

Dissociating indifferent, directional, and extreme responding in personality data

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Dissociating Indifferent, Directional, and Extreme Responding in Personality Data: Applying the Three-Process Model to Self- and Observer Reports

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Abstract

Research suggests that respondents vary in their tendency to use the response scale of typical (Likert-style) questionnaires. We study the nature of the response process by applying a recently introduced item response theory modeling procedure, the three-process model, to data of self- and observer reports of personality traits. The three-process model captures indifferent, directional, and extreme responding. Substantively, we hypothesize that, and test whether, trait Honesty-Humility is negatively linked to extreme responding. We applied the three-process model to personality data of 577 dyads (self- and observer reports of the HEXACO Personality Inventory-Revised; Lee & Ashton, 2006) of Dutch and German undergraduate respondents. First, we provide evidence that indifferent, directional, and extreme responding can be separated from each other in personality data through the use of the three-process model. Second, we show that the various response processes show a pattern of correlations across traits and rating sources which is in line with the idea that indifferent and extreme responding are person-specific tendencies, whereas directional responding is content-specific. Third, we report findings supporting the hypothesis that Honesty-Humility is negatively linked to extreme responding. In Likert-based personality data, applying the three-process model can unveil individual differences in the response process.

In the social sciences and many applied fields, questionnaires are arguably one of the most pervasive sources of data. Especially in the field of personality psychology, researchers frequently ask participants to complete questionnaires with multipoint response scales (e.g., *strongly disagree*, *disagree*, *neutral*, *agree*, and *strongly agree*), seeking information about traits, states, thoughts, emotions, and behavior. Generally, the validity of questionnaire-based test score interpretations has been well supported. For instance, research has indicated strong overlap between self- and observer ratings of personality traits (e.g., Lee & Ashton, 2006), and plausible relations between questionnaire-measured variables and “actual behavior” have been found (e.g., Hilbig, Glöckner, & Zettler, 2014).

However, some caveats of questionnaires have also been noted. In particular, researchers have voiced concerns about the extent to which a questionnaire-based test score reflects a

respondent’s true level of the targeted construct. Among other possible distorting influences (e.g., faking; Ziegler, MacCann, & Roberts, 2012), it has been suggested that respondents vary in their use of the response scale itself (e.g., Möttus et al., 2012; Van Vaerenbergh & Thomas, 2012). Such individual differences in using response scales can easily distort estimates of questionnaire-based measurement—even to the extent of implying reversed conclusions (e.g., Johnson, 2003; Moors, 2012).

Consider the fictitious—and, for illustration, extreme—example of three individuals who complete a personality questionnaire. Assume the three have the same underlying level of Openness to Experience, but they differ in their tendency to use

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the extreme response options: One answers with “strongly agree” to each Openness to Experience item, one answers with “strongly agree” to half of the items and with “agree” to the other half, and one answers with “agree” to each item. In the 100-item HEXACO Personality Inventory-Revised (HEXACO-PI-R; Lee & Ashton, 2006), for instance, the first respondent would have an Openness to Experience z -score of 2.65, the second would have a z -score of 1.82, and the third would have a z -score of 0.98. As this vividly demonstrates, individual differences in responding, rather than actual differences in the underlying trait, can affect the resulting test scores.

In this article, we delve into corresponding response processes from different angles. First, we describe a recently introduced item response theory (IRT) tree model, the three-process model (Böckenholt, 2012), that considers three response processes when individuals answer Likert items. These response processes are (a) indifference, that is, the tendency to endorse the neutral response option; (b) direction, that is, the tendency to answer in the direction of the trait; and (c) intensity, that is, the tendency to endorse the extreme response options. Second, to the best of our knowledge, we are the first to apply this model to data of self- and observer reports of basic personality traits. In doing so, we provide information on whether and how the three processes can be separated from each other, as well as on the importance of this dissociation in Likert-based (personality) data. Third, we link the IRT-estimated individual differences in the three processes across both personality traits and self- and observer ratings. Considering different traits provides information on the extent to which indifference, direction, and intensity apply similarly irrespective of questionnaire content. Considering two rating sources provides information on the extent to which indifference, direction, and intensity are person- versus content-specific. Fourth, we hypothesize that, and test whether, trait Honesty-Humility is negatively linked to intensity.

Multiple Response Processes

For some decades, researchers have assumed that respondents of Likert scale questionnaires vary in their tendency to use the response categories (e.g., Hamilton, 1968; Light, Zax, & Gardiner, 1965). This idea has been investigated particularly within the response styles framework. Several response styles, such as a midpoint response style or an extreme response style, have been introduced (Baumgartner & Steenkamp, 2001; Weijters, Geuens, & Schillewaert, 2010; Wetzel, Carstensen, & Böhnke, 2013), and it has been repeatedly suggested that response styles can affect estimates of means, variances, correlations etc. and consequently threaten the validity of test score interpretations (e.g., Chun, Campbell, & Yoo, 1974; Johnson, 2003; Moors, 2012). Thus, methods assessing response styles—or, more generally, response behavior to Likert scale questionnaires—have been put forward (for a recent overview, see Van Vaerenbergh & Thomas, 2012).

There exists a multitude of approaches to dealing with response processes in Likert-based data. For instance, it has been suggested to simply count the number of responses to a specific response category in a questionnaire (e.g., Bachman & O'Malley, 1984), or to apply this counting technique only to a subset of items that have low inter-item correlations and a similar pattern of response proportions (e.g., Greenleaf, 1992), or to use latent class or mixed Rasch modeling (e.g., Austin, Deary, & Egan, 2006). In the latter approach, typically subgroups of respondents who differ in their use of the response scale are identified, and each subgroup is inferred to represent a particular responding behavior.

Whereas these approaches have their own pros and cons (e.g., cf. De Jong, Steenkamp, Fox, & Baumgartner, 2008; Van Vaerenbergh & Thomas, 2012), they share a lack of conceptual ideas about how respondents decide to choose a specific option as their answer. In particular with regard to this missing conceptualization, Böckenholt (2012) recently introduced a strikingly different approach that accounts for the response process in terms of decision-making steps. Specifically, he suggested that multiple response processes occur when participants answer Likert items, and that IRT tree models (De Boeck & Partchev, 2012) can be used to estimate these processes.

