moskowitz & Côté, 1995) and trait activation theory (Tett & Burnett, 2003; Tett & Guterman, 2000), for example, propose that people experience more pleasant affect when engaging in trait-congruent personality states than in trait-incongruent states. Moreover, the contra-trait effort hypothesis (Gallagher et al., 2011) argues that incongruent personality states

require more effort than congruent personality states. Therefore, trait-incongruent personality states should be associated with tiredness, fatigue, and even with impaired performance on subsequent tasks requiring similar effort (Gallagher et al., 2011; Zelenski et al., 2012).

Despite this theoretical basis, empirical findings on the consequences of trait-congruent and trait-incongruent personality states are mixed. Most prominently, a series of lab experiments examined associations between trait extraversion, state extraversion, and affect (e.g., Fleeson et al., 2002): Participants were instructed to be either talkative and bold (i.e., extraverted) or reserved and quiet (i.e., introverted) in a 10-minute group discussion. Afterwards, they rated their behavior and affect during the discussion. These experiments modeled interactions between personality traits and personality states to examine whether the association between personality states and positive affect depends on the personality trait level. However, they did not find any evidence for such an interaction; instead, all participants, regardless of their trait extraversion levels, reported higher levels of positive affect and lower levels of negative affect when behaving extravertedly (Fleeson et al., 2002; McNiel et al., 2010; McNiel & Fleeson, 2006; Zelenski et al., 2012; for a similar finding in an experience sampling study, see Margolis & Lyubomirsky, 2020).

In contrast, other studies—mostly using experience sampling designs—found evidence for trait-congruence effects. In an experimental experience sampling study, people low on trait extraversion reported weaker increases in positive affect and stronger increases in negative affect and tiredness when behaving extravertedly than people high on trait extraversion (Jacques-Hamilton et al., 2018). Moreover, people who behaved less extravertedly than normal in a group discussion reported more effort (Gallagher et al., 2011) and reacted more slowly in a subsequent Stroop task (Zelenski et al., 2012). Additionally, two recent studies modeled congruence with quadratic regressions to examine whether the association between personality states and affect

takes the form of an inverted U with its peak at the trait level. These studies found that people who behaved less conscientiously or more extravertedly than normal experienced less positive affect and less vitality, respectively, than people behaving congruently (Pickett, Hofmans, Debusscher, et al., 2020; Pickett, Hofmans, Feldt, et al., 2020). However, most of these effects were asymmetric such that, for example, only incongruent personality states below the trait extraversion level, but not above the trait level, were reported to be more effortful (Gallagher et al., 2011; Pickett, Hofmans, Feldt, et al., 2020; Pickett, Hofmans, Debusscher, et al., 2020). The associations between trait–state congruence and relevant outcomes may thus depend on the trait level and the direction of the incongruence.

To accurately model such asymmetric effects, more sophisticated statistical methods than mere interactions are needed. A particularly well-suited method for examining congruence effects is response surface analysis (Cronbach, 1958; J. R. Edwards, 2002, 2007; Humberg, Nestler, et al., 2019). Response surface analysis models congruence with polynomial regressions that comprise linear effects, curvilinear effects, and interactions. A significant congruence effect (typically called *fit pattern*) is not represented by a significant interaction coefficient or a significant quadratic coefficient as used in previous studies, but by a more complex pattern of associations involving both interactions and curvilinear effects (J. R. Edwards, 2007; see Humberg, Dufner, et al., 2019). This approach is currently considered best practice for examining congruence effects (J. R. Edwards, 2007; Humberg, Dufner, et al., 2019). Moreover, response surface analysis has two important advantages: First, it includes interactions *and* quadratic effects and therefore makes it possible to compare the results to those found in previous studies. Second, response surface analysis can also model and detect asymmetric effects as reported in some of the previous studies.

Overall, we take away three key points: First, most previous research indicated that there is no interaction between personality traits and personality states with regard to positive affect, though a few recent studies suggest otherwise. Second, it may be important to examine outcomes other than positive affect such as tiredness or cognitive measures. Third, more complex statistical models such as response surface analyses could improve our understanding of the associations between trait-incongruent personality states and relevant outcomes.

Trait–State Congruence in Context

Another important limitation of previous research on trait–state congruence is that most previous studies failed to acknowledge possible influences of the situation. However, personality and behaviors are always contextualized in situations, and situations may therefore affect associations between trait–state congruence and relevant outcomes. Situations contain, for example, information such as incentives or rules about which behaviors are appropriate and will be rewarded and which behaviors are inappropriate and will be punished (Funder, 2016). Behaving extravertedly at a funeral, for example, may have completely different consequences than behaving extravertedly at a party. Accordingly, theories such as person–environment fit (J. R. Edwards et al., 1998, 2006; Kristof, 1996) and trait-activation theory (Tett & Burnett, 2003; Tett & Guterman, 2000) propose that *state–situation congruence*, congruence between personality states and characteristics of the situation, is also associated with outcomes such as positive affect. That is, *situation-congruent personality states* should have positive consequences, whereas *situation-incongruent personality states* should have negative consequences.

Many of the previous studies examining trait–state congruence used a group discussion paradigm (e.g., Fleeson et al., 2002; McNiel et al., 2010; McNiel & Fleeson, 2006; Zelenski et al., 2012). A group discussion represents a situation that probably calls for rather extraverted

personality states. Extraverted personality states may be congruent with such a situation and therefore lead to more positive affect. In these studies, the situational context may therefore have confounded the results regarding trait–state congruence. Put differently: The reason why both people low and people high on trait extraversion experienced more positive affect when behaving extravertedly in the group discussions may be that extraverted personality states were appropriate to this situation. The associations between trait–state congruence and positive affect might be different when examined in a situation that does not reward extraverted personality states. Indeed, Whelan (2013) found that the association between extraverted personality states and positive affect weakened when the group discussion paradigm was changed to a group puzzling task. Moreover, Kritzler et al. (2020) found that the association between personality states and state affect was moderated by situation characteristics such that the association between state extraversion and state positive affect, for example, was stronger when the situation was perceived as more social.

Overall, state–situation congruence may have confounded the effects of trait–state congruence. Therefore, it is important to include state–situation congruence when examining trait–state congruence.

An Experimental Situation for Manipulating Personality States and Situation

Characteristics

Like many previous studies, we aimed to examine trait–state congruence and state–situation congruence in an experimental study. An experimental manipulation of situation and behavior was necessary to ensure that sufficient congruent and incongruent personality states could be sampled. Moreover, experimental designs have the advantage that they enable causal inferences. However, a group discussion as used in most previous studies (e.g., Fleeson et al.,

2002; McNiel & Fleeson, 2006) may not be well suited for our purposes because it is a situation that is difficult to control and manipulate.

We therefore sought a situation that is easier to control and manipulate and that is relevant to personality traits and personality states. We found that economic games based on the prisoner's dilemma (Flood, 1958; Rapoport, 1989; Tucker, 1980) are well-suited for this purpose because they have been associated with personality and aspects of the situation have been previously manipulated (Kagel & McGee, 2014; Pothos et al., 2011; Zettler et al., 2013). In the prisoner's dilemma, two criminals are interrogated separately by the police for a crime. If both criminals remain silent (i.e., *cooperate*), they can only be convicted of a lesser crime and spend one year in prison. If one confesses and accuses the other (i.e., *defects*), the first one goes free while the other spends three years in prison. If both confess, they both go to prison for two years. The criminals have no way of knowing what the other will do. The dilemma in this situation is that each criminal is always better off by defecting than by cooperating, but that mutual cooperation yields a better outcome than mutual defection. In research, the prisoner's dilemma is often reframed to have monetary rewards instead of prison sentences as payoffs (e.g., Kagel & McGee, 2014; Pothos et al., 2011).

Decisions in the prisoner's dilemma are associated with the personality dimensions *agreeableness* (being patient, gentle vs. being quarrelsome, stubborn) and *honesty-humility* (being faithful, loyal vs. being sly, hypocritical) (Kagel & McGee, 2014; Pothos et al., 2011; Zettler et al., 2013). Moreover, both the prisoner's dilemma and the personality dimensions *agreeableness* and *honesty-humility* are associated with the situation characteristics *adversity* (the extent to which the situation contains threats, problems, conflicts, competition, or criticism) and *deception* (the extent to which the situation contains mistrust, lying, or betrayal) (Rauthmann et

al., 2014, 2015, 2016). *Situation characteristics* represent psychologically relevant and meaningful interpretations of situations that describe situations similarly to how personality states describe persons (Rauthmann et al., 2014). They thus facilitate the assessment of associations such as congruence between personality states and characteristics of the situation.

