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# MORE IS NOT ALWAYS BETTER: UNPACKING THE COGNITIVE PROCESS UNDERLYING INTROSPECTIVE PSYCHOLOGICAL MEASUREMENT

by

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B.S., University of Miami, 2013

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# ABSTRACT

For decades, psychometricans have measured non-cognitive constructs with little attention paid to the underlying cognitive processes of response. Previous advancement in psychometrics suggests that traditional cognitive oriented approaches may, in fact, yield construct deficiency and spurious results when applied to non-cognitive measurement. This thesis highlights the importance of specifying an ideal point response process for non-cognitive measurement and empirically demonstrates that an ideal point response processes undergirds self-reported personality and attitude measurement. Furthermore, this thesis also advances current understanding on the limitations of ideal point assumptions by exploring the moderating effects of various individual differences in motivation and ability.



Keywords: cognitive process, item response theory, ideal point model, non-cognitive measurement

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# INTRODUCTION

Throughout the history of psychological science, much of what we know about psychological individual differences (such as personality and attitudes) has been captured by the use of introspective self-report methods. Introspective self-report methods are the workhorse of the measurement of latent constructs and, for the most part, have proven to be both reliable and valid (Barbaranelli & Caprara, 2000; Joseph & Newman, 2010; Ones, Viswesvaran, & Reiss, 1996). When developing introspective measures, researchers typically assume that the endorsement of a given item is monotonically related to the latent trait of interest, which is the assumption of *dominance models* that typically underlie cognitive measurement. Specifically, the dominance model assumes that *more is better*—the higher level an individual's latent trait is, the more likely they answer a testing item correctly.

However, recent advances in psychometrics have revealed that the cognitive-oriented dominance models in fact misfit non-cognitive constructs such as personality. Indeed it has been demonstrated that dominance model analyses (such as factor analysis) produce spurious results when applied to introspective non-cognitive constructs (Drasgow, Chernyshenko, & Stark, 2010; Roberts, Laughlin, & Wedell, 1999; Tay & Drasgow, 2012). In contrast, recent research has suggested that non-cognitive measurement is better suited by ideal-point models, which assume that the probability to endorse an item is negatively related to person-item distance (i.e., $|\theta–\delta|$, where $\theta$ is the person's latent standing and $\delta$ is the item difficulty parameter) (Stark, Chernyshenko, Drasgow, & Williams, 2006).

The goal of this paper is to *empirically* test the assumptions of ideal point models by investigating the fundamental cognitive process of the response. More specifically, with a series of experiments, this thesis investigates whether or not the endorsement process underlying non-

cognitive measurement truly follows ideal point models, and examines the boundaries of this assumption by exploring moderators.

The structure of the thesis is organized as follows. I will first discuss recent developments and emerging research in psychometrics which suggest that the endorsement of non-cognitive measurement is better described by a non-monotonic curvilinear model known as the ideal-point model. Then using two studies, I will show endorsement actually has a curvilinear relationship to the latent construct of interest for personality and attitudes. Furthermore, I will advance existing theories of endorsement by exploring moderators of the response process. Specifically I will examine the moderating effects of verbal ability, conscientiousness, psychological mindfulness, and alexithymia, on the accuracy of ideal point response processes.

## THE IMPORTANCE OF NON-COGNITIVE CONSTRUCTS

Although there is strong evidence for the predictive validity of general intelligence (*g*) (Gottfredson, 1997; Hunter & Hunter, 1984; Schmidt & Hunter, 2004), research has pointed out that there is still additional variance to be accounted for. Some have called for tests that tap constructs other than "academic ability" or general intelligence. This movement towards constructs that do not load highly on the *g*-factor but offer incremental predictive validity is often labeled as "non-cognitive" testing (Murphy, 1996). Non-cognitive tests sample a wide range of personalogical variables (such as personality, attitudes, affect and beliefs) and are usually distinguishable from cognitive tests due to their *introspective* nature. That is, the distinguishing characteristic of non-cognitive tests is that they require the respondent to observe and report their own internal beliefs, attitudes, states, and emotions (to name a few). This thesis focuses on two non-cognitive areas: personality and attitudes.

Personality is conceptualized as stable individual differences in behavior and stable patterns of behavioral variability across situations (Mischel & Shoda, 1995). The Big Five personality model of openness, conscientiousness, extraversion, and neuroticism is among the most well research personality constructs. Meta-analyses have found that measures of the Big Five are correlated .27 with job performance and, among other criterion: .31 with organizational citizenship behavior, .45 with leadership, .40 with training performance, and .36 with job satisfaction (Ones, Dilchert, Viswesvaran, & Judge, 2007). Research has also shown that personality is best described as a density distribution of states, where an individual has a mean (their average behavior) and dispersion (the variability in their behavior) to describe their standing along the latent continuum (Fleeson, 2001). The conceptualization of personality as a density distribution that lies along a latent continuum lends itself naturally to the assumptions of

an ideal point response process (see section on ideal point models). For example, if we had a person of moderate extraversion, we could expect that person to act within a certain range of their moderately-located distribution. A moderately extraverted person, therefore, is less likely to agree with low extraversion items (ex. "I prefer to be alone") and high extraversion items (ex. "I love large parties") than with moderate extraversion items (ex. "I feel comfortable around people").

Attitudes are 'psychological tendencies that are expressed by evaluating a particular entity with some degree of favor or disfavor' (Eagly & Chaiken, 1993). The nature of attitudes and their ability to predict behavior have been the subject of numerous studies. Job satisfaction, for example, has been found to predict numerous important organizational outcomes including: organizational commitment (.59), job performance (.30), citizenship behavior (.27), employee health (.32), and employee withdrawal (Harrison, Newman, & Roth, 2006; Judge, Hulin, & Dalal, 2012). Glasman and Albarracin (2006) meta analyzed some 128 studies and found that the overall meta-analytic attitude-behavior relationship was .51; this attitude-behavior correspondence highlights the importance of attitudes in psychological measurement. In regards to the present study, it is essential to note that attitudes are *evaluative judgments* (Kruglanski & Stroebe, 2005). As attitudes towards an object form, there are subjective processes in play, and the eventual response to a stimulus will fall along a continuum of favor-disfavor.

Since both personality and attitudes involve subjective, introspective judgments, I believe that responses to items tapping personality or attitude constructs will follow the assumptions of an ideal point response process.

# THEORIES OF ENDORSEMENT

## Dominance Model

The dominance model, the implicit item-level paradigm of modern cognitive intelligence tests, emerged from cognitive ability testing wherein examinees are viewed as competing against items and it is expected that an individual would 'dominate' an item (i.e. answer correctly) with sufficient latent ability (Coombs, 1964; Tay & Drasgow, 2012). Murphy (1996) points out that mental ability is treated "with the assumption that the more of it you have, the better you perform" (p. 12). At the item level, the dominance model assumes that the probability of endorsement is positively related to $\theta - b$ (where $\theta$ is the person's latent standing and $b$ is the item difficulty parameter). By definition, because probability of endorsement always increases as $\theta$ increases given an item with a fixed difficulty parameter $b$, the dominance model is *monotonic* in nature. It should be noted that because cognitive tests typify the dominance model, other constructs are routinely measured with implicit dominance assumptions. Of particular relevance to this investigation, the ubiquitous Likert scaling method used in many non-cognitive applications relies on dominance model assumptions (Stark et al., 2006).

## Ideal-Point Model

In light of the roots of psychometrics and the success of cognitive ability testing in education and organizational selection, research up to the present has extended and applied the dominance model theory of endorsement to non-cognitive introspective constructs. Emerging research, however, has begun to suggest that the dominance model does not accurately describe endorsement for non-cognitive constructs. In particular, for constructs that require self-report and introspection the "maximum probability of endorsement occurs when the attitude level of the item equals the individual's attitude level" (Drasgow et al., 2010). Known as the ideal point

model, this theory stands in contrast to the dominance model previously described; here probability of endorsing an item is a function of the distance of the item difficulty (*b*) from a person's latent standing (i.e. is negatively related to $|\theta - b|$). By definition, because the probability of endorsement increases as the absolute person-item distance (PID) decreases, the ideal point model is non-monotonic in nature.

**Consequences of Model Misspecification**

Researchers have demonstrated that the misapplication of model assumptions to introspective constructs leads to spurious results. For example, Tay, Ali, Drasgow and Williams (2011) used simulated data to demonstrate that an ideal-point model fit ideal point data (i.e., introspective response data) better than the dominance model. Their results strongly suggest that the application of correct assumptions is critical to achieving model fit. Furthermore, Tay and Drasgow (2012) found that when measuring the dimensionality of non-cognitive constructs (such as emotions), using traditional factor analysis or principal component analysis (both of which have dominance model assumptions) leads to spurious bipolarity. Roberts, Laughlin and Wedell (1999) discussed at length that the use of Likert scaling resulted in the systematic under/overestimation of latent standing for individuals at the extremes of the distribution. This is because Likert scaling does not consider item difficulty and all item endorsement values are simply summed. Roberts et al. (1999) also pointed out that this method assumed total test score to be linearly related to latent standing. In fact, since many scales contain moderately negative and moderately positive items, we expect relatively low test scores (endorsement) from extreme negative, extreme positive and moderate individuals. Furthermore, since Likert scaling relies on internal consistency as a metric of item quality, items with non-monotonic ICCs often get excluded due to low item-total correlations. Thus, model misspecification can result in the

systematic exclusion of neutral and moderate items. Regarding the use of dominance model assumptions to measure non-cognitive constructs, Drasgow, Chernyshenko, and Stark (2010) stated, "dominance response processes, such as classical test theory, factor analysis, and the logistic item response theory (IRT) models, are ill suited for response processes that require introspection" (p. 467).

**Theories of Measurement: Classical Test Theory vs. Item Response Theory**

When discussing the differences between dominance and ideal point models, it is necessary to note that these theories of endorsement are often intertwined with our theories of measurement, specifically, Classical Test Theory (CTT) and Item Response Theory (IRT). CTT's primary assumption is that an individual's score on a test is a combination of true score variance and error. CTT inherently focuses on overall summed test scores and aggregates all items; as such, scores derived using CTT are necessarily both person and test dependent (i.e. scores are only meaningful within the context of the particular test and sample) and items are treated as having equal difficulty (i.e. items are treated as parallel tests). In CTT, there is a strong dependency on the dominance model theory of endorsement due to its linear assumptions. For example, under CTT a necessary condition for a scale to be 'good' is reliability. Reliability analyses of scales naturally depend on correlations (e.g. Chronbach's alpha) which make assumptions of linearity. These assumptions necessitate that, in order to find a scale is reliable, probability of endorsement of items must also behave in a linear fashion. For cognitive testing, the assumption of linearity may hold but, for introspective constructs, these assumptions are dubious (please see section on Consequences of Model Misspecification).

Item Response Theory, on the other hand, takes a more molecular approach to scale building and focuses on the properties of the items with reference to the latent continuum. Unlike

CTT, IRT does not assume all items are equally difficult and, because estimates of person scores and item parameters are made with reference to the underlying latent continuum, IRT is, theoretically, both person and test independent.

The point in delineating these two theories is to demonstrate that it is essential to specify both the theory of endorsement and the theory of measurement because omitting one or the other can lead to theory poor scale building. This conclusion is certainly not new, and I point the interested reader to the works of Thurstone who painstakingly laid out the assumptions for psychological measurement (L. L. Thurstone, 1928; L. Thurstone, 1927). Other authors have noted that, at the time, Thurston's contemporaries rejected the idea that psychological measurement needed more stringent assumptions in order to be valid (Andrich, 1989). In fact, our most widely used scaling method, Likert Scaling, was developed by Likert as a rejection of what he considered to be overly-complex assumptions. One should note that Likert scaling holds to CTT assumptions and treats all items as parallel tests. That is, traditional Likert scaling and scoring methods inherently ignore variation in item difficulty and treat all items as equally difficult. When combined with reliability analyses, which have linear assumptions, these CTT methods encourage the use of a restricted range of items along the latent continuum. For example, Chernyshenko, Stark, Drasgow, and Roberts (2007) constructed and compared scales from an item bank using traditional classical test theory, dominance IRT, and ideal point IRT assumptions. Not surprisingly, scales constructed using traditional CTT excluded middling items due to low inter-item correlations. Most notably, the authors found that scores derived from responses to the ideal point scale (which included items across the whole range of the latent continuum) were highly correlated with scores on the CTT scale ($r$ = .88), had high convergent validity, and were predictive of behavior. These findings indicate that the exclusion of moderate

items under CTT is unnecessary and support the intimation that current scaling methods ignore the underlying response process. While scales built with CTT have acceptable criterion-related validity, the arbitrary exclusion of moderate items leads to poor construct validity (Stark et al., 2006).

The widespread and a-theoretical use of Likert scaling highlights the importance of this thesis: in order to advance our understanding of the measurement of introspective constructs, it is essential to specify the underlying theory of endorsement and choose an appropriate and corresponding theory of measurement.

**Testing the Ideal Point Model: Does the model hold?**

As previously noted, it is statistically demonstrable that ideal point models better fit introspective data, but, as of yet, there is no integrative framework empirically verifying that introspective responding is indeed ideal point. Therefore, the question I attempt to address in this thesis is: can it be demonstrated that the response pattern theorized by ideal point models undergirds responses to self-reported non-cognitive variables (such as attitudes, affect and personality)? In other words, my research question is:

> *R1: Do respondents truly follow an ideal point response process for some introspective constructs?*

If non-cognitive constructs follow the unfolding model assumptions, then when presented with a set of items, participants are expected to be more likely to endorse the item closer to their latent standing. Thus, I hypothesize:

> *H1: When presented with a set of items with varying locations, the probability of endorsement is maximized the closer the items are to the individual's latent standing.*

Furthermore, if the ideal point assumptions hold across the latent continuum of interest, the introspective process respondents use must obey some form of the law of transitivity (Tversky & Kahneman, 1986). Tversky and Kahneman (1986) discuss the implications of the

assumption of transitivity with reference to economic decision making. Essentially, if one is to assume a set of preferences (e.g., A is preferable to B) for decisions lies on an ordinal scale, the preference for option A must be independent of the other presented options (B, C, D, and E) and the order of preference must not change (e.g. preference A>B>C>D>E). For our discussion of item response processes, when considering which item to endorse, individuals should— under the assumption of transitivity— consistently choose items that are closer to their latent standing. For example, suppose A, B, C, D, and E are items evenly spaced along the latent continuum. If a respondent has a standing of B, then when presented with CD we would expect them to endorse C. Since E is farther along the latent continuum than D, by transitivity, knowing only that the respondent chose C over D, we could reasonably predict that they would also choose D over E when given the DE item pair. While this is an implicit assumption to decision making paradigms, Tversky (1969) pointed out that in many cases it can be demonstrated that individuals have intransitive decision making processes:

> Consider, for example, a person who is about to purchase a compact car of a given make. His initial tendency is to buy the simplest model for $2089. Nevertheless, when the salesman presents the optional accessories, he first decides to add power steering, which brings the price to $2167, feeling that the price difference is relatively negligible. Then, following the same reasoning, he is willing to add $47 for a good car radio, and then an additional $64 for power brakes. By repeating this process several times, our consumer ends up with a $2593 car, equipped with all the available accessories. At this point, however, he may prefer the simplest car over the fancy one, realizing that he is not willing to spend $504 for all the added features, although each one of them alone seemed worth purchasing. (p. 455)

The preference (utility) for a particular option can, in fact, be dependent on the other options available. The question that remains is: do introspective constructs obey the law of transitivity? It seems unlikely that participants, given many item pairs will always choose the closest item. In fact, the ideal point model states that individuals are *more likely* to endorse items closer to their latent standing (i.e. we expect some cases where respondents choose non-optimal

responses). Tversky (1969) referred to this assumption that choices obey transitivity probabilistically as weak stochastic transitivity (WST).

> *H2: When given a set of items, response patterns will obey weak stochastic transitivity based on the absolute distance of each item from the individual's/group's mean latent standing.*

**Testing the Ideal Point Model: What are the Boundaries?**

Like all models, the ideal point response process also has boundary conditions in its ability to describe phenomena. While the practical limitations due to large sample size requirements, complex software and computing, and sophisticated statistical knowledge have been noted (Brown & Maydeu-Oluvares, 2010; Dalal, Withrow, Gibby, & Zickar, 2010; Stark et al., 2006), there is a dearth of research investigating the conditions under which the ideal point response process does not hold. For example, some have noted that since ideal point models and dominance models can produce similar ICCs, it may be that the dominance model is simply a special case of the ideal point model "where the ideal point is allowed to be located at infinity". Hence it is important to investigate the conditions under which ideal point model assumptions might fail or be unnecessary. Of particular interest are the characteristics intrinsic to the person that leads to a violation of assumptions.

> *R2: For introspective constructs, are there quantifiable individual differences that predict when respondents fail to accurately report their latent standing?*

I will break the search for moderators into two topic areas: ability to respond and motivation to respond. Barrett, Gross, Christensen and Benvenuto (2001) demonstrated that there are individual differences on how well one can distinguish between discreet emotions. For example, people high on the ability of emotional granularity make clear distinctions between similarly valenced (but distinct) emotions such as happiness, contentedness, and amusement. While those low on emotional granularity tend to experience all emotions more globally based

on simple positive or negative valence. Barrett et al. (2001) further showed that an index of emotional granularity predicted emotional regulation ability. Others have also described more general inability of the respondent to access their own thoughts and feelings. In clinical psychology, there is a strong interest in measuring the individual's ability to access their own thoughts and feelings because it has implications for the effectiveness of therapy interventions. Alexithymia, for example, is identified as a personality trait which manifests itself as an inability of the individual to recognize and identify feelings and to describe emotional states (Bagby, Parker, & Taylor, 1994; Martínez et al., 2014). Research shows it is an important moderator to patient outcomes. Martinez et al. (2014) demonstrated that for patients with fibromyalgia, the alexithymia personality trait predicted more patient reported emotional distress and pain; that is, difficulty in identifying/describing feelings led to poorer patient outcomes. Alexithymia dimensions have also been found to inhibit respondent's ability to describe events in a written essay format. Paez, Velasco and Gonzalez (1999) found that when participants were asked to write about and disclose a traumatic event, higher alexithymia predicted less introspective responses and more inhibition in disclosure. Related to alexithymia, is the concept of psychological mindfulness. Psychological mindfulness is rooted in eastern meditation practices and is defined as one's ability to bring attention to experiences occurring in the present in a non-judgmental and accepting way (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Researchers believe that meditation practices can increase one's self-awareness, and that psychological mindfulness measures tap a respondent's level of self-awareness. Baer Smith and Allen (2004) showed that the *describe* dimension of psychological mindfulness correlates with the *difficulty identifying feelings* ($r$ = -.60) and with the *difficulty describing feelings* ($r$ = -.74) dimensions of alexithymia. Returning to our discussion of introspective response processes, I

propose that measures of self-awareness and introspective ability will moderate the ideal point response process:

> *H3: Respondents who score high (vs. low) on Alexithymia and low on the describe dimension of psychological mindfulness will have increased (vs. decreased) difficulty responding to introspective items which will be reflected by poorer (vs. clearer) response patterns.*

In addition to ability to engage in introspective thoughts, ability to understand the content of a survey is a second key prerequisite to ideal point responding. Verbal ability, a sub-facet of *g*, reflects a person's ability to comprehend linguistic materials (such as written text or spoken language) (Sternberg & Powell, 1983). Research has shown that verbal ability accounts for variance in the scores on many tests and scales because responding to written questions requires verbal ability. Personality tests, for example, which fall into the category of introspective non-cognitive tests, have modest but significant correlations with tests of verbal ability (Noftle & Robins, 2007). Since introspective data is collected using survey methodologies which depend on written or spoken questions, it is apparent the verbal ability must play some role in introspective responding. I expect that individuals low on verbal ability may show poorer response patterns because survey methodologies capture data using verbally-laden items.

> *H4: Respondents who score low (vs. low) on verbal ability will have increased (vs. decreased) difficulty responding to survey items which will be reflected by poorer (vs. clearer) response patterns.*

The second category of moderators I shall examine concerns motivation to respond. Assuming a respondent has the ability to engage in introspective thought and comprehend the questions, the next logical prerequisite is motivation. Here I would like to point out introspective tests often assume motivation to respond (i.e. there is often an implicit assumption that subjects will respond to the best of their abilities). In truth, motivation to respond is not constrained and research suggests that there are individual differences in motivation. Need for cognition, for

example, is a construct that is defined as "an individual's tendency to engage in and enjoy cognitive endeavors" (Cacioppo, Petty, & Feng Kao, 1984). Individuals high in need for cognition have been found to engage in more metacognitive processes such as evaluating their own thoughts for validity, and engaging in controlled and automatic bias correction processes (Briñol & Petty, 2005). Of particular relevance to this study, findings show individuals high in need for cognition exhibit lower attitude polarization (dogmatism) and more willingness to reflect on attitudes (Cacioppo & Petty, 1982). Lower tendency towards attitude polarization is important because individuals who do become polarized when asked to respond to attitudinal items may not exhibit an ideal point response pattern.