Conceptual Idea of the Three-Process Model

According to Böckenholt's (2012) approach, a respondent's decision to choose a specific response category when answering a Likert item is guided by underlying processes. Among others, Böckenholt described the three-process model, which is tailored to Likert items with five answer options (note that this approach could also be applied to other numbers of response options). In this model, responses are explained through a series of three conceptually distinct decision-making processes, namely, indifference, direction, and intensity.

The three-process model presumes that respondents sequentially execute up to three decision-making processes—first indifference, then direction, and finally intensity—when answering 5-point Likert items. Figure 1 displays the three-process model as a decision tree. In the first process, indifference, people decide whether they have a clear opinion about the item content. If this is not the case, they decide to endorse the middle category of the response scale (*neutral*) and the response process ends. If one is not in the state of indifference, the second and the third processes come into play. In the second process, direction, people decide whether they agree or disagree with the item content. Consequently, they decide toward which pole of the scale they lean. In the third process, intensity, people finally decide how strong this tendency is, choosing between the extreme response category and the less extreme response category (*strongly disagree* vs. *disagree* or *strongly agree* vs. *agree*). So, according to the three-process model, responses are either governed by one decision-making process (when indifference is endorsed) or

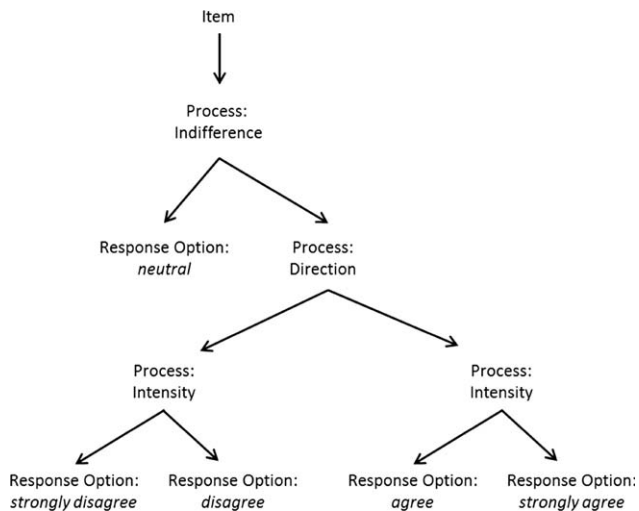


Figure 1 Exemplification of the three-process model (adapted from Böckenholt, 2012).

three (when indifference is not endorsed). As the three-process model thus provides a clear account of how respondents choose a specific answer option, it potentially overcomes the typical lack of conceptual ideas in accounting for individual differences in the response process.

Importantly, the three-process model does not presume that indifference and intensity are necessarily unrelated to the item content in a questionnaire. For instance, a respondent may have no particular opinion (resulting in a high indifference estimate) or strong feelings (resulting in a high intensity estimate) regarding some specific contents. However, if individual differences in indifference and intensity independent of item content exist, then respondents must show similar such tendencies (of using the neutral and/or extreme answer options) across different contents (i.e., scales). Direction, by contrast, is defined as the process that is entirely conditional on the content of a scale and, in turn, must differ across sufficiently different target contents.

Applying the Three-Process Model to Personality Traits Data

Despite the apparent strengths of the three-process model in providing a specified decision-process account of response behavior that conceptually dissociates indifferent, directional, and extreme responding, empirical evidence for the model's usefulness is, as yet, relatively scarce. That is, the model has not been applied to data of self- and observer reports of basic personality traits. Such cross-source data are essential for a strict test of the notion that indifference and intensity are individual response tendencies (i.e., hold within a respondent and across different scale contents—but not across sources), whereas direction is related to the targeted content (i.e., holds across sources for the same content but not across different contents). Thus, assuming that the general idea of individual differences in the response

process holds and that the three-process model can dissect these differences, we herein apply the three-process model to self- and observer reports of basic personality traits. Specifically, we expect the following—first referring to the application of the three-process model in general, and then to a pattern of correlations across the response processes (for clarification, we briefly repeat the main reasoning for Hypotheses 2a–2e):

HYPOTHESIS 1. Applying the three-process model to Likert-based data of self- and observer reports of basic personality traits reveals individual differences in the response processes indifference, direction, and intensity.

HYPOTHESIS 2a. Both indifference and intensity correlate across different traits within the same rating source. The reason is that both indifference and intensity reflect tendencies of a particular respondent and should thus apply similarly to different targeted contents.

HYPOTHESIS 2b. Direction does not correlate across the different traits within the same rating source. The reason is that a respondent's agreement with a certain content should vary across different targeted contents.

HYPOTHESIS 2c. Direction correlates for the same trait between self- and observer reports. The reason is that target participants and observers should tend to agree when questioned about the same targeted content.

HYPOTHESIS 2d. Both indifference and intensity do not correlate across the different traits between self- and observer reports.

HYPOTHESIS 2e. Both indifference and intensity do not correlate for the same trait between self- and observer reports. For Hypotheses 2d and 2e, the reason is that both indifference and intensity are considered individual differences variables and, thus, to be person-specific.

Predicting an Extreme Response Style

Beyond attempting to capture the response process in Likert-based data, researchers have also aimed to identify predictors or correlates of specific response behaviors. Next to studies focusing on situational or cultural effects (e.g., Johnson, Kulesa, Cho, & Shavitt, 2005), individual differences variables have also been considered. For instance, sex, age, and education have repeatedly been related to an extreme response style. However, across different studies, rather small associations have typically been observed, and findings appear to be inconsistent (cf. e.g., Böckenholt, 2012; Greenleaf, 1992; Light et al., 1965). Concerning basic personality factors, Austin et al. (2006), for instance, found Big Five Conscientiousness and Extraversion to be positively related to an extreme response style. However, no theoretical underpinnings for these results have been provided (Naemi, Beal, & Payne, 2009), and other investigations did not

find comparable results (Paulhus, 1991). Thus, little is known about whether and which basic personality dimensions affect specific response behaviors.

