

Continuous or Dichotomous Scales? Holistic and Analytic Thinking Styles Influence Response Fluency to Different Scale Formats and Trait-Consistent Behavior

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Abstract

Personality scales use response formats ranging from dichotomous to continuous. Understanding how individuals respond to these formats is crucial for interpreting the consequences of those responses. This research examines the moderating role of holistic-analytic thinking style on the impact of response formats on fluency and subsequent behavioral outcomes. Across multiple personality scales and methodological approaches ($N = 3,636$), holistic (vs. analytic) thinkers experienced greater fluency with continuous (vs. dichotomous) scales. This effect was observed with measured and manipulated thinking styles (Studies 1 and 2) and replicated using cultural groups as a proxy (Study 3). We also explored psychological discomfort as a mechanism. A 3-point (Study 4) and a 6-point scale (Study 5) also elicited fluency among holistic individuals. Finally, matching thinking styles with scale formats affected behavioral intentions (Study 5) and behavior (Study 6). Our research indicates that choosing response formats should consider factors beyond psychometric properties, including cultural and individual differences.

Keywords

scale format, personality, culture, thinking style, fluency

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Introduction

Researchers use psychological scales to assess constructs such as personality, motivation, and anxiety. These instruments inform interventions in well-being, training, and mental health (Simms, 2008). Despite their ubiquity, little is known about how individual differences in cognitive processing influence the response experience and how scale design interacts with respondents' characteristics. One relevant construct is holistic-analytic thinking style (Choi et al., 2007).

We propose that these cognitive differences influence how individuals respond to psychological scales. Consider a person responding to "I tend to manipulate other people to get what I want." The item might use a 7-point Likert scale or a dichotomous "agree/disagree" format. Our question is whether response fluency varies with the interaction between thinking style and scale format. We hypothesize that matching the scale format to thinking style reduces psychological discomfort and, consequently, enhances fluency, such that holistic thinkers show greater fluency with continuous scales, whereas analytic thinkers show greater fluency with dichotomous scales. We test this hypothesis in six main studies (plus

three additional online studies) examining how holistic-analytic thinking influences response fluency and its behavioral consequences. Understanding this interaction can improve the predictive validity of personality scales.

Holistic and Analytic Thinking Style

Holistic individuals perceive the world as interconnected and dynamic, focusing on wholes rather than components. Analytic thinkers, by contrast, see elements as separate and stable over time (Choi et al., 2007; Nisbett et al., 2001). Holistic individuals' attentional focus (Wong et al., 2021) may align better with continuous scales offering gradients of response. Analytic individuals, who focus on discrete

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elements, may find dichotomous scales more natural. For example, Peng and Nisbett (1999) found that holistic thinkers, like the Chinese participants, tended to view contradictory statements as potentially true, employing a compromise strategy. By contrast, analytic thinkers, like the American participants, favored a differentiation strategy, perceiving one statement as more plausible than the other. This study highlights the holistic worldview's emphasis on nuance and balance, in contrast to the analytic perspective's preference for clear distinctions. Similarly, dichotomous formats reflect an either-or logic, such that individuals are categorized as either introverted or extroverted, whereas response formats with more options allow greater granularity and nuance. For example, selecting 5 on a 7-point scale can reflect being more extroverted while still allowing some introverted tendencies within the response. Furthermore, holistic individuals tend to seek balance and compromise, avoiding extreme responses and preferring options near the midpoint of a scale. Consistent with this idea, prior research has shown that participants from Asian cultures use midpoint responses more frequently than those from Western cultures (Chen et al., 1995), suggesting that response formats with only two options may be less suitable for holistic than analytic thinkers.

More recent work shows that holistic thinkers are more likely to assign causal responsibility when multiple outcomes are considered simultaneously, whereas analytic thinkers show the opposite pattern, assigning greater responsibility when fewer outcomes are considered (Santos et al., 2025). Together, these findings suggest that holistic thinkers are more comfortable integrating multiple possibilities, whereas analytic thinkers tend to focus on fewer, more clearly differentiated options. Accordingly, we propose that holistic individuals should find it easier to respond to scales with more response categories, whereas analytic individuals should find it easier to respond to scales with fewer categories.

Scale Response Format, Personality, and Culture

Different response formats are used in test administration. Among these formats, two commonly used are continuous and dichotomous (Tourangeau et al., 2000). In the present research, we refer to polytomous Likert-type or ordinal formats (e.g., 5–7 points) as “continuous” for consistency with common usage, and we also include a final study using a more continuous slider format (0–100). In the continuous response format, participants are asked to provide a response along a numerical or gradient scale, providing a more nuanced assessment of their perceptions or behaviors. By contrast, the dichotomous response format requires participants to make a binary choice, often in the form of a “yes” versus “no” or “agree” versus “disagree” response, which simplifies the response process but may lack the granularity of continuous scales.

Extant literature has focused on how test features, such as polarity, numbering, and labeling of scale points, impact

response styles (Bruzios & Harwood, 2020), which are typically defined as systematic tendencies to use particular regions of a response scale (e.g., acquiescence, extreme responding, or midpoint responding), often independently of the substantive meaning of the items (Smith, 2017).

Some studies have also examined the relationships between these response styles and personality traits (Möttus et al., 2012). For example, certain response styles have been associated with some Big-Five traits (Khorramdel & von Davier, 2014). Agreeableness is linked to acquiescent and socially desirable responses (Graziano & Tobin, 2002). Extraversion shows a positive correlation with extreme responding and a negative correlation with midpoint response style (Austin et al., 2006). In addition, socially desirable responding is negatively related to neuroticism (Pauls & Stemmler, 2003).

Moreover, some response styles are more likely to emerge in certain cultures than in others (Chen et al., 1995). For example, Smith and Fischer (2008) identified that an acquiescent response style was more prevalent among collectivists and an extreme response style was more prevalent among individualists (Johnson et al., 2011). Similarly, Marin et al. (1992) showed that African Americans and Hispanics exhibited higher levels of acquiescence in responding than Euro-Americans. Overall, this research has focused on how personality and/or scale characteristics affect which items individuals tend to select on the scale. By contrast, our research does not focus on which specific response options individuals select, but rather on the extent to which different scale formats are more fluently perceived by individuals with different thinking styles and their consequences.

Previous research has shown that the choice of scale format matters (Cabooter et al., 2016; Schwarz, 1999) and that it can have downstream consequences on how respondents interpret and respond to the content in the items. However, none of this research has extended its focus beyond psychometric properties to analyze the interactions with individual difference variables. We provide the first test that scale response formats (dichotomous vs. continuous) interact with individual differences (i.e., holistic vs. analytic thinking styles) to produce greater fluency in responding to such scales.

Processing Fluency and Scale Response Format

Processing fluency is the ease with which information is processed and affects how individuals perceive and evaluate a variety of stimuli (Reber et al., 2004). Fluency has several important implications. For example, events that are easy to recall are judged to be more frequent (Tversky & Kahneman, 1973), information that is easy to process is perceived to be more truthful (Alter & Oppenheimer, 2009), and perceptually fluent people and objects tend to be more likable (Bornstein, 1989). We expect that thinking styles differ in response fluency when using continuous versus dichotomous options, leading to different levels of fluency across scale formats.

The fluency generated by matching response formats to thinking styles can also have behavioral consequences because it acts as a metacognitive cue. When a scale format aligns with an individual's thinking style, the resulting ease of processing signals that their responses are informative and reliable (Schwarz et al., 1991). This prediction builds on research linking processing fluency to confidence (Petrocelli & Whitmire, 2017). Specifically, if people can more easily respond to a trait scale, they become more certain that they possess that trait. This certainty is crucial, as it has been shown to enhance the predictive validity of measured traits in relation to actual behavior (Horcajo et al., 2022; Shoots-Reinhard et al., 2015). A review by Briñol et al. (2025) recently highlighted how metacognitive experiences of confidence influence trait-behavior consistency across a range of constructs, including the Dark Triad and Honesty-Humility. Building on this, we expect that individuals who experience high processing fluency when responding to a scale will display a higher correlation between their reported trait and subsequent behavior related to that trait.

Study 1

Study 1 was designed to examine how individuals' thinking style (holistic vs. analytic) influences the fluency with which they respond to scales with different response formats (continuous vs. dichotomous). Specifically, we predicted that individuals with a holistic thinking style would respond more fluently to items presented in a continuous (vs. dichotomous) format. By contrast, we expected that individuals with an analytic thinking style would respond more fluently to items presented in a dichotomous (vs. continuous) format.