In our study, we aimed to manipulate state agreeableness and state honesty-humility and perceived adversity and deception in the prisoner's dilemma. We manipulated state agreeableness and state honesty-humility together¹ by instructing participants to act either agreeably and honestly or disagreeably and dishonestly. We manipulated perceived adversity and deception together by manipulating the game's payoffs and the description and behavior of the other player. We then examined how trait-state congruence and state-situation congruence in the prisoner's dilemma were associated with relevant outcomes. Because trait-state congruence and state-situation congruence have been theoretically and empirically linked to a variety of outcomes (e.g., Gallagher et al., 2011; McNiel & Fleeson, 2006; Zelenski et al., 2012), we examined three different outcomes in our study: positive affect, tiredness, and cognitive performance.

Hypotheses

First, we expected the manipulation to be successful (H1). That is, we hypothesized that participants instructed to behave honestly and agreeably would be more honest, share more often, and report higher levels of state agreeableness and state honesty-humility than participants instructed to behave dishonestly and disagreeably. Moreover, we hypothesized that participants in

¹ We manipulated state agreeableness and state honesty-humility, as well as adversity and deception together because the two dimensions, respectively, are most likely highly correlated in the prisoner's dilemma and it would thus have been difficult and unrealistic to manipulate them separately (Ashton et al., 2014; Rauthmann & Sherman, 2016a).

the more adverse and deceptive condition would report higher levels of adversity and deception than participants in the less adverse and deceptive condition. In contrast, we expected the experimental conditions to not be significantly associated with state emotionality, state extraversion, state conscientious, and state openness and also not with the situation characteristics duty, intellect, mating, positivity, negativity, and sociality. Second, because main effects of personality states and situation characteristics on state affect are well documented in the literature regardless of trait–state congruence and state–situation congruence (e.g., Ching et al., 2014; Kritzler et al., 2020; Sherman et al., 2015), we expected to replicate these main effects (H2). That is, we expected higher levels of state agreeableness and state honesty-humility to be associated with more positive affect, and higher levels of perceived adversity and deception to be associated with more negative affect. Finally, and most importantly, we expected trait-congruent personality states (H3) and situation-congruent personality states (H4) to be related to more positive affect, less tiredness, and better cognitive performance than trait-incongruent and situation-incongruent states.

Methods

Data collection was approved by local ethics committee of [INSTITUTION BLINDED FOR PEER REVIEW]. The preregistration of sample sizes, hypotheses, and primary analyses can be found at [Link](#). A summary of deviations from this preregistration, study materials, data, analysis scripts, and supplementary materials are available on the Open Science Framework ([LINK](#)).

Participants

We determined a required sample size of 152 participants based on an interaction effect of partial eta-square = .05 reported by Zelenski et al. (2012). However, because we suspected that effects might be smaller in our study, we aimed for a sample size of 200 participants with complete and valid data.

Participants were recruited via CloudResearch's Prime Panels (Chandler et al., 2019). In total, 917 participants started the study but 610 were excluded because they were screened out or answered instructed response items incorrectly. Thus, 307 participants (201 of whom completed the study) were included in the following analyses. The participants were on average 56.82 years old (median = 63.00, $SD = 16.68$) and were evenly distributed between the genders with 154 male participants and 153 female participants. All participants lived in the United States and the majority (95.11%) spoke English as their first language.

Materials

Experimental Paradigm

Our experimental paradigm was a modified version of the classical prisoner's dilemma (Flood, 1958; Tucker, 1980, 1983). We reframed the game to be about a jackpot of coins instead of prison sentences. Participants played 15 rounds against a computer-simulated player. In every round, the players had the opportunity to distribute a jackpot between them. Each player independently decided to either split the jackpot or steal the jackpot. If both chose to split, the jackpot was split between them. If one chose to steal while the other chose to split, the former received the jackpot whereas the latter received nothing. If both chose to steal, the jackpot was lost and both received nothing. To allow for more variation in honest and agreeable behavior, the players communicated to each other what they were planning to do before making their final

decision—but they could lie or change their mind. We measured the number of honest decisions (i.e., trials in which the participants' communicated intention and the final decision matched) and the number of share decisions (i.e., trials in which the participants' final decision was to share the jackpot) as indices of participants' behaviors during the game.

We aimed to manipulate behavior and situation independently in a 2 (behavior condition: high agreeableness and honesty vs. low agreeableness and honesty) X 2 (situation condition: high adversity and deception vs. low adversity and deception) between-person design. Behavior during the game was manipulated by directly instructing participants to act either honestly and agreeably or dishonestly and disagreeably. The situation was manipulated by varying payoffs and information about the other player. In the low adversity and deception condition, payoffs signaled that stealing is not worthwhile (Zettler et al., 2013) and the other player was framed as and behaved like a trustworthy partner. In the high adversity and deception condition, payoffs signaled that stealing pays off (Zettler et al., 2013) and the other player was framed as and behaved like an untrustworthy opponent. We tested an earlier version of the experimental paradigm in a preliminary study. Details on this pretest can be found in the [OSM](#).

Personality Traits

Personality traits were operationalized as self-reported HEXACO model personality traits (Ashton et al., 2004; Ashton & Lee, 2001) measured with the 24-item Brief HEXACO Inventory (Vries, 2013). Participants indicated on a scale from 1 (*disagree strongly*) to 5 (*agree strongly*) how much they agreed with descriptive statements such as “I think science is boring,” an item for Openness. Scale scores were computed by reverse-coding items when applicable and then averaging over all items that belonged to a scale.

Personality States

Personality states were operationalized as self-reported HEXACO model personality states measured with bipolar items adopted from Sherman et al. (2015) and Churchyard (2013). All personality states were measured with one bipolar item each adopted from Sherman et al. (2015). State honesty-humility and state agreeableness were additionally measured with three items from Churchyard (2013), and all four items were combined into one scale score for these states. Participants indicated on a 7-point bipolar scale how they behaved in the game situation (e.g., for one of the agreeableness items, the scale ranged from *cold, quarrelsome* to *warm, agreeable*). Scale scores (when applicable) were computed by reverse-coding items when applicable and then averaging over all items that belonged to a scale.

Situation Characteristics

Situation characteristics were operationalized as perceived situation characteristics from the Situational Eight DIAMONDS taxonomy (Rauthmann et al., 2014). The situation characteristics adversity and deception were measured with three items each taken from the DIAMONDS S8* (Rauthmann & Sherman, 2016a), the other situation characteristics were measured with one item each taken from the DIAMONDS S8-I (Rauthmann & Sherman, 2016b). Participants indicated on a scale from 1 (*not at all*) to 7 (*totally*) how well certain statements described the game situation they had just encountered (e.g., for deception, one item was “It is possible to deceive someone.”). Scale scores (when applicable) were computed by reverse-coding items when applicable and then averaging over all items that belonged to a scale.

Positive Affect and Tiredness

Positive affect was operationalized as the good–bad dimension and tiredness was operationalized as the active–tired dimension of the three-dimensional model of affect (e.g., Matthews et al., 1990; Steyer et al., 1994; Wilhelm & Schoebi, 2007). These dimension assess

the valence (from unpleasant to pleasant) and the energetic arousal (from tired/without energy to awake/full of energy) of the current mood. Positive affect and tiredness were measured with a short form of the multidimensional mood state questionnaire (Steyer et al., 1994) comprising . Participants indicated on a scale from 1 (*not at all*) to 7 (*totally*) how intensely they had experienced moods characterized by certain adjectives at the end of the game (e.g., “content” and “tired”). Scale scores (when applicable) were computed by reverse-coding items when applicable and then averaging over all items that belonged to a scale.

Stroop Task

Participants performed a numerical Stroop task (Henik & Tzelgov, 1982) as a measure of cognitive performance. In this task, participants were presented two numbers (ranging from 1 to 9) and indicated which number is numerically larger. The two numbers that always had a numerical difference of one and were presented in different physical sizes (see Figure 1): In neutral trials, both numbers had the same physical size and only differed in their numerical size. In congruent trials, the numerically larger number was also displayed physically larger. In incongruent trials, the numerically smaller number was displayed physically larger.