Naemi et al. (2009) found observer ratings of decisiveness, intolerance of ambiguity, and simplistic thinking to be positively related to an extreme response style. While this study has several advantages, such as providing a sophisticated theoretical background and relying on observer reports for assessing the predictor variables, one might argue that the predictors do not represent basic traits with regard to more widely accepted frameworks of personality structure or that scales assessing the predictor variables were adapted after the data were obtained. Importantly, these potential limitations should not be taken as refutations of Naemi and colleagues' findings. Rather, they strongly imply that more research on the effects of individual differences in response behavior is required (Böckenholt, 2012; Wetzel et al., 2013). We aim to contribute to this quest by combining the most important strengths of Naemi and colleagues' (2009) work (i.e., providing a theoretical underpinning and using observer ratings of personality characteristics) with attempts to overcome the potential limitations.

Honesty-Humility and Intensity

Lexical studies across various languages (Lee & Ashton, 2008) have suggested that personality can be adequately described via six basic traits, summarized in the HEXACO Model of Personality (Ashton & Lee, 2007). Three of the HEXACO traits (Conscientiousness, Extraversion, Openness to Experience) are essentially identical, and two (Agreeableness, Emotionality) are similar to traits from the well-known Big Five. However, compared to the Five-Factor Model, the HEXACO model also includes a sixth trait, called Honesty-Humility. It represents individual differences in being honest, modest, and sincere versus boastful, deceitful, and greedy. The inclusion of Honesty-Humility as a basic personality trait has not only been supported by lexical studies, but also by findings indicating that this trait explains unique variance in diverse criteria beyond the other five traits (e.g., Ashton & Lee, 2008).

Importantly, Ashton and Lee (2007, 2008) describe individuals low in Honesty-Humility as striving for power and social status, which is substantiated by negative correlations between this trait and materialistic tendencies (Ashton & Lee, 2008), the motivational value of power (Pozzebon & Ashton, 2009), and status-driven risk taking (Ashton, Lee, Pozzebon, Visser, & Worth, 2010). Moreover, several studies have indicated a negative relation between Honesty-Humility and social dominance orientation (e.g., Lee et al., 2013), a social attitude reflecting "a preference for social hierarchy and inequality" (p. 170). Thus, individuals low in Honesty-Humility can also be characterized by endorsing orders, rankings, and differentiations. Given this link between Honesty-Humility and a desire for power, social status, and, more generally, maximizing differences between

individuals, we hypothesize that it is also predictive of the response process intensity.

Specifically, we presume that a preference for differentiations will result in a stronger use of extreme response options: When participants are asked to provide information about themselves, they often "have no way to judge in an absolute sense what they do, but they also need to rely on social comparisons (even implicitly) with other relevant persons" (Perugini & Richetin, 2007, p. 978). Thus, frame-of-reference effects (cf. Ashton, 2007; Heine, Lehman, Peng, & Greenholtz, 2002) impact the judgments on an individual basis. Given that those low in Honesty-Humility strive for making distinctions and differences between people, they should tend to make use of the full range of answer options, selecting extreme response options more often. Individuals high in Honesty-Humility, by contrast, should display much less pull toward maximizing differences, as their trait-related values include more egalitarian notions and modesty. Indeed, it is most plausible that they tend to provide genuine information without any increased motivation to emphasize differences by means of extreme positions. Consequently, there should be a negative link between Honesty-Humility and intensity.

Indirect support for this conjecture can be found in a study by Triandis and Triandis (1962), in which people with high levels on a social distance scale (a scale in which a person indicates the distance that exists between her-/himself and another person) gave more extreme responses. Also, findings from cross-cultural research indicate that variables theoretically associated with low Honesty-Humility, such as power distance or individualism, are positively related to using the extreme response options more often (Harzing, 2006; Johnson et al., 2005). So, based on the HEXACO theory and previous findings concerning constructs entailing conceptual overlap with Honesty-Humility, we hypothesize the following:

HYPOTHESIS 3. There is a negative correlation between Honesty-Humility and intensity.

METHOD

Procedure and Participants

Study materials were distributed to students of two undergraduate courses in psychology at a Dutch university close to the Dutch–German border. The study materials consisted of two sets, each comprising questions concerning demographic information and a questionnaire assessing the six traits of the HEXACO model as self- or observer ratings. Specifically, students were asked to pass on the set assessing self-ratings of personality to a closely acquainted person (e.g., friend, partner, relative), who served as the target, and to complete observer reports of targets' personality themselves. Students received partial course credit for returning both questionnaires. In order to mitigate problems concerning careless responding or even faked respondents (e.g., students could have completed both questionnaire sets by themselves), we not only checked for any

conspicuous features in the returned questionnaires, such as straight-line responding (i.e., long strings of the same response category) or similar handwriting in questionnaire sets, but also asked for an enclosed consent form signed by the acquaintances. In total, 615 out of 659 complete sets of questionnaires were returned (response rate = 93%).

In accordance with their language background, students could choose between a Dutch, an English, or a German version of the set of questionnaires. From the 615, 376 (61%) chose the Dutch, 38 (6%) the English, and 201 (33%) the German version. Because of the small number of participants, the data regarding the English version were not analyzed further. Analyses concerning the Dutch- and German-speaking participants were run for both groups separately and jointly. As the results were very similar, and for the sake of simplicity, we herein report the findings for the total data set ($N = 577$). Fifty-one percent of the target participants and 73% of the observers were female, the mean age was 30 years ($SD = 14$, range = 16–72) for target participants and 21 years ($SD = 3$, range = 18–54) for observers, and observers indicated knowing the target participants for a mean of 11 years ($SD = 9$).

Measures

Target participants' traits were assessed via the self- and observer report form of the 200-item HEXACO-PI-R (Lee & Ashton, 2006), assessing each trait of the HEXACO model via 32 items on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The 32 items per trait can further be grouped into four facets per trait, each composed of eight items. The items are ordered in such a way that the factors always alternate in the order Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. In addition, within a factor, the items are ordered in such a way that the four facets alternate. Between 13 and 22 of the items for each trait are worded negatively (i.e., have to be recoded). Sample items can be found at www.hexaco.org.