Besides need for cognition, need to evaluate is another measure that taps motivation for cognition. More specifically, the need to evaluate is defined as the tendency to chronically engage in evaluative thought (Jarvis & Petty, 1996). Jarvis and Petty (1996) found that their need to evaluate scale showed convergent and discriminant validity with need for cognition ($r$ = .35). In explaining why need for evaluation is an important construct, the authors point out that social science research often requires participants to report their evaluation of a stimuli (such as an attitude toward a social issue or political candidate) without the opportunity to previously evaluate the object. Under these conditions, the self-reported attitudes of those high in need for evaluation may be better indicators of actual attitudes because these individuals are more likely to engage in the thoughtful evaluative process required for opinion formation. Indeed the authors found that when students were given a political attitudes questionnaire, those with a low need to evaluate more frequently endorsed the "no opinion" option. In light of these findings, participants low in need to evaluate may not provide as much information as we expect when responding to introspective non-cognitive tests because of a lack of motivation to form opinions.

*H5a: Respondents who score low (vs. high) on need for cognition will have increased (vs. decreased) difficulty responding to introspective items which will be reflected by a poorer (vs. clearer) response pattern.*

*H5b: Respondents who score low (vs. high) on need to evaluate will have lower (vs. higher) motivation to respond to introspective items which will be reflected by a poorer (vs. clearer) response pattern.*

Finally, conscientiousness is a personality trait characterized by orderliness, responsibility, and dependability (Costa & McCrae, 1992). In the context of the nomological net of moderators discussed thus far, research has shown conscientiousness to be related to both ability and motivation. For example, Schmidt and Hunter's (1998) meta-analysis showed that conscientiousness does indeed overlap with tests of GMA but also has some incremental predictive validity of task performance above and beyond GMA. Additionally, conscientiousness has also been shown to moderate the effectiveness of mindfulness training (Vibe et al., 2015); as discussed earlier, mindfulness taps the ability to describe. In regards to motivation, Eilman, Zeidner and Aharon (2009) showed that conscientiousness predicts academic achievement and that this relationship is mediated by self-regulated learning behaviors. Self-regulated learning (SRL) consists of tactics used to reach a learning goal, the multilevel process of monitoring feedback and engaging in self-regulation, and the self-efficacy of the learner. Conceptually, SRL reflects the extent to which learners are motivationally engaged in the learning process. Thus, research has conceptually modeled conscientiousness as both: (1) a moderator of the ability to engage in metacognitive processes (e.g. mindfulness) and (2) a predictor that is moderated by motivation (e.g. SRL). Since conscientiousness has been shown to be an important predictor of performance, and, since it is conceptually related to other ability and motivational constructs, I expect that conscientiousness will moderate of the ideal point response process.

*H6: Respondents who score low (vs. high) on conscientiousness will have poorer (vs. clearer) response pattern.*

# STUDY 1

Study 1 is aimed at demonstrating that an ideal point unfolding response process undergirds personality measurement. In this study, participants were administered personality items with a traditional five-point scale and forced-choice scale. For each personality item, participants were placed into homogeneous groups and the response patterns of these groups to the forced choice personality items were plotted.

## Methods

**Participants.** Data were collected from 911 undergraduates in a large southeastern university. Student participants received class credit for their participation. Incomplete cases and cases where participants failed to correctly answer validation questions were excluded. 767 complete surveys were attained for a completion rate of 84.19%. The sample contained 590 females and 174 males with an average age of 20.05 years (*SD* = 4.69). The sample was 58% white, 9.6% African American, 18% Hispanic, 6.1% Asian, 0.4% Native American, .3% Pacific Islander, 4.8% multiracial, and 2.5% of the sample selected 'other' as their race.

**Measures.** I used a series of 15 adjectives from the Mini-marker scale of the big 5 personality traits (Saucier, 1994). The original mini-marker scale contained 8 items for each dimension: extraversion ($\alpha$ = .85), agreeableness ($\alpha$ = .85), conscientiousness ($\alpha$ = .86), emotional stability ($\alpha$ = .76), and intellect/openness ($\alpha$ = .82). The selected adjectives include: talkative, extroverted, bold, sympathetic, warm, kind, organized, efficient, systematic, moody, jealous, temperamental, creative, imaginative, and philosophical. For the first item set given to participants, each adjective had 5 levels of agreement (e.g. 1= I am not creative, 2=I am slightly creative, 3= I am moderately creative, 4= I am very creative, 5= I am extremely creative). For the second item set, each adjective had 10 forced-choice items where only two of the five agreement

options are given. These 10 items are a complete set of all unique combinations of the 5 levels of agreements (example items may be found in the appendix). Note that due to the nature of the second item set, it would be impractical to include all 40 adjectives from the original Mini-Marker as this would result in 400 paired comparison items.

**Procedures.** The survey was administered online through the UCF SONA research participation system. Using Qualtrics, each participant read a description of the research and informed consent page. The participants first answered the randomized 15 adjective items from the Mini-marker scale described above. Participants then completed a set of 150 randomized forced-choice items for the same 15 adjectives. During the course of answering the 150 forced-choice items, participants also answered 10 validation questions. Participants with 5 correct answers or less were excluded from the analyses. At the conclusion of the study, participants answered some brief demographics questions and were thanked for their time.

**Analyses.** Using the item responses, it can be shown that the response pattern to the personality items follows the ideal point assumptions which are represented by Figure 1, where items are represented by letters A, B, C, D and E, which represent very negative (- -), negative (-), neutral (0), positive (+), and very positive (+ +) levels on a latent continuum, respectively. For example, for a person with positive standing (+) we would expect:

$$P_E < P_D < (P_C \approx P_A) < P_B$$

where $P$ is the probability of endorsement for each corresponding item, e.g., $P_E$ refers to the possibility of endorsing item E. Comparing this to Figure 2 which represents the pattern of endorsement we would expect to observe for a set of dominance model items. Given a respondent of standing $\theta$, the more difficult items are always less likely to be endorsed than easier items:

$$P_A < P_B < P_C < P_D < P_E$$

If non-cognitive introspective variables such as personality and attitudes follow the unfolding model assumptions, then when presented with an array of items of varying difficulty (A(+ +), B(+), C(0), D(-), and E(- -)), participants should be more likely to endorse the one closest to their latent standing.

Using the responses to the mini-marker 15 item scale as the indicator of self-reported latent standing, I grouped individuals and calculated group mean responses to the force-choice items.

**Results and Discussion**

Figures 3 through 8 present the group mean endorsement of the adjectives from the Mini-Marker Scale. For the 15 personality adjectives, participants showed endorsement patterns consistent with the ideal point response process. As hypothesized in figure 1, an ideal point response process posits that participants are more likely to endorse items they perceive to be closer to themselves. Looking at Figures 3 through 8, one can observe that for each group the hypothesized 'ideal' response always has the highest mean endorsement. In other words, the item that is most strongly endorsed within a group matches our expectations. Thus hypothesis 1 was supported.

Hypothesis 2 stated item endorsement should obey weak stochastic transitivity (WST); that is, the probability of endorsement should obey a consistent pattern where items farther from one's latent standing are always less likely to be endorsed. Under an assumption of WST, we would not expect a person who is *moderately imaginative* to prefer the *extremely imaginative* item over the *very imaginative* item. For all 5 groups within each of the 15 items, there were no cases where an item farther away from the group's latent standing was preferred over a closer

item. For example, Figure 3 shows the average endorsement of each of the forced choice *extroverted* items on the y-axis. On the x-axis, respondents are grouped based on their level of endorsement to the single mini-marker adjective *extroverted*. Figure 3 clearly shows an ideal point pattern that obeys WST. For example, Individuals low on extroversion (i.e. the *not extroverted* group) have a pattern of decreasing preference for increasingly extroverted items (i.e. $P_A < P_B < P_C < P_D < P_E$). Likewise, individuals moderate on extroversion (i.e. the *moderately extroverted* group) and those high on extroversion (i.e. the *extremely extroverted* group) prefer moderate (i.e. $(P_A \approx P_E) < (P_B \approx P_D) < P_C$) and extreme extroversion items respectively (i.e. $P_E < P_D < P_C < P_B < P_A$). These results provide preliminary support for hypothesis 2.

Several interesting patterns emerged across the groups, items, and personality dimensions shown in Figures 3 through 7. At the dimension level, it is apparent that some dimensions of personality show a clearer ideal point pattern than others. For example, while the pattern for extroversion was clear across all groups and items, this was not the case for agreeableness. For low agreeableness groups, there appeared to be less discrimination between the low agreeableness items. In Figure 5, for example, the *not warm* group had almost equal mean endorsement of *not warm* and *slightly warm*. This pattern of low discrimination for the lower groups can also be observed for conscientiousness. It is interesting that persons who consider themselves *not efficient* would only have an average endorsement of the *not efficient* item of approximately 3 and also have mean endorsement of *slightly efficient* and *moderately efficient* above 2. Perhaps in this case conscientiousness itself plays a role in an individual's ability/motivation to endorse otherwise distinct items. Similar patterns of low discrimination between items also emerged for Neuroticism. For Neuroticism, however, it was the moderately temperamental and very temperamental groups that did not discriminate between nearby items.

To explore the possibility that conscientiousness moderates the ideal point model patterns, I conducted supplemental analyses where the sample was split into a low conscientiousness group and a high conscientiousness group. The low conscientiousness group consisted of individuals who responded that they were *not organized* or *slightly organized* and the high conscientiousness group consisted of individuals who responded that they were *very organized* or *extremely organized*. Figure 9 shows the results of these analyses. Interestingly, conscientiousness seems to moderate the extent to which the preference of endorsement obeys WST. For example, in the low conscientiousness *not warm* group the pattern still shows decreasing preference for increasingly warm items. This pattern is not as clear, however, as the high conscientious not warm group. Similarly, the high conscientious *not talkative* group shows a mean endorsement of the *extremely talkative* items of 0, while the low conscientious *not talkative* group endorsed this same item around 0.6.

In summary, study 1 provided evidence that the basic assumptions of the ideal point model are indeed appropriate in describing the response process to personality items. First, respondents can be expected to agree most strongly with the item that is closer to them along the psychological continuum. Second, the mean response pattern to items across groups and dimensions obeys WST. Items that are psychologically farther are not only less likely to be endorsed but the degree of agreement will follow a predictable order. Finally, study 1 provided some preliminary evidence that personality traits (i.e. conscientiousness) moderate the process of endorsement. These results have important implications to the assertion that introspective constructs follow an ideal point pattern. These implications will be further explored in study 2.

# STUDY 2

In study 2, I further demonstrated ideal point unfolding patterns appropriately describe attitude constructs by creating item characteristic curves. I measured participant's attitudes toward several socio-political issues to show that the ideal point response process also undergirds responses to attitudinal items. The attitudinal topics included: Abortion, capital punishment, censorship, evolution, and belief in god. Using empirically derived item scale values, I calculated participant's scores for each attitude scale, grouped individuals with similar scores, and then plotted group mean endorsement to each item to generate ICCs. Additionally, study 2 investigated the moderators of attitudinal ideal point responding. I collected measures of Big Five personality, alexithymia, psychological mindfulness, verbal ability, need for cognition, and need to evaluate. These measures will be used to examine the moderating effects of individual differences in self-awareness, introspective ability, verbal ability, motivation, and conscientiousness on the ideal point response process.

## Method

**Participants.** Two independent samples were used in study 2: the first was used to gain ratings of item location and the second was used to assess the person location on the attitudinal continuum. For the first sample 204 southeastern university undergraduates were surveyed. Students received class credit for their participation. Incomplete cases, cases where participant's primary language spoken was not English, and cases where participant's standard deviation of judgments to the attitude items were less than 1 were excluded. 155 surveys meeting these criteria were attained for a completion rate of 75.98%. The sample contained 106 females and 49 males with average age of 22.05 years (SD = 5.54). Sample 1 was 61.3% white, 10.3% African

American, 16.8% Hispanic, 5.8% Asian, 0.6% Native American, 3.2% multiracial, and 1.9% of the sample selected 'other' as their race.

For the second sample 401 southeastern university undergraduates were surveyed. Students received class credit for their participation. Incomplete cases and cases where participant's primary language spoken was not English were excluded. 282 surveys meeting these criteria were attained for a completion rate of 70.32%. Sample 2 contained 202 females and 78 males with an average age of 21.42 years (*SD* = 2.02). Sample 2 was 61% white, 10.3% African American, 17% Hispanic, 5% Asian, 0.4% Native American, 0.4% Pacific Islander, 4.6% multiracial, and 1.4% of the sample selected 'other' as their race.

**Measures.** To capture a sample of attitude responses, participants were given items on abortion, capital punishment, censorship, evolution, and belief in god. Moderator measures included Big Five personality, alexithymia, psychological mindfulness, verbal ability, need for cognition, and need to evaluate. For the item ranking task, attitude measures were given on a scale from 1 (most unfavorable attitude) to 7 (most favorable attitude). For the item endorsement task, items were administered on a 6-point scale ranging from1 (strongly disagree) to 6 (strongly agree).

***Abortion.*** To capture attitudes towards abortion, the 10-item measure from Roberts, Laughlin and Wedell (1999) was used. These 10-items were developed by Roberts et al. (1999) and given scale values using the method of successive intervals (see analysis section for an explanation of the successive interval scaling procedure). Example items include, "Abortion violates the unborn child's fundamental right to life" and "Society has no right to limit a woman's access to abortion." No reliability estimates are available for this scale.

***Capital punishment.*** To capture attitudes toward capital punishment, I used 25 items taken from two scales. The first is a 24-item scale created by Louis Thurstone to measure attitudes towards the punishment of criminals (as cited in Shaw & Wright, 1967). An example item is, "Every criminal should be executed." Thurstone reported a test-retest reliability coefficient of .71 for this scale in a sample of school-age children (L. L. Thurstone, 1931). Ferguson (1944) later found the internal consistency reliability of the scale in a sample of adult students to be satisfactory ($\alpha$ = .79). One item was excluded from this scale due to its outdated language ("I think the return of the whipping post would be more effective than capital punishment"). The second scale is a 15-item measure created by Balogh and Mueller (1960) to measure attitudes toward capital punishment using an equal-appearing interval scaling procedure. No reliability estimates were provided for this scale. I selected two additional items from this scale for use in this study ("Capital punishment is not morally right or wrong; it is merely just one method of punishment" and "when society sentences a murderer to death, we ourselves become murderers").

***Censorship.*** To capture attitudes toward censorship, I used 25 items taken from Rosander and Thurstone (as cited in Shaw and Wright, 1967). The original scale contained two 20-item equivalent forms and had reliability estimates ranging from .72 to .84. Items were selected based on reported scale values so that a range of attitudes about censorship were represented. Additionally, the language of many items were updated to reflect current censorship issues. For example, "Some authorized power is certainly needed to keep obscene *literature* in check" was changed to "Some authorized power is certainly needed to keep obscene *movies and video games* in check."

***Evolution.*** To capture attitudes towards evolution, a 20-item measure by Thelma Thurstone was used (as cited in Shaw & Wright, 1967). This scale contained items that directly reference the theory of evolution and items that contrast the theory of evolution with religious doctrine. Two example items are, "The theory of evolution is a lot of unsupported guesses" and "We should oppose the theory of evolution because it undermines our faith in God." Likert, Roslow and Murphy (1934) found that this scale has acceptable internal consistency reliability ($\alpha$= .75).

***Belief in God.*** To capture attitudes towards the reality of god, I used 25 items taken from a scale by Ernest Chave and Louis Thurstone (as cited in Shaw & Wright, 1967). Originally, the scale contained two 20-item equivalent forms (L. L. Thurstone, 1931). Likert et al. (1934) reported good internal consistency reliability of the scale ($\alpha$ = .85). For this study, the 25-items were chosen such that there was a range of items from unfavorable attitudes towards God to Favorable attitudes towards God. Items with outdated language, or overly specific references to Christianity were excluded (e.g. "My faith in God is complete for though he slay me yet will I trust him"). An example item is, "The idea of God gives me a sense of security."

***Personality.*** Big Five personality factors were measured with the 120-item IRT theory based International Personality Item Pool NEO (IRT IPIP-NEO; Maples, Guan, Carter, & Miller, 2014). The IRT IPIP-NEO is an improved and shortened version of the IPIP-NEO that was constructed using a graded IRT model. Maples, Guan, Carter and Miller (2014) selected items with the highest discrimination parameters from the IPIP. The IRT IPIP-NEO has excellent internal consistency reliability (Openness $\alpha$ = .85; Conscientiousness $\alpha$ = .84; Extraversion $\alpha$ = .85; Agreeableness $\alpha$ = .79; Neuroticism $\alpha$ = .88) and convergent with the revised NEO personality inventory. The IRT IPIP-NEO was administered on the 5-point scale (1 = very

inaccurate; 2 = moderately inaccurate; 3 = neither inaccurate nor accurate; 4 = moderately accurate; 5 = very accurate).

***Alexithymia.*** The alexithymia personality trait was measured with the 20-item Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994). The TAS-20 has three factors including difficulty identifying feelings ($\alpha$ = .79), difficulty describing feelings ($\alpha$ = .75), and externally oriented thinking ($\alpha$ = .66). Example items from each dimension are, "I am often confused about what emotion I am feeling", "People tell me to describe my feelings more", and "I prefer talking to people about their daily activities rather than their feelings." Bagby, Taylor and Parker (1994) found that the TAS-20 correlates negatively with both psychological mindedness ($r$ = -.68) and need for cognition ($r$ = -.55). Note that, although the two constructs are similar and correlated ($r$ = -.41), psychological mindedness should not be confused with the construct of psychological mindfulness discussed below (Beitel, Ferrer, & Cecero, 2005).

***Ability to describe.*** 10 items from the describe factor of the Five Facets of Mindfulness Questionnaire (Baer et al., 2006) were used to tap ability to describe. An example item is, "I can usually describe how I feel at the moment in considerable detail." The describe factor of the FFMQ has excellent internal consistency reliability ($\alpha$ = .91).

***Verbal ability.*** Verbal ability was measured with 10 items taken from the Graduate Record Exam (GRE) revised second edition practice test (*Practice Book for the Paper-based GRE revised General Test*, 2012) and 15 items taken from the SAT I Reasoning Test (*SAT I: Reasoning Test*, 2002). The complete GRE verbal test has excellent internal consistency reliability ($\alpha$ = .92) (*GRE Guide to the Use of Scores*, 2014). Research has shown that GRE scores are excellent predictors of academic performance and that GRE verbal scores can predict a wide range of outcomes including graduate GPA (.34), faculty ratings (.42), and graduate

degree attainment (.18) (Kuncel, Ones, & Hezlett, 2001). Likewise SAT verbal scores have been found to be very predictive of first-year college GPA ($r$=.53; Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008). For each question, participants were asked to select the correct answer out of four or five unique response options. Items included both sentence completion and word analogy tasks.

***Need for cognition.*** Motivation to engage in cognitive endeavors was measured with the short form Need for Cognition Scale (NCS) by Cacioppo, Petty, and Kao (1984). Example items include, "I would prefer complex to simple problems" and "I only think as hard as I have to." The 18-item short form NCS has excellent internal consistency reliability ($\theta$ = .90).

***Need to evaluate.*** Motivation to engage in evaluative thought was measured with the Need to Evaluate Scale (NES) by Jarvis and Petty (1996). Example items include, "I form opinions about everything" and "I often prefer to remain neutral about complex issues." The 16 NES has excellent internal consistency reliability ($\alpha$ = .87).

**Procedures.** Participants signed up for the study via the University of Central Florida SONA research participation system; after signup, a provided link directed participants to the web-based survey. The first survey page displayed a brief description of the research along with an informed consent page. After consenting, the main attitudes study questionnaires were administered. Participants completed one of two attitudes survey tasks. For sample 1 the task required participants to rank the items from each attitude measure on a 7-point scale (1= most unfavorable attitude, 2= unfavorable attitude, 3= somewhat unfavorable attitude, 4= neutral attitude, 5= somewhat favorable attitude, 6= favorable attitude, and 7 = most favorable attitude). This was accomplished by displaying all the items on the left side of the computer screen with seven ordered and labeled boxes on the right side of the computer screen. Participants were

instructed to drag and drop each item into the box they believe the item belongs in. For sample 2, the task simply required participants to respond to each item of the attitude scales on a 6-point Likert scale (1= strongly disagree to 6 = strongly agree).

After completing the attitude scale tasks, participants then responded to the scales measuring personality, alexithymia, ability to describe, verbal ability, need for cognition, and need to evaluate. Finally participants were asked some demographics questions, the survey closed, and then a screen thanking them for their participation was displayed.