Method

Participants and Design. Assuming a small-to-medium interaction effect of $f^2 = 0.016$ (based on Online Study 1), the desired sample size for a two-tailed test ($\alpha = .05$) with .80 power was $N = 493$ (as indicated by an *a priori* power analysis using G*Power; Faul et al., 2009). Our final sample size (500 participants) fulfilled this requirement. There were no exclusions. Five hundred participants were recruited anonymously through CloudResearch Connect (52% females, 46% males, and 2% non-binary, $M_{\text{age}} = 41.75$, $SD = 12.53$). Participants were randomly assigned to one of two conditions (Scale Response Format: Continuous vs. Dichotomous) in a between-subjects design. Thinking Style (continuous variable) was measured as an additional predictor. The fluency with which they responded to the items in the response format manipulation was measured as the key dependent variable. All materials, data, and code are openly accessible in a repository (https://osf.io/j7wzb/overview?view_only=42e7f1282e6d47289052de5f365681e5). We pre-registered the last two studies and Online Study 3. Unless otherwise noted, all statistical analyses reported in this manuscript were conducted using SPSS.

Procedure. Participants completed the study through Qualtrics, believing it was for personality scale validation. They first completed the full Analysis-Holism Scale (AHS) and then rated a self-monitoring personality scale using either a continuous or dichotomous format, depending on condition. They subsequently reported the fluency of their responses to the self-monitoring scale, provided socio-demographic information, and were debriefed about the study's actual purpose.

Predictor/Independent Variables

Thinking Style. Participants' holistic-analytic thinking was measured using the 24-item AHS (Choi et al., 2007). The 24 items were averaged to form an index of Analytic-Holistic Thinking Style ($\alpha = .78$). Participants rated items such as "It is more desirable to take the middle ground than go to extremes," and "It is more important to find a point of compromise than to debate who is right/wrong, when one's opinions conflict with other's opinions" on a 7-point Likert-type scale anchored at 1 ("Strongly disagree") to 7 ("Strongly agree"). Values ranged from 2.50 to 6.58 ($M = 4.76$, $SD = 0.61$) and scores above mid-point indicated a more holistic thinking style, whereas scores below mid-point indicated a more analytic thinking style.

Scale Response Format. Participants responded to the Self-Monitoring Scale (Snyder, 1974), which measures one's motivation and ability to adjust self-presentation in different situations. The scale consists of 25 items, originally in a dichotomous true/false format. Half of the participants used a continuous response format (from 1 = "Definitely false" to 7 = "Definitely true"), while the other half used the original dichotomous format (0 = "False" and 1 = "True").

Dependent Variable

Fluency. Participants rated the ease of responding to the self-monitoring scale items using three fluency questions: "How fluent was it for you to answer the previous questions?," "How easy was it?," and "How difficult was it?" (reverse-scored). Responses were given on a 7-point Likert scale (1 = "not fluent/not easy/not difficult"; 7 = "extremely fluent/extremely easy/extremely difficult"). Items were adapted from prior fluency research (Gandarillas et al., 2018). These responses were averaged into a composite fluency index ($\alpha = .87$), with higher scores indicating greater fluency. Scores ranged from 1 to 7 ($M = 5.25$, $SD = 1.34$).

Results

Main effects results can be found in the Supplemental Material. More importantly, we found a significant interaction between thinking style and scale response format manipulation, $B = 0.268$, $t(496) = 2.596$, $p = .010$, 95% confidence interval (CI) [0.065, 0.470], Cohen's $f^2 = .014$.¹

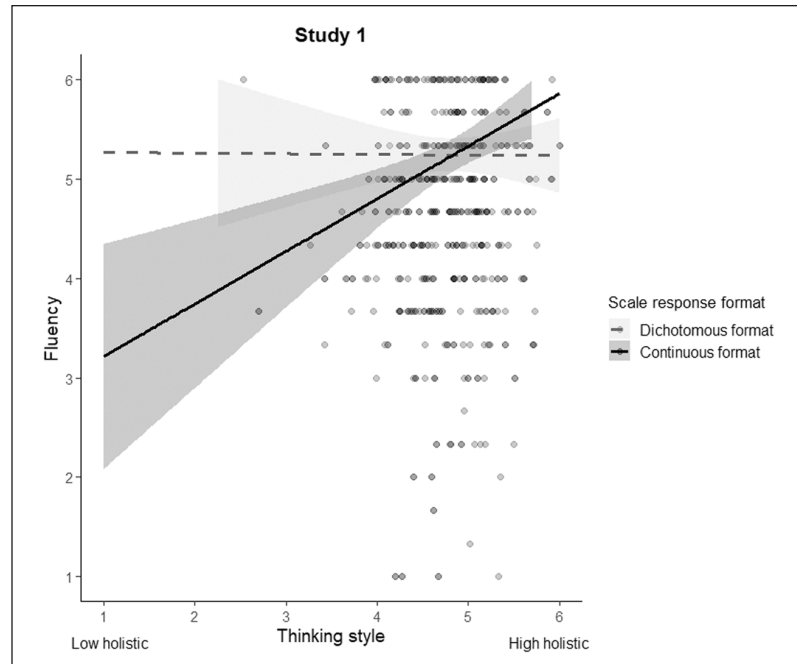


Figure 1. Study 1. Fluency as a function of thinking style and scale response format (dichotomous vs. continuous).

As illustrated in Figure 1, this interaction showed that for participants with higher levels of holistic thinking (+1 *SD*), those in the continuous format condition tended to report more fluency than those in the dichotomous format condition, $B = 0.155$, $t(496) = 1.839$, $p = .067$ [$-0.011, 0.320$]. However, for those participants with lower levels of holistic thinking (i.e., a more analytic thinking style; -1 *SD*), those in the dichotomous format condition tended to report more fluency than those in the continuous format condition, $B = -0.154$, $t(496) = -1.834$, $p = .067$ [$-0.320, 0.011$].

Discussion

The results of Study 1 revealed that individuals with higher (vs. lower) levels of holistic thinking tended to report more fluency when responding to items with a continuous format than with a dichotomous format. In this study, participants self-reported their thinking style, and as such, there may be other confounding factors co-varying along with this variable. To address this concern and isolate the effect of thinking style, we manipulated holistic versus analytic style in the next study. This approach will also provide a stronger causal test for our hypothesis as we move to a full experimental design. We also examined psychological discomfort as a potential mechanism.

Study 2

The aim of Study 2 was to manipulate, rather than measure, thinking style to provide evidence for its causal role. Therefore, we manipulated both thinking style and scale response format. In addition, Study 2 used a more general

personality scale, namely the Big Five. This allows us to generalize and extend the results of the previous study to more global personality traits. Moreover, we aimed to identify a potential mediator (i.e., psychological discomfort). Thus, we expected to replicate the two-way interaction observed in Study 1 between thinking style and scale response format on fluency using an experimental approach. Furthermore, we expected that psychological discomfort would serve as an explanatory mechanism.

Method

Participants and Design. Study 2 aimed for a sample size of 526 based on a power analysis for a two-tailed test ($\alpha = .05$, power = .80) predicting a small-to-medium interaction effect (Cohen's $f^2 = 0.014$); however, the final sample consisted of 214 university students due to availability. Participants (85.4% females, 13.6% males, and 1% non-binary, $M_{\text{age}} = 19.46$, $SD = 1.42$) were randomly assigned to one of four conditions in a 2×2 factorial design, manipulating thinking style (holistic vs. analytic) and response format (continuous vs. dichotomous). Overall psychological discomfort and the fluency with which they responded to the personality scale were measured as dependent variables.