Analyses

The structure of the analyses section is fourfold. First, we describe the statistical specification of the three-process model. Second, we describe how individual differences in indifference, direction, and intensity in self- and observer reports are approximated via the three-process model (referring to Hypothesis 1). Third, we describe how we test the patterns of correlations for indifference, direction, and intensity across traits and rating sources (referring to Hypotheses 2a–2e). Finally, we describe how we test the idea that Honesty-Humility is negatively linked to intensity (referring to Hypothesis 3).

Specification of the Three-Process Model. The conceptual idea underlying the three-process model—that participants conduct up to three decision-making processes when responding to a

Likert item—can be translated into an IRT tree model (Böckenholt, 2012; De Boeck & Partchev, 2012; Tutz, 1990). An IRT tree model assumes that more than one response process occurs per item and therefore splits the information from an item into separate processes. Each response process is called a pseudoitem and is modeled by a separate Rasch-type model. The different processes are nested in each other. That is, the second process is conditional on the first, and the third is conditional on the second. IRT tree models are a form of the generalized multilevel mixed-effects model and can therefore be fitted using multilevel software.

To illustrate the differences between the three-process model as an IRT tree model and traditional scoring of Likert scales, it is helpful to consider how the information from a questionnaire is transformed. Figure 2 shows how the data from a 5-point Likert scale are typically scored, and how they are transformed into the long-format scoring and into the conceptually equivalent wide-format representation. IRT tree models are typically analyzed via software using the long-format scoring. An advantage of long-format scoring is its convenience for dealing with values that are missing by design in tree models. In the three-process model, direction and intensity are missing by design whenever indifference is endorsed. The wide-format representation shows that the data structure underlying the three-process model basically measures three different traits—indifference, direction, and intensity—for each item, which can then be correlated with each other.

Mapping to its conceptual idea, the first pseudoitem of the three-process model (Pseudoitem I) captures whether a respondent endorses indifference. If indifference is endorsed, the response process ends. If indifference is not endorsed, the two other pseudoitems become active. Pseudoitem II captures direction, and Pseudoitem III captures intensity. Table 1 shows the probabilities that person i selects item j 's response category 1 (*strongly disagree*), 2 (*disagree*), 3 (*neutral*), 4 (*agree*), or 5 (*strongly agree*). As can be seen therein, for each Likert item, the model estimates three item parameters ($\gamma_j^{(I)}$, $\gamma_j^{(II)}$, and $\gamma_j^{(III)}$) and three latent traits ($\theta_i^{(I)}$, $\theta_i^{(II)}$, and $\theta_i^{(III)}$).

Note that in this model specification, the cumulative standard normal distribution was used as the link function (also known as the probit or the ogive model; Bimbaum, 1968). An advantage of using the cumulative standard normal distribution is that response processes can be interpreted on the basis of the well-known normal distribution. Specifically, probit values can be interpreted like z -values. For instance, a probit value of 0 corresponds to a 50% chance that the response of interest occurs, and a probit value of 1 corresponds to an 84% chance. In specifying the three-process model using a probit link function, person and item parameters indicate the degree to which different persons and items affect the probability that the three processes occur on the probit scale. For instance, consider a hypothetical scenario in which a person i with a person parameter $\theta_i^{(II)}$ of -0.8 for direction works on an item j with an item parameter $\gamma_j^{(II)}$ of 1.2 after already deciding to answer to the item. The predicted response tendency that the person answers with *agree* or *strongly agree* after already deciding to answer would then be $-0.8 + 1.2 = 0.4$ on the probit scale which is equal to a probability of 66 percent.

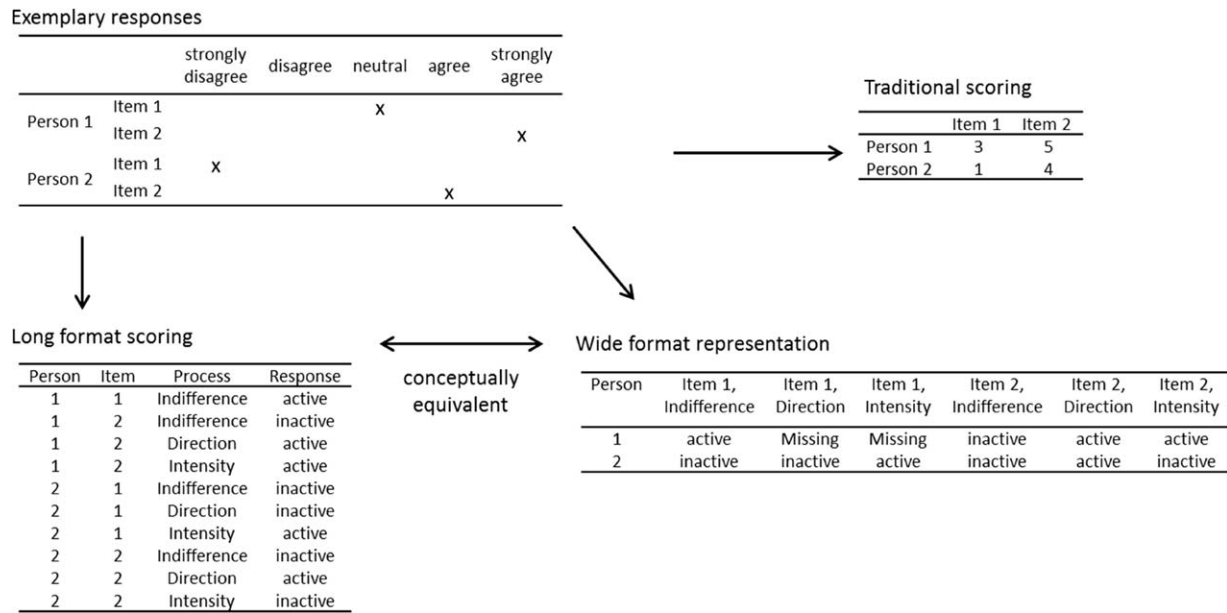


Figure 2 Exemplary transformations of responses into long-format scoring and wide-format representation.