**Analysis.** To accurately assess the pattern of endorsement for items across the latent continuum, values representing item location on the latent continuum were generated using the item rankings collected from sample 1. I calculated item scale values using an empirical procedure developed by Louis Thurstone called the method of successive intervals (Edwards, 1957; Safir, 1937). This method is efficient as it requires each respondent to make a single judgment for each item by placing it on a scale whose anchors range from unfavorable to favorable. Using the judgments of favorability obtained, the frequency each item was placed into the seven categories of favorability was determined. From there the proportion and cumulative proportion of the judgments for each item into the seven categories of favorability were calculated (for an example using 4 hypothetical items, please see table 1). For clarity, table 2 lists the cumulative proportions for the hypothetical example items. Here $p_{ij}$, the cumulative proportion, is taken as the upper boundary of the *j*th category for the *i*th item. Each $p_{ij}$ represents the proportion of judges who place the *i*th item below the upper boundary of the *j*th category. In the method of successive intervals, scale values are theoretically defined as the median of the cumulative distribution of endorsement projected onto the latent continuum (Edwards, 1957). To project these values, the cumulative proportions must first be standardized. Table 3 contains the

z-values, labeled $z_{ij}$, for each of the proportions shown in table 2. From here, the width of intervals is found using the following formula:

$$\omega_{ij} = z_{ij} - z_{i(j-1)} \quad (1)$$

where $\omega_{ij}$ is an estimate of the width of the *j*th interval using item *i*. Note that with *k* categories of endorsement, the method of successive intervals provides estimates for *k*-2 intervals; as such table 4 has five intervals. The final estimate of the width of each of the five intervals is the arithmetic mean, $\bar{\omega}_{ij}$, of the columns of table 4.

Finally, the scale values for each of the items will be calculated using the formula taken from Edwards (1957):

$$S_i = l + \left( \frac{.50 - \sum p_b}{p_w} \right) \left( \bar{\omega}_{\bullet j} \right) \quad (2)$$

Where $S_i$ is the estimated scale value for the *i*th item, *l* is the lower limit of the interval on the psychological continuum where the median of the cumulative proportion distribution falls, $\Sigma p_b$ is the sum of the cumulative proportions below the interval that contains the median, $p_w$ is the cumulative proportion within the interval that contains the median, and $\bar{\omega}_{ij}$ is the width of the interval calculated earlier. Take item 1 for example. The median of the distribution of cumulative proportions falls on the interval from 3 to 2. Therefore, from equation (2) we have:

$$S_1 = 1.21 = .77 + \left( \frac{.50 - .3}{.71 - .3} \right) (.91) \quad (3)$$

The procedures described above and in Tables 1 through 4 were applied to the obtained item rankings from sample 1. Scale values derived from these procedures were then used to calculate participant's attitude scores for sample 2. Using the item scale values, each subject's score on the latent continuum was calculated by taking the median scale value of the items to

which they agree (i.e. items they at least 'slightly' agree with). Following procedure similar to Roberts et al. (1999), subjects were divided based on their scores into attitude-homogeneous groups for each scale. Using sample quantile algorithm definition 7 given in Hyndman and Fan (1996) to obtain sample quantile cut values, I divided the participants based on their attitude scores into vigintiles for each attitude (groups each representing 20% of the sample). For example, the first vigintile for abortion is a grouping of those individuals scoring at or below the $20^{th}$ percentile for attitude towards abortion. Since lower scores represent unfavorable attitudes in this study, the first vigintile here represents individuals with extremely anti-abortion sentiments. Likewise the fifth vigintile is a grouping of those individuals scoring above the $80^{th}$ percentile on attitudes towards abortion. Since higher scores represent more favorable attitudes, the fifth vigitile represents individuals with extremely pro-choice sentiments. Finally, item characteristic curves (ICCs) were drawn by plotting the mean group score (the mean of the attitude score of interest within a vigintile) on the x-axis, and average item endorsement on the y-axis (the mean agreement to the attitude item within a vigintile).

To examine the moderation effects of ability, motivation and personality on the response process, I divided the sample into groups of low ability, low motivation and low conscientiousness by taking the lowest 25% of the distribution of interest. For example, to test the effect of verbal ability on responding, I compare those individuals scoring at or below the $25^{th}$ percentile on the verbal ability measure to those scoring above the $25^{th}$ percentile. Following the procedures given above, I generated ICCs for the low ability, low motivation and low conscientiousness groups and compare these to the ICCs for the whole sample, and ICCs drawn for those falling above the $25^{th}$ percentile on the moderator of interest.

## Results and Discussion

**Item Characteristic Curves.** Figures 10 through 14 present the obtained ICCs and scale values for each item. For each figure, items are presented in ascending order of scale value (i.e. are shown from most unfavorable to most favorable attitude). Across all 5 attitude scales, the results were consistent with the probabilistic orders we expect if an unfolding pattern undergirds responses to attitudinal constructs (see figure 1). For items with low scale values, groups of increasingly favorable attitude showed a decreasing willingness to agree. Take for example item #5 of the capital punishment scale, "Capital punishment cannot be regarded as a sane method of dealing with crime" (see Figure 11); as we move along the direction of increasing group mean Thurstone score, the average agreement to the item monotonically decreases. For items that have high scale values, groups with increasingly favorable attitude show an increasing willingness to endorse the items. Take for example item #15 of the evolution scale, "Anti-evolution legislation is ridiculous in a civilized nation" (see Figure 13); as we move along the x-axis in the direction of increasing group mean Thurstone score, the average agreement to the item monotonically increases. Most convincing, however, is the pattern that we see for items that fall in the middle of the attitudinal continuum. For these items, there is a clear curvilinear relationship between group attitude scores and mean level of endorsement —as group latent standing increases, agreement increases to a point then, after this inflection point, agreement decreases. For example, take item #8 from the God scale, "I believe in God, but my idea of God is vague" (see Figure 14). It is clear that only groups in the middle of the latent continuum are likely to agree with this item. These curvilinear patterns are a hallmark of the ideal point response process and the results here provide evidence that an ideal point response process does undergird attitudinal responding.

For the abortion scale (Figure 10), capital punishment scale (Figure 11), evolution scale (Figure 13) and God scale (Figure 14), the ICCs show a range of items with good discrimination. Item discrimination is determined by the slope of the ICCs— items with flat slopes have low discrimination because the strength of endorsement does not change much across the latent continuum. As such, items with a flat curve do not provide much information about a person's attitude because the level of agreement does not change as attitude changes (i.e. the slope approaches 0). Many of the items for the censorship scale exhibit this type of flat, low discrimination ICC. For example, item #2 of the censorship scale, "The judgment of intelligent people is the only effective censorship" (see Figure 12) has a slope of nearly 0. Thus, posing this question to a participant would not give much indication about whether they hold anti-censorship, moderate-censorship, or pro-censorship views. Since ICCs for censorship were generally flat, this could be an indication that our sample did not have strong salient opinions about the nature of censorship. That is, it is likely a lack of a formed salient opinion in the sample towards censorship results in 'flat' attitudinal responding across the latent continuum.

It is worth noting that the items which exemplify the characteristic ideal point unfolding pattern (e.g. abortion items #5 #6 #7 & #8, capital punishment items #6 #9 #17 #21 & #22, evolution items #2 & #16, and God items #4, #8, #11 & #23) often express ambivalence, uncertainty, or an attitude that is more complex than a 'black and white' understanding of the issue. Table 5 presents the correlations between unfavorable, moderate, and favorable items for the abortion, capital punishment, and evolution scales. It is clear that favorable and unfavorable items have significant moderate correlations. Moderate items, however, do not correlate well with either unfavorable or favorable items. Traditional dominance model psychometric theory would dictate that we delete these items because they have low inter-item correlations and low

item total correlations. Given that the ICCs reported here show that moderate items have clear, consistent, curvilinear relationships with the latent attitude continuum, it may be the case that deleting these items to improve internal consistency is inconsistent with the ideal point response pattern that undergirds introspective measurement.

**Moderators.** Table 6 presents the correlations between the six moderators. Because Alexithymia and Ability to Describe were highly correlated ($r$= -.69), I aggregated these two measures into an introspective ability composite. No observable patterns or differences were found for individual's low on Need for Cognition or Need to Evaluate compared to the rest of the sample; thus hypothesis 5 was not supported. Figure 15 and 16 present the results of the moderation analyses for the God and Evolution subscales respectively. In these figures, the solid black line represents the ICC based on the whole sample, the dashed red line represents the ICC for the subsample scoring at or below the 25$^{th}$ percentile on the moderator of interest, and the green curve represents the subsample scoring above the 25$^{th}$ percentile on the moderator of interest.

For verbal ability, the introspective ability composite, and conscientiousness, a clear pattern emerged across multiple attitude constructs. Individuals low on verbal ability, low on the ability composite or, low on conscientiousness actually showed increased agreement to extreme unfavorable or extreme favorable items. This pattern was observed across many items on the evolution, god, and capital punishment scales with either low or high scale values. Looking at items #6 and #3 of the God scale (see Figure 15) and items #13 and #5 of the evolution scale (see Figure 16) we can see that individuals scoring lower on verbal ability, the introspective ability composite score, or conscientiousness show higher agreement and their curves actually appear steeper and more peaked than the rest of the sample. This finding is inconsistent with our

hypothesis that low ability individuals would have poorer response patterns and, therefore, flatter ICCs. This pattern of results, however, reverses for moderate items. Looking at item #11 from the God scale and item #16 from the evolution scale it is clear that individuals scoring lower on verbal ability, the ability composite, or conscientiousness have flatter ICCs. For individuals scoring above the 25$^{th}$ percentile on the moderators, ICCs appear peaked and have the characteristic inverted u-shape. One possible explanation is that verbal ability, ability to think introspectively (Alexithymia and Ability to describe), and conscientiousness moderate the response process to moderate items because these items reflect more nuanced or complex attitudes. Moderate items are often wordy, and contain multiple conflicting ideas to reflect uncertainty or ambivalence towards an attitude construct. Thus it may be the case that we find steeper more peaked curves for the low ability, and low conscientiousness sub-samples on extreme items because the valence of these items are easy to evaluate. That is, for a person of low ability or low conscientiousness we might expect them to discriminate more clearly among items that are clearly favorable or unfavorable. For items that require more verbal ability or ability to describe and label thoughts, low ability/low conscientiousness individuals may exhibit less discrimination.

For the results discussed above one pitfall unaddressed by our analyses is the possibility that splitting the sample into smaller parts itself can cause the changes seen in the moderated ICCs in Figures 15 and 16. Because the low moderator group is created by using only those individuals scoring at or below the 25$^{th}$ percentile and the high moderator group is created using those individuals scoring above the 25$^{th}$ percentile, by definition the ICC drawn for the low verbal ability, low introspective ability composite, and low conscientiousness groups contain approximately one-third of the number of subjects in the high moderator group. To address the

potential that unequal sample size may have influenced the results, I conducted supplemental moderation analyses. For these supplemental analyses, the high moderation groups were created using a random sampling of 71 participants drawn from above the 25$^{th}$ percentile on the distribution of the moderator of interest. I conducted these supplemental analyses for the evolution and God scales. Figure 17 presents the results of the analyses for the evolution scale. As can be seen, the pattern of results observed in previous analyses remains the same, high ability, high conscientiousness groups show more peaked curves for moderate items and flatter curves for extreme items. Results of the God supplemental moderation analyses were also consistent with our previous findings.

**Summary.** In summary, Study 2 provided strong support that ideal point response patterns do underlie the response process to attitude constructs. First, this study showed that attitude-homogeneous groups are consistent in their endorsement of items with increasing scale values. The ICCs drawn showed that groups agree with items close to their latent standing and disagree with items as the item scale values get farther away from the group location. Second, this study demonstrated that moderate items display clear curvilinear relationships with the attitude continuum. Finally, Study 2 provided evidence that verbal ability, self-reported alexithymia, ability to describe, and conscientiousness all moderate the ideal point response process.

# DISCUSSION

This thesis demonstrated that an ideal point response process undergirds self-reported introspective personality and attitude measures. Across both study 1 and study 2, results supported the principle assumption of the ideal point model—as person-item distance increases, the probability or strength of endorsement decreases. A necessary consequence of this ideal point response process is that personality and attitudes have non-monotonic curvilinear relationships with the latent continuum. As such, the dominance approach to psychometric practices may be ill-suited for both building personality and attitude scales, and for estimating the latent standing of individuals on the continuum of personality and attitudes.

For example, Classical Test Theory (CTT) makes strong dominance model assumptions and posits that test scores are linearly related to the latent construct of interest. The substantive result is that when constructing a personality or attitude scale, CTT encourages the exclusion of middling items because these items have low item-total correlations and low inter item correlations. Indeed looking at Table 5, we can extrapolate that middling items (such as, "There is much to be said on both sides of the evolution controversy") have low item inter-correlations and would be excluded from a scale consisting of mostly unfavorable or favorable items. However, as demonstrated in this thesis, measuring moderate items using linear assumptions (e.g. Cronbach's alpha) is theoretically unsound because these items have curvilinear patterns that are better described by an ideal point response process.

Likewise, the dominance assumptions of CTT also present a theory-poor option for estimating the latent standing of respondents along the continuum of interest. In CTT, all items are treated as parallel tests. As demonstrated in this thesis, it is not the case that items are parallel tests; the ICCs reported in Figures 10 through 14 clearly show that attitudinal statements differ in

scale value (i.e. the location parameter) and discrimination (i.e. the slope) in a meaningful and predictable way. As such, the use of psychometric methods that ignore item locations (such as summed scoring) are problematic.

This thesis also demonstrated that individual differences in ability and conscientiousness do affect the response process to introspective items. Study 1 found preliminary evidence that conscientiousness indeed suppresses discrimination between items. Study 2 further explored this possibility and found an interesting pattern of results. For individuals low on verbal ability, an ability composite (alexithymia and ability to describe), or conscientiousness, ICCs for extreme items actually appeared steeper and more peaked. Interestingly, the expected flat ICCs for low ability, or low conscientiousness groups only emerged for moderate items. The implication of these findings for IRT research is that items may differentially discriminate among individuals varying on ability and conscientiousness. This interaction is such that a test consisting of mostly extreme unfavorable or favorable items would discriminate well amongst a sample of low ability or low conscientiousness individuals. A test containing more moderate items, however, would have less meaningful variation across the latent continuum for low ability and low conscientiousness individuals (i.e. the ICC would have a slope approaching 0) but would discriminate well amongst most other individuals.

**Limitations and Future Directions.** Although this thesis discussed extensively the introspective process and individual differences, in order to generate scale values and ICCs, a necessary limitation was that I used group-level data. Therefore, I did not examine the consequences of an ideal point response process at the individual level. Future research should explore the differences between person scores generated using an ideal point method and traditional dominance/CTT summed scoring methods. Theoretically, specifying scale values

should increase the predictive validity of personality and attitudes scores onto the constructs of interest because doing so increases the correspondence between obtained score and actual latent standing (i.e. reduces error).

A second limitation of this study was the range of the latent continuum that was sampled for personality, attitudes, ability, and conscientiousness. Because this study used undergraduates, there is likely restriction of range in the attitudes (e.g. undergraduates may be less likely to hold extreme attitudes), verbal ability, motivation, and conscientiousness, of the obtained respondents. Future research should seek to replicate these findings in a broader more representative sample. In particular, since the motivation moderators (Need for Cognition and Need to Evaluate) did not produce effects here, future studies should reexamine this issue in a less motivation-homogeneous sample.

Finally, future research should explore the possibility that items with moderate scale values have different discrimination parameters for low ability low conscientiousness individuals. This may indicate that tests containing moderate items may have differential predictive validity for individuals on the lower end of the ability/conscientiousness distribution.

# CONCLUSION

In summary, the results presented here confirmed that an ideal point response process did in fact undergird personality and attitude constructs. For personality and attitudes, this thesis demonstrated that there exist curvilinear, unfolding ICCs for moderate items. These findings underscore the importance of specifying a theory of endorsement that matches the construct of interest. Furthermore, this thesis showed that individual differences in ability and conscientiousness interact with item location to increase or decrease the discrimination of the items.

# APPENDIX A: TABLES AND FIGURES

| | | | | |
|---|---|---|---|---|
| E | D | C | B | A |
| D | CE | DB | CA | B |
| C | B | EA | D | C |
| B | A | | E | D |
| A | | | | E |
| - - | - | 0 | + | + + |
| E | D | C | B | A |

Figure 1. *The Ideal Point Response Process*

Note: Here items are represented by the letters A, B, C, D, and E which represent five levels along the latent continuum (very negative (- -), negative (-), neutral (0), positive (+), and very positive (+ +) respectively). Notice that if as we move along the latent continuum, the preference of endorsement changes. For example, a person of standing (+) their pattern of endorsement should obey the following probabilistic order: $P_B < (P_C \approx P_A) < P_D < P_E$

| | | | | |
|---|---|---|---|---|
| E | E | E | E | E |
| D | D | D | D | D |
| C | C | C | C | C |
| B | B | B | B | B |
| A | A | A | A | A |
| - - | - | 0 | + | + + |
| E | D | C | B | A |

Figure 2. *The Dominance Response Process*

Note: Here items are represented by the letters A, B, C, D, and E which represent five levels along the latent continuum (very negative (- -), negative (-), neutral (0), positive (+), and very positive (+ +) respectively). Notice that if as we move along the latent continuum, the probabilistic order remains the same (i.e. $P_A < P_B < P_C < P_D < P_E$).

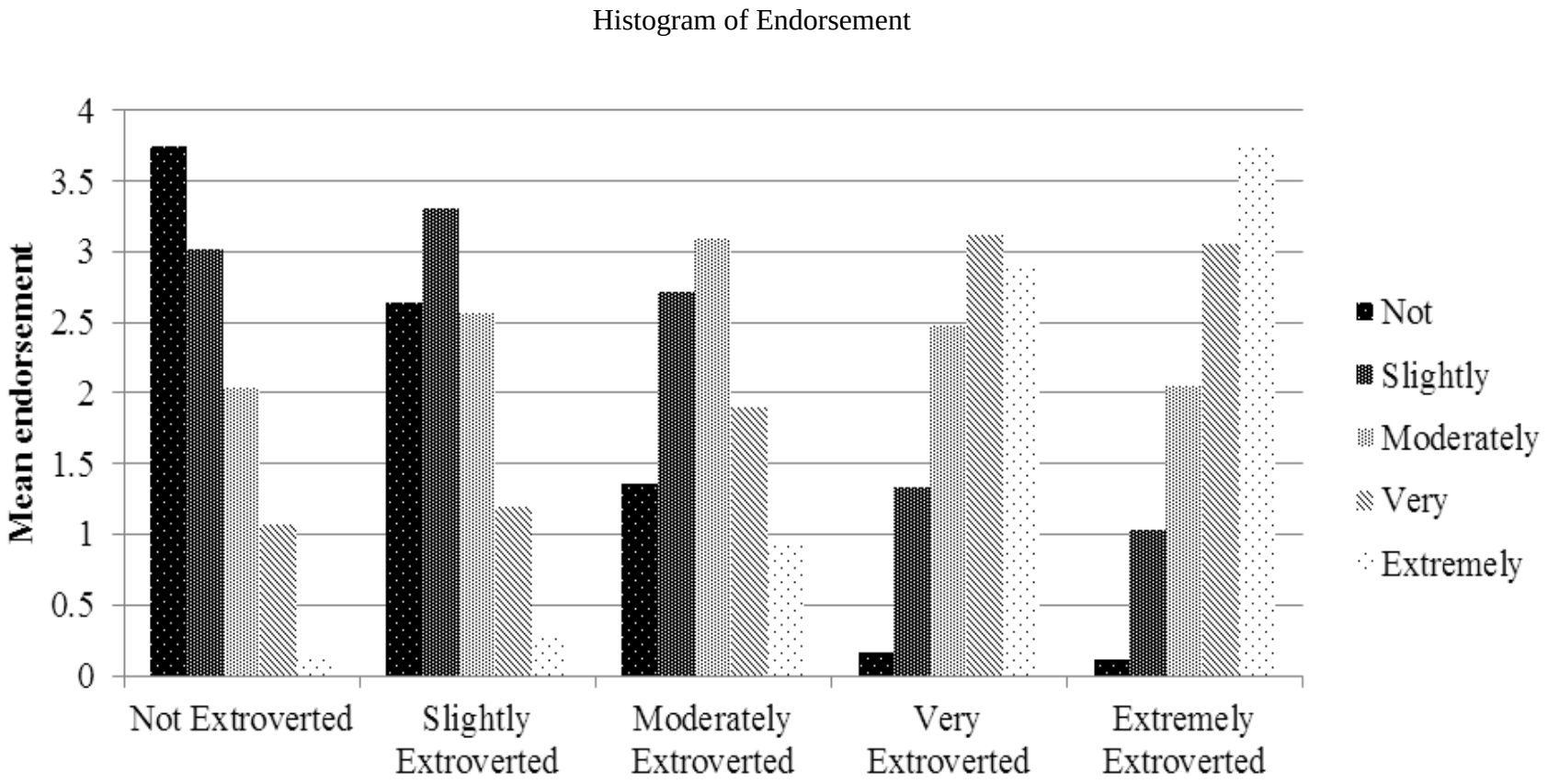



Figure 3. *Forced Choice Ideal Point Response Pattern – Extroverted*

Note: The x-axis groups individuals into discrete categories of extroversion based on their response to the multiple-choice extroverted item. The y-axis shows the mean endorsement of each level of extroversion in the forced-choice exercise (i.e. total number of times an option was chosen divided by number of individuals in the group). Each level of extroversion appeared 4 times in the forced-choice exercise.