Procedure. Participants completed a Qualtrics survey under the cover of personality research. They were first randomly assigned to either a holistic or analytic thinking condition, followed by assignment to one of two response format conditions (continuous or dichotomous) for a Big-Five personality scale. Participants then reported their levels of psychological

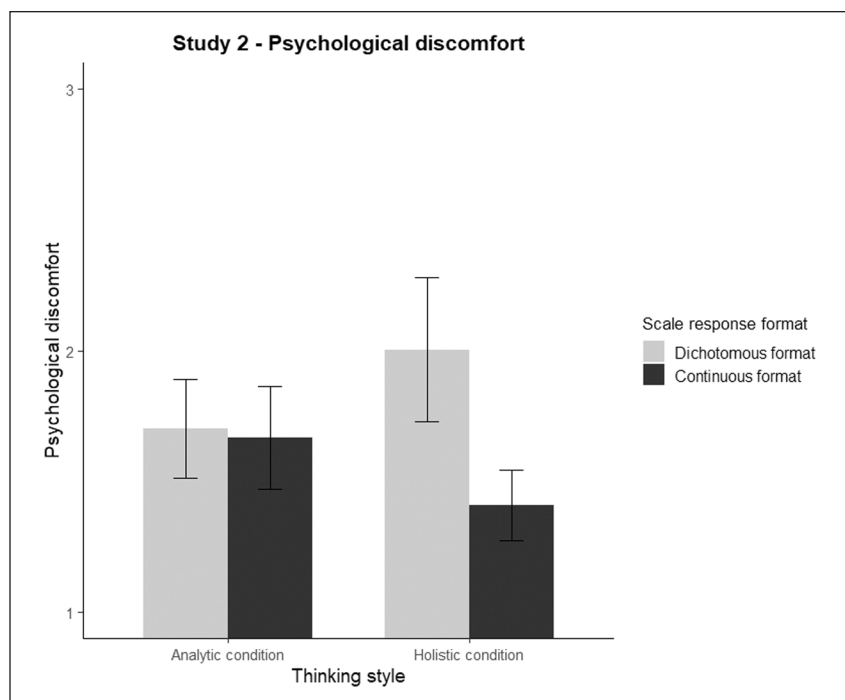


Figure 2. Study 2. Psychological discomfort as a function of thinking style (holistic vs. analytic) and scale response format (continuous vs. dichotomous).

discomfort and fluency in responding, completed demographic questions, and received a debrief on the study's purpose.

Independent Variables

Thinking Style. Participants completed a Navon task designed to induce holistic or analytic thinking. In this task, they viewed large “global” letters composed of smaller “local” letters and responded quickly to specific target letters depending on condition. In the analytic condition, they focused on target letters appearing as local elements, while in the holistic condition, target letters appeared as global elements. The 44-trial task effectively induced thinking style (Santos et al., 2025).

Scale Response Format. Participants completed a personality scale based on the Big-Five Model (BFI-10; Rammstedt & John, 2007), which consists of 10 items assessing five key personality traits. The response format of the scale was manipulated as part of the study. Half the participants responded to this scale in a continuous format, ranging from 0 (“Strongly disagree”) to 10 (“Strongly agree”). The other half responded to the same scale in a dichotomous format, with just two anchors from 0 (“Disagree”) to 1 (“Agree”).

Dependent Variables

Psychological Discomfort. Participants rated their psychological discomfort by indicating their levels of feeling “tense,” “distressed,” “irritable,” “nervous,” and “jittery” on

a 1 to 5 scale. These ratings were averaged to form a discomfort index ($\alpha = .86$), with higher values indicating more discomfort. Scores ranged from 1 to 4 ($M = 1.69$, $SD = 0.78$), in line with prior research on psychological discomfort measures (Elliot & Devine, 1994).

Fluency. Participants rated the fluency of their responses to the Big-Five test using the same three items as in Study 1. These ratings were averaged to create a composite fluency index ($\alpha = .65$). Higher values reflected a greater fluency in responding to the items in the manipulation. Values ranged from 2.67 to 7 ($M = 5.69$, $SD = 0.96$).

Results

Psychological Discomfort. An ANOVA 2 (Thinking Style: Holistic vs. Analytic) $\times$ 2 (Scale Response Format: Continuous vs. Dichotomous) was conducted on psychological discomfort. Main effects results can be found in the Supplemental Material. We found a significant interaction between thinking style and scale response format on psychological discomfort, $F(1, 209) = 7.217$, $p = .008$, $\eta_p^2 = .033$. As illustrated in Figure 2, this interaction showed that for participants induced to think holistically, those in the continuous format condition ($M = 1.41$, $SD = 0.48$) reported less psychological discomfort than those in the dichotomous format condition ($M = 2.00$, $SD = 0.98$), $F(1, 209) = 15.294$, $p < .001$, $\eta_p^2 = .068$. However, for those participants induced to think analytically, there was no difference

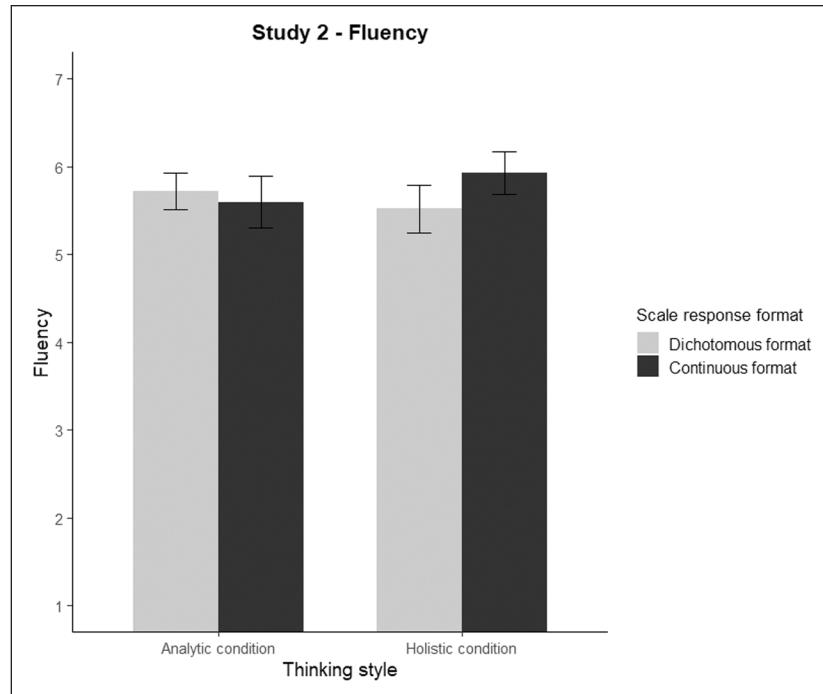


Figure 3. Study 2. Fluency as a function of thinking style (holistic vs. analytic) and scale response format (continuous vs. dichotomous).

in psychological discomfort between the continuous ($M = 1.67$, $SD = 0.71$) and dichotomous format ($M = 1.70$, $SD = 0.77$), $F(1, 209) = 0.060$, $p = .807$, $\eta_p^2 > .001$.

Fluency. An ANOVA 2 (Thinking Style: Holistic vs. Analytic) $\times 2$ (Scale Response Format: Continuous vs. Dichotomous) was also conducted on fluency. Main effects results can be found in the Supplemental Material. We found a significant interaction between manipulated thinking style and scale response format on fluency, $F(1, 210) = 4.094$, $p = .044$, $\eta_p^2 = .019$. As illustrated in Figure 3, this interaction showed that for participants induced to think holistically, those in the continuous format condition ($M = 5.92$, $SD = 0.88$) reported more fluency than those in the dichotomous format condition ($M = 5.52$, $SD = 0.98$), $F(1, 210) = 4.501$, $p = .035$, $\eta_p^2 = .021$. However, for those participants induced to think analytically, there was no difference in fluency between the continuous ($M = 5.60$, $SD = 1.10$) and dichotomous format ($M = 5.72$, $SD = 0.85$), $F(1, 210) = 0.478$, $p = .490$, $\eta_p^2 = .002$.

Moderated Mediation Analysis. Moderated mediation was tested by using Model 8 of the PROCESS macro in SPSS (Hayes, 2013). The results indicated that the 95% CI of the moderated mediation index did not include zero, $B = 0.079$, $SE = 0.040$; 95% CI [0.024, 0.177]. The effect was significant both for the dichotomous format, $B = -0.042$, $SE = 0.028$ [-0.109, -0.002], and the continuous format, $B = 0.036$, $SE = 0.021$ [0.004, 0.086]. Therefore, the moderated mediation through psychological discomfort is supported (Figure 4; full model results reported in the Supplemental Material).

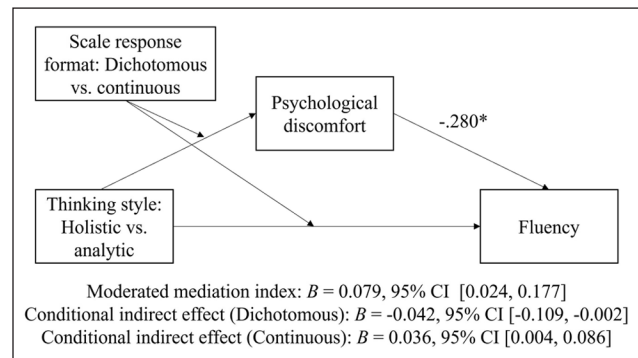


Figure 4. Study 2. Moderated mediation model including psychological discomfort as mediator.
 $*p < .05$.