Please note that this model specification is identical to Böckenholt’s (2012), with the exception that we use the mixed-effects nomenclature like De Boeck and Partchev (2012). That is, we write $\gamma_j + \theta_i$ instead of $\theta_i - \gamma_j$. The reason for this is that the mixed-effects nomenclature allows us to directly interpret the coefficients that the mixed-effects modeling software estimates. We believe that this nomenclature is more useful for readers who use the three-process model in the R environment (R Core Team, 2014) or similar software (e.g., GLIMMIX; SAS Institute, 2013).

The coding of the pseudoitems is as follows: Pseudoitem I is coded 0 when indifference is endorsed, Pseudoitem II is coded 1 when direction is endorsed, and Pseudoitem III is coded 0 when intensity is endorsed. The type of coding for I (indifference) and III (intensity) may appear to be counterintuitive, as most models use 1 when a state is present and 0 when it is not. But in the three-process model, this type of coding is needed for technical reasons (e.g., to adequately model the activation-deactivation process of indifference).

Table 1 Category Probabilities of the Three-Process Model

Response Option	Category Probabilities
Strongly disagree	$\Phi(\gamma_j^{(I)} + \theta_i^{(I)})[1 - \Phi(\gamma_j^{(II)} + \theta_i^{(II)})][1 - \Phi(\gamma_j^{(III)} + \theta_i^{(III)})]$
Disagree	$\Phi(\gamma_j^{(I)} + \theta_i^{(I)})[1 - \Phi(\gamma_j^{(II)} + \theta_i^{(II)})]\Phi(\gamma_j^{(III)} + \theta_i^{(III)})$
Neutral	$1 - \Phi(\gamma_j^{(I)} + \theta_i^{(I)})$
Agree	$\Phi(\gamma_j^{(I)} + \theta_i^{(I)})\Phi(\gamma_j^{(II)} + \theta_i^{(II)})\Phi(\gamma_j^{(III)} + \theta_i^{(III)})$
Strongly agree	$\Phi(\gamma_j^{(I)} + \theta_i^{(I)})\Phi(\gamma_j^{(II)} + \theta_i^{(II)})[1 - \Phi(\gamma_j^{(III)} + \theta_i^{(III)})]$

Note. Adapted from Böckenholt (2012). Response option labels are examples, representing any original scale. Φ = short form of the cumulative standard normal distribution for the ogive version of the Rasch model; $\gamma_j^{(I)}$ = item difficulty parameter for indifference; $\gamma_j^{(II)}$ = item difficulty parameter for direction; $\gamma_j^{(III)}$ = item difficulty parameter for intensity; $\theta_i^{(I)}$ = person’s latent trait to endorse indifference; $\theta_i^{(II)}$ = person’s latent trait to endorse direction; $\theta_i^{(III)}$ = person’s latent trait to endorse intensity.

The three latent traits— $\theta_i^{(I)}$, $\theta_i^{(II)}$, and $\theta_i^{(III)}$ —are modeled as random effects and are thus allowed to correlate with covariance matrix Σ_1 and are assumed to follow a trivariate normal distribution. Item-level variability in indifference, direction, and intensity can be modeled as fixed effects (i.e., persons as random, items as fixed; cf. Böckenholt, 2012) or as random effects (i.e., persons and items as random; cf. De Boeck, 2008; De Boeck & Partchev, 2012). When items are modeled as fixed effects, each item has fixed effects for each of the three processes and no intercept and there are no assumptions on the distribution of the item effects. When items are modeled as random effects, the model has fixed-effects intercepts for each of the three processes that indicate the average item effect and random effects for each item that indicate to what degree the item deviates from this average. The item effects in Table 1, $\gamma_j^{(I)}$, $\gamma_j^{(II)}$, and $\gamma_j^{(III)}$, consequently consist of the average item effect and the random effect for the item. We modeled items as random because inventories capturing personality traits, such as the HEXACO-PI-R, typically contain items that are sampled from a population of similar items and do not constitute a fixed, exhaustive set (De Boeck, 2008). It was consequently feasible to treat items as random effects and assume that differences between items follow a trivariate normal distribution with covariance matrix Σ_2 . The advantages of modeling items as random are that corresponding models are more parsimonious and directly estimate correlations and variances of item effects. Thus, random characteristics of persons and items can readily be compared. In practice, substantive conclusions from models with fixed item effects and similar models with random item effects rarely differ (De Boeck, 2008).

Individual Differences in Indifference, Direction, and Intensity. We fit the three-process model as described using the glmer function in the lme4 package (Bates, Maechler,

Bolker, & Walker, 2013) in the R environment (R Core Team, 2014). For data preparation, we used the *irtree* package (De Boeck & Partchev, 2012). In order to investigate Hypothesis 1, we especially considered the person random effects for each trait and rating source to evaluate whether people systematically differ in indifference, direction, and intensity. We also calculated the correlations between the response processes for each trait and rating source to investigate the extent to which the response processes capture overlapping response behavior. Finally, we tested whether each component of the three-process model improved the model fit. To this end, we contrasted the full three-process model for each trait and rating source with constrained versions in terms of constraining variability in one of the processes of indifference, direction, and intensity (but leaving the fixed effect for these processes in the model) using the Bayesian information criterion (BIC). The BIC is a conservative index penalizing model complexity, which becomes smaller when a model provides a better fit to the data. Δ BIC values of more than 10 are commonly considered as strong evidence for one model over another (Raftery, 1995). When BIC values indicate that a more complex model provides a better fit, χ^2 -difference tests also indicate that the more complex model provides a better fit. We thus only report BIC values.

Analyzing the Correlation Pattern of Indifference, Direction, and Intensity. To investigate the correlation pattern of indifference, direction, and intensity across both traits and rating sources, we calculated several means across different bivariate correlations. First, for each response process, we calculated the means of all possible bivariate correlations between any two traits *within* both self- and observer reports. For instance, we calculated the mean for the correlations within self-reports between indifference concerning Honesty-Humility and indifference concerning Emotionality, indifference concerning Honesty-Humility and indifference concerning Extraversion, and so on. Second, for each response process, we calculated the means of all possible bivariate correlations between any two traits *between* self- and observer reports. Finally, for each response process, we calculated the means of correlations for the *same* trait between self- and observer reports. For comparison, we repeated these analyses with the raw scores of the HEXACO-PI-R.