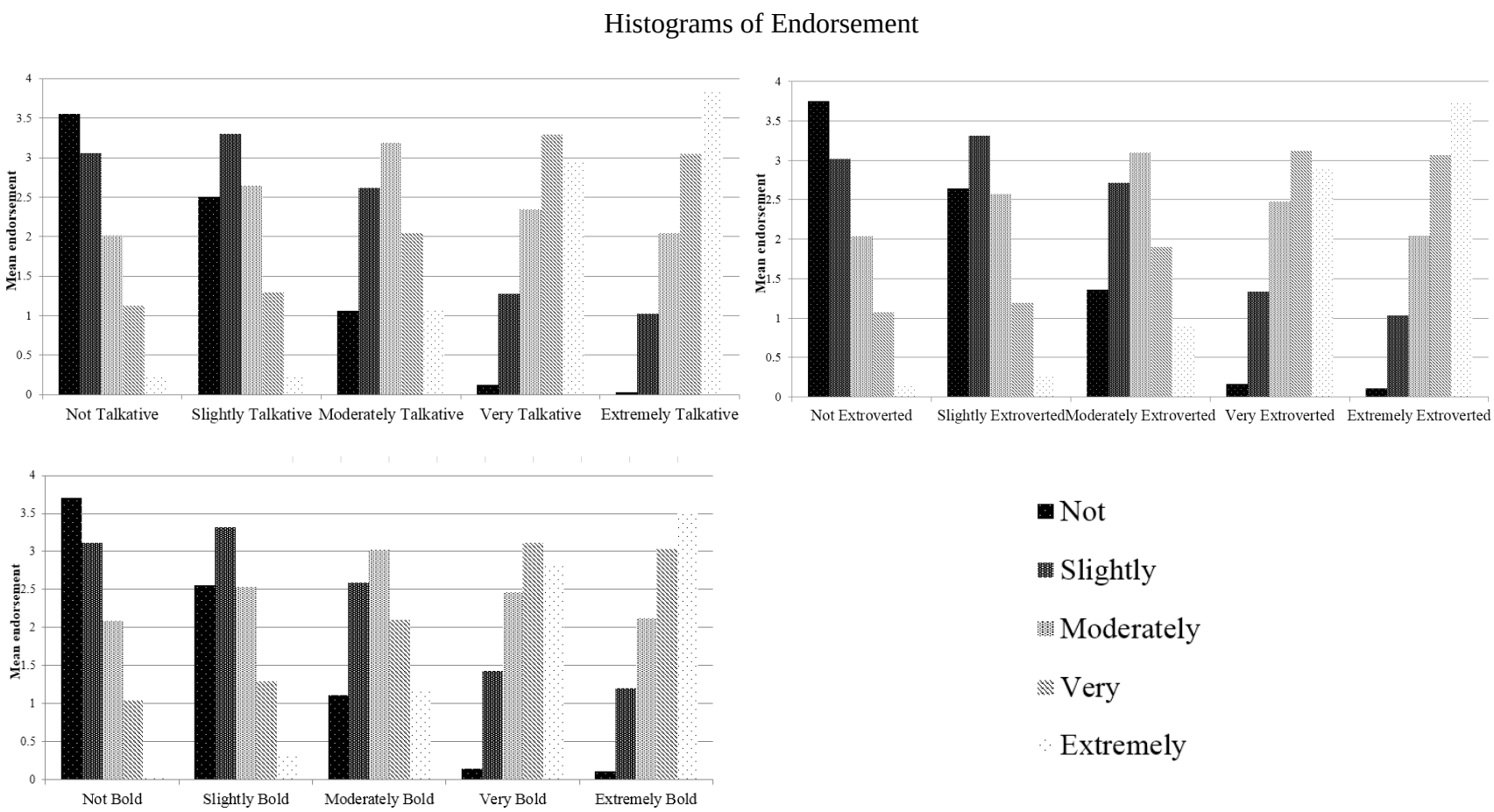



Figure 4. *Forced Choice Ideal Point Response Pattern – Extroversion*

Note: This figure presents the endorsement for the three extroversion items: Talkative, extroverted and bold. The x-axis groups individuals into discrete categories. The y-axis shows the mean endorsement of each item (i.e. total number of times an option was chosen divided by number of individuals in the group).

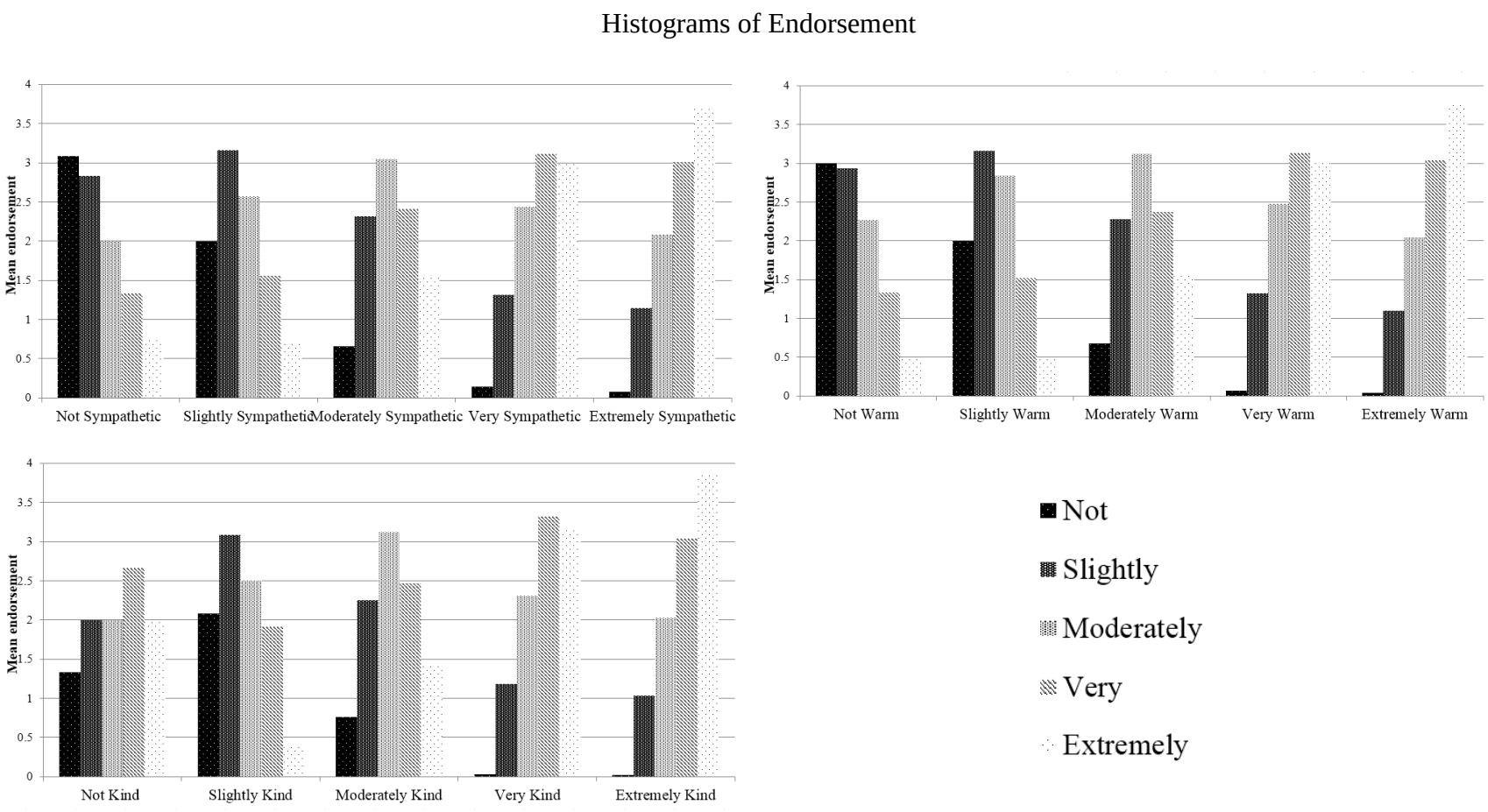



Figure 5. *Forced Choice Ideal Point Response Pattern – Agreeableness*

Note: This figure presents the endorsement for the three agreeableness items: Sympathetic, warm, and kind. The x-axis groups individuals into discrete categories.The y-axis shows the mean endorsement of each item (i.e. total number of times an option was chosen divided by number of individuals in the group).

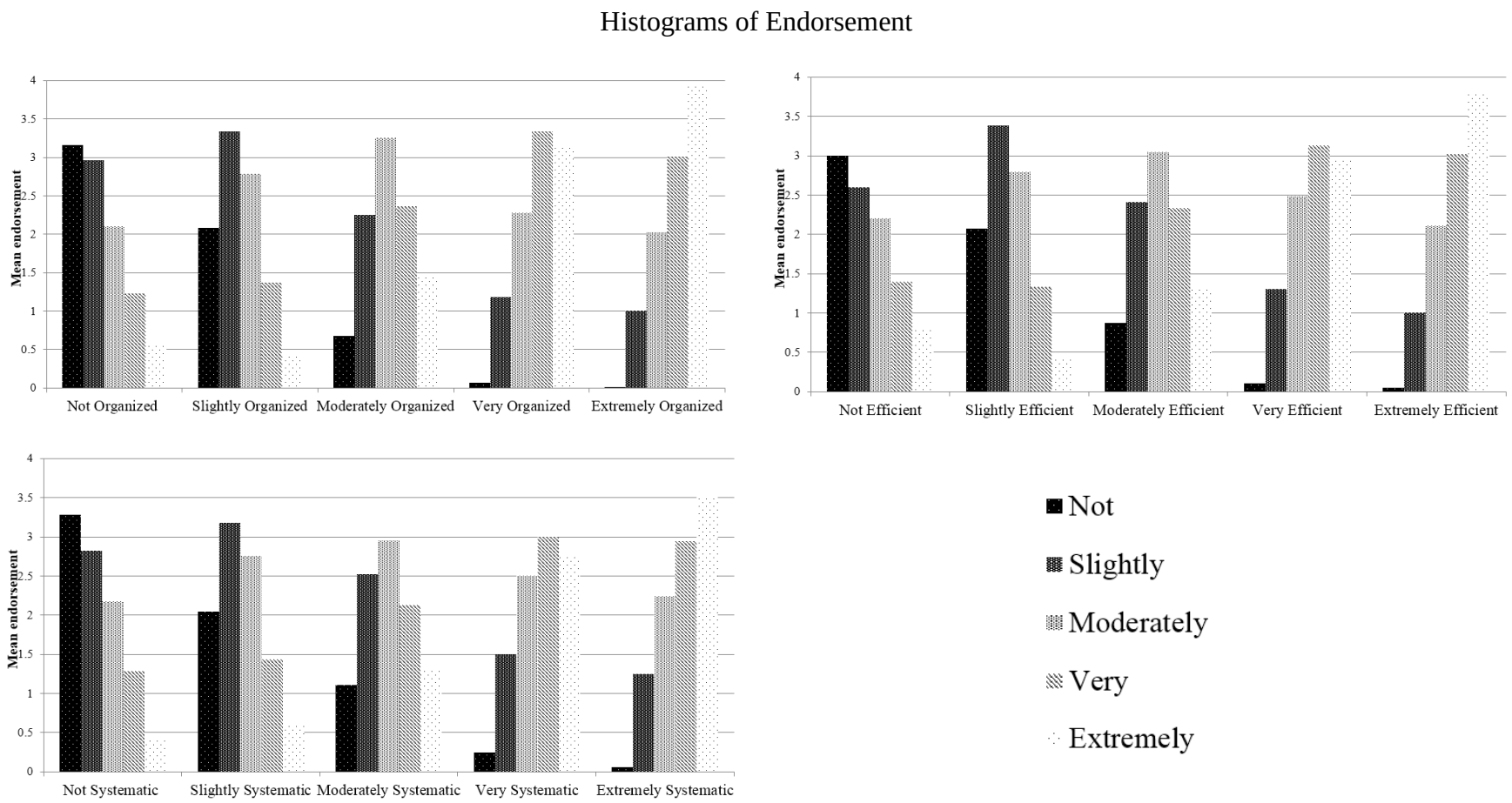



Figure 6. *Forced Choice Ideal Point Response Pattern – Conscientiousness*

Note: This figure presents the endorsement for the three conscientiousness items: Organized, systematic, and efficient. The x-axis groups individuals into discrete categories.The y-axis shows the mean endorsement of each item (i.e. total number of times an option was chosen divided by number of individuals in the group).

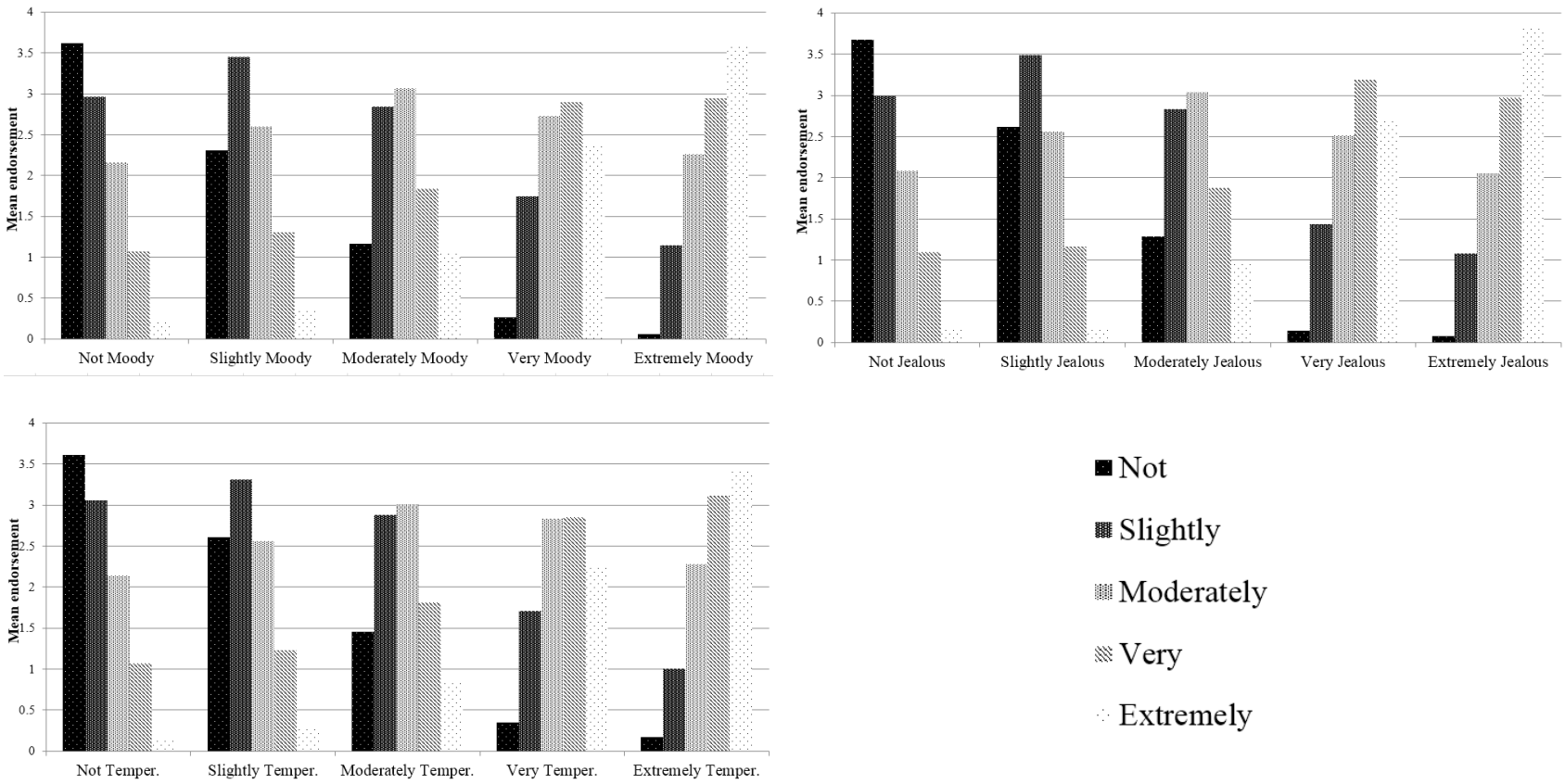



Figure 7. *Forced Choice Ideal Point Response Pattern – Neuroticism*

Note: This figure presents the endorsement for the three neuroticism items: Moody, jealous, and temperamental. The x-axis groups individuals into discrete categories.The y-axis shows the mean endorsement of each item (i.e. total number of times an option was chosen divided by number of individuals in the group).

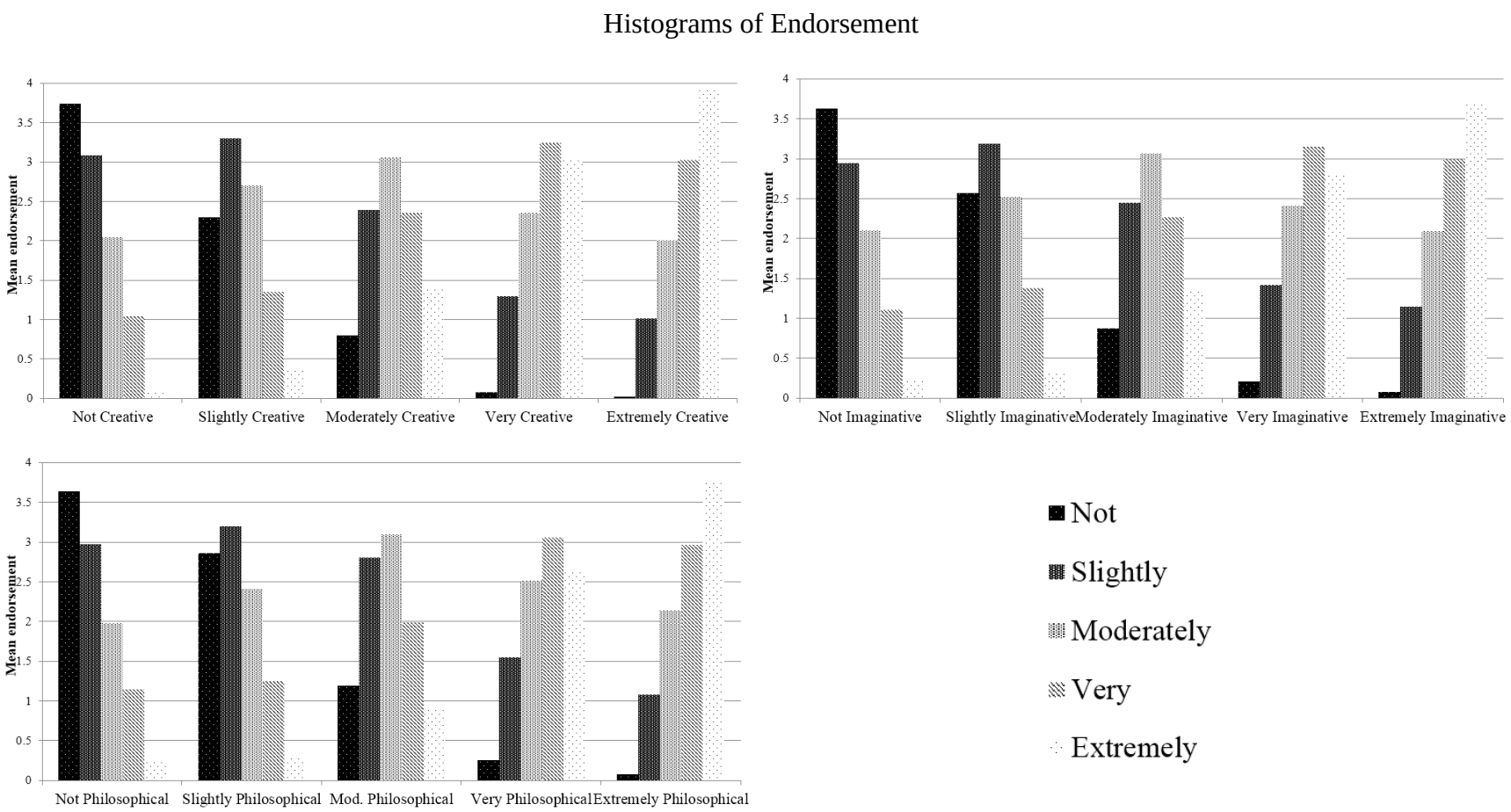



Figure 8. *Forced Choice Ideal Point Response Pattern – Openness*

Note: This figure presents the endorsement for the three openness items: Creative, imaginative, philosophical. The x-axis groups individuals into discrete categories. The y-axis shows the mean endorsement of each item (i.e. total number of times an option was chosen divided by number of individuals in the group).