Participants first completed a trial round with immediate feedback. The main task then consisted of 75 trials with 15 neutral, 30 congruent, and 30 incongruent trials presented in a random order. Participants were instructed to answer as fast as possible but correctly. We sampled three types of information during the main Stroop task: reaction time, trial type (congruent, incongruent, or neutral), and correctness of the answer.

Figure 1

Examples of neutral (A), congruent (B), and incongruent (C) stimuli in the Stroop task

Note. Participants had to indicate which number is numerically larger.

Comprehension, Attention, and Careless Responding

We included a short screening consisting of four synonym tasks (see Chandler et al., 2019) at the beginning of the study to assess language comprehension and attentiveness. Additionally, we included two instructed response items (e.g., “To secure data quality, please choose answer option 4”; Meade and Craig, 2012) to further identify careless responders. Only participants who passed the screening and provided correct responses on the instructed response items were included in the final sample.

Procedure

The study was implemented using the online survey platform Qualtrics (Qualtrics, 2020). To be eligible, participants had to be at least 18 years old, live in the United States, access the study with a laptop or desktop computer, and consent to participate. After providing informed consent, the participants completed the screening task. Participants who did not fulfill eligibility criteria or did not answer the screening questions correctly were screened out and did not complete the rest of the study.

Participants who passed the screening then answered questions regarding their personality traits and demographics. They then played the prisoner's dilemma game which took on average 14 minutes ($Q_1 = 5.65$, median = 7, $Q_3 = 8.19$). Next, participants answered questions regarding their personality states, perceived situation characteristics, and their positive affect and tiredness at the end of the game in randomized order. Finally, participants performed the numerical Stroop task (duration ~ 7 minutes). In the end, participants were given the chance to comment on the study, created their individual code for further reference, and were compensated for study participation. Overall, participants took on average 33 minutes (median = 24, $SD = 85$) to complete the study.

Analytic Strategy

Analyses were conducted in R (Version 4.0.3; R Core Team, 2019) with the R-packages² *tidyverse* (Version 1.3.0; Wickham et al. 2019), *afex* (Version 0.28.1; Singmann et al., 2021), *RSA* (Version 0.10.2; Schönbrodt and Humberg, 2020), *specr* (Version 0.2.1; Masur and Scharkow, 2019), and *papaja* (Version 0.1.0.9997; Aust and Barth, 2020).

² We, furthermore, used the R-packages *apaTables* (Version 2.0.8; Stanley, 2021), *BayesFactor* (Version 0.9.12.4.2; Morey & Rouder, 2018), *car* (Version 3.0.10; Fox & Weisberg, 2019); Fox et al., 2019), *carData* (Version 3.0.4; Fox et al., 2019), *circlize* (Version 0.4.12; Gu et al., 2014), *coda* (Version 0.19.4; Plummer et al., 2006), *cowplot* (Version 1.1.1; Wilke, 2020), *dplyr* (Version 1.0.4; Wickham et al., 2020), *forcats* (Version 0.5.1; Wickham, 2020), *ggplot2* (Version 3.3.3; Wickham, 2016), *inlmisc* (Version 0.5.2; Fisher, 2020), *irr* (Version 0.84.1; Gamer et al., 2019), *jpeg* (Version 0.1.8.1; Urbanek, 2019), *knitr* (Version 1.31; Xie, 2015), *lattice* (Version 0.20.41; Sarkar, 2008), *lavaan* (Version 0.6.7; Rosseel, 2012), *lemon* (Version 0.4.5; S. M. Edwards, 2020), *lme4* (Version 1.1.26; Bates et al., 2015), *lpSolve* (Version 5.6.15; Berkelaar & others, 2020), *Matrix* (Version 1.2.18; Bates & Maechler, 2019), *patchwork* (Version 1.1.1; Pedersen, 2019), *psych* (Version 2.0.12; Revelle, 2019), *purrr* (Version 0.3.4; Henry & Wickham, 2020), *readr* (Version 1.4.0; Wickham et al., 2018), *readxl* (Version 1.3.1; Wickham & Bryan, 2019), *stringr* (Version 1.4.0; Wickham, 2019), *tibble* (Version 3.1.0; Müller & Wickham, 2020), *tidyr* (Version 1.1.2; Wickham & Henry, 2020), *tinylabls* (Version 0.2.0; Barth, 2020), and *yarr* (Version 0.1.5; Phillips, 2017).

The planned analyses depended on the results from the manipulation check. We preregistered different analyses depending on which manipulations were successful. Here, we only report on the analyses that were ultimately realized. Information about the other planned analysis strategies can be found in the preregistration.

For the manipulation check (H1), we conducted analyses of variance with the different situation characteristics and personality states as dependent variables and effects-coded variables indicating the experimental situation and behavior conditions and their interaction as independent variables. The main effects of personality states and situation characteristics on the positive affect dimension (H2) were examined in a multiple regression analysis. The congruence hypotheses (H3 and H4) were examined in response surface analyses. Moreover, we conducted specification curve analyses for all response surface analyses with cognitive performance indicators as dependent variables. Details on response surfaces analysis and specification curve analysis can be found in the respective sections. We controlled for the results of the game (i.e., points won and difference between participants' points and the computer's points) and for experimental groups in all analyses.

Overall, we examined two combinations for trait–state congruence (i.e., trait agreeableness–state agreeableness and trait honesty-humility–state honesty-humility) and four combinations for state–situation congruence (i.e., state agreeableness-adversity, state agreeableness–deception, state honesty-humility–adversity, and state honesty-humility–deception). Moreover, we considered two different operationalizations of congruence (i.e., interactions to compare the results to previous studies and fit patterns to use the best practice response surface analyses) and four different outcomes (i.e., positive affect, tiredness, Stroop reaction times, and Stroop error rates). We thus examined a total of 6 (congruence) (congruence

operationalization) (outcomes) = 48 associations between congruence and relevant outcomes. Because a maximum of eight of these were used to test the same hypothesis, we used a Bonferroni-corrected significance level of $\alpha = .00625$ for these analyses.

Response Surface Analysis

Response surface analyses (Cronbach, 1958; J. R. Edwards, 2002, 2007; Humberg, Nestler, et al., 2019) are based on polynomial regressions. The associations between the variables of interest are modeled using polynomial regressions that include main effects, squared effects, and interactions. Parameters of the model are then statistically and graphically interpreted, and the predicted values are plotted as a three-dimensional surface to facilitate their interpretation.

Depending on the operationalization of congruence as an interaction or as a fit pattern, a significant congruence effect would either be represented by a significant interaction coefficient in the polynomial regression or by a specific pattern of associations in a polynomial regression (J. R. Edwards, 2007; see Humberg, Dufner, et al., 2019). This fit pattern is defined by specific parameters of the response surface which test the shape of the surface above the line of congruence (i.e., where $X = Y$) and the line of incongruence (i.e., where $X = -Y$) and examine the position of the ridge of the surface (the specific criteria for a fit pattern in a broad sense are $a_4 < 0$, $a_2 = 0$, $a_3 = 0$, and $a_5 = 0$; see Humberg, Nestler, et al., 2019; Nestler et al., 2019). A significant fit pattern indicates that the highest values of a dependent variable (e.g., positive affect) are predicted when the values of both predictor variables are equal, and that the predicted values decrease the more the two predictor variables deviate from each other. Figure 2 compares response surfaces for congruence operationalized as an interaction (A) and as a fit pattern (B): The two approaches are similar (in fact, interactions are a part of the fit pattern), but still differ meaningfully.

For the response surface analyses, personality traits were transformed from a 5-point scale to a 7-point scale and personality traits, personality states, and situation characteristics were centered on the midpoints of their respective scales (J. R. Edwards & Parry, 1993; Humberg, Nestler, et al., 2019).

Figure 2

Exemplary response surface plots of congruence operationalized as an interaction (A) and congruence operationalized as a fit pattern as defined in response surface analyses (B)

Note. Association between two predictor variables X and Y and an outcome variable Z are plotted as a three-dimensional surface. The color of the surface indicates the predicted levels of the outcome variable with greener colors indicating higher levels and orange to red colors indicating lower levels. The blue lines represent the line of congruence (LOC; i.e., $X = Y$) and the line of incongruence (LOIC; i.e., $X = -Y$).