Analyzing Whether Honesty-Humility Is Linked to Intensity. To investigate whether Honesty-Humility is linked to intensity, we calculated the correlations between the latent variable estimate for the direction process concerning Honesty-Humility in both self- and observer reports and the mean latent variable estimate of intensity concerning the other traits in self-ratings. We built a composite across the five other traits instead of looking at the correlations with the intensity estimates of the other traits individually because this allowed for a more generalizable interpretation of the results. We did not include intensity concerning Honesty-Humility in the composite to rule out any potential confound between direction and intensity concerning Honesty-Humility.

We also investigated whether the emerging results apply to Honesty-Humility in particular (and are not a spurious outcome due to any unconsidered relations between direction concerning Honesty-Humility and the intensity composite). To this end, we repeated our analytical strategy for all other traits. That is, we correlated direction concerning each remaining trait in both self- and observer reports with a composite of intensity in self-reports concerning the respective five remaining traits. For instance, we correlated direction concerning Emotionality in self- and observer reports with a composite of intensity concerning the five other traits in self-reports.

RESULTS

Means, standard deviations, intercorrelations, and Cronbach's alpha (α) coefficients of all variables (non-IRT-based) for self- and observer reports are listed in Table 2. The correlations between all indifference, direction, and intensity processes (IRT-based) across traits and rating sources can be found in the supplemental material.

Application of the Three-Process Model

Table 3 shows the fixed effects, item and person random effects, and model information for the full three-process model for each trait and both rating sources. It also provides information on differences between the full and constrained models using BIC. As shown therein, the item and person variability in all processes was substantial and considerably improved model fit. That is, σ^2 differed from 0 in all response processes for both item and person random effects for all traits in both self- and observer reports.

The correlations between the response processes indicate that they can be separated from each other. More precisely, the correlations between indifference and intensity, on the one hand, and direction, on the other, were generally small to medium-sized for both item ($M_r = .34$) and person random effects ($M_r = .19$) across traits and rating sources. The correlations between indifference and intensity were negative throughout all analyses ($-.86 \leq r \leq -.39$). The same conclusion emerges from the Δ BIC values, indicating that, across traits and rating sources, all model components were significant ($91 \leq \Delta$ BIC ≤ 3172). Together, these findings indicate that the response process to Likert items can be divided into indifference, direction, and intensity via the three-process model. Concerning Hypothesis 1 more specifically, the person variability effects in indifference, direction, and intensity ($0.10 \leq \sigma^2 \leq 0.80$) indicate that participants differed in the response processes, substantiating the view that they reflect individual differences variables. In sum, these findings corroborate Hypothesis 1.

Pattern of Correlations Across the Response Processes

Table 4 provides a summary of the mean correlations as described above. As shown therein, intensity values

Table 2 Means, Standard Deviations, Cronbach's Alphas, and Intercorrelations of the Variables (Non-IRT-Based)

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. H-SR	3.54	0.54	(.90)											
2. E-SR	3.12	0.49	.20*	(.89)										
3. X-SR	3.57	0.48	-.13*	-.14*	(.90)									
4. A-SR	2.93	0.47	.34*	-.08	.17*	(.88)								
5. C-SR	3.29	0.48	.19*	-.03	.16*	.05	(.87)							
6. O-SR	3.21	0.54	-.01	-.01	.17*	.04	.00	(.88)						
7. H-OR	3.53	0.58	.67*	.18*	-.14*	.29*	.09*	-.05	(.92)					
8. E-OR	3.10	0.54	.28*	.73*	-.14*	-.05	.02	-.03	.19*	(.92)				
9. X-OR	3.60	0.51	-.12*	-.08	.71*	.13*	.04	.12*	-.07	-.17*	(.92)			
10. A-OR	2.96	0.56	.30*	.02	.06	.60*	.05	.04	.48*	-.03	.14*	(.93)		
11. C-OR	3.34	0.59	.21*	.09*	.01	.00	.62*	-.08*	.23*	.17*	.01	.08*	(.92)	
12. O-OR	3.00	0.56	.02	.04	.08	.04	-.04	.72*	.05	.03	.14*	.08	.02	(.90)

Note. $N = 577$. Cronbach's alphas are in the diagonal. H = Honesty-Humility; E = Emotionality; X = Extraversion; A = Agreeableness; C = Conscientiousness; O = Openness to Experience; SR = self-reports; OR = observer reports.
 * $p < .05$, two-tailed.

substantially correlated within both self- ($M_r = .56$) and observer reports ($M_r = .46$), indicating that participants' tendency to endorse the extreme response options generalized across traits. The same, albeit to a smaller extent, applies to indifference

($M_r = .42$ and $M_r = .30$), but not to direction ($M_r = .07$ and $M_r = .09$). Thus, Hypotheses 2a and 2b were supported. Direction correlated for the same trait between self- and observer reports ($M_r = .65$), supporting Hypothesis 2c. Both indifference

Table 3 Effect Estimates of the Three-Process Model for Self- and Observer Reports