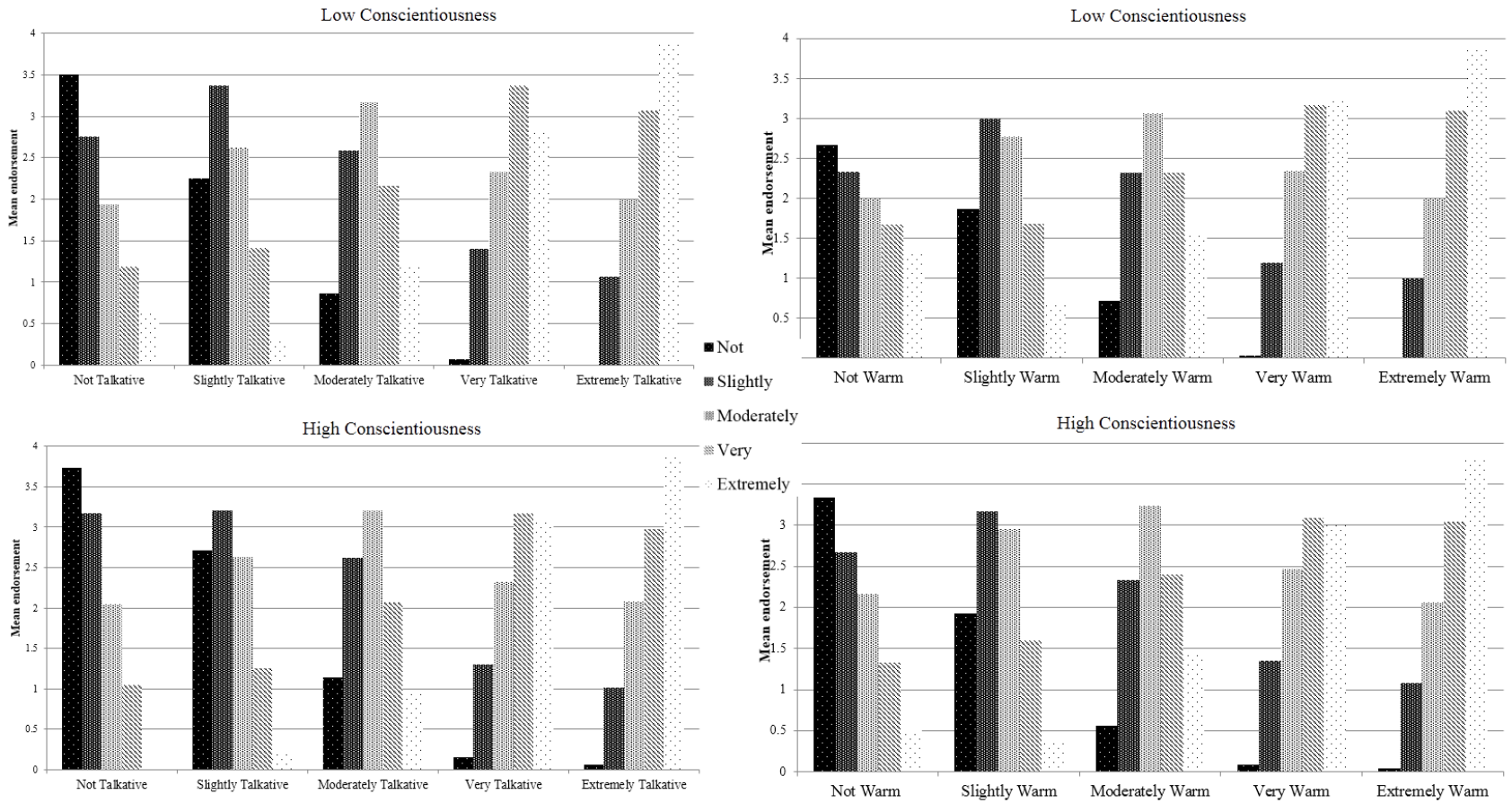



Figure 9. *Conscientiousness Moderated Forced Choice Ideal Point Response Pattern – Talkative and Warm*

Note: This figure presents the endorsement patterns for a low and high conscientiousness group to the items talkative and warm. The x-axis groups individuals into discrete categories. The y-axis shows the mean endorsement of each item (i.e. total number of times an option was chosen divided by number of individuals in the group).

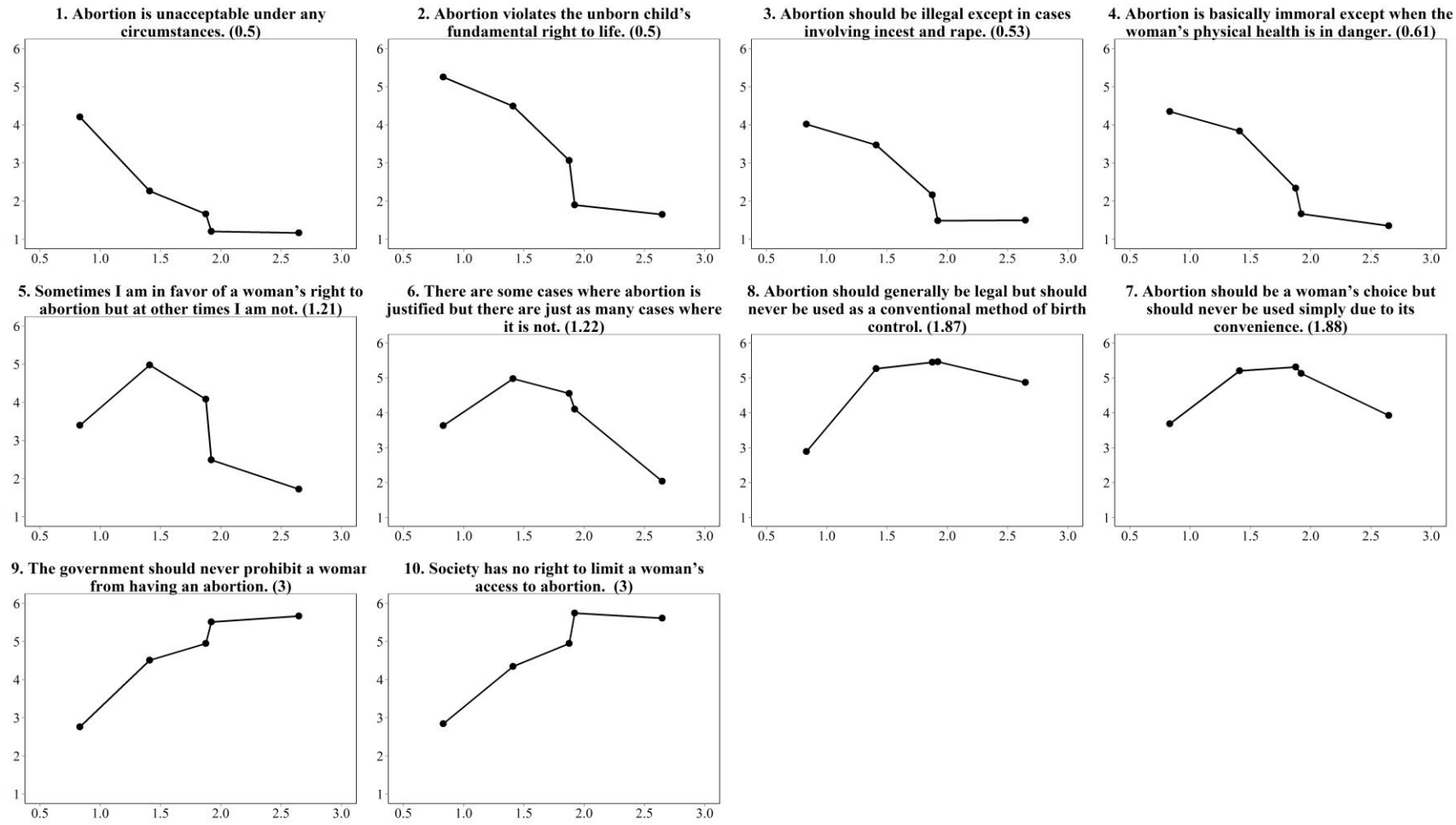
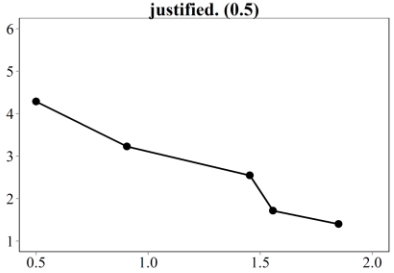


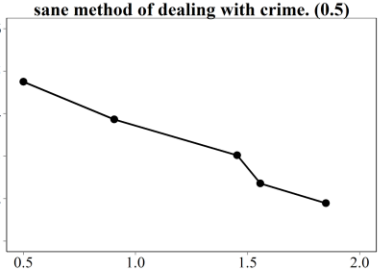

Figure 10. *Item Characteristic Curves – Abortion*

Note: This figure presents the ICCs for the 10 abortion items. Scale values are in parentheses. Here the x-axis represents the mean Thurstone attitude group-score. Larger x-axis values represent more favorable attitudes. The y-axis shows the mean level of agreement. Each of the 5 dots represents a vigintile.

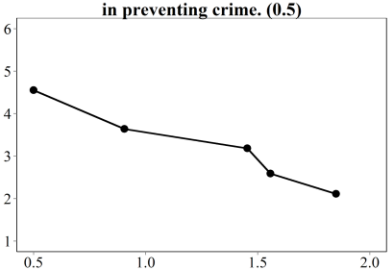
**2. Capital punishment is absolutely never justified. (0.5)**



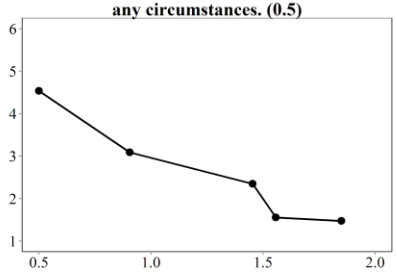

**5. Capital punishment cannot be regarded as a sane method of dealing with crime. (0.5)**



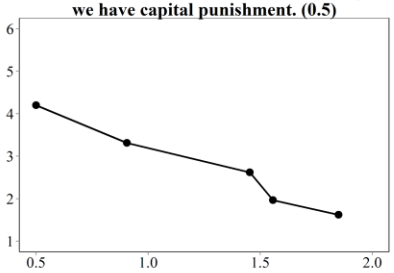

**8. Capital punishment has never been effective in preventing crime. (0.5)**



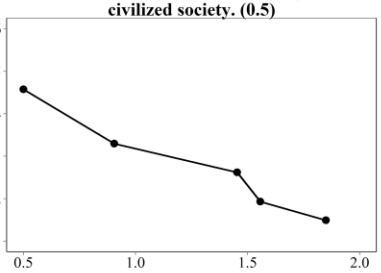

**11. I do not believe in capital punishment under any circumstances. (0.5)**



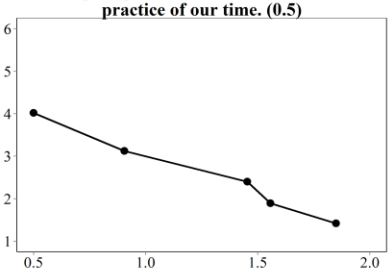

**13. We can't call ourselves civilized as long as we have capital punishment. (0.5)**



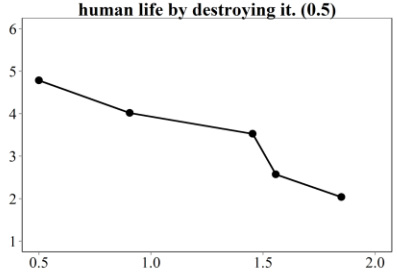

**15. Execution of criminals is a disgrace to civilized society. (0.5)**



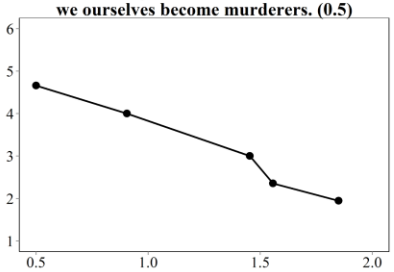

**18. Capital punishment is the most hideous practice of our time. (0.5)**



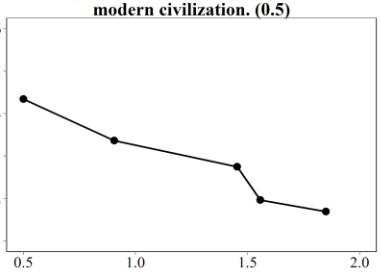

**20. The state cannot teach the sacredness of human life by destroying it. (0.5)**



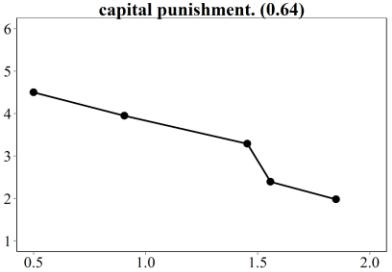

**25. When society sentences a murderer to death we ourselves become murderers. (0.5)**



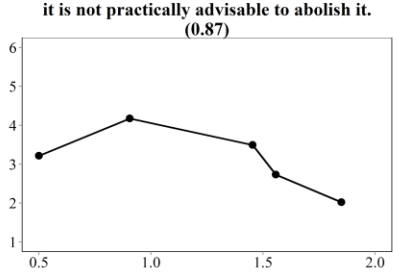

**12. Capital punishment is not necessary in modern civilization. (0.5)**



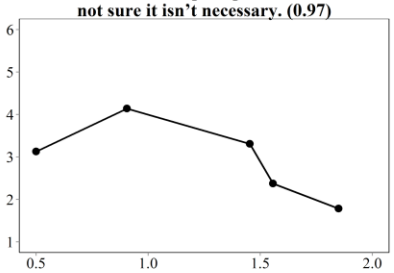

**14. Life imprisonment is more effective than capital punishment. (0.64)**



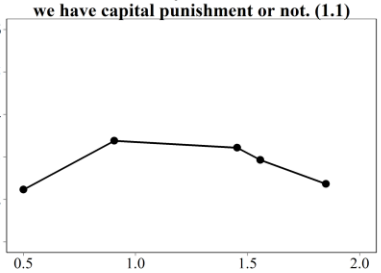

**17. I do not believe in capital punishment but it is not practically advisable to abolish it. (0.87)**



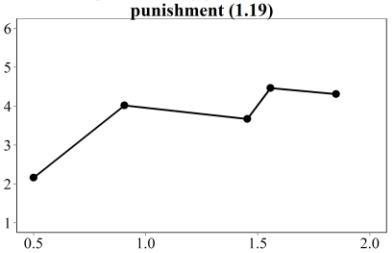

**9. I don't believe in capital punishment but I'm not sure it isn't necessary. (0.97)**



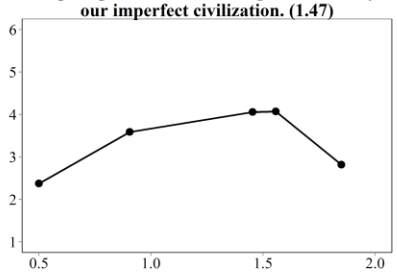

**21. It doesn't make any difference to me whether we have capital punishment or not. (1.1)**




**24. Capital punishment is not morally right or wrong; it is merely just one method of punishment (1.19)**




**6. Capital punishment is wrong but necessary in our imperfect civilization. (1.47)**



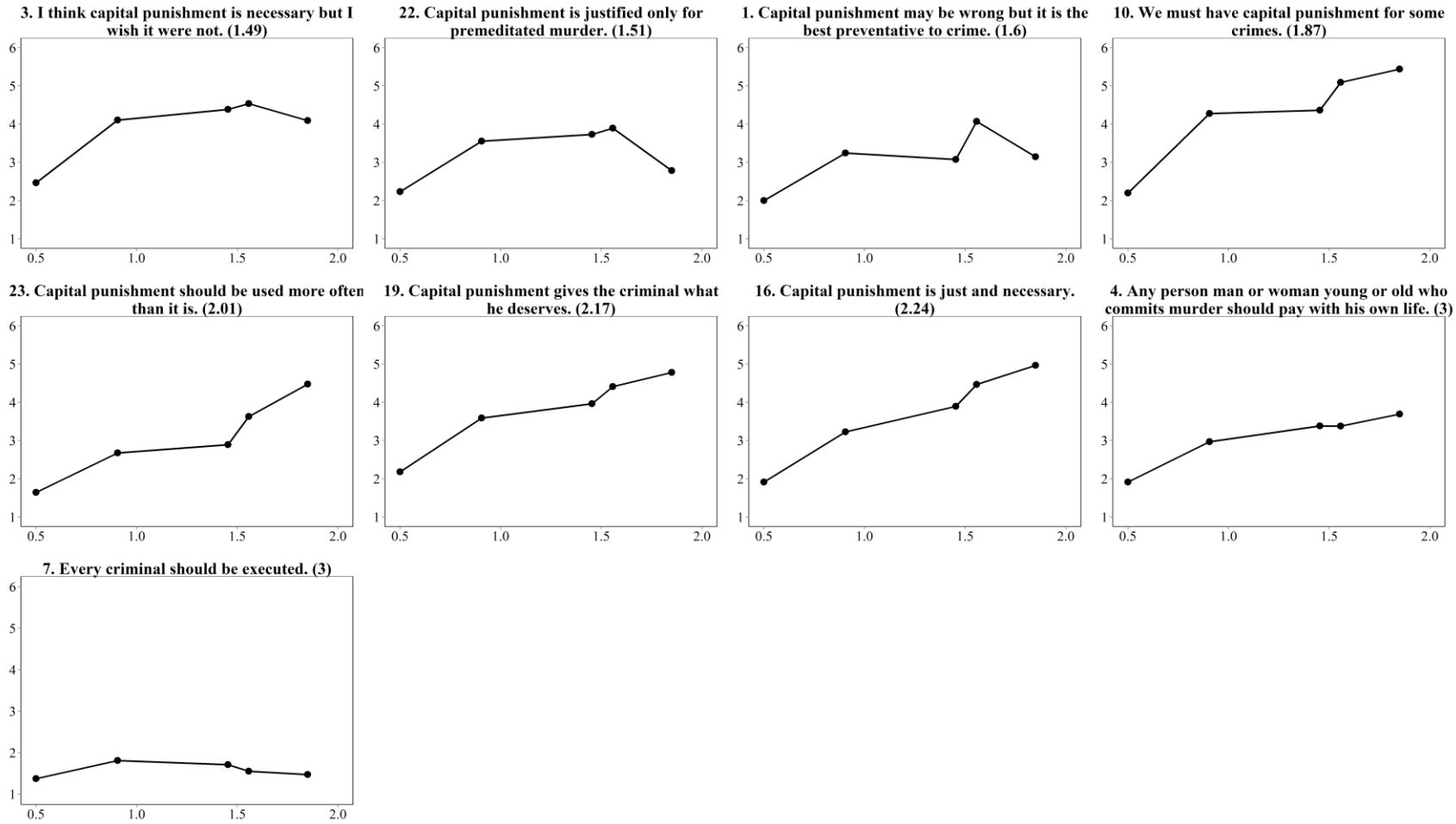
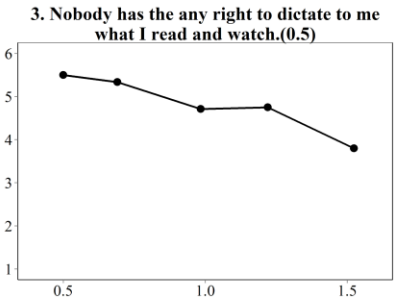
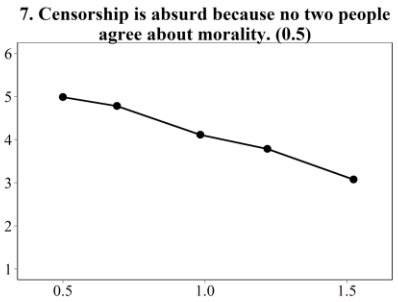
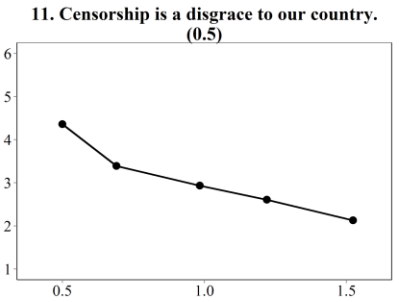


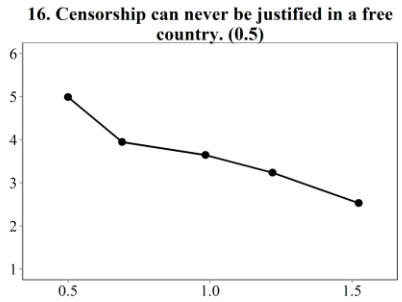

Figure 11. *Item Characteristic Curves – Capital Punishment*

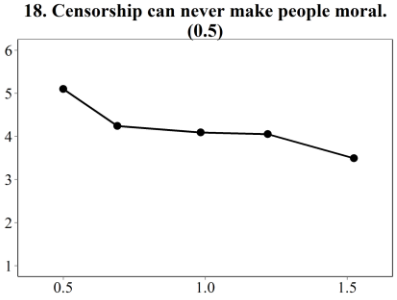
This figure presents the ICCs for the 25 capital punishment items. Scale values are in parentheses. Here the x-axis represents the mean Thurstone attitude group-score. Larger x-axis values represent more favorable attitudes. The y-axis shows the mean level of agreement. Each of the 5 dots represents a vigintile.