Discussion

As predicted, the results of Study 2 showed that individuals induced to think holistically experienced greater fluency when responding in a continuous rather than dichotomous format. This effect was not observed for individuals induced to think analytically. Importantly, the core construct was manipulated rather than measured, allowing a more direct causal test of holistic-analytic thinking style. This study also introduced psychological discomfort as a plausible mediator of the effect of holistic-analytic thinking $\times$ scale response format on fluency.²

Study 1 and Online Study 1 measured thinking style using two versions of a validated analysis-holism scale, while Study 2 manipulated it through a well-established induction. That is,

thinking style was treated as an individual difference either by measurement or induction. As noted, most prior research has used Western versus Eastern participants to characterize analytic versus holistic thinkers (Nisbett et al., 2001). Our subsequent study aimed to provide convergent validity by replicating the effect with a cross-cultural approach, sampling Chinese participants to represent holistic thinking and American participants to reflect analytic thinking.

Study 3

Study 3 tested the prediction that Chinese participants would experience more fluency than Euro-Americans when responding to continuous rather than dichotomous scales, whereas Euro-Americans would experience more fluency than Chinese when responding to dichotomous (vs. continuous) scales. Unlike previous studies that employed neutral scales (i.e., self-monitoring and Big-Five), the present study used a Dark Triad scale to generalize the effect to negatively valenced traits. The scale shows measurement invariance across several regions, including the United States, Europe, and China (Rogoza et al., 2021).

Method

Participants and Design. A power analysis for multiple regression (three predictors, averaged Study 1–2 $f^2 = 0.017$, $\alpha = .05$, power = .80) indicated that a minimum sample size of $N = 376$ is required. The final sample consisted of 345 participants due to limited access to a Chinese group (170 participants) and a similar-sized Euro-American group (175 participants). All participants were pre-screened, with no exclusions. The Chinese participants (70.6% females, 28.8% males, and 0.6% non-binary, $M_{\text{age}} = 23.54$, $SD = 4.62$) were recruited through the Love Experiment platform, while the Euro-American participants (53.7% females, 45.1% males, and 1.1% non-binary, $M_{\text{age}} = 38.97$, $SD = 11.67$) were sourced from the CloudResearch Connect platform. The design followed a 2 (Culture: Chinese vs. Euro-American) $\times$ 2 (Scale Response Format: Continuous vs. Dichotomous) between-subjects factorial design. Fluency was recorded as the key dependent variable.

Procedure. Participants completed the study using Qualtrics, where they were informed they would be involved in personality research. They were randomly assigned to one of two response format conditions while using the Dark Triad scale. After responding to the scale, participants evaluated the fluency of their responses. Validated scales were used in Chinese where available, and the remaining materials were translated into Chinese by a native researcher using a back-translation method.

Independent Variables

Culture. Participants were recruited in China or the United States. Materials were administered in participants'

native language: English for the Euro-American sample and Mandarin for the Chinese sample.

Scale Response Format. Participants were presented with a validated short scale about Dark Triad traits in which the response format was manipulated. The American version was extracted from the brief inventory "Dirty Dozen" (Jonason & Webster, 2010) and was comprised of 12 items regarding narcissism, Machiavellianism, and psychopathy. The Chinese version of this scale was validated in Mandarin by Geng et al. (2015). An example of an item was "I tend to manipulate others to get my way." Half the participants replied to this scale in a continuous format, ranging from 1 ("Strongly disagree") to 5 ("Strongly agree"). The other half replied to the same scale in a dichotomous format, with just two anchors from 0 ("Disagree") to 1 ("Agree").

Dependent Variable

Fluency. Participants assessed the fluency of their responses to the Dark Triad scale using the same three items as in the previous studies. Items were averaged to create a composite index of fluency ($\alpha = .78$). Higher values reflected a greater fluency in responding to the items in the manipulation. Values ranged from 2.33 to 7 ($M = 5.61$, $SD = 1.15$).

Results

An ANOVA 2 (Culture: Chinese vs. Euro-American) $\times$ 2 (Scale Response Format: Continuous vs. Dichotomous) was conducted on fluency. Main effects results can be found in the Supplemental Material. We found a significant interaction between culture and scale response format on fluency, $F(1, 341) = 8.200$, $p = .004$, $\eta_p^2 = .023$. As illustrated in Figure 5, this interaction showed that for Chinese participants, those in the continuous format condition ($M = 5.67$, $SD = 1.12$) reported more fluency than those in the dichotomous format condition ($M = 5.14$, $SD = 1.03$), $F(1, 341) = 9.338$, $p = .002$, $\eta_p^2 = .027$. However, for Euro-American participants, there was no difference in fluency between the continuous ($M = 5.72$, $SD = 1.20$) and dichotomous format ($M = 5.89$, $SD = 1.11$), $F(1, 341) = 0.961$, $p = .328$, $\eta_p^2 = .003$.

Discussion

Study 3 revealed that Chinese participants responded more fluently to continuous rather than dichotomous scales, while Euro-Americans responded equally fluently to both formats. Across the first three studies, we have established the effect using a triangulation approach by measuring thinking style, manipulating it, or using natural groups based on assumed cultural differences. Next, we explored the minimum conditions required for the effect to emerge. We examined whether a 3-point scale condition would be enough for holistic individuals to respond fluently to a scale. Thus, in the next study, we added a new condition to our design by including a response format with three options: disagree, neutral, or agree.

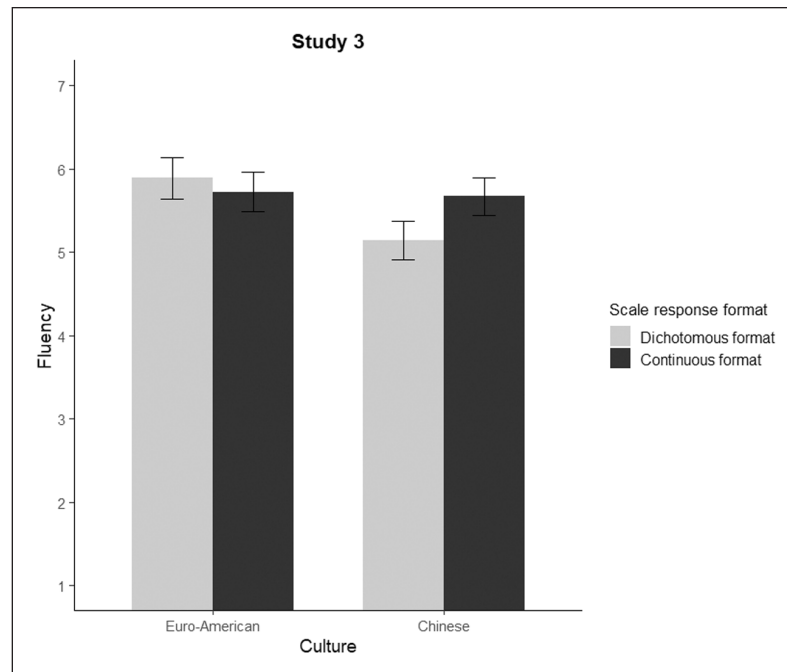


Figure 5. Study 3. Fluency as a function of culture (Chinese vs. Euro-American) and scale response format (continuous vs. dichotomous).

Study 4

The main goal of Study 4 was to examine the minimum conditions required in the response format for holistic individuals to experience fluency when responding to more continuous items. We predicted that individuals induced to think holistically (vs. analytically) would respond more fluently to items presented in a continuous or in a trichotomous (vs. dichotomous) format. Furthermore, we hypothesized that holistic individuals would report similar fluency in the continuous and trichotomous format conditions.

Method

Participants and Design. Based on an assumed small-to-medium interaction effect ($f^2 = 0.019$) from Study 2, the necessary sample size for a two-tailed test ($\alpha = .05$) with 80% power was determined to be 408. However, the final sample consisted of 752 participants, exceeding this number.³ There were no exclusions, and all participants were anonymously recruited via CloudResearch Connect (58.0% females, 40.7% males, and 1.3% non-binary, $M_{\text{age}} = 39.37$, $SD = 13.02$). Participants were randomly assigned to conditions in a 2 (Thinking Style: Holistic vs. Analytic) $\times$ 3 (Scale Response Format: Continuous vs. Trichotomous vs. Dichotomous) between-subjects factorial design. Fluency was recorded as the key dependent variable.