	Self-Reports						Observer Reports						
	H	E	X	A	C	O	H	E	X	A	C	O	
Fixed effects													
Direction	0.80	0.27	0.98	-0.11	0.45	0.38	0.80	0.23	1.07	-0.09	0.54	0.07	
Indifference	0.94	0.88	0.88	0.81	0.90	0.82	0.97	0.89	0.97	0.84	0.92	0.78	
Intensity	0.59	0.83	0.83	1.19	0.89	0.64	0.70	0.94	0.89	1.11	0.85	0.77	
Item random effects													
$\sigma^2_{\text{Direction item}}$	0.28	0.47	0.40	0.54	0.32	0.29	0.23	0.41	0.42	0.53	0.34	0.29	
$\sigma^2_{\text{Indifference item}}$	0.05	0.04	0.10	0.03	0.06	0.06	0.03	0.03	0.08	0.02	0.04	0.08	
$\sigma^2_{\text{Intensity item}}$	0.10	0.06	0.11	0.09	0.06	0.08	0.11	0.07	0.11	0.10	0.09	0.10	
$r_{\text{Direction item, Indifference item}}$.47	-.06	.82	.00	.29	-.21	.58	.01	.87	.21	.24	-.43	
$r_{\text{Direction item, Intensity item}}$	-.40	.15	-.56	-.22	-.30	.09	-.47	.23	-.49	-.42	-.12	.40	
$r_{\text{Indifference item, Intensity item}}$	-.73	-.62	-.78	-.76	-.66	-.82	-.79	-.58	-.74	-.78	-.74	-.86	
Person random effects													
$\sigma^2_{\text{Direction person}}$	0.60	0.54	0.57	0.50	0.46	0.49	0.70	0.76	0.79	0.80	0.79	0.59	
$\sigma^2_{\text{Indifference person}}$	0.16	0.15	0.17	0.16	0.15	0.10	0.17	0.13	0.14	0.13	0.12	0.12	
$\sigma^2_{\text{Intensity person}}$	0.40	0.35	0.41	0.39	0.34	0.33	0.40	0.30	0.40	0.31	0.41	0.34	
$r_{\text{Direction person, Indifference person}}$.32	.15	.36	-.25	.10	.22	.29	.19	.49	-.06	.34	.00	
$r_{\text{Direction person, Intensity person}}$	-.22	-.02	-.33	.16	-.02	-.01	-.19	-.07	-.38	.04	-.24	.17	
$r_{\text{Indifference person, Intensity person}}$	-.45	-.50	-.60	-.47	-.48	-.39	-.62	-.52	-.66	-.57	-.59	-.53	
Model fit ($df = 15$)													
BIC	47735	48495	45247	46657	48213	50786	47114	47391	43762	45682	47279	49988	
ΔBIC													
vs. $\sigma^2_{\text{Direction item}} = 0$	1498	2874	1702	3172	2038	1725	1184	2462	1726	2971	1869	1727	
vs. $\sigma^2_{\text{Indifference item}} = 0$	338	214	752	145	424	423	184	136	589	91	283	628	
vs. $\sigma^2_{\text{Intensity item}} = 0$	653	318	552	488	311	431	652	339	576	603	505	509	
vs. $\sigma^2_{\text{Direction person}} = 0$	2253	2150	1780	1826	1770	1937	2730	3061	2497	3118	3067	2460	
vs. $\sigma^2_{\text{Indifference person}} = 0$	641	617	754	672	609	356	751	510	607	554	465	469	
vs. $\sigma^2_{\text{Intensity person}} = 0$	1723	1295	1568	1218	1185	1185	1620	1014	1636	945	1556	1203	

Note. $N = 577$. H = Honesty-Humility; E = Emotionality; X = Extraversion; A = Agreeableness; C = Conscientiousness; O = Openness to Experience; BIC = Bayesian information criterion.

Table 4 Mean Correlations (M_r) Between Traits Both Within and Between Rating Sources

	Raw Scores	Three-Process Model		
		Direction	Indifference	Intensity
Between different traits within self-reports	.06	.07	.42	.56
Between different traits within observer reports	.09	.09	.30	.46
Between different traits between self- and observer reports	.05	.05	.12	.20
For the same trait between self- and observer reports	.68	.65	.33	.39

($M_r = .12$) and intensity ($M_r = .20$) correlated marginally across the different traits between self- and observer reports, thus only partially supporting Hypothesis 2d. Indifference ($M_r = .33$) and intensity ($M_r = .39$) correlated even more strongly for the same trait between self- and observer reports, thus contradicting Hypothesis 2e. However, the magnitudes of the latter mean correlations were clearly smaller than for direction, indicating that indifference and intensity differ functionally from directional responding even in the most conservative test (i.e., two sources rating the same targeted content). Overall, the findings suggest that indifference and intensity occur equivalently across traits whereas direction does not, and that indifference and intensity are mostly person-specific but also carry some directional information.

Linking Honesty-Humility to Intensity

The results of the analyses linking direction concerning Honesty-Humility to intensity in self-ratings can be found in Table 5, together with the corresponding analyses concerning the other traits. For the purpose of simplifying interpretation, the results are shown such that higher values in intensity actually reflect stronger intensity (although, as described above, higher values originally

Table 5 Correlations of HEXACO Traits (Process: Direction) With Intensity in Self-Reports

Direction in	Intensity in Self-Reports Composite					
	EXACO	HXACO	HEACO	HEXCO	HEXAO	HEXAC
H-SR	-.24*					
E-SR		-.10*				
X-SR			-.05			
A-SR				-.01		
C-SR					-.12*	
O-SR						.06
H-OR	-.18*					
E-OR		-.05				
X-OR			-.03			
A-OR				.03		
C-OR					-.13*	
O-OR						.04

Note. $N = 577$. H = Honesty-Humility; E = Emotionality; X = Extraversion; A = Agreeableness; C = Conscientiousness; O = Openness to Experience; SR = self-reports; OR = observer reports. For the purpose of simplifying interpretation, the model coefficients are shown such that high values in intensity reflect high values on the psychological entity.

* $p < .05$, two-tailed.

reflect less intensity for technical reasons). As can be seen, direction concerning Honesty-Humility was negatively associated with intensity in self-ratings for both rating sources ($r = -.24$ and $r = -.18$, both $ps < .05$), supporting Hypothesis 3. Regarding the other traits, only direction concerning Conscientiousness was associated with intensity in both self- and observer ratings, though to a smaller extent than Honesty-Humility.

DISCUSSION

For decades, researchers and practitioners alike have used Likert scale questionnaires to measure a broad array of traits, feelings, and behaviors, and countless conclusions have been based on such assessments. But the interpretation of Likert-based data is not as straightforward as might be assumed at first glance. Among different potential drawbacks, researchers have emphasized that individual differences in using response scales can affect estimates of the targeted construct and even bias conclusions (e.g., Baumgartner & Steenkamp, 2001; Bolt & Johnson, 2009; Moors, 2012). Although individual differences in response behavior and their potential negative effects have been investigated for some time (e.g., Hamilton, 1968), previous approaches capturing these differences lack a conceptual understanding of why respondents choose a specific response option, in addition to other specific limitations (cf. Van Vaerenbergh & Thomas, 2012). Moreover, there is a lack of knowledge on the underlying determinants (in terms of basic traits) of individual differences in specific response patterns (Naemi et al., 2009; Weijters et al., 2010; Wetzel et al., 2013).