Specification Curve Analysis

We conducted specification-curve analyses (Simonsohn et al., 2020) to account for the great amount of researcher degrees of freedom in identifying and handling outliers and calculating the summary statistic in the Stroop task (Simmons et al., 2011). The specification

curve analyses involved three steps. First, we determined the set of reasonable specifications. We specified different options for identifying outliers, handling these outliers, selecting the trials to be considered for the calculation of the summary statistic, and calculating the summary statistic. In sum, we analyzed a total of 2224 reaction time specifications and 556 error rate specifications. Details on the set of reasonable specifications can be found in the OSM.

In the next step, the response surface analyses were conducted separately with each specification as the dependent variable and the results were graphically illustrated in descriptive specification curves. These curves displayed the effects of interest (i.e., interaction coefficients or presence of fit patterns) from all specifications ranked by size of the effect. Additionally, these plots indicate which analytic decisions lead to which effects. Descriptive specification curves were used to examine the range of the effects across all specifications, the proportion of significant effects, and how the analytic decisions impacted the estimated effects.

Finally, to come to an overall conclusion regarding the presence of the hypothesized effect, we applied a permutation technique to test how inconsistent the results were with the null hypothesis of no effect across the specification curve. We created 500 data sets by shuffling the values within the dependent variables (i.e., the different reaction time and error rate specifications) and repeated the response surface analyses with these shuffled data. Because of the random distribution of reaction times or error rates, the null hypothesis of no effect is per definition true in these shuffled datasets. The number of shuffled data with at least as many significant specifications as the original data was then used to calculate a p-value of the permutation test. Additionally, we graphically compared the specification curve of the effects obtained in the original data to the range of the expected-under-the-null specification curves from the shuffled datasets.

Results

Because of the high number of different analyses, not all results can be shown and discussed in detail in the main manuscript. Here, we focus on the overarching pattern of results. The online supplementary materials ([OSM](#)) entail additional results, tables, and figures.

Manipulation Check

As expected, participants in the high agreeableness and honesty condition reported significantly higher levels of state agreeableness ($M = 5.23$, $SD = 1.40$) and state honesty-humility ($M = 5.30$, $SD = 1.51$) than participants in the low agreeableness and honesty condition ($M_{agree} = 4.32$, $SD_{agree} = 1.65$, $d_{agree} = 0.60$, 95% CI [0.34; 0.85]; $M_{honest} = 3.58$, $SD_{honest} = 1.92$, $d_{honest} = 1.00$, 95% CI [0.72; 1.27]; full results in Table 1). Moreover, participants in the ‘trustworthy partner’-condition perceived the game situation to have significantly lower levels of adversity ($M = NA$, $SD = NA$) but not deception ($M = NA$, $SD = NA$) than participants in the ‘untrustworthy opponent’-condition ($M_{adv} = NA$, $SD_{adv} = NA$, $d_{adv} = 0.28$, 95% CI [0.06; 0.51]; $M_{dec} = NA$, $SD_{dec} = NA$, $d_{dec} = 0.11$, 95% CI [-0.11; 0.34]; full results in Table 1).

However, contrary to our hypotheses, participants in the high agreeableness and honesty condition also reported significantly higher levels of state openness and perceived positivity and significantly lower levels of state emotionality than participants in the low agreeableness and honesty condition (see Table 1). Moreover, we found that participants’ concrete behaviors in the game (i.e., deciding to share and being honest when communicating the intended decision) were significantly associated with both the behavior conditions, the situation conditions, and with their interaction. Thus, the manipulations also had rather diffuse and unwanted effects on top of the

expected effects. We therefore regarded both manipulations as unsuccessful and conducted the analyses that were preregistered for the case that both manipulations failed.

Table 1

Results from analyses of variance examining effects of the experimental manipulations

Predictor	SS	df	MS	F	p	η_p^2	95% CI for η_p^2
DV: Number of share decisions							
(Intercept)	11500.36	1	11500.36	762.99	< .001		
Behavior condition	704.80	1	704.80	46.76	< .001	.16	[.08, .24]
Situation condition	827.35	1	827.35	54.89	< .001	.18	[.10, .27]
Behavior condition x Situation condition	86.15	1	86.15	5.72	.018	.02	[.00, .07]
Error	3707.91	246	15.07				
DV: Number of honest decisions							
(Intercept)	33960.13	1	33960.13	2715.74	< .001		
Behavior condition	161.21	1	161.21	12.89	< .001	.04	[.01, .10]
Situation condition	12.21	1	12.21	0.98	.324	.00	[.00, .03]
Behavior condition x Situation condition	53.31	1	53.31	4.26	.040	.01	[.00, .05]
Error	3663.94	293	12.50				
DV: State agreeableness							
(Intercept)	5815.05	1	5815.05	2505.20	< .001		
Behavior condition	50.88	1	50.88	21.92	< .001	.08	[.03, .15]
Situation condition	6.64	1	6.64	2.86	.092	.01	[.00, .05]
Behavior condition x Situation condition	6.12	1	6.12	2.64	.106	.01	[.00, .05]
Error	587.26	253	2.32				
DV: State honesty-humility							
(Intercept)	5018.31	1	5018.31	1685.00	< .001		
Behavior condition	188.10	1	188.10	63.16	< .001	.20	[.12, .28]
Situation condition	9.36	1	9.36	3.14	.077	.01	[.00, .05]
Behavior condition x Situation condition	1.26	1	1.26	0.42	.516	.00	[.00, .03]
Error	753.49	253	2.98				
DV: Adversity							
(Intercept)	1794.44	1	1794.44	754.97	< .001		
Behavior condition	0.02	1	0.02	0.01	.930	.00	[.00, .01]
Situation condition	15.31	1	15.31	6.44	.012	.02	[.00, .06]
Behavior condition x Situation condition	6.89	1	6.89	2.90	.090	.01	[.00, .04]
Error	713.05	300	2.38				

Predictor	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	η_p^2	95% CI for η_p^2
DV: Deception							
(Intercept)	8656.47	1	8656.47	4354.99	< .001		
Behavior condition	4.20	1	4.20	2.11	.147	.01	[.00, .04]
Situation condition	1.92	1	1.92	0.97	.326	.00	[.00, .03]
Behavior condition x Situation condition	1.74	1	1.74	0.88	.350	.00	[.00, .03]
Error	596.31	300	1.99				
DV: State openness							
(Intercept)	6628.26	1	6628.26	2478.05	< .001		
Behavior condition	18.27	1	18.27	6.83	.009	.03	[.00, .08]
Situation condition	1.33	1	1.33	0.50	.481	.00	[.00, .03]
Behavior condition x Situation condition	7.13	1	7.13	2.67	.104	.01	[.00, .05]
Error	676.72	253	2.67				
DV: State conscientiousness							
(Intercept)	6994.47	1	6994.47	2668.09	< .001		
Behavior condition	22.05	1	22.05	8.41	.004	.03	[.00, .09]
Situation condition	0.16	1	0.16	0.06	.806	.00	[.00, .02]
Behavior condition x Situation condition	0.40	1	0.40	0.15	.698	.00	[.00, .02]
Error	663.25	253	2.62				
DV: State emotionality							
(Intercept)	1835.05	1	1835.05	615.68	< .001		
Behavior condition	15.20	1	15.20	5.10	.025	.02	[.00, .07]
Situation condition	0.15	1	0.15	0.05	.822	.00	[.00, .02]
Behavior condition x Situation condition	0.00	1	0.00	0.00	.973	.00	[.00, 1.00]
Error	754.08	253	2.98				
DV: Positivity							
(Intercept)	4656.75	1	4656.75	1366.85	< .001		
Behavior condition	41.05	1	41.05	12.05	.001	.04	[.01, .09]
Situation condition	11.05	1	11.05	3.24	.073	.01	[.00, .04]
Behavior condition x Situation condition	0.13	1	0.13	0.04	.848	.00	[.00, .01]
Error	1032.30	303	3.41				

Note. The lines separate the different models from each other.