Procedure. Participants completed the study on Qualtrics, initially reading a cover story about personality research. They were randomly assigned to either a holistic or analytic

thinking condition. Depending on their assigned response format, they responded to the Dark Triad scale using continuous, trichotomous, or dichotomous formats. Afterward, they reported the fluency of their responses to the scale, followed by socio-demographic questions and a debriefing about the study's purpose.

Independent Variables

Thinking Style. Participants' thinking style was manipulated using the same induction as in Study 2.

Scale Response Format. Participants were presented with the same scale on Dark Triad traits as in the previous study (Jonason & Webster, 2010). The response format for this scale varied across three conditions. In the continuous format, participants used a 5-point scale, ranging from 1 ("Strongly disagree") to 5 ("Strongly agree"). In the dichotomous format, participants utilized a 2-point scale with anchors from -1 ("Disagree") to 1 ("Agree"). Finally, in the trichotomous format, participants were presented with a 3-point scale incorporating -1 ("Disagree"), 0 ("Neither disagree nor agree"), and 1 ("Agree") as response options.

Dependent Variable

Fluency. Participants assessed the fluency of their responses using the same three items from previous studies. These evaluations were averaged to create a composite index of fluency ($\alpha = .82$). Higher values reflected a greater fluency in responding to the items in the manipulation. Values ranged from 1 to 7 ($M = 5.76$, $SD = 1.17$).

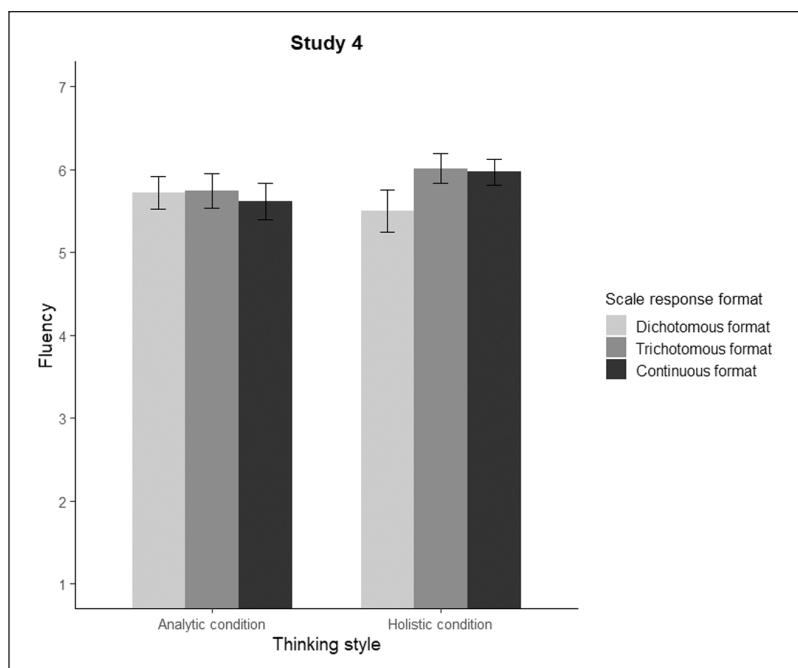


Figure 6. Study 4. Fluency as a function of thinking style (holistic vs. analytic) and scale response format (dichotomous vs. trichotomous vs. continuous).

Results

An ANOVA 2 (Thinking Style: Holistic vs. Analytic) $\times$ 3 (Scale Response Format: Dichotomous vs. Trichotomous vs. Continuous) was conducted on fluency. Main effects results can be found in the Supplemental Material. We found a significant interaction between manipulated thinking style and scale response format on fluency, $F(2, 746) = 4.463$, $p = .012$, $\eta_p^2 = .012$ (Figure 6). To fully interpret this interaction, we conducted a series of further contrasts. First, the comparison between the dichotomous and continuous format conditions revealed a significant interaction between thinking style and scale response format, $F(1, 511) = 7.440$, $p = .007$, $\eta_p^2 = .014$. This interaction showed that for participants induced to think holistically, those in the continuous format condition ($M = 5.97$, $SD = 0.96$) reported more fluency than those in the dichotomous format condition ($M = 5.50$, $SD = 1.43$), $F(1, 511) = 10.088$, $p = .002$, $\eta_p^2 = .019$. However, for those participants induced to think analytically, there was no difference in fluency between the continuous ($M = 5.61$, $SD = 1.28$) and dichotomous format ($M = 5.72$, $SD = 1.07$), $F(1, 511) = 0.487$, $p = .486$, $\eta_p^2 = .001$. This finding replicated the effect obtained in the previous studies.

Second, for the comparison between the dichotomous and the trichotomous format, we also found a significant two-way interaction between thinking style and scale response format, which is conceptually similar to the previous interaction described, $F(1, 472) = 5.202$, $p = .023$, $\eta_p^2 = .011$. This interaction showed that for participants induced to think holistically, those in the trichotomous format condition ($M = 6.01$, $SD = 1.03$) reported more fluency than those in the

dichotomous format condition ($M = 5.50$, $SD = 1.43$), $F(1, 472) = 11.633$, $p = .001$, $\eta_p^2 = .024$. However, for those participants induced to think analytically, there was no difference in fluency between the trichotomous ($M = 5.74$, $SD = 1.12$) and dichotomous format ($M = 5.72$, $SD = 1.07$), $F(1, 472) = 0.014$, $p = .907$, $\eta_p^2 < .001$. This interaction pattern is similar to the one observed for the effect between dichotomous and continuous formats.

Finally, for the comparison of the trichotomous and continuous formats, the data revealed no interaction between thinking style and scale response format, $F(1, 509) = 0.185$, $p = .667$, $\eta_p^2 < .001$.

Discussion

In Study 4, in addition to replicating the effect established in the previous three studies, we found that simply adding a third point to a dichotomous variable is enough to increase fluency for holistic individuals. An open question is whether matching thinking style and format affects outcomes beyond metacognitive experience. For instance, if participants feel more certain in their trait assessment because they responded more fluently to the trait scale, would the association between the trait and trait-consistent behavioral intentions increase? We designed the next study to answer this question.

Study 5

The main goal of Study 5 was to test whether the fluency that stems from matching thinking style with scale format can be consequential for behavioral intentions. Thus, we included a

measure of behavioral intentions regarding the likelihood of behaving pro-socially. As we included helping intentions as the outcome, we selected empathy as the trait, as previous research has shown a strong link between empathy and helping intentions (Verhaert & Van den Poel, 2011). Another goal of the present study was to extend the results to continuous rating scales that do not include a middle point. Therefore, we used a 6-point scale as the continuous condition in this study. First, we predicted an interaction between manipulated thinking style and scale response format on fluency. Second, we expected this fluency to moderate the relationship between participants' scores on the empathy scale and the behavioral outcome: helping intentions. This study and the analyses conducted were pre-registered (https://aspre-dicted.org/KPP_PY1).

Method

Participants and Design. We pre-registered to collect 400 participants. CloudResearch Connect returned 404 complete responses (46.8% females, 52.2% males, and 1% non-binary, $M_{age} = 24.69$, $SD = 13.17$). As indicated in our pre-registration, participants who failed the attention check ($n = 9$; 2.23%) were excluded from the analyses. Thus, our final sample size consisted of 395 participants. They were randomly assigned to conditions in a 2 (Thinking Style: Holistic vs. Analytic) $\times$ 2 (Scale Response Format: Continuous vs. Dichotomous) between-subjects factorial design. Fluency and helping intentions were recorded as the dependent variables.

Procedure. Participants in the study completed it on Qualtrics, starting with a cover story about personality research. They were randomly assigned to either a holistic or analytic condition and then responded to an empathy scale using either a continuous or dichotomous format based on their assigned condition. Afterward, they assessed the fluency of their responses and indicated their helping intentions. The study concluded with socio-demographic questions and a debriefing on its purpose.

Independent Variables

Thinking Style. Participants' thinking style was manipulated using the same induction as in Studies 2 and 4.

Scale Response Format. Participants were presented with a validated scale about trait empathy in which the response format was manipulated. The empathy scale used is the Interpersonal Reactivity Index (IRI; Davis, 1983) and was comprised of seven positive items regarding empathic concern. Half the participants replied to this scale in a continuous format, ranging from 1 ("Strongly disagree") to 6 ("Strongly agree"), without a middle point. The other half replied to the same scale in a dichotomous format, with just two anchors from 0 ("Disagree") to 1 ("Agree").