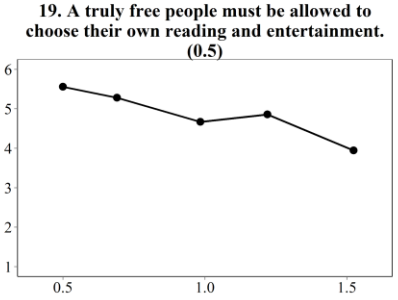

3. Nobody has the any right to dictate to me what I read and watch.(0.5)
6
5
4
3
2
1
0.5
1.0
1.5

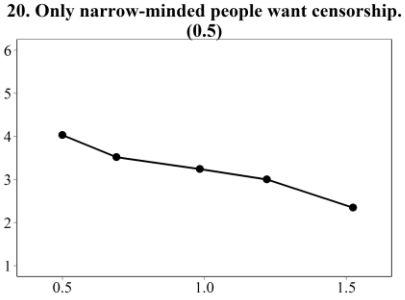

7. Censorship is absurd because no two people agree about morality. (0.5)
6
5
4
3
2
1
0.5
1.0
1.5

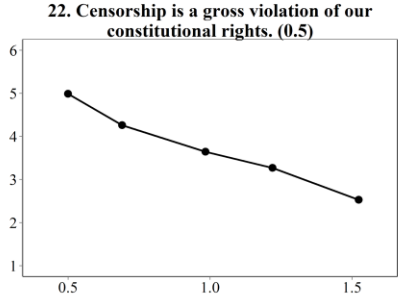

11. Censorship is a disgrace to our country. (0.5)
6
5
4
3
2
1
0.5
1.0
1.5

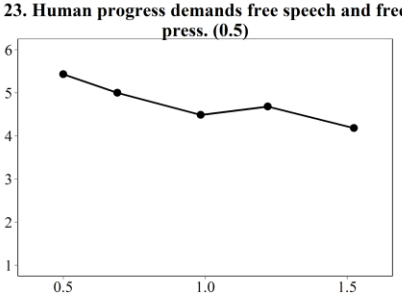

16. Censorship can never be justified in a free country. (0.5)
6
5
4
3
2
1
0.5
1.0
1.5

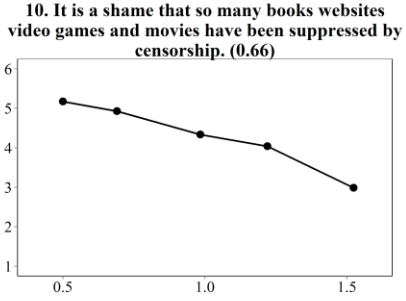

18. Censorship can never make people moral. (0.5)
6
5
4
3
2
1
0.5
1.0
1.5

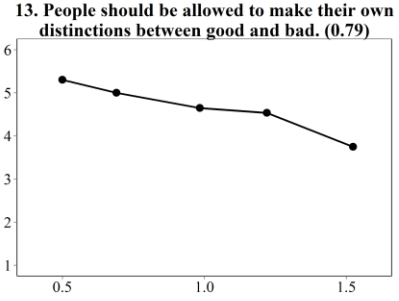

19. A truly free people must be allowed to choose their own reading and entertainment. (0.5)
6
5
4
3
2
1
0.5
1.0
1.5

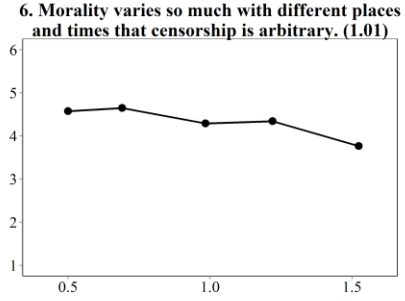

20. Only narrow-minded people want censorship. (0.5)
6
5
4
3
2
1
0.5
1.0
1.5

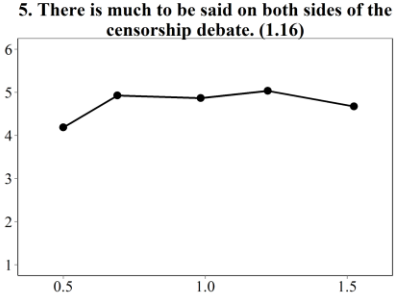

22. Censorship is a gross violation of our constitutional rights. (0.5)
6
5
4
3
2
1
0.5
1.0
1.5

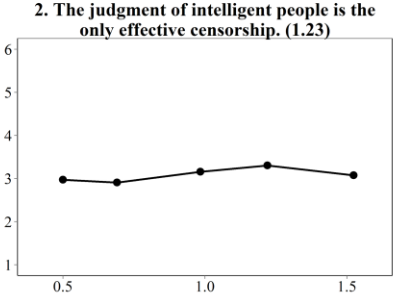

23. Human progress demands free speech and free press. (0.5)
6
5
4
3
2
1
0.5
1.0
1.5

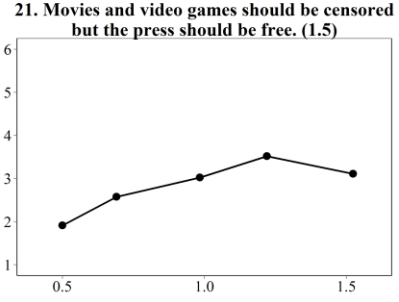

10. It is a shame that so many books websites video games and movies have been suppressed by censorship. (0.66)
6
5
4
3
2
1
0.5
1.0
1.5

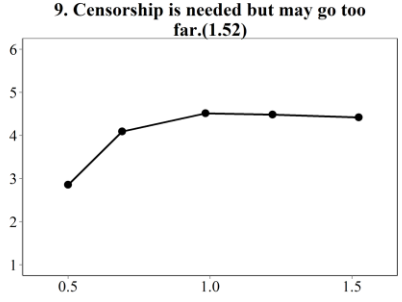

13. People should be allowed to make their own distinctions between good and bad. (0.79)
6
5
4
3
2
1
0.5
1.0
1.5


6. Morality varies so much with different places and times that censorship is arbitrary. (1.01)
6
5
4
3
2
1
0.5
1.0
1.5


5. There is much to be said on both sides of the censorship debate. (1.16)
6
5
4
3
2
1
0.5
1.0
1.5


2. The judgment of intelligent people is the only effective censorship. (1.23)
6
5
4
3
2
1
0.5
1.0
1.5


21. Movies and video games should be censored but the press should be free. (1.5)
6
5
4
3
2
1
0.5
1.0
1.5


9. Censorship is needed but may go too far.(1.52)
6
5
4
3
2
1
0.5
1.0
1.5

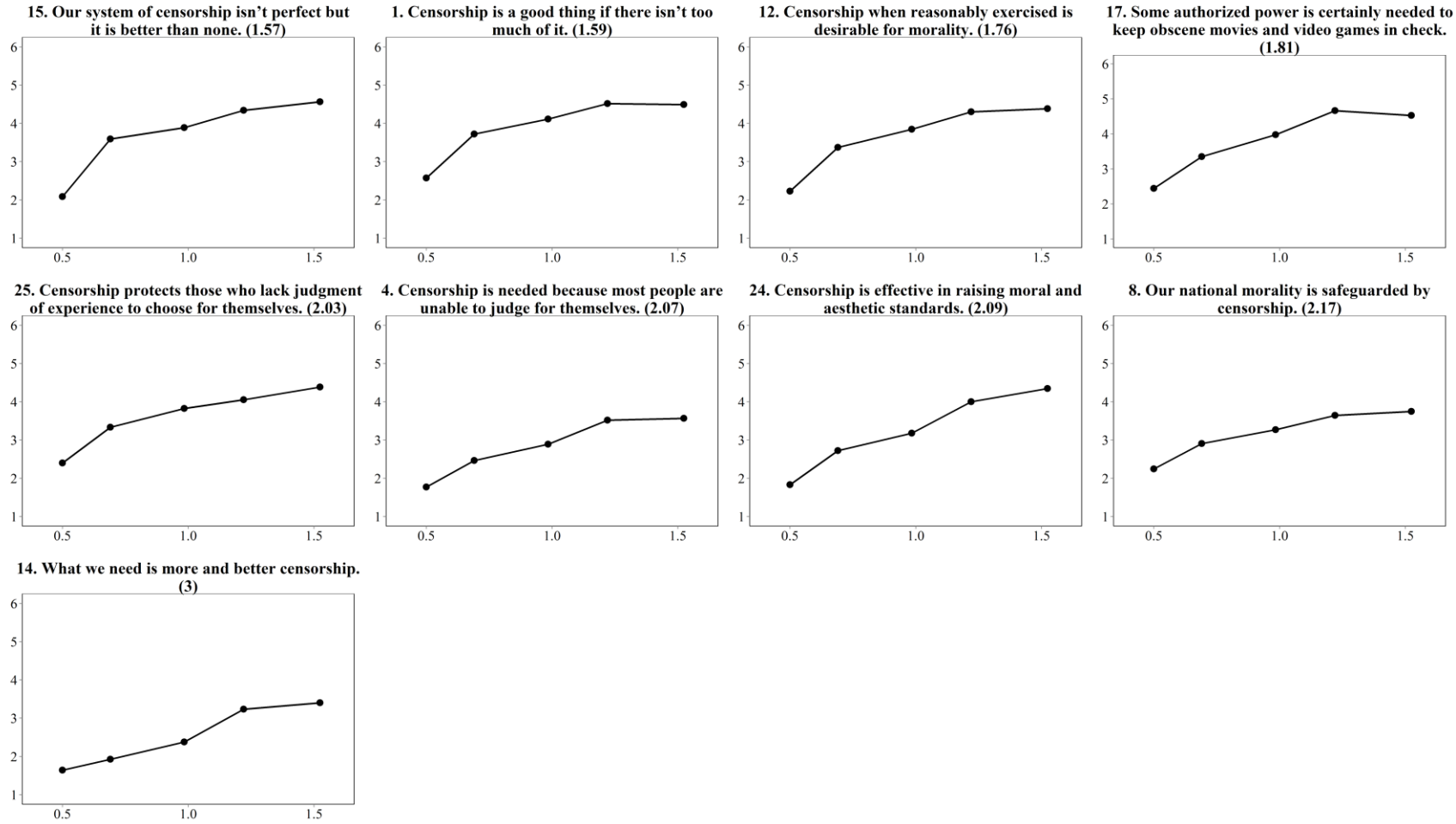
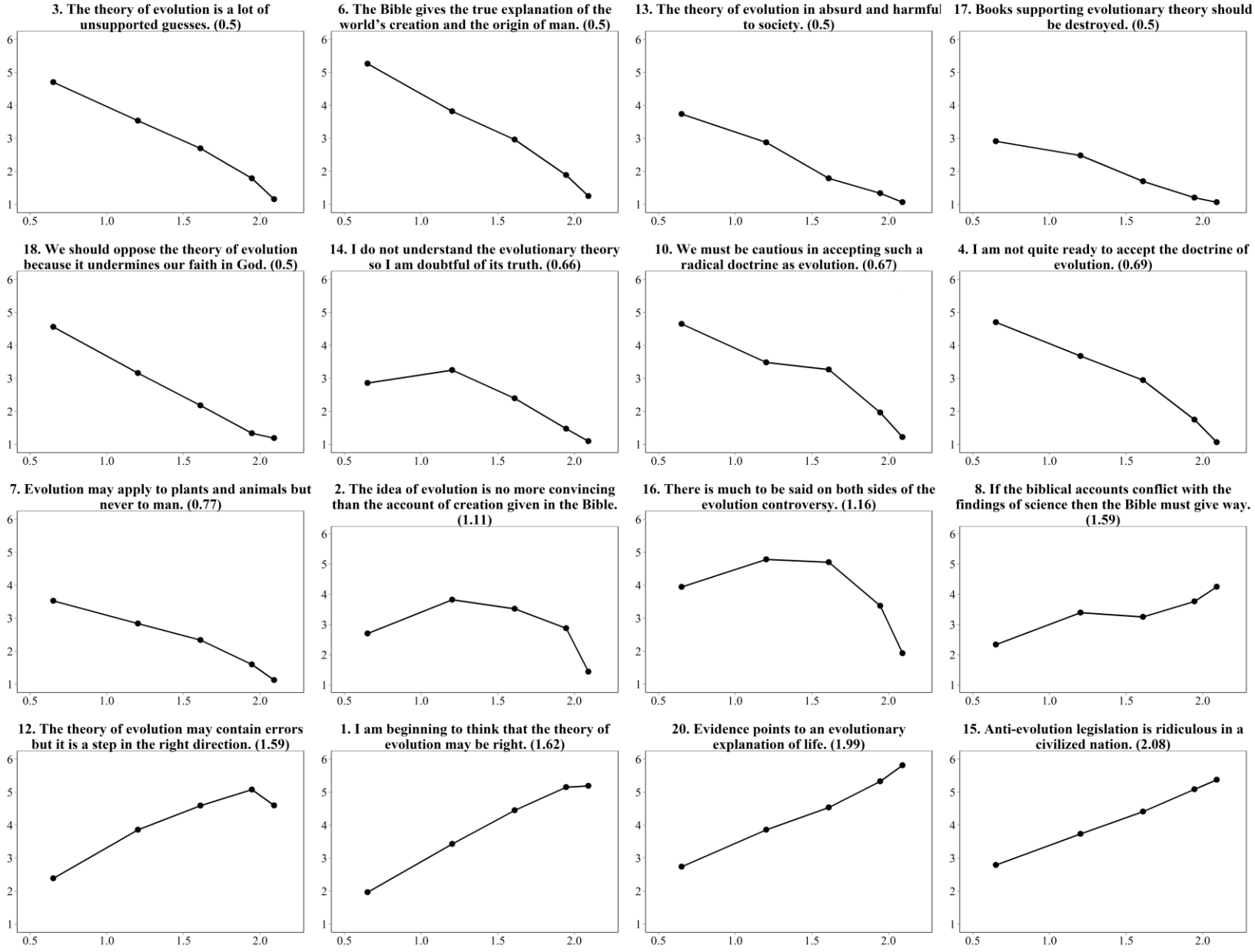



Figure 12. *Item Characteristic Curves – Censorship*

Note: This figure presents the ICCs for the 25 censorship. Scale values are in parentheses. Here the x-axis represents the mean Thurstone attitude group-score. Larger x-axis values represent more favorable attitudes. The y-axis shows the mean level of agreement. Each of the 5 dots represents a vigintile.


3. The theory of evolution is a lot of unsupported guesses. (0.5)
6. The Bible gives the true explanation of the world's creation and the origin of man. (0.5)
13. The theory of evolution in absurd and harmful to society. (0.5)
17. Books supporting evolutionary theory should be destroyed. (0.5)
18. We should oppose the theory of evolution because it undermines our faith in God. (0.5)
14. I do not understand the evolutionary theory so I am doubtful of its truth. (0.66)
10. We must be cautious in accepting such a radical doctrine as evolution. (0.67)
4. I am not quite ready to accept the doctrine of evolution. (0.69)
7. Evolution may apply to plants and animals but never to man. (0.77)
2. The idea of evolution is no more convincing than the account of creation given in the Bible. (1.11)
16. There is much to be said on both sides of the evolution controversy. (1.16)
8. If the biblical accounts conflict with the findings of science then the Bible must give way. (1.59)
12. The theory of evolution may contain errors but it is a step in the right direction. (1.59)
1. I am beginning to think that the theory of evolution may be right. (1.62)
20. Evidence points to an evolutionary explanation of life. (1.99)
15. Anti-evolution legislation is ridiculous in a civilized nation. (2.08)

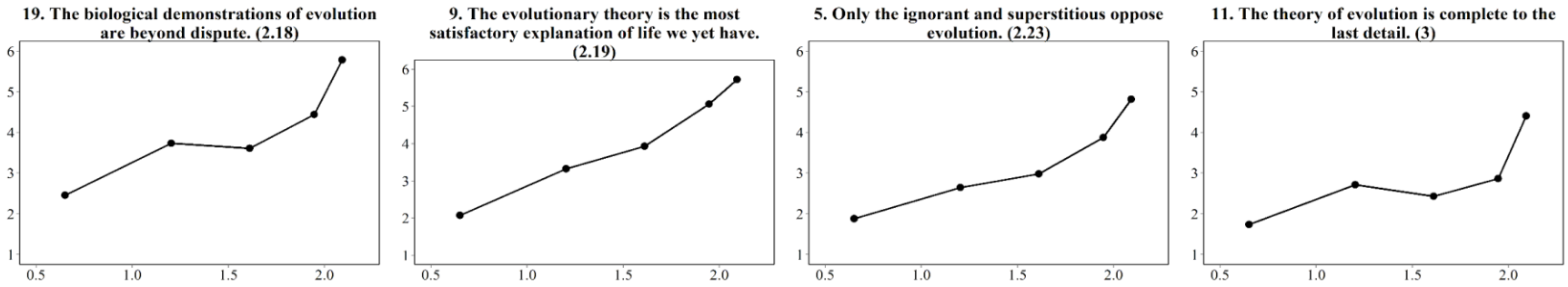
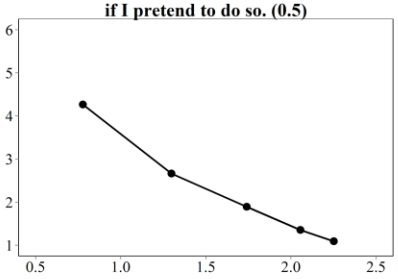


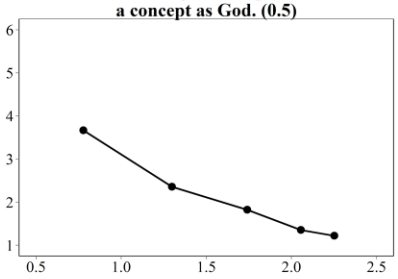

Figure 13. *Item Characteristic Curves – Evolution*

Note: This figure presents the ICCs for the 20 evolution items. Scale values are in parentheses. Here the x-axis represents the mean Thurstone attitude group-score. Larger x-axis values represent more favorable attitudes. The y-axis shows the mean level of agreement. Each of the 5 dots represents a vigintile.