Replicating Main Effects

As expected, people who reported higher levels of state agreeableness, $\beta = 0.25$, 95% CI [0.05, 0.44], $t(226) = 2.50$, $p = .013$, state honesty-humility, $\beta = 0.32$, 95% CI [0.10, 0.54], $t(226) = 2.88$, $p = .004$, and lower levels of adversity of the situation, $\beta = -0.21$, 95% CI [-0.32, -0.09], $t(226) = -3.59$, $p < .001$, experienced more positive affect. In contrast, perceived deception was not significantly associated with positive affect, $\beta = -0.03$, 95% CI [-0.15, 0.09], $t(226) = -0.51$, $p = .614$. Adding personality traits and interactions between personality traits and personality states did not change the pattern of associations meaningfully. Detailed results from these analyses can be found in the OSM.

Associations Between Congruence and Positive Affect

Table 2 summarizes the results from the polynomial regressions regarding associations between trait–state congruence and state–situation congruence and positive affect. The polynomial regressions showed that only higher levels of state agreeableness and state honesty-humility were consistently significantly associated with better mood across all models (bs ranging from 0.22 to 0.31). In contrast, neither personality traits nor situation characteristics nor any of the trait–state interactions, state–situation interactions, or curvilinear coefficients were significantly associated with positive affect in any of the models (Table 2).

Figure 3 shows the response surface plots for the associations between personality traits, personality states, and positive affect (A and B) and between personality states, situation characteristics, and positive affect (C to F). The surfaces were mostly steep along the personality state-axis. This illustrates the results from polynomial regressions that personality states were the only significant predictors of positive affect. Additionally, none of the response surfaces fulfilled

criteria for a fit pattern (i.e., $a_2 = 0$, $a_3 = 0$, $a_4 < 0$, and $a_5 = 0$). Thus, overall, trait–state congruence and state–situation congruence were not significantly associated with positive affect.

Table 2

Results from polynomial regression models of association between positive affect and congruence

Term	<i>b</i>	<i>SE</i>	95% CI	β	<i>p</i>
Trait–state congruence: Agreeableness					
Intercept	2.96	0.39	[2.21, 3.72]	2.85	< .001
State A	0.30	0.05	[0.20, 0.40]	0.46	< .001
Trait A	0.01	0.08	[-0.15, 0.17]	0.01	.913
State A ²	0.04	0.02	[0.00, 0.08]	0.13	.039
State A x trait A	-0.01	0.04	[-0.09, 0.07]	-0.02	.796
Trait A ²	0.01	0.04	[-0.07, 0.09]	0.01	.762
Behavior conditions	0.25	0.12	[0.03, 0.48]	0.12	.030
Situation conditions	0.06	0.22	[-0.37, 0.50]	0.03	.775
Points	0.00	0.00	[-0.01, 0.00]	-0.08	.685
Point difference	0.00	0.00	[0.00, 0.00]	0.15	.328
Model Fit					$R^2 = 0.30$
Trait–state congruence: Honesty-humility					
Intercept	3.50	0.39	[2.74, 4.26]	3.35	< .001
State HH	0.22	0.06	[0.10, 0.34]	0.40	< .001
Trait HH	-0.14	0.10	[-0.34, 0.06]	-0.16	.157
State HH ²	0.00	0.02	[-0.04, 0.03]	0.00	.983
State HH x trait HH	0.05	0.03	[-0.01, 0.11]	0.19	.103
Trait HH ²	0.05	0.04	[-0.02, 0.13]	0.15	.164
Behavior conditions	0.14	0.13	[-0.11, 0.38]	0.06	.283
Situation conditions	-0.08	0.22	[-0.52, 0.35]	-0.04	.717
Points	0.00	0.00	[-0.01, 0.00]	-0.04	.845
Point difference	0.00	0.00	[0.00, 0.00]	0.22	.145
Model Fit					$R^2 = 0.29$
State–situation congruence: Agreeableness and adversity					
Intercept	2.90	0.38	[2.15, 3.66]	2.79	< .001

Term	<i>b</i>	<i>SE</i>	95% CI	β	<i>p</i>
State A	0.25	0.06	[0.13, 0.37]	0.38	< .001
Adversity	0.05	0.06	[-0.07, 0.17]	0.08	.413
State A ²	0.03	0.02	[-0.01, 0.08]	0.11	.102
State A x adversity	0.01	0.03	[-0.04, 0.07]	0.05	.617
Adversity ²	0.03	0.02	[-0.01, 0.08]	0.11	.175
Behavior conditions	0.26	0.11	[0.03, 0.48]	0.12	.025
Situation conditions	0.06	0.22	[-0.37, 0.48]	0.03	.800
Points	0.00	0.00	[-0.01, 0.00]	-0.12	.545
Point difference	0.00	0.00	[0.00, 0.00]	0.16	.301
Model Fit					R ² = 0.33
State–situation congruence: Agreeableness and deception					
Intercept	3.17	0.41	[2.37, 3.97]	3.04	< .001
State A	0.27	0.05	[0.17, 0.38]	0.42	< .001
Deception	0.06	0.06	[-0.07, 0.19]	0.08	.344
State A ²	0.04	0.02	[0.00, 0.08]	0.12	.076
State A x deception	-0.02	0.02	[-0.07, 0.02]	-0.08	.322
Deception ²	-0.01	0.02	[-0.05, 0.04]	-0.03	.732
Behavior conditions	0.24	0.12	[0.00, 0.48]	0.11	.052
Situation conditions	0.05	0.23	[-0.40, 0.51]	0.03	.820
Points	0.00	0.00	[-0.01, 0.00]	-0.09	.653
Point difference	0.00	0.00	[0.00, 0.00]	0.16	.308
Model Fit					R ² = 0.31
State–situation congruence: Honesty-humility and adversity					
Intercept	3.46	0.37	[2.73, 4.19]	3.32	< .001
State HH	0.26	0.05	[0.16, 0.36]	0.48	< .001
Adversity	0.08	0.07	[-0.05, 0.21]	0.12	.233
State HH ²	-0.01	0.02	[-0.05, 0.02]	-0.04	.503
State HH x adversity	0.01	0.02	[-0.03, 0.06]	0.06	.527
Adversity ²	0.04	0.03	[-0.01, 0.09]	0.15	.106
Behavior conditions	0.09	0.13	[-0.16, 0.34]	0.04	.475
Situation conditions	-0.01	0.22	[-0.43, 0.41]	0.00	.969
Points	0.00	0.00	[-0.01, 0.00]	-0.14	.455
Point difference	0.00	0.00	[0.00, 0.00]	0.25	.098
Model Fit					R ² = 0.33
State–situation congruence: Honesty-humility and deception					
Intercept	3.52	0.38	[2.77, 4.26]	3.36	< .001
State HH	0.31	0.06	[0.20, 0.42]	0.58	< .001
Deception	0.05	0.05	[-0.05, 0.16]	0.07	.311
State HH ²	0.00	0.02	[-0.04, 0.04]	0.00	.988
State HH x deception	0.00	0.02	[-0.04, 0.05]	0.02	.845

Term	<i>b</i>	<i>SE</i>	95% CI	β	<i>p</i>
Deception ²	0.02	0.02	[-0.02, 0.06]	0.06	.377
Behavior conditions	0.08	0.13	[-0.18, 0.33]	0.04	.561
Situation conditions	0.00	0.22	[-0.43, 0.44]	0.00	.983
Points	0.00	0.00	[-0.01, 0.00]	-0.07	.717
Point difference	0.00	0.00	[0.00, 0.00]	0.20	.177
Model Fit					$R^2 = 0.28$

Note. The lines separate the different models from each other. Personality traits, personality states, and situation characteristics were centered on the midpoints of their respective scales. Personality traits were transformed from a 5-point scale to a 7-point scale. Trait A and State A refer to trait and state agreeableness, respectively, and Trait HH and State HH refer to trait and state honesty-humility, respectively.

Figure 3

Response surface plots for associations between trait–state congruence (A–B) and state–situation congruence (C–F) and predicted values of positive affect

Note. Situation characteristics were reverse-coded (indicated by (r)) such that high values represent more desirable values and are congruent with high values of the personality states. The response surface parameters are listed below

the titles. The blue lines represent the line of congruence (LOC; i.e., $X = Y$) and the line of incongruence (LOIC; i.e., $X = -Y$).

Associations Between Congruence and Tiredness

We conducted the same analyses with tiredness as the dependent variable and found a very similar pattern of results (Table 3): Higher levels of state agreeableness and state honesty-humility were associated with more active mood in all models except one (*bs* ranging from 0.13 to 0.26). In contrast, neither personality traits nor situation characteristics nor any of the trait–state interactions, state–situation interactions, or curvilinear coefficients were significantly associated with tiredness in any of the models (Table 3).