Empathy Scores. We created an empathy index by averaging the scores of the seven items for each condition of the Scale Response Format variable. Since half of the participants completed the scale using a continuous response format and the other half used a dichotomous response format, we converted the ratings from each condition into Z-scores and then combined them to create a single empathy index ($M = 0.01$, $SD = 1.00$).

Dependent Variables

Fluency. Participants evaluated the fluency of their responses to the empathy scale using the same three items as before. These evaluations were averaged to create a composite index of fluency ($\alpha = .86$). Higher values reflected a greater fluency in responding to the items in the manipulation. Values ranged from 1 to 7 ($M = 6.02$, $SD = 1.03$).

Helping Intentions. Participants responded to three 7-point scales ranging from 1 ("Low likelihood I will do it") to 7 ("High likelihood I will do it"): (1) "How likely is that will you be willing to help a homeless person?," (2) "How likely is that will you be willing to give money to a homeless person?," and (3) "How likely is that will you willing to solve a problem of a homeless person?" Items were averaged to form a single index of helping intentions ($\alpha = .73$). Higher scores indicated greater intentions to help a homeless person ($M = 3.64$, $SD = 1.47$). Similar items had been used in prior research to assess prosocial intentions (Moreno et al., 2021).

Results

Fluency. An ANOVA 2 (Thinking Style: Holistic vs. Analytic) $\times$ 2 (Scale Response Format: Continuous vs. Dichotomous) was conducted on fluency. Main effects results can be found in the Supplemental Materials. We found a significant interaction between manipulated thinking style and scale response format on fluency, $F(1, 391) = 5.181$, $p = .023$, $\eta_p^2 = .013$. As illustrated in Figure 7, this interaction showed that for participants induced to think holistically, there was no difference in fluency between the continuous ($M = 6.16$, $SD = 0.91$) and dichotomous format ($M = 5.94$, $SD = 1.12$), $F(1, 391) = 1.985$, $p = .160$, $\eta_p^2 = .005$. However, for those participants induced to think analytically, those in the continuous format condition tended to report less fluency ($M = 5.86$, $SD = 1.04$) than those in the dichotomous format ($M = 6.12$, $SD = 1.06$), $F(1, 391) = 3.360$, $p = .068$, $\eta_p^2 = .009$.

Helping Intentions. To test the moderating role of fluency on the relationship between participants' scores on the empathy scale and helping intentions, a multiple regression analysis was conducted on helping intentions. Main effects results can be found in the Supplemental Material. A significant interaction between fluency and empathy on helping intentions was

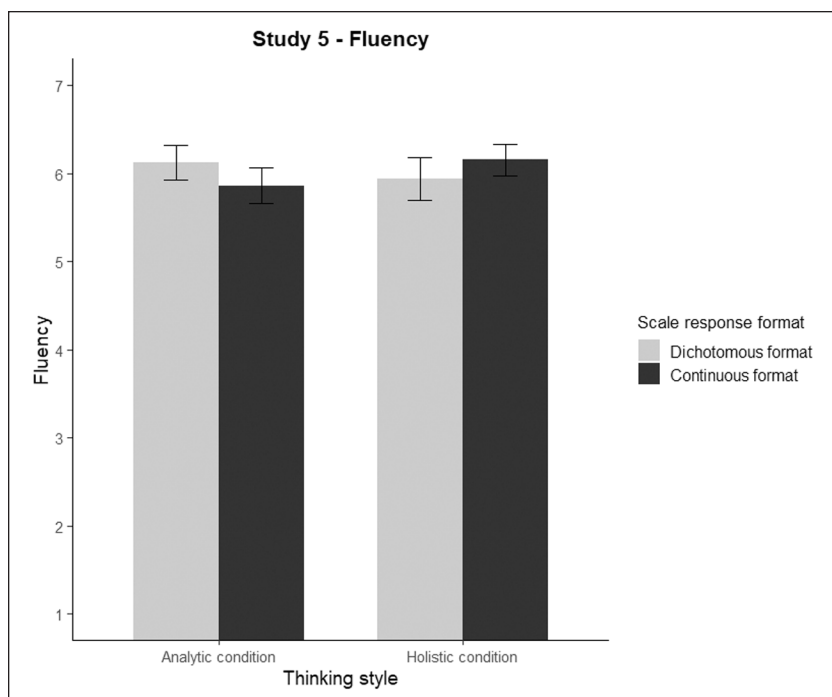


Figure 7. Study 5. Fluency as a function of thinking style (holistic vs. analytic) and scale response format (continuous vs. dichotomous).

found, $B = 0.247$, $t(391) = 2.898$, $p = .004$, 95% CI [0.080, 0.415], Cohen's $f^2 = 0.017$. As illustrated in Figure 8, this interaction showed that among participants reporting higher fluency (+1 SD), those with greater empathy (+1 SD) reported more helping intentions than those with lower empathy (−1 SD), $B = 0.832$, $t(391) = 7.143$, $p < .001$ [0.603, 1.061]. For participants reporting lower fluency (−1 SD), individuals with greater empathy (+1 SD) also reported more helping intentions than those with less empathy (−1 SD), but this difference was significantly reduced as indicated by the previously mentioned interaction, $B = 0.335$, $t(391) = 2.427$, $p = .016$ [0.064, 0.607].

Discussion

The study found that holistic-analytic thinking style significantly influenced how fluently individuals responded to an empathy scale, even when using a continuous scale without a midpoint (a 6-point scale). Holistic (vs. analytic) individuals showed greater fluency in responding to continuous scales compared to dichotomous ones. In addition, this fluency, arising from aligning thinking style with scale format, enhanced the relationship between empathy and helping intentions. As fluency increased, empathy scores became more predictive of helping intentions. To assess whether this effect extends to a more consequential outcome, the final study included a measure of actual helping behavior, allowing us to examine whether fluency enhances trait-behavior correspondence beyond intentions.

Study 6

The main goal of Study 6 was to replicate the effects observed in Study 5 while strengthening some aspects. First, we replaced behavioral intentions with a more behaviorally grounded outcome by assessing participants' actual support for charity organizations. Second, we modified the continuous response format by using a slider-based scale ranging from 0 to 100. Third, we included a response time measure (see the Supplemental Material for results). We predicted an interaction between thinking style and scale response format on fluency and that fluency would moderate the relationship between empathy scores and the behavioral outcome. This study was pre-registered (<https://aspredicted.org/tg9bj6.pdf>).

Method

Participants and Design. We pre-registered to collect 400 participants. CloudResearch Connect returned 402 complete responses (44.8% females, 54.7% males, and 0.5% non-binary, $M_{age} = 44.13$, $SD = 13.17$). As indicated in our pre-registration, participants who failed the attention check ($n = 31$; 7.7%) were excluded from the analyses. Thus, our final sample size consisted of 371 participants. They were randomly assigned to conditions in a 2 (Thinking Style: Holistic vs. Analytic) $\times$ 2 (Scale Response Format: Continuous vs. Dichotomous) between-subjects factorial design. Fluency and helping behavior were recorded as the dependent variables.

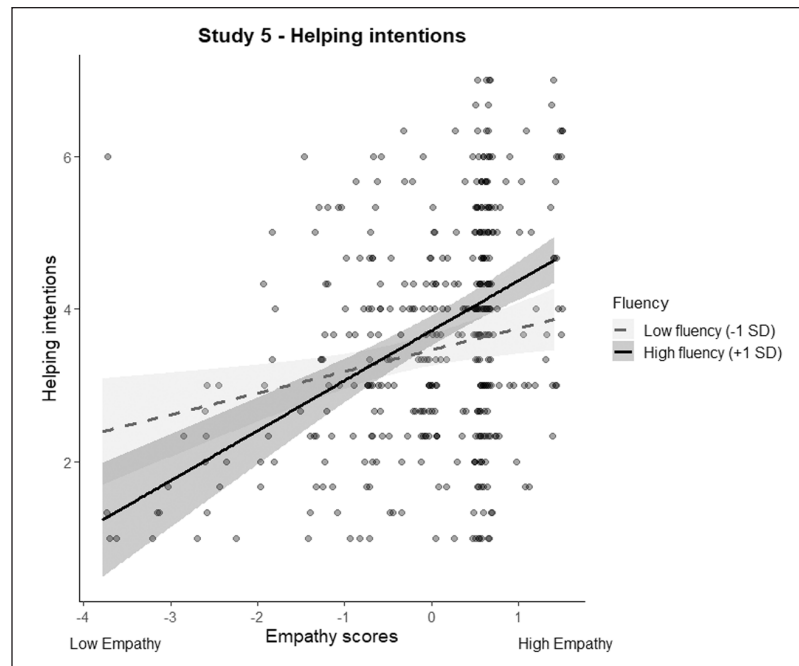


Figure 8. Study 5. Helping intentions as a function of empathy and fluency.