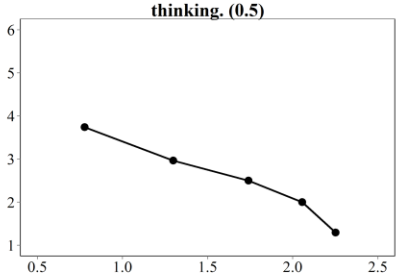
**1. I do not believe in God and would be a coward if I pretend to do so. (0.5)**



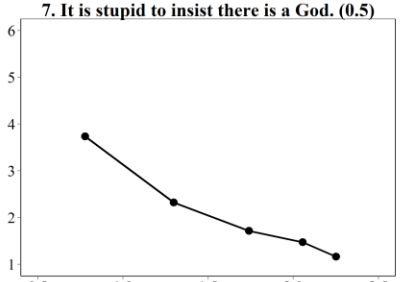
**2. It is absurd for any thinking man to use such a concept as God. (0.5)**



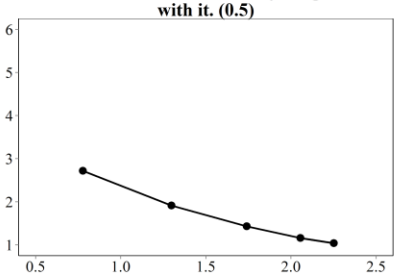
**6. The idea of God is a hindrance to clear thinking. (0.5)**



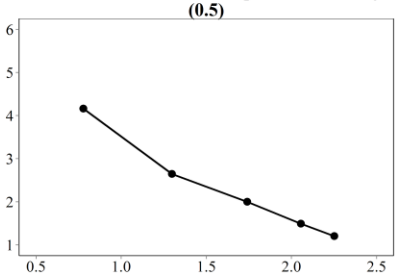
**7. It is stupid to insist there is a God. (0.5)**



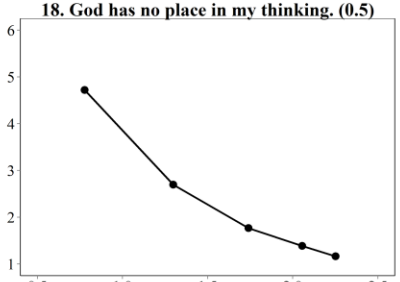
**12. I hate the word God and everything associated with it. (0.5)**



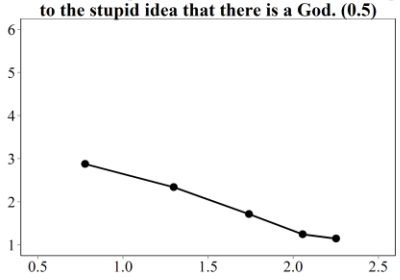
**16. The idea of God seems quite unnecessary. (0.5)**



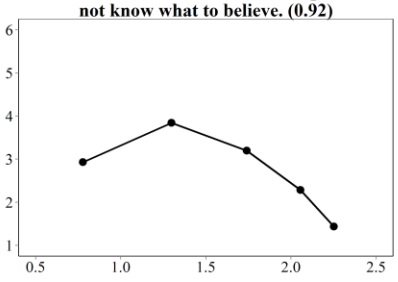
**18. God has no place in my thinking. (0.5)**



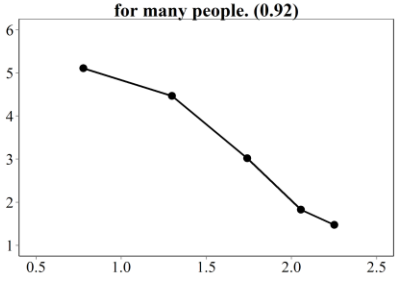
**25. I have no patience with those who still cling to the stupid idea that there is a God. (0.5)**



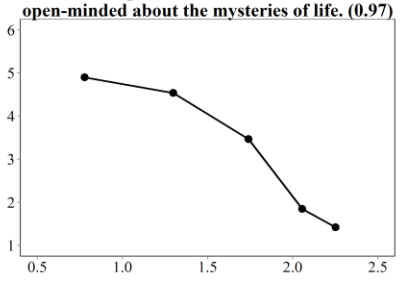
**19. The ideas of God are so confusing that I do not know what to believe. (0.92)**



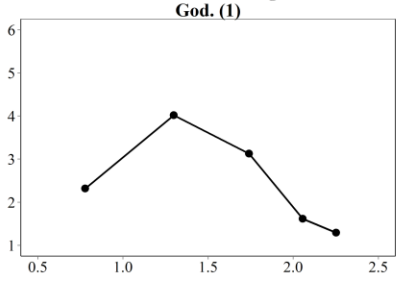
**20. I don't believe in God but the idea has value for many people. (0.92)**



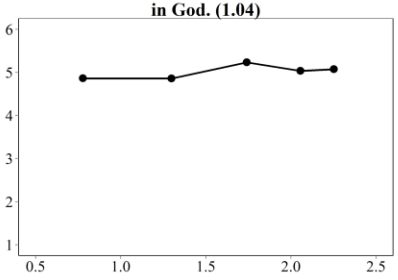
**10. Although I do not believe in God I am open-minded about the mysteries of life. (0.97)**



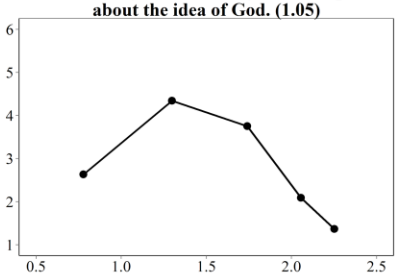
**15. I do not know whether I ought to believe in God. (1)**



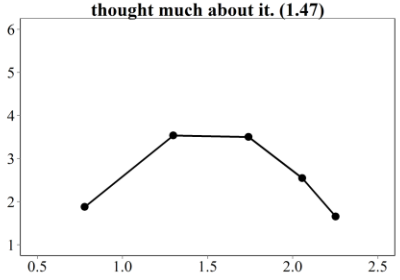
**5. I am tolerant toward those who still believe in God. (1.04)**



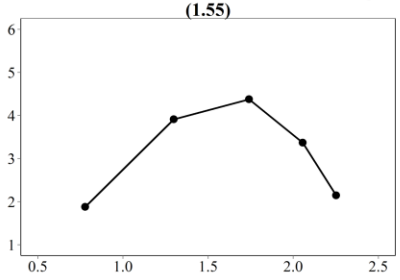
**11. I haven't yet reached any definite opinion about the idea of God. (1.05)**



**4. I think I believe in God but I really haven't thought much about it. (1.47)**



**8. I believe in God but my idea of God is vague. (1.55)**



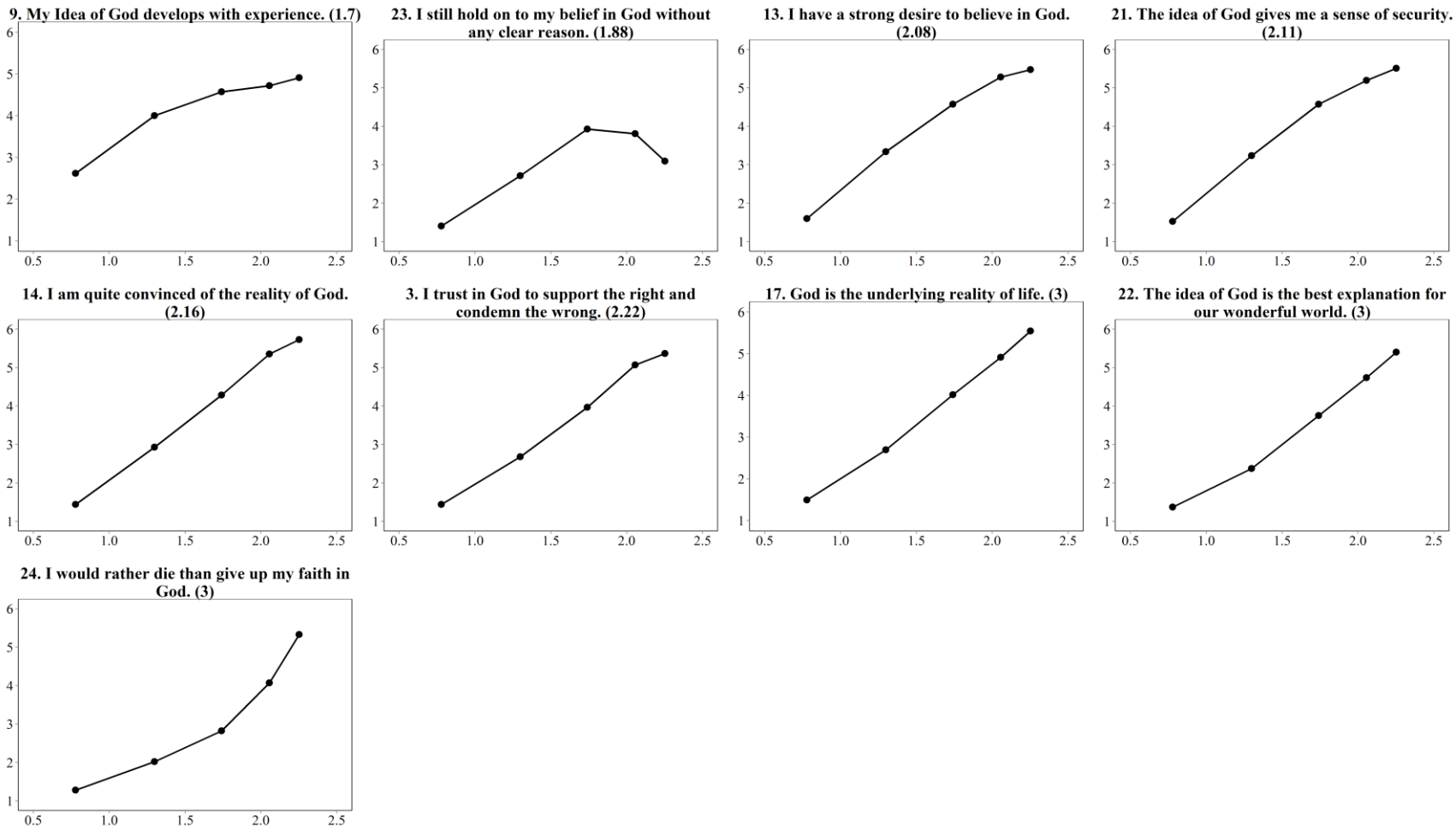



Figure 14. *Item Characteristic Curves – God*

Note: This figure presents the ICCs for the 25 evolution items. Scale values are in parentheses. Here the x-axis represents the mean Thurstone attitude group-score. Larger x-axis values represent more favorable attitudes. The y-axis shows the mean level of agreement. Each of the 5 dots represents a vigintile.

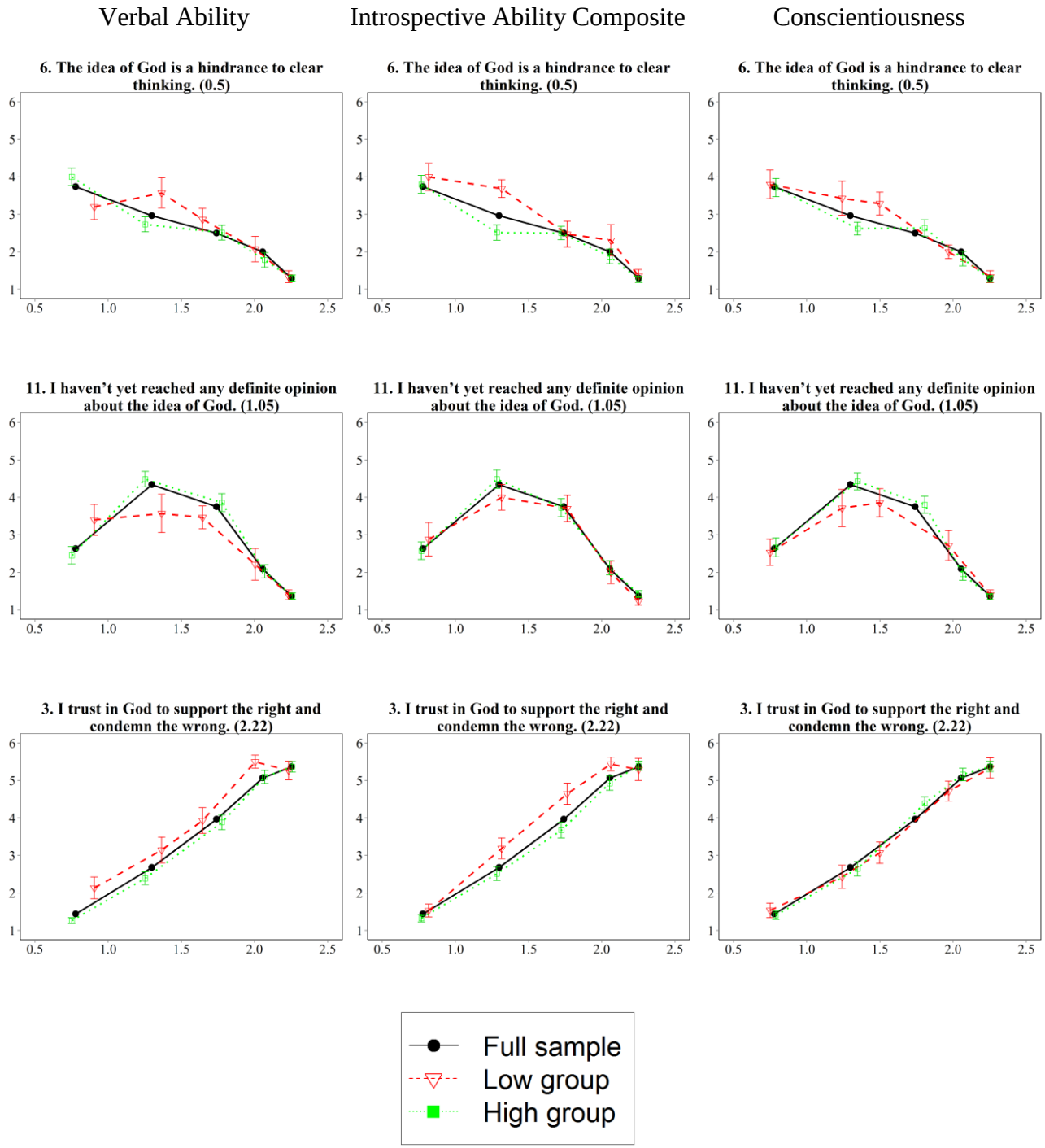



Figure 15. *Moderated Item Characteristic Curves – God*

Note: This figure presents the ICCs for 3 God items with sub-samples split based on moderators. The solid black line represents the un-split full sample, the dashed red line represents those falling at or below the 25$^{th}$ percentile for each respective moderator, and the green dotted line represents those scoring above the 25$^{th}$ percentile for each respective moderator. Error bars represent +/- one standard error of the mean.

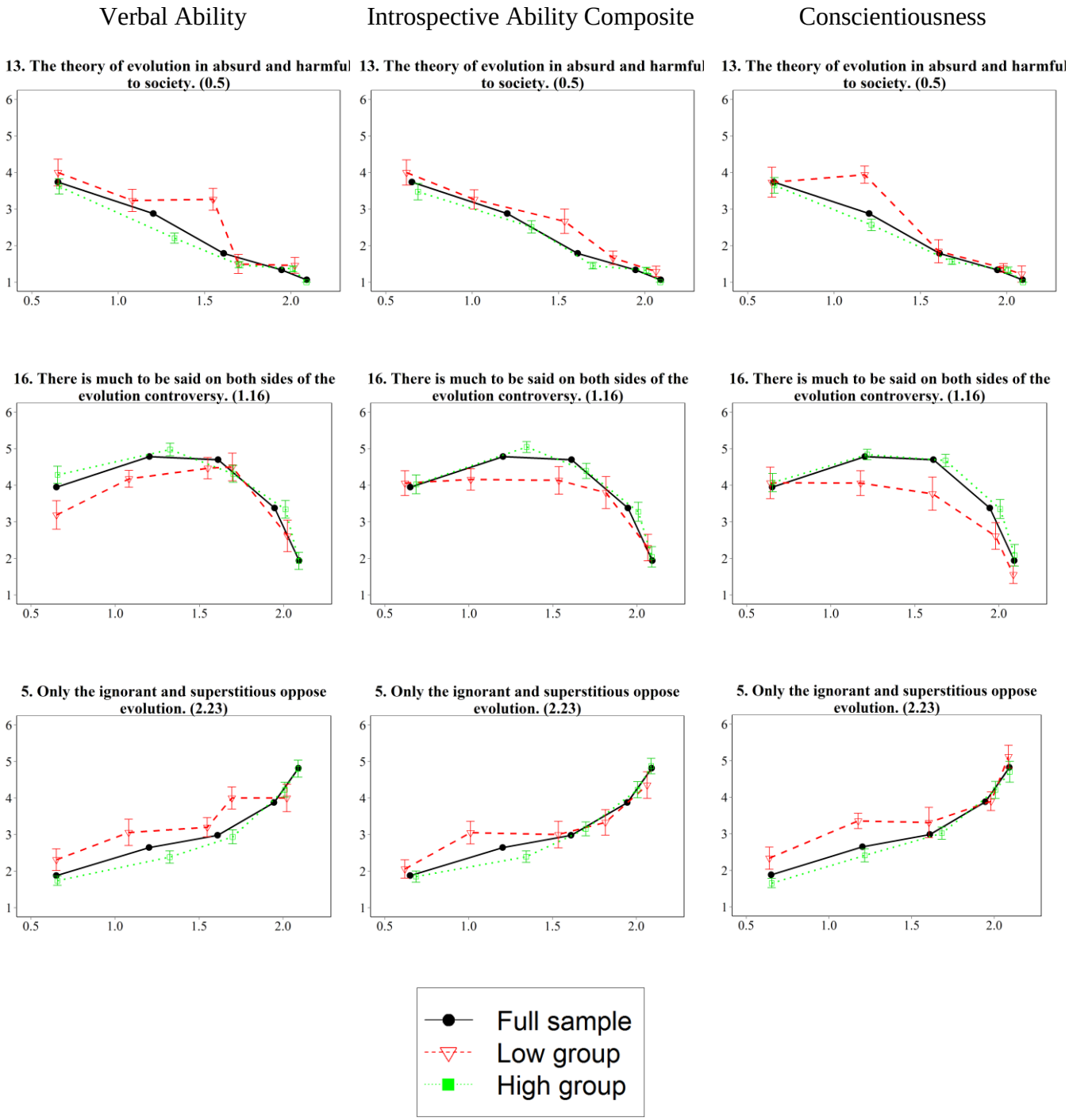



Figure 16. *Moderated Item Characteristic Curves – Evolution*

Note: This figure presents the ICCs for 3 Evolution items with sub-samples split based on moderators. The solid black line represents the un-split full sample, the dashed red line represents those falling at or below the 25$^{th}$ percentile for each respective moderator, and the green dotted line represents those scoring above the 25$^{th}$ percentile for each respective moderator. Error bars represent +/- one standard error of the mean.

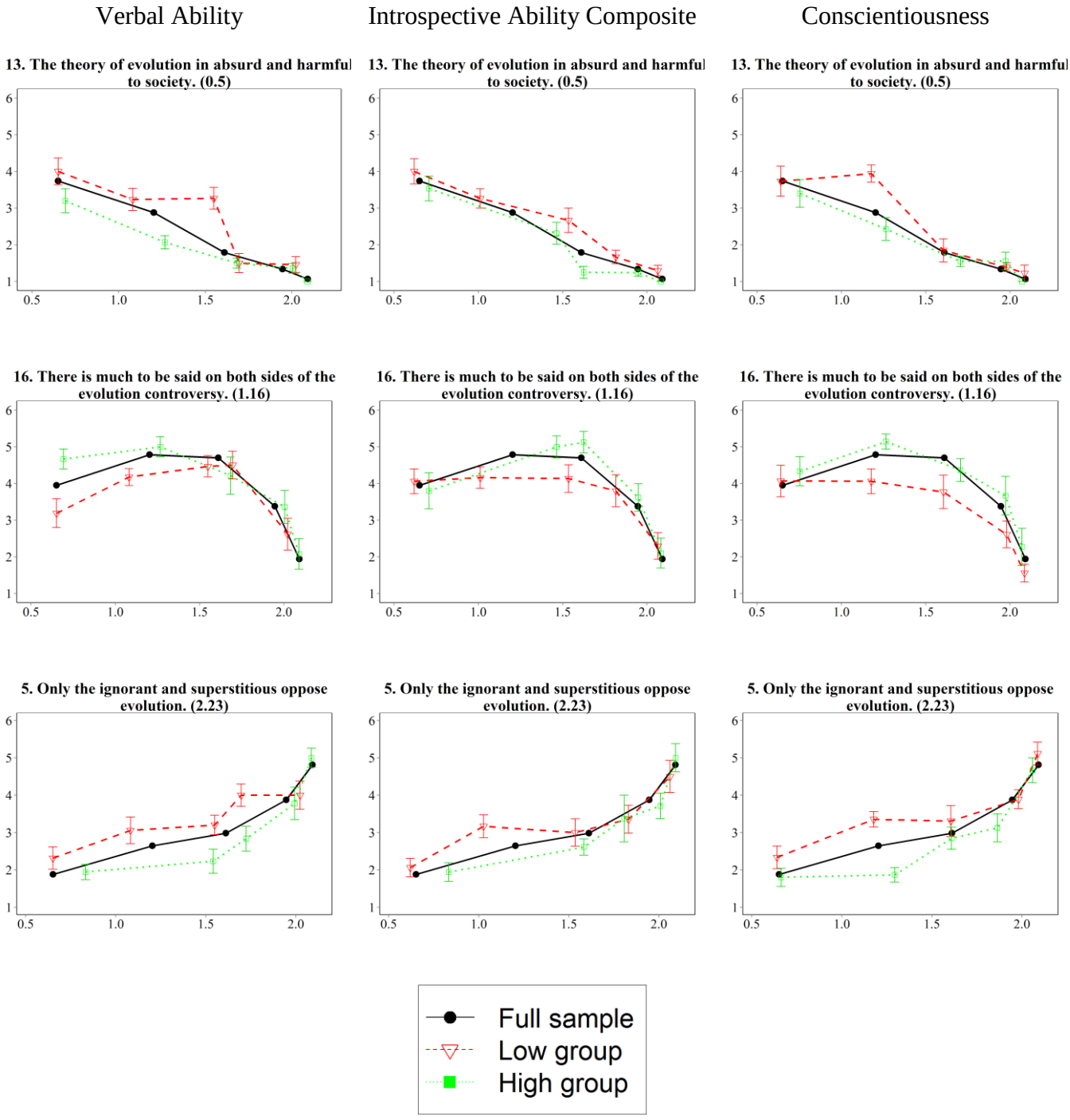



Figure 17. *Moderated Item Characteristic Curves with Random Sub-sampling – Evolution*

Note: This figure presents the ICCs for 3 Evolution items with sub-samples split based on moderators. The solid black line represents the un-split full sample, the dashed red line represents those falling at or below the 25$^{th}$ percentile for each respective moderator, and the green dotted line represents a random sample of 71 individuals scoring above the 25$^{th}$ percentile for each respective moderator. Error bars represent +/- one standard error of the mean.