Figure 4 shows the response surface plots for the associations between personality traits, personality states, and tiredness (A and B) and between personality states, situation characteristics, and tiredness (C to F). Again, these surfaces were—if at all—mostly steep along the axis of personality states as these were the only significant predictors in the models. The surfaces also did not fulfill criteria for a congruence pattern. Overall, thus, congruence between personality traits and personality states and congruence between personality states and situation characteristics was not associated with tiredness.

Table 3

Results from polynomial regression models of association between tiredness and congruence.

Term	b	SE	95% CI	β	p
Trait–state congruence: Agreeableness					
Intercept	3.13	0.39	[2.37, 3.90]	3.42	< .001
State A	0.22	0.04	[0.13, 0.30]	0.37	< .001
Trait A	0.11	0.06	[-0.01, 0.23]	0.11	.062
State A ²	0.02	0.02	[-0.01, 0.06]	0.08	.224
State A x trait A	-0.04	0.03	[-0.11, 0.02]	-0.08	.190
Trait A ²	0.06	0.04	[-0.01, 0.13]	0.08	.089
Behavior conditions	0.15	0.12	[-0.08, 0.38]	0.08	.193
Situation conditions	-0.08	0.21	[-0.50, 0.33]	-0.05	.694
Points	0.00	0.00	[-0.01, 0.00]	-0.05	.827
Point difference	0.00	0.00	[0.00, 0.00]	0.17	.369
Model Fit	R ² = 0.20				
Trait–state congruence: Honesty-humility					
Intercept	3.44	0.38	[2.69, 4.19]	3.75	< .001
State H	0.12	0.06	[0.01, 0.24]	0.26	.039
Trait H	-0.15	0.08	[-0.32, 0.01]	-0.19	.073
State H ²	-0.01	0.02	[-0.04, 0.03]	-0.03	.686
State H x trait H	0.05	0.03	[-0.01, 0.10]	0.21	.082
Trait H ²	0.07	0.03	[0.00, 0.13]	0.21	.043
Behavior conditions	0.11	0.12	[-0.13, 0.34]	0.06	.380
Situation conditions	-0.26	0.19	[-0.62, 0.11]	-0.14	.171
Points	0.00	0.00	[0.00, 0.00]	0.04	.858
Point difference	0.00	0.00	[0.00, 0.00]	0.18	.303
Model Fit	R ² = 0.18				
State–situation congruence: Agreeableness and adversity					
Intercept	3.15	0.40	[2.37, 3.94]	3.44	< .001
State A	0.16	0.05	[0.05, 0.26]	0.27	.004
Adversity	0.00	0.06	[-0.11, 0.11]	0.00	.979
State A ²	0.02	0.02	[-0.02, 0.06]	0.05	.443
State A x adversity	0.03	0.03	[-0.02, 0.09]	0.14	.203
Adversity ²	0.03	0.02	[-0.02, 0.07]	0.10	.228
Behavior conditions	0.15	0.11	[-0.07, 0.38]	0.08	.170
Situation conditions	-0.13	0.20	[-0.52, 0.27]	-0.07	.532
Points	0.00	0.00	[-0.01, 0.00]	-0.06	.772
Point difference	0.00	0.00	[0.00, 0.00]	0.16	.384
Model Fit	R ² = 0.21				

Term	b	SE	95% CI	β	<i>p</i>
State–situation congruence: Agreeableness and deception					
Intercept	3.14	0.40	[2.36, 3.93]	3.43	< .001
State A	0.24	0.05	[0.15, 0.34]	0.42	< .001
Deception	0.08	0.06	[-0.03, 0.19]	0.13	.150
State A ²	0.01	0.02	[-0.03, 0.05]	0.05	.484
State A x deception	0.01	0.02	[-0.04, 0.06]	0.03	.758
Deception ²	0.03	0.02	[-0.01, 0.08]	0.13	.107
Behavior conditions	0.14	0.12	[-0.09, 0.37]	0.08	.237
Situation conditions	-0.12	0.21	[-0.53, 0.29]	-0.06	.566
Points	0.00	0.00	[-0.01, 0.00]	-0.01	.949
Point difference	0.00	0.00	[0.00, 0.00]	0.12	.523
Model Fit	R ² = 0.20				
State–situation congruence: Honesty-humility and adversity					
Intercept	3.49	0.39	[2.72, 4.26]	3.81	< .001
State H	0.14	0.05	[0.04, 0.25]	0.30	.008
Adversity	0.02	0.06	[-0.10, 0.13]	0.03	.797
State H ²	-0.02	0.02	[-0.05, 0.02]	-0.06	.362
State H x adversity	0.03	0.02	[-0.01, 0.07]	0.16	.150
Adversity ²	0.04	0.02	[0.00, 0.09]	0.17	.076
Behavior conditions	0.06	0.12	[-0.17, 0.29]	0.03	.625
Situation conditions	-0.16	0.19	[-0.53, 0.21]	-0.09	.400
Points	0.00	0.00	[-0.01, 0.00]	-0.08	.699
Point difference	0.00	0.00	[0.00, 0.00]	0.22	.234
Model Fit	R ² = 0.20				
State–situation congruence: Honesty-humility and deception					
Intercept	3.44	0.38	[2.70, 4.18]	3.74	< .001
State H	0.25	0.05	[0.16, 0.35]	0.53	< .001
Deception	0.08	0.05	[-0.02, 0.17]	0.12	.105
State H ²	-0.01	0.02	[-0.05, 0.02]	-0.04	.502
State H x deception	0.02	0.02	[-0.02, 0.07]	0.09	.343
Deception ²	0.05	0.02	[0.01, 0.09]	0.19	.012
Behavior conditions	0.03	0.12	[-0.21, 0.27]	0.01	.828
Situation conditions	-0.14	0.19	[-0.51, 0.23]	-0.07	.468
Points	0.00	0.00	[0.00, 0.00]	-0.01	.948
Point difference	0.00	0.00	[0.00, 0.00]	0.16	.366
Model Fit	R ² = 0.18				

Note. The lines separate the different models from each other. Tiredness was reverse-coded such that higher values indicate less tiredness or a more active mood. Personality traits, personality states, and situation characteristics were centered on the midpoints of their respective scales. Personality traits were transformed from a 5-point scale to a 7-point scale. Trait A and State A refer to trait and state agreeableness, respectively, and Trait HH and State HH refer to trait and state honesty-humility, respectively.

Figure 4

Response surface plots for associations between trait–state congruence (A and B) and state–situation congruence (C to F) and predicted values of tiredness

Note. Situation characteristics were reverse-coded (indicated by (r)) such that high values represent more desirable values and are congruent with high values of the personality states. The response surface parameters are listed below

the titles. The blue lines represent the line of congruence (LOC; i.e., $X = Y$) and the line of incongruence (LOIC; i.e., $X = -Y$).

Associations Between Congruence and Stroop Performance

Effects in the Stroop task are often found either regarding reaction times or regarding error rates (Zelenski et al., 2012). We therefore examined both dependent variables separately using specification-curve analyses (Simonsohn et al., 2019).

Associations Between Congruence and Reaction Times

In a first step, we conducted separate response surface analyses for all specifications of the dependent variables and examined interaction effects and fit patterns across the different specifications in descriptive specification curves. Figure 5 shows two examples of such descriptive specification curves for the associations between trait–state and state–situation interactions and reaction times. Figures presenting results of the remaining associations can be found in the OSM. Overall, the descriptive specification curves indicated that none or only very few interactions between personality traits and personality states or between personality states and situation characteristics were significantly associated with reaction times in the Stroop task.

Figure 5C and D indicate which analytic decisions corresponded to the effects depicted in Figure 5A and B. This view can be used to understand how the analytic decisions affect the size of the effect. Only the decision which conditions (incongruent trials only, congruent trials only, neutral trials only, or all trials) were used to calculate reaction times consistently affected the size of the effect: Interaction coefficients were lowest when only neutral trials were analyzed and highest when only incongruent trials were analyzed.