In this article, we tackled both issues. Specifically, first we described and applied a recently introduced IRT tree model, the three-process model, that provides a theoretical account of how different response processes—indifference, direction, and intensity—occur in terms of decision processes. As our results confirm, the model allows for capturing individual differences in these processes relatively independent from each other in actual Likert-based personality data. Specifically, at least for the HEXACO-PI-R, indifference and intensity can be considered primarily person-specific response processes, whereas direction particularly mirrors a content-specific response process. However, note that indifference and intensity also appear to carry some content-related variance, as is particularly implied by the (albeit modest) mean correlations for these processes for the same trait between self- and observer reports.

Second, we have outlined why the basic trait Honesty-Humility should be negatively linked to intensity, and we found support for this conjecture in our data.

STRENGTHS AND POTENTIAL LIMITATIONS

Considering the strengths of our investigation, the three-process model provides estimates of response processes in line with both general notions on IRT tree models and plausible decision-making processes (e.g., cf. Partchev & De Boeck, 2012). This approach has advantages over earlier ways to understand response behavior, as it allows for a clear differentiation between when and how different response processes come into play—both conceptually and statistically. To the best of our knowledge, the current investigation is the first application of the three-process model to self- and observer reports of basic personality traits. Importantly, the reliance on self- and observer reports rules out limitations in terms of common method bias. Finally, we followed calls for more theory-driven investigations of the underlying determinants of specific response patterns. Based on a framework of basic personality structure, we linked low Honesty-Humility to intensity and indeed found that the only other trait to play a noteworthy (albeit less significant) role was Conscientiousness. An explanation for the latter finding may be that respondents high in Conscientiousness (in terms of high direction estimates) are more cautious about giving full endorsement to self-descriptive statements, in line with their characterization as being careful, precise, and thorough (Ashton & Lee, 2007). However, given that the respective correlations were rather small and stand in contrast to findings by Austin et al. (2006), we would rather conclude that the exact nature of the link between Conscientiousness and intensity is still unclear.

Concerning potential limitations, it should be noted that our results stem from participants with Western European backgrounds, at least in terms of their language. Thus, cultural influences may have affected the distribution of indifference, direction, and intensity. Therefore, similar investigations should be conducted in other cultures or with regard to specific ethnicities (cf. Bachman & O'Malley, 1984) before further generalizations of our results are warranted. Reflecting another potential limitation, participants completed only one questionnaire that included the hypothesized predictor of intensity, Honesty-Humility. Thus, future studies might measure the predictor independently from the questionnaire through which intensity (or another response process) is estimated. However, in the current data, the noteworthy consistency between results from observer reports and self-reports alleviates this concern at least partially.

THEORETICAL AND PRACTICAL IMPLICATIONS

The current findings substantiate the notion that the response process in Likert scales is more complex than one might initially

intuit. That is, responding involves not only some judgment related to the targeted construct itself, but also processes of indifference and intensity. In other words, responses to Likert scale questionnaires are not driven by an underlying unidimensional construct alone. As such, the three-process model provides a more complete description of the response process. This is well in line with recent calls for a better understanding of response processes to ultimately foster a more conclusive view on validity (Borsboom, Mellenbergh, & Herden, 2004). Our application of the three-process model to a well-established measure of personality traits illustrates what underlying processes drive participants' response behavior, and we consequently encourage researchers and practitioners to consider this approach when dealing with corresponding data. Indeed, given a sufficient sample size, the three-process model can be applied to all Likert-based data immediately, as, for instance, no specific additional items or scales need to be included in a data set.

In particular, test developers could be urged to provide not only norm values for the raw scores of an inventory, but also estimates that take different response processes into account. Our Tables 3 (concerning the strength of such processes) and 4 (concerning the estimates based on both raw scores and response processes) might serve as a starting point for such an approach. Researchers and practitioners could then gain insight into how strong the effects of different response processes are in a particular inventory and, in turn, how much raw scores may be affected. For instance, questionnaires that do not measure their targeted contents appropriately or that are strongly affected by acquiescence or social desirability might show a different pattern of correlations across rating sources (e.g., strong correlations between different direction processes within a rating source and weak correlations for the direction processes of the same construct between rating sources). Also, researchers might aim to provide more insights into the three-process model and, for instance, pick up our findings of small correlations for both indifference and intensity between self- and observer reports across different traits (e.g., one might investigate whether there is some similarity of peers in terms of how they make use of response options).

Another implication of our investigation is that the response processes are interesting individual differences variables per se. For instance, the tendency to exaggerate one's own characteristics has been discussed as a valuable predictor of behavior in the context of knowledge tests (Paulhus, 2012) and might thus also be related to narcissistic tendencies—in line with our finding concerning Honesty-Humility (which is negatively related to narcissism; e.g., Lee et al., 2013).

SUMMARY AND OUTLOOK

The present investigation combined two lines of research that have received growing attention in recent years. Besides providing evidence for the predictive validity of Honesty-Humility by extending previous theoretical and empirical links between this trait and a drive for power and status and for maximizing

differences, we, most importantly, followed up on the notion that individual differences exist in response behavior. Although corresponding remarks have been made for years, calls for more thorough investigations have been voiced particularly in the last decade—potentially due to the increasing attention to cross-cultural findings and advances in statistical approaches. Indeed, it has been suggested that *not* taking individual differences in response behavior into account might yield inexact results, even to the degree of running contrary to the “true” underlying effect. Given the widespread use of questionnaires, it seems worthwhile to look at the influence of different response processes before final conclusions are drawn (e.g., via the three-process model). In particular, the findings that indifference and intensity are primarily person-specific whereas direction is mostly content-specific substantiate the call for more commonplace consideration of different response processes in analyses of Likert-based data.

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