Procedure. The procedure was identical to Study 5 with the modifications described above.

Independent Variables

Thinking Style. Participants' thinking style was manipulated using the same induction as in Studies 2, 4, and 5.

Scale Response Format. Participants were presented with the same empathy scale (IRI; Davis, 1983) as in Study 5. Half the participants responded using a continuous format, in which items were answered on a Qualtrics slider ranging from 0 ("Disagree") to 100 ("Agree"), with labels "Disagree" above 0 and "Agree" above 100. The other half replied to the same scale in a dichotomous format, with just two anchors from 0 ("Disagree") to 1 ("Agree").

Empathy Scores. Based on the responses to the IRI, we created an empathy index as in Study 5.

Dependent Variables

Fluency. Participants evaluated the fluency of their responses to the empathy scale using the same three items as before. These evaluations were averaged to create a composite index of fluency ($\alpha = .75$). Higher values reflected a greater fluency in responding to the items in the manipulation. Values ranged from 2 to 7 ($M = 5.63$, $SD = 1.18$).

Helping Behavior. Participants were presented with the opportunity to support charitable organizations and could choose whether to sign up to be included in a list of individuals endorsing humanitarian aid initiatives. This list could be shared

with organizations to demonstrate public support for their work. Participation was voluntary, and choosing not to sign had no consequences for compensation or study participation. We recorded whether participants chose to sign up (0 = *No*, 1 = *Yes*). In our study, 43.9% of participants chose to sign up to support the charitable initiative. Similar behavioral choices have been used in previous research (Moreno et al., 2021).

Results

Fluency. An ANOVA 2 (Thinking Style: Holistic vs. Analytic) $\times$ 2 (Scale Response Format: Continuous vs. Dichotomous) was conducted on fluency. Main effects results and pairwise comparisons for the interaction can be found in the Supplemental Material. A significant interaction between manipulated thinking style and scale response format on fluency emerged, $F(1, 371) = 5.784$, $p = .017$, $\eta_p^2 = .016$ (Figure 9).

Helping Behavior. A binary logistic regression analysis was conducted on helping behavior. Main effects results can be found in the Supplemental Material. A significant interaction between fluency and empathy on helping behavior was found, $B = 0.328$, $SE = 0.131$, $Wald \chi^2(1) = 6.249$, $p = .012$, $OR = 1.389$, 95% CI [1.073, 1.797]. As illustrated in Figure 10, this interaction showed that among participants reporting higher fluency (+1 *SD*), those with greater empathy (+1 *SD*) helped more than those with lower empathy (-1 *SD*), $B = 0.904$, $SE = 0.240$, $Wald \chi^2(1) = 14.205$, $p < .001$, $OR = 2.470$ [1.543, 3.952]. For participants reporting lower fluency (-1 *SD*), no difference in helping behavior was found between individuals with less empathy (-1 *SD*) and those

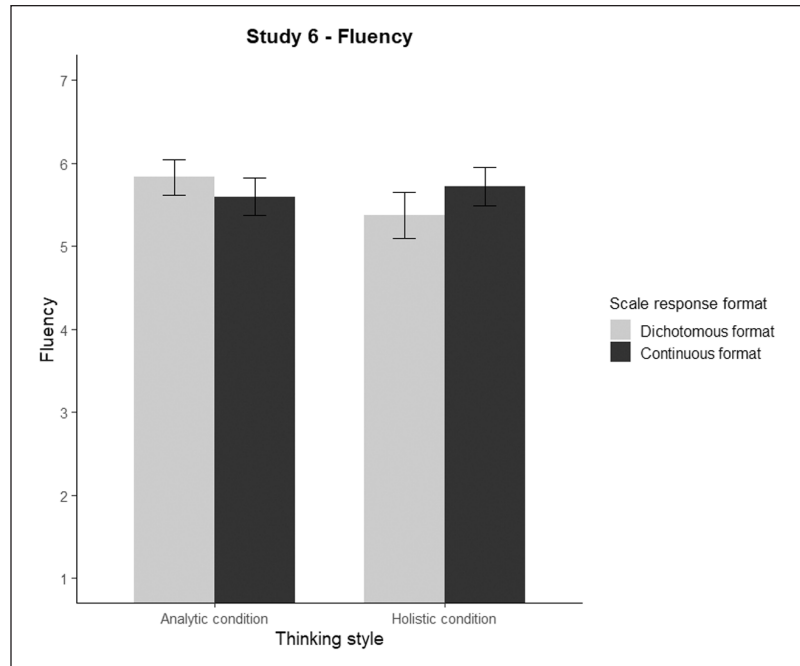


Figure 9. Study 6. Fluency as a function of thinking style (holistic vs. analytic) and scale response format (dichotomous vs. continuous).

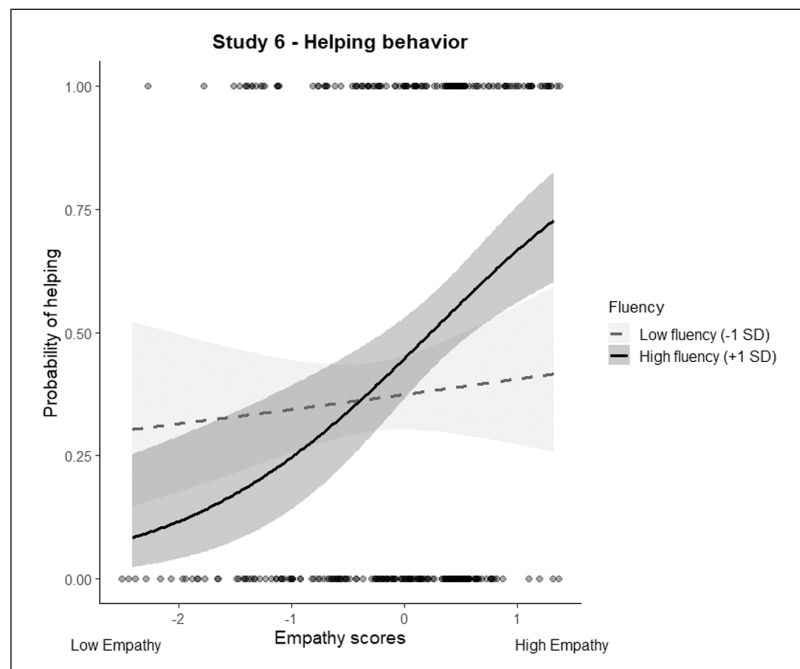


Figure 10. Study 6. Helping behavior as a function of empathy and fluency.

with greater empathy (+1 *SD*), $B = 0.132$, $SE = 0.207$, $Wald \chi^2(1) = .404$, $p = .525$, $OR = 1.141$ [0.760, 1.713].

Discussion

Study 6 replicated the effects observed in Study 5, showing that holistic-analytic thinking style influenced how fluently

individuals responded to an empathy scale, even when using a highly continuous slider format. Holistic (vs. analytic) participants again showed greater fluency in responding to continuous compared to dichotomous scales. Importantly, this fluency moderated the relationship between empathy and helping behavior, such that empathy was a stronger predictor of actual helping among participants reporting higher (vs. lower) fluency.

General Discussion

The present research investigated for the first time how individual differences in holistic-analytic thinking influence the fluency with which people perceive responding to personality scales in different formats (continuous vs. dichotomous). The first two studies established the core effect by measuring or inducing thinking style and examined psychological discomfort as a potential mechanism. Study 3 replicated these effects across cultures (Chinese vs. Euro-American). Study 4 found that a three-option scale (agree, neutral, and disagree) yielded similar fluency to continuous formats for holistic individuals. Study 5 (pre-registered) confirmed the interaction even without a midpoint, further showing that fluency is consequential for predictive validity, as the link between empathy and helping intentions was stronger as fluency in empathy scores increased. Finally, Study 6 (pre-registered) replicated the predicted effect on fluency, showing that this fluency is consequential for a behavioral outcome (i.e., helping behavior), and extended the results to a continuous format using slider scales.