Figure 5

Results from specification curve analyses of the associations between the interaction of trait honesty-humility and state honesty-humility (A, C, E) and of state honesty-humility and reverse-coded adversity (B, D, F) and reaction times in the Stroop task

Note. A and B represent descriptive specification curves with specifications ranked by size and significant specifications marked in blue. C and D present the analytics choices that led to the effects displayed in A and B. E

and F compare the effect observed in the real data (blue and grey dots) to the 2.5th and 97.5th percentiles (dotted lines) of the effects observed in the shuffled data.

In the second step, the descriptive specification curves were compared to under-the-null specification curves in permutations tests. Table 4 summarizes the results from these permutation tests for all analyses. None of the permutation tests for reaction times were significant. That is, the result supported the null hypothesis of no effect across the specification curve. Moreover, Figure 5E and F graphically compare the effects obtained in the original data to the 2.5th and 97.5th percentiles of the ranked effects in the shuffled datasets. As the effects found in the original data were well within the range of effects obtained with the shuffled datasets (in which the null hypothesis of no effect is per definition true), the plots further support the conclusion that there was no interaction effect. Thus, overall, the specification curve analyses clearly indicated that trait–state congruence and state–situation congruence were not significantly associated with reaction times in the Stroop task.

Associations Between Congruence and Error Rates

We repeated the specification curve analyses with error rates as the dependent variables. Figure 6A and B again show two examples of descriptive specification curves, the remaining figures can be found in the OSM. Overall, none or only very few interactions coefficients were significantly associated with error rates in the Stroop task. Moreover, none of the analytic decisions consistently affected the size or direction of the interaction effects (Figure 6C and D and additional figures in the OSM).

Table 4

Summary of the joint significance tests from specification curve analyses

Operationalization and relevant predictor		Observed specification curve			Permutation test	
		Number of specifications	Median effect size	Significant specifications (%)	Number of shuffled samples with more significant specifications than for the original sample	<i>p</i> -value of permutation test
DV: Reaction times						
Interaction	Trait A x State A	2224	-2.00	0	500	> .999
Interaction	Trait HH x State HH	2224	-5.26	1	111	.222
Interaction	State A x Adversity	2224	3.55	0	500	> .999
Interaction	State A x Deception	2224	-3.90	0	500	> .999
Interaction	State HH x Adversity	2224	-2.17	0	500	> .999
Interaction	State HH x Deception	2224	-0.42	0	500	> .999
Fit pattern	Trait A x State A	2224	no	0	193	.386
Fit pattern	Trait HH x State HH	2224	no	2	88	.176
Fit pattern	State A x Adversity	2224	no	0	500	> .999
Fit pattern	State A x Deception	2224	no	0	500	> .999
Fit pattern	State HH x Adversity	2224	no	0	500	> .999
Fit pattern	State HH x Deception	2224	no	0	500	> .999
DV: Error rates						
Interaction	Trait A x State A	556	0.00	12	79	.158
Interaction	Trait HH x State HH	556	0.00	0	500	> .999
Interaction	State A x Adversity	556	0.00	1	302	.604
Interaction	State A x Deception	556	0.00	1	255	.510
Interaction	State HH x Adversity	556	0.00	0	500	> .999
Interaction	State HH x Deception	556	0.00	2	211	.422
Fit pattern	Trait A x State A	556	no	7	134	.268
Fit pattern	Trait HH x State HH	556	no	7	91	.182
Fit pattern	State A x Adversity	556	no	0	500	> .999
Fit pattern	State A x Deception	556	no	21	39	.078
Fit pattern	State HH x Adversity	556	no	0	434	.868
Fit pattern	State HH x Deception	556	no	26	22	.044

Note. Trait A and State A refer to trait and state agreeableness, respectively, and Trait HH and State HH refer to trait and state honesty-humility, respectively. For fit patterns, the median effect size is indicated as presence of a fit pattern (yes) or absence of a fit pattern (no).

Figure 6

Results from specification curve analyses of the associations between the interaction of trait agreeableness and state agreeableness (A, C, E) and of state agreeableness and reverse-coded deception and error rates (B, D, F) in the Stroop task

Note. A and B represent descriptive specification curves with specifications ranked by size and significant specifications marked in blue. C and D present the analytics choices that led to the effects displayed in A and B. E

and F compare the effect observed in the real data (blue and grey dots) to the 2.5th and 97.5th percentiles (dotted lines) of the effects observed in the shuffled data.

Permutation tests confirmed that neither interactions nor fit patterns between personality traits and personality states or between personality states and situation characteristics were associated with error rates in the Stroop task (Table 4). P values of the permutation test were all bigger than $p = .044$ and the effects in the real data were well within the 2.5th and 97.5th percentile of the effects found in the shuffled data (Figure 6E and F). Thus, overall, neither trait–state congruence nor state–situation congruence was significantly associated with error rates in the Stroop task.

Discussion

We examined whether two forms of behavioral congruence, trait–state congruence and state–situation congruence, were associated with positive affect, tiredness, and performance in a Stroop task. Because the experimental manipulations of the situation and the behavior had diffuse, unintended effects in addition to the intended effects, the manipulations were considered unsuccessful. We therefore discarded the experimental manipulation and analyzed the data in a correlative, cross-sectional design as had been preregistered for this case. Overall, we found that state agreeableness and state honesty-humility significantly predicted positive affect and tiredness, but congruence did not. Cognitive performance was not consistently associated with either of the predictors, including trait–state congruence and state–situation congruence.

Experimental Manipulations

This study was originally intended to experimentally manipulate trait–state congruence and state–situation congruence to examine their effects on mood and cognitive performance. We aimed to manipulate the behavior and personality states in a prisoner’s dilemma game by directly

instructing participants to act either honestly and agreeably or dishonestly and disagreeably. Direct instructions as manipulations of personality states have already been used in a few studies (e.g., McNiel et al., 2010; Zelenski et al., 2012) and we therefore expected them to be effective. Interestingly, the instructions did have the intended effects on state agreeableness and state honesty-humility, but they also had unintended effects on state openness, state conscientiousness, and state emotionality. The manipulation had therefore rather unspecific or diffuse effects, affecting not only the targeted personality states but also most of the other personality states. As far as we are aware, previous studies using instructions to manipulate personality states did not report whether their manipulations also affected other personality states and it is therefore unclear whether this is a general problem with this type of manipulation or specific to our study. If such manipulations indeed affected not only the desired variables but also undesired variables, this would be a serious threat to the internal validity of these designs. We therefore strongly recommend that future studies using similar manipulations examine their effects on all personality states to test the specificity of the manipulation.

Additionally, we aimed to manipulate perceived adversity and deception of the game by manipulating the game's payoff structure and the description and behavior of the computer-simulated player. To our best knowledge, no one has manipulated such economic games with the intent to manipulate perceived characteristics of the game before. Our manipulation was therefore novel and exploratory. We observed two main problems with the situation manipulation: First, although the manipulation was significantly associated with the perception of adversity (but not of deception), the effect was rather small. The effect of the manipulation therefore might have been too small to show the hypothesized effects even if the other problems had not existed. Second, as situation perceptions and personality states were interrelated, the effects of the manipulations often showed trends towards interactions between the behavior and situation

conditions. Thus, it may be particularly difficult to manipulate situation perception and personality states independently from each other.

Moreover, the ulterior motive of these manipulations was to manipulate congruence between personality states and personality trait and between personality states and situation characteristics. Descriptive analyses (see OSM) demonstrated that difference scores between the variables (used as an approximation of congruence) differed less between the experimental conditions than the manipulated variables themselves. For example, although state agreeableness was significantly lower in the ‘low agreeableness and honesty’-condition, participants on average behaved more agreeably than normal in all experimental conditions. Thus, experimentally manipulating congruence may be even more challenging as it may require more than just manipulating the involved variables (J. R. Edwards et al., 2006).

Associations Between Congruence and Positive Affect and Tiredness

We cross-sectionally examined how interactions and fit patterns as operationalizations of congruence were associated with positive affect and tiredness. Theories such as trait-activation theory (Tett & Burnett, 2003; Tett & Guterman, 2000) and the contra-trait effort hypothesis (Gallagher et al., 2011) predicted that behaving congruently should be associated with more positive affect and less tiredness, whereas behaving incongruently should be associated with less positive affect and more tiredness. However, we found that neither interactions nor fit patterns were associated with either positive affect or tiredness. Across the two different combinations of trait–state congruence and the four different combinations of state–situation congruence, only state agreeableness and state honesty-humility were significantly associated with positive affect and tiredness.

These findings have both theoretical and practical implications: First, our findings are consistent with those from previous studies that also found no interactions or congruence effects but only main effects of personality states (e.g., Fleeson et al., 2002; McNiel et al., 2010; Zelenski et al., 2012). This supports the concept of trait-state isomorphism (Fleeson et al., 2002): Personality states are functionally equivalent to personality traits, that is, they have the same correlates and consequences. Future research should thus further examine this idea of trait–state isomorphism (e.g., van Allen & Zelenski, 2018). Moreover, not finding congruence effects also stresses the need to reconsider and possibly adapt or discard theories proposing trait–state congruence effects or state–situation congruence such as trait-activation theory (Tett & Burnett, 2003; Tett & Guterman, 2000) or the contra-trait effort hypothesis (Gallagher et al., 2011). Finally, from a more practical perspective, main effects of personality states without any congruence effects may also indicate that people can improve their well-being by behaving extravertedly, agreeably, honestly, openly, and conscientiously more often (e.g., Blackie et al., 2014; Fleeson et al., 2002; Wilt et al., 2012).

However, it is also possible that our sample might have been too small to detect congruence effects. Within-situation effects are typically rather small and unfold their power by accumulating over many situations (Funder & Ozer, 2019; Rauthmann et al., 2015). Particularly interactions and fit patterns are statistically more complex and thus require a bigger sample size than main effects to be reliably detected. We used a previously reported effect size for power considerations for this study, but the reported effect (Zelenski et al., 2012) was based on analyses of variance with a median split. It may therefore not have been the best benchmark for the response surface analyses we finally conducted. Notably, significant congruence effects were most often reported in experience sampling studies (e.g., Jacques-Hamilton et al., 2018; Pickett, Hofmans, Debuscher, et al., 2020; Pickett, Hofmans, Feldt, et al., 2020; but see also Margolis &

Lyubomirsky, 2020), whereas non-significant congruence effects were most often reported in experimental lab studies (e.g., Fleeson et al., 2002; McNiel et al., 2010; McNiel & Fleeson, 2006). One of the systematic differences between these types of studies were their sample sizes with experimental studies typically examining at most 200 participants and experience sampling studies typically examining more than 1,000 different observations. Thus, one might suspect that these differences in sample sizes (and accordingly in statistical power) might at least partially explain the differences in findings.

Overall, we did not find any evidence that trait–state congruence or state–situation congruence were significantly associated with positive affect or tiredness. Even if studies with more statistical power may find some effects, these would presumably be rather small or only occur under specific circumstances. Thus, congruence effects may—if at all—only play a minor role in the associations between personality states and relevant outcomes.

Associations Between Congruence and Stroop Performance

We cross-sectionally examined how interactions and fit patterns as operationalizations of congruence were associated with reaction times and error rates in a Stroop task. We used specification curve analyses to control for researcher degrees of freedom in computing the summary statistics for reaction times or error rates (Simonsohn et al., 2020). Theories such as the contra-trait effort hypothesis (Gallagher et al., 2011) suggested that behaving incongruently depletes self-control and that this self-control is then unavailable for subsequent tasks requiring mental effort. A previous study had already shown Stroop reaction times to be slower when participants acted less extraverted than their trait level (Zelenski et al., 2012). We therefore also hypothesized that trait–state congruence and state–situation congruence would be associated with performance in the Stroop task. However, we found that neither interactions nor fit patterns were

associated with reaction times or error rates in the Stroop task. In fact, Stroop performance was not consistently associated with any of the predictor variables across the different specifications.

These results can be interpreted in different ways: First, the hypothesis may simply be false and subsequent performance is not impaired by incongruent personality states. The hypothesis is based on the ego depletion literature which proposes that self-control is a resource that can be depleted (Baumeister et al., 1998, 2007). However, several recent studies have failed to replicate the ego depletion effect (Carter et al., 2015; Hagger et al., 2016; Lurquin et al., 2016; but consider also Dang et al., 2020) and therefore raised concerns regarding the notion of self-control as a limited resource (Frieze et al., 2019; Inzlicht & Frieze, 2019). This may in turn also raise concerns regarding the theoretical foundation for the hypothesis that congruence affects cognitive performance. Second, self-control includes different responses such as controlling thoughts, regulating emotions, or guiding behavior (Baumeister et al., 2007) and the Stroop task is just one specific measure for one specific aspect of these processes, namely cognitive inhibition (Cohen Kadosh et al., 2011). Thus, it may be that the task did not measure the aspects of self-control that are impacted by incongruent personality states (Gallagher et al., 2011). Third, it could be argued that a certain amount or duration of incongruent personality states is needed to exert enough self-control to have an effect (Gallagher et al., 2011). Our situation may have been too short or the incongruence too small to see the hypothesized effect. Based on our study, we unfortunately cannot conclude which of these explanations is the correct one.

Overall, we did not find any evidence that trait–state congruence or state–situation congruence were significantly associated with cognitive performance in a Stroop task. There are several possible explanations, and based on our study, we unfortunately cannot conclude which of these explanations is correct. However, since the theoretical basis for these hypotheses is

currently under heavy criticism, future research seems best advised to wait and see what the ego depletion debate yields before further applying these theories to incongruent personality states.

Importance of Statistical Operationalizations

Our study emphasizes the importance of operationalizations and analytic decisions. Congruence is a concept that has been examined using a multitude of operationalizations from difference scores to interactions to polynomial regressions and response surface analyses (e.g., J. R. Edwards, 1993; Humberg, Dufner, et al., 2019). In our study, we have seen that operationalizing congruence as interaction effects and fit patterns did not always yield the same results. Therefore, it is important to carefully decide on the operationalization to use and to be aware of the implications of these decisions. Additionally, the theoretical concept of congruence needs to be further refined so that it becomes clearer which operationalizations are appropriate under which circumstances and thus which empirical findings are informative for these theories and which are not.

Moreover, our study has demonstrated that analytic decisions regarding the calculation of summary statistics are also important and can possibly affect the conclusions. We conducted specification curve analyses (Simonsohn et al., 2020) to account for the multitude of possible analytic decisions regarding the calculation of reaction time and error rate indices in the Stroop task. In the specification curve analyses, we found that the results indeed differed depending on the analytic decisions. Particularly the decision over which type of trials the reaction times were computed (i.e., all trials vs. only congruent vs. only incongruent vs. only neutral trial) impacted the results regarding interaction coefficients. Overall, then, this study emphasizes that researchers should be aware of the importance and implications of their decisions and actively incorporate

the implications of these decisions into their research more often, for example, using specification curve analyses (Simonsohn et al., 2020).

Limitations and Future Directions

Beyond the well-known and often discussed limitations of self-reports and WEIRD samples (Henrich et al., 2010), this study had a few rather specific limitations. First, the study was conducted online, which allowed us to collect a bigger and more diverse sample than possible in the lab, but also led to complications. We had, for example, less control over the participants and their environments and possible distractions in such an online study. This might be particularly important when cognitive tasks such as the Stroop task are included. Moreover, situation research in an online study may also bring about some challenges because it is unknown how comparable online situations are to “real” situations in the lab or even in everyday life. It is therefore possible that participants would have perceived and reacted to a comparable prisoner’s dilemma game in the lab differently than to the online game. Researching situations online could be a great opportunity for situation research as it makes larger and more diverse samples accessible, however, future research should first aim to learn more about differences and similarities of situations and situation perception online and offline.

Conclusion

The present study aimed to examine effects of trait–state and state–situation congruence on mood and cognitive performance. First, as the manipulations had rather diffuse effects, the study emphasized the difficulty of manipulating personality states, situation characteristics, and congruence in general. Second, in cross-sectional response surface analyses, we found that neither interactions nor fit patterns between personality traits and personality states or between

personality states and situation characteristics were associated with positive affect, tiredness, or performance in a Stroop task. Instead, positive affect and tiredness were only associated with personality states and Stroop performance was not consistently associated with any of the predictors at all. Overall, we concluded that most likely, congruence effects may—if at all—only play a minor role in the associations between personality states and relevant outcomes. Finally, from a methodological point of view, more studies that are carefully designed, carefully operationalized, and well-powered are needed to examine effects of congruence on relevant outcomes such as mood and tiredness and the manipulation of personality states, situation perceptions, and congruence in general.

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