Theoretical and Practical Implications

This research has implications for personality research and test design. For instance, when developing a new instrument to assess personality traits, it is essential to consider the target population. When developing a test in China, choosing a continuous format seems preferable compared to a dichotomous format. Similarly, understanding the thinking style of the test taker allows for the possibility of matching that style with the scale format, potentially leading to scores that reflect more fluent cognitive processes. In any case, researchers and practitioners may benefit from measuring thinking style at the end of a survey, as this individual difference can affect the experience of fluency with which people answer the scales in the personality test. Beyond conventional self-report questionnaires, the slider findings (Study 6) may also have implications for Ecological Momentary Assessment research, where continuous slider scales are common. Future research should examine whether the present effects generalize to repeated assessments in naturalistic settings. Furthermore, Study 4, which included a 3-point scale condition, and Study 5, which included a 6-point scale condition, determined the minimum requirements for holistic individuals to experience response fluency. It appears that providing a neutral option, even within a set of limited response categories (i.e., agree-neutral-disagree), constitutes an effective strategy for holistic individuals to enhance their sense of fluency while responding to the test. This is in line with previous cross-cultural research suggesting that holistic cultures (e.g., Japan, Taiwan) tend to choose the middle option (over other options) when responding to different scales (Chen et al., 1995).

At the same time, and as shown in Study 5, a midpoint is not necessary for holistic individuals to feel this fluency.

This suggests that a trichotomous format is perceived as more continuous than a dichotomous one and similarly to the 5-, 6-, and 7-point response formats. A post-test study indicated that 3-point scales were perceived as more continuous than dichotomous formats but significantly less continuous than 5-, 6-, and 7-point scales (see Online Study 3 in the Supplemental Material for a full report).

Furthermore, we explored the relationship between trait-behavior correspondence. Study 5 demonstrated that aligning thinking styles with response formats can strengthen the link between personality traits and behavioral intentions. Similarly, Study 6 demonstrated that this match extends to behavior, enhancing the link between empathy and helping. These last two studies add to the literature by introducing new variables (i.e., scale response format and thinking styles) that can lead to trait-behavior correspondence. This has implications for the predictive ability of personality scales. If the scale format matches an individual's thinking style, it may enhance the ability of predicting trait-consistent behavior. For example, previous research has shown that when confidence is applied to a personality trait, the predictive validity of the trait on behavior is increased (Horcajo et al., 2022; Santos et al., 2019; Shoots-Reinhard et al., 2015).

Limitations and Future Research

The present research is not without limitations. First, although we used a well-established induction of holistic versus analytic thinking (Santos et al., 2025), future studies should replicate the effect with different inductions. For instance, a visual induction could produce stronger effects in this case given that the core finding is related to visual representation of (number of) response categories in a scale. Second, the format of the fluency variable was continuous in all studies; therefore, future studies should also use dichotomous outcomes to generalize the effect. Third, although the studies differed in samples and contexts, supplementary analyses help address concerns about comparability. A multi-group CFA supported approximate scalar invariance of the fluency measure, and a mega-analysis showed that the critical Thinking Style $\times$ Scale Response Format interaction remained significant and was not moderated by study, supporting the robustness of the findings across contexts (see Supplemental Materials). Fourth, cross-cultural comparisons were limited to Chinese and Euro-American participants; broader cultural samples are needed. Fifth, fluency was assessed primarily through self-reports; hence, future research should supplement this measure with objective indicators of processing. Sixth, in Study 2, because psychological discomfort was measured rather than manipulated, the mediational finding should be interpreted cautiously. As Spencer et al. (2005) noted, establishing causal claims requires research designs in which the mediator is directly manipulated or its causal role is clearly isolated. Thus, the mediation results should be viewed as preliminary, providing

a promising direction for future research. Finally, a further consideration concerns the possibility that measuring or inducing thinking styles immediately before the dependent variables may have produced short-term accessibility effects that inflated the observed results (Bless & Burger, 2016). However, in Study 3, thinking style was neither measured nor induced but inferred from the cultural context, and the same interaction pattern emerged. This suggests that although short-term accessibility may play a role, it cannot fully account for the effect. Similarly, in Studies 5 and 6, measuring fluency immediately before helping intentions and behavior may have introduced accessibility effects, potentially influencing participants' responses. Future research should vary the order of measurement to further examine these potential accessibility effects.

Furthermore, future investigations should explore the potential extension of this effect beyond thinking styles to encompass other individual-difference variables. For instance, it would be valuable to examine whether individuals with a high need for cognitive closure exhibit a preference for responding to items with fewer, rather than more, response options (Webster & Kruglanski, 1997). Similarly, it is plausible that individuals with neurotic tendencies or introverted personalities may lean toward fewer response options, while extroverted or emotionally stable individuals may prefer having a greater number of options (McCrae & Costa, 1987). This future avenue of research has the potential to provide a nuanced understanding of how different personality traits might influence preferences for the quantity of response options (Cabooter et al., 2016; Schwarz, 1999).

Although the primary focus of the present research was on fluency, we conducted supplementary analyses to address potential psychometric and response-style concerns. Specifically, we examined whether key psychometric properties (e.g., internal consistency and scale means) and response patterns (e.g., midpoint or extreme responding) varied as a function of thinking style or response format. These analyses revealed no consistent or systematic differences across conditions (see the Supplemental Material for full results).

Beyond these robustness checks, future research should further examine whether fluency-related effects extend to other psychometric properties, such as scale means (Cabooter et al., 2016), which would have implications for the comparability of scores across formats. Even with identical item content, differences in response fluency may lead individuals to respond differently due to measurement characteristics rather than true trait differences (Meredith, 1993).

In addition, future work could more directly test whether individual differences in response styles (e.g., midpoint vs. extreme responding) interact with scale format to shape fluency, such that midpoint responders experience greater fluency with more continuous scales, whereas extreme responders may show the opposite pattern. Finally, an important avenue for future psychometric research is to examine

whether differential validity associated with fluency reflects differences in measurement precision (e.g., reliability).

Conclusion

Across multiple studies using different measures, manipulations, cultures, and response formats, the present research demonstrates that the experience of responding to personality scales depends on the match between the respondent's thinking style and the response format. Holistic thinkers generally experienced greater fluency with response formats offering continuous response options, whereas analytic thinkers tended to respond at least as fluently to dichotomous formats. Importantly, this fluency was not merely a subjective experience but also strengthened the relationship between personality traits and both behavioral intentions and actual behavior. Thus, response formats should be viewed not only as a measurement choice but also as a psychologically meaningful feature that can shape respondents' experience and the predictive validity of personality assessment.

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Ethical Considerations

(a) The research was conducted ethically, responsibly, and legally. (b) The results are reported clearly, honestly, and without fabrication, falsification, or inappropriate data manipulation. (c) New findings are presented in the context of previous research, which is accurately represented. (d) Researchers have made their data available prior to submission. (e) Methods are described clearly and unambiguously. (f) Submitted work is original, not (self-)plagiarized, and has not been published elsewhere. (g) The authors attest that this manuscript is not being considered by another journal nor has it been published elsewhere. (h) Authorship accurately reflects individuals' contributions. (i) Funding sources and conflicts of interest are disclosed.

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The materials (methodology file), anonymized raw data, and related coding information underlying all findings reported in the paper have been stored in a public repository (https://osf.io/j7wzb/overview?view_only=42e7f1282e6d47289052de5f365681e5). Researchers agree to

the access and use of such data provided that (a) the confidentiality and informed consent of participants are not compromised, (b) legal rights concerning proprietary data do not preclude their release, and (c) professionals accessing data agree in writing in advance that shared data will be used exclusively for the purpose of verifying the substantive claims through reanalysis or for some other agreed-upon use.

Supplemental Material

Supplemental material is available online with this article.

Notes

1. We replicated the interaction effect in a supplemental study extending the paradigm to attitudes toward others, $B = 0.349$, $t(263) = 2.048$, $p = .042$, 95% CI [0.013, 0.685], Cohen's $f^2 = 0.016$ (see Online Study 1 in the Supplemental Materials for full details).
2. We ran a study to test whether increasing familiarity with the response format through prior training would alter the fluency effects. Our reasoning is that this prior training might reduce psychological discomfort by increasing familiarity with the response format. The results showed a significant three-way interaction between thinking style, training, and scale response format on fluency, $F(1, 606) = 12.052$, $p = .001$, $\eta_p^2 = .019$. In the no-training condition, the thinking style $\times$ response format interaction replicated the effect observed across all previous studies, $F(1, 606) = 12.126$, $p < .001$, $\eta_p^2 = .020$, but was not significant in the training condition, $F(1, 606) = 2.138$, $p = .144$, $\eta_p^2 = .004$ (see Online Study 2 in the Supplemental Materials for full details).
3. The actual power can be expected to be higher due to oversampling.

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