Table 1. *Item-Interval Endorsement Frequency*

| Item | | Successive intervals | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1= Most Unfavorable | 2 | 3 | 4=Neutral | 5 | 6 | 7= Most Favorable |
| 1 | *f* | 10 | 20 | 40 | 20 | 5 | 3 | 1 |
| | *cf* | 10 | 30 | 70 | 90 | 95 | 98 | 99 |
| | *cp* | 0.1 | 0.3 | 0.7 | 0.9 | 0.95 | 0.98 | 1 |
| 2 | *f* | 0 | 10 | 20 | 60 | 5 | 2 | 1 |
| | *cf* | 0 | 10 | 30 | 90 | 95 | 99 | 100 |
| | *cp* | 0 | 0.1 | 0.3 | 0.9 | 0.95 | 0.99 | 1 |
| 3 | *f* | 0 | 0 | 10 | 10 | 20 | 40 | 20 |
| | *cf* | 0 | 0 | 10 | 20 | 40 | 80 | 100 |
| | *cp* | 0 | 0 | 0.1 | 0.2 | 0.4 | 0.8 | 1 |
| 4 | *f* | 0 | 0 | 5 | 10 | 20 | 40 | 25 |
| | *cf* | 0 | 0 | 5 | 15 | 35 | 75 | 100 |
| | *cp* | 0 | 0 | 0.05 | 0.15 | 0.35 | 0.75 | 1 |

Note: *f* = frequency (i.e. the number of times an item was placed into a particular interval), *cf*= cumulative frequency, and *cp* = cumulative proportion.

Table 2. *Cumulative Frequency of Endorsement*

| Item | | Successive intervals | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | $p_{1j}$ | 0.1 | 0.3 | 0.71 | 0.91 | 0.96 | 0.99 | 1 |
| 2 | $p_{2j}$ | 0 | 0.1 | 0.31 | 0.92 | 0.97 | 0.99 | 1 |
| 3 | $p_{3j}$ | 0 | 0 | 0.1 | 0.2 | 0.4 | 0.8 | 1 |
| 4 | $p_{4j}$ | 0 | 0 | 0.05 | 0.15 | 0.35 | 0.75 | 1 |

Notes: $p_{ij}$= the cumulative proportion of the *i*th item in the *j*th interval.

Table 3. *Standard Normal Deviates of the Cumulative Proportions*

| Item | | Successive intervals | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | $Z_{1j}$ | -1.28 | -0.51 | 0.54 | 1.35 | 1.75 | 2.32 |
| 2 | $Z_{2j}$ | | -1.27 | -0.51 | 1.38 | 1.87 | 2.32 |
| 3 | $Z_{3j}$ | | | -1.282 | -0.842 | -0.253 | 0.842 |
| 4 | $Z_{4j}$ | | | -1.645 | -1.036 | -0.385 | 0.674 |

Note: $Z_{ij}$ = the z-value of the standard normal distribution for the proportion of the *i*th item in the *j*th interval.

Table 4. *Standard Normal Deviates of the Cumulative Proportions*

| Statements | | Sucessive intervals | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2-1 | 3-2 | 4-3 | 5-4 | 6-5 | $S_i$ | |
| 1 | $\omega_{1j}$ | 0.772 | 1.050 | 0.810 | 0.400 | 0.570 | $S_1$ | 1.21 |
| 2 | $\omega_{2j}$ | | 0.760 | 1.900 | 0.480 | 0.450 | $S_2$ | 1.97 |
| 3 | $\omega_{3j}$ | | | 0.440 | 0.588 | 1.095 | $S_3$ | 3.34 |
| 4 | $\omega_{4j}$ | | | 0.608 | 0.651 | 1.060 | $S_4$ | 3.44 |
| | $\omega_{\cdot j}$ | 0.772 | 0.905 | 0.940 | 0.530 | 0.794 | | |
| | Cum$\omega_{\cdot j}$ | 0.772 | 1.677 | 2.616 | 3.146 | 3.940 | | |

Note: $\omega_{ij}$ is an estimate of the width of the *j*th interval using item *i*. $S_i$ is the final obtained scale value to the *i*th item.

Table 5. *Inter-correlations of Unfavorable, Moderate, and Favorable Items*

| Scale | Item Valence | Item | Favorable Item | Moderate Item |
|---|---|---|---|---|
| Abortion | | | | |
| | Unfavorable | 1. Abortion is unacceptable under any circumstances. (0.5) | -0.59** | 0.05 |
| | Moderate | 5. Sometimes I am in favor of a woman's right to abortion but at other times I am not. (1.21) | -.11 | |
| | Favorable | 10. Society has no right to limit a woman's access to abortion. (3) | | |
| Capital Punishment | | | | |
| | Unfavorable | 5. Capital punishment cannot be regarded as a sane method of dealing with crime. (0.5) | -.577** | .329** |
| | Moderate | 9. I don't believe in capital punishment but I'm not sure it isn't necessary. (0.97) | -.263** | |
| | Favorable | 16. Capital punishment is just and necessary. (2.24) | | |
| Evolution | | | | |
| | Unfavorable | 3. The theory of evolution is a lot of unsupported guesses. (0.5) | -.51** | -.14* |
| | Moderate | 16. There is much to be said on both sides of the evolution controversy. (1.16) | .187** | |
| | Favorable | 15. Anti-evolution legislation is ridiculous in a civilized nation. (2.08) | | |

N=282
*p< .05.
**p<.01
Note: scale values are in parentheses

Table 6. *Inter-correlations of Moderator Variables*

| Moderator | M | SD | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 1. Verbal Ability | 17.52 | 6.14 | - | | | | |
| 2. Alexithymia | 16.91 | 12.49 | -.34** | - | | | |
| 3. Ability to Describe | 17.63 | 8.50 | .19** | -.69** | - | | |
| 4. Need for Cognition | 3.84 | 9.98 | .25** | -.27** | .13* | - | |
| 5. Need to Evaluate | 13.57 | 8.30 | .04 | -.05 | .05 | .26** | - |
| 6. Conscientiousness | 19.54 | 13.59 | .20** | -.44** | .32** | .26** | .05 |

N=282

*p< .05. **p<.01

# APPENDIX B: MEASURES

**Mini-Marker Sample Items From Study 1**

Please choose one statement for each trait that most accurately describes you.

Talkative
- I am **not** talkative.
- I am **slightly** talkative.
- I am **moderately** talkative.
- I am **very** talkative.
- I am **extremely** talkative.

Please carefully compare the two statements and select the ONE that describes you more accurately.

1. Talkative
   - I am **not** talkative.
   - I am **slightly** talkative.
2. Talkative
   - I am **not** talkative.
   - I am **slightly** talkative.
3. Talkative
   - I am **not** talkative.
   - I am **very** talkative.
4. Talkative
   - I am **not** talkative.
   - I am **extremely** talkative.
5. Talkative
   - I am **slightly** talkative.
   - I am **moderately** talkative.
6. Talkative
   - I am **slightly** talkative.
   - I am **very** talkative.
7. Talkative
   - I am **slightly** talkative.
   - I am **extremely** talkative.
8. Talkative
   - I am **moderately** talkative.
   - I am **very** talkative.
9. Talkative
   - I am **moderately** talkative.
   - I am **extremely** talkative.
10. Talkative
    - I am **very** talkative.
    - I am **extremely** talkative.

**Attitudes Towards Abortion Items:**

1. Abortion is unacceptable under any circumstances.
2. Abortion violates the unborn child's fundamental right to life.
3. Abortion should be illegal except in cases involving incest and rape.
4. Abortion is basically immoral except when the woman's physical health is in danger.
5. Sometimes I am in favor of a woman's right to abortion, but at other times I am not.
6. There are some cases where abortion is justified but there are just as many cases where it is not.
7. Abortion should be a woman's choice, but should never be used simply due to its convenience.
8. Abortion should generally be legal, but should never be used as a conventional method of birth control.
9. The government should never prohibit a woman from having an abortion.
10. Society has no right to limit a woman's access to abortion.

**Attitudes Towards Capital Punishment Items**

1. Capital punishment may be wrong but it is the best preventative to crime.
2. Capital punishment is absolutely never justified.
3. I think capital punishment is necessary but I wish it were not.
4. Any person, man or woman, young or old, who commits murder, should pay with his own life.
5. Capital punishment cannot be regarded as a sane method of dealing with crime.
6. Capital punishment is wrong but necessary in our imperfect civilization.
7. Every criminal should be executed.
8. Capital punishment has never been effective in preventing crime.
9. I don't believe in capital punishment but I'm not sure it isn't necessary.
10. We must have capital punishment for some crimes.
11. I do not believe in capital punishment under any circumstances.
12. Capital punishment is not necessary in modern civilization.
13. We can't call ourselves civilized as long as we have capital punishment.
14. Life imprisonment is more effective than capital punishment.
15. Execution of criminals is a disgrace to civilized society.
16. Capital punishment is just and necessary.
17. I do not believe in capital punishment but it is not practically advisable to abolish it.
18. Capital punishment is the most hideous practice of our time.
19. Capital punishment gives the criminal what he deserves.
20. The state cannot teach the sacredness of human life by destroying it.
21. It doesn't make any difference to me whether we have capital punishment or not.
22. Capital punishment is justified only for premeditated murder.
23. Capital punishment should be used more often than it is.
24. Capital punishment is not morally right or wrong; it is merely just one method of punishment
25. When society sentences a murderer to death, we ourselves become murderers.

**Attitudes Towards Censorship Items**

1. Censorship is a good thing if there isn't too much of it.
2. The judgment of intelligent people is the only effective censorship.
3. Nobody has the any right to dictate to me what I read and watch.
4. Censorship is needed because most people are unable to judge for themselves.
5. There is much to be said on both sides of the censorship debate.
6. Morality varies so much with different places and times that censorship is arbitrary.
7. Censorship is absurd because no two people agree about morality.
8. Our national morality is safeguarded by censorship.
9. Censorship is needed, but may go too far.
10. It is a shame that so many books, websites, video games and movies have been suppressed by censorship.
11. Censorship is a disgrace to our country.
12. Censorship when reasonably exercised is desirable for morality.
13. People should be allowed to make their own distinctions between good and bad.
14. What we need is more and better censorship.
15. Our system of censorship isn't perfect but it is better than none.
16. Censorship can never be justified in a free country.
17. Some authorized power is certainly needed to keep obscene movies and video games in check.
18. Censorship can never make people moral.
19. A truly free people must be allowed to choose their own reading and entertainment.
20. Only narrow-minded people want censorship.
21. Movies and video games should be censored but the press should be free.
22. Censorship is a gross violation of our constitutional rights.
23. Human progress demands free speech and free press.
24. Censorship is effective in raising moral and aesthetic standards.
25. Censorship protects those who lack judgment of experience to choose for themselves.

**Attitudes Towards Evolution Items**

1. I am beginning to think that the theory of evolution may be right.
2. The idea of evolution is no more convincing than the account of creation given in the Bible.
3. The theory of evolution is a lot of unsupported guesses.
4. I am not quite ready to accept the doctrine of evolution.
5. Only the ignorant and superstitious oppose evolution.
6. The Bible gives the true explanation of the world's creation and the origin of man.
7. Evolution may apply to plants and animals, but never to man.
8. If the biblical accounts conflict with the findings of science, then the Bible must give way.
9. The evolutionary theory is the most satisfactory explanation of life we yet have.
10. We must be cautious in accepting such a radical doctrine as evolution.
11. The theory of evolution is complete to the last detail.
12. The theory of evolution may contain errors but it is a step in the right direction.
13. The theory of evolution in absurd and harmful to society.
14. I do not understand the evolutionary theory, so I am doubtful of its truth.
15. Anti-evolution legislation is ridiculous in a civilized nation.
16. There is mush to be said on both sides of the evolution controversy.
17. Books supporting evolutionary theory should be destroyed.
18. We should oppose the theory of evolution because it undermines our faith in God.
19. The biological demonstrations of evolution are beyond dispute.
20. Evidence points to an evolutionary explanation of life.

**Attitudes Towards God Items**

1. I do not believe in God and would be a coward if I pretend to do so.
2. It is absurd for any thinking man to use such a concept as God.
3. I trust in God to support the right and condemn the wrong.
4. I think I believe in God, but I really haven't thought much about it.
5. I am tolerant toward those who still believe in God.
6. The idea of God is a hindrance to clear thinking.
7. It is stupid to insist there is a God.
8. I believe in God but my idea of God is vague.
9. My Idea of God develops with experience.
10. Although I do not believe in God, I am open-minded about the mysteries of life.
11. I haven't yet reached any definite opinion about the idea of God.
12. I hate the word God and everything associated with it.
13. I have a strong desire to believe in God.
14. I am quite convinced of the reality of God.
15. I do not know whether I ought to believe in God.
16. The idea of God seems quite unnecessary.
17. God is the underlying reality of life.
18. God has no place in my thinking.
19. The ideas of God are so confusing that I do not know what to believe.
20. I don't believe in God but the idea has value for many people.
21. The idea of God gives me a sense of security.
22. The idea of God is the best explanation for our wonderful world.
23. I still hold on to my belief in God without any clear reason.
24. I would rather die than give up my faith in God.
25. I have no patience with those who still cling to the stupid idea that there is a God.

**120-Item IPIP NEO**

On the following pages, there are phrases describing people's behaviors. Please use the rating scale below to describe how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully, and then fill in the bubble that corresponds to the number on the scale.

Response Options
1: Very Inaccurate
2: Moderately Inaccurate
3: Neither Inaccurate nor Accurate
4: Moderately Accurate
5: Very Accurate

**Neuroticism**

N1: Anxiety

1. Worry about things.
2. Fear for the worst.
3. Am afraid of many things.
4. Get stressed out easily.

N2: Anger

5. Get angry easily.
6. Get irritated easily.
7. Lose my temper.
8. Rarely get irritated. (R)

N3: Depression

9. Often feel blue.
10. Dislike myself.
11. Am often down in the dumps.
12. Have a low opinion of myself.

N4: Self-Consciousness

13. Find it difficult to approach others.
14. Am easily intimidated.
15. Am not embarrassed easily. (R)
16. Am able to stand up for myself. (R)

N5: Immoderation

17. Often eat too much.
18. Go on binges.
19. Rarely overindulge. (R)

20. Am able to control my cravings. (R)

N6: Vulnerability

21. Feel that I'm unable to deal with things.
22. Remain calm under pressure. (R)
23. Know how to cope. (R)
24. Am calm even in tense situations. (R)

**Extraversion**

E1: Friendliness

25. Make friends easily.
26. Warm up quickly to others.
27. Feel comfortable around people.
28. Act comfortably with others.

E2: Gregariousness

29. Love large parties.
30. Talk to a lot of different people at parties.
31. Don't like crowded events. (R)
32. Avoid crowds. (R)

E3: Assertiveness

33. Take charge.
34. Try to lead others.
35. Take control of things.
36. Wait for others to lead the way. (R)

E4: Activity Level

37. Am always busy.
38. Am always on the go.
39. Do a lot in my spare time.
40. Can manage many things at the same time.

**Openness**

O1: Imagination

41. Have a vivid imagination.
42. Enjoy wild flights of fantasy.
43. Love to daydream.
44. Like to get lost in thought.

O2: Artistic Interests

45. See beauty in things that others might not notice.
46. Do not like art. (R)
47. Do not like poetry. (R)
48. Do not enjoy going to art museums. (R)

O3: Emotionality

49. Experience my emotions intensely.
50. Seldom get emotional. (R)
51. Am not easily affected by my emotions. (R)
52. Experience very few emotional highs and lows. (R)

O4: Adventurousness

53. Prefer to stick with things that I know. (R)
54. Dislike changes. (R)
55. Don't like the idea of change. (R)
56. Am attached to conventional ways. (R)

O5: Intellect

57. Am not interested in abstract ideas. (R)
58. Avoid philosophical discussions. (R)
59. Have difficulty understanding abstract ideas. (R)
60. Am not interested in theoretical discussions. (R)

O6: Liberalism

61. Tend to vote for liberal political candidates.
62. Believe in one true religion. (R)
63. Tend to vote for conservative political candidates. (R)
64. Like to stand during the national anthem. (R)

**Agreeableness**

A1: Trust

65. Trust others.
66. Believe that others have good intentions.
67. Trust what people say.
68. Distrust people. (R)

A2: Morality

69. Use flattery to get ahead. (R)
70. Know how to get around the rules. (R)
71. Cheat to get ahead. (R)
72. Take advantage of others. (R)

A3: Altruism

73. Make people feel welcome.
74. Love to help others.
75. Am concerned about others.
76. Turn my back on others. (R)

A4: Cooperation

77. Love a good fight. (R)
78. Yell at people. (R)
79. Insult people. (R)
80. Get back at others. (R)

A5: Modesty

81. Believe that I am better than others. (R)
82. Think highly of myself. (R)
83. Have a high opinion of myself. (R)
84. Make myself the center of attention. (R)

A6: Sympathy

85. Sympathize with the homeless.
86. Feel sympathy for those who are worse off than myself.
87. Suffer from others' sorrows.
88. Am not interested in other people's problems. (R)

**Conscientiousness**

C1: Self-Efficacy

89. Complete tasks successfully.
90. Excel in what I do.
91. Handle tasks smoothly.
92. Know how to get things done.

C2: Orderliness

93. Like order.
94. Like to tidy up.
95. Leave a mess in my room. (R)
96. Leave my belongings around. (R)

C3: Dutifulness

97. Keep my promises.
98. Tell the truth.
99. Break my promises. (R)
100. Get others to do my duties. (R)

C4: Achievement Striving

101. Work hard.
102. Do more than what's expected of me.
103. Set high standards for myself and others.
104. Am not highly motivated to succeed. (R)
105. C5: Self-Discipline
106. Start tasks right away.
107. Find it difficult to get down to work. (R)
108. Need a push to get started. (R)
109. Have difficulty starting tasks. (R)
110. C6: Cautiousness
111. Jump into things without thinking. (R)
112. Make rash decisions. (R)
113. Rush into things. (R)
114. Act without thinking. (R)

**Need to Evaluate Scale**

1. I form opinions about everything.
2. I prefer to avoid taking extreme positions. (R)
3. It is very important to me to hold strong positions.
4. I want to know exactly what is good and bad about everything.
5. I often prefer to remain neutral about complex issues. (R)
6. If something does not affect me, I do not determine if it is good or bad. (R)
7. I enjoy strongly and disliking new things.
8. There are many things for which I do not have a preference. (R)
9. It bothers me to remain neutral.
10. I like to have strong opinions even when I am not personally involved.
11. I have many more opinions than the average person.
12. I would rather have a strong opinion than no opinion at all.
13. I pay a lot of attention to whether things are good or bad.
14. I only form strong opinions when I have to. (R)
15. I like to decide that new things are really good or really bad.
16. I am pretty much indifferent to many important issues. (R)

**Need For Cognition Scale**

1. I would prefer complex to simple problems.
2. I like to have the responsibility of handling a situation that requires a lot of thinking.
3. Thinking is not my idea of fun.
4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.
5. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.
6. I find satisfaction in deliberating hard and for long hours.
7. I only think as hard as I have to.
8. I prefer to think about small, daily projects to long-term ones.
9. I like tasks that require little thought once I've learned them.
10. The idea of relying on thought to make my way to the top appeals to me.
11. I really enjoy a task that involves coming up with new solutions to problems.
12. Learning new ways to think doesn't excite me very much.
13. I prefer my life to be filled with puzzles that I must solve.
14. The notion of thinking abstractly is appealing to me.
15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much though.
16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.
17. It's enough for me that something gets the job done; I don't care how or why it works.
18. I usually end up deliberating about issues even when they do not affect me personally.

**Toronto Alexithymia Scale**

1. I am often confused about what emotion I am feeling.
2. I have physical sensations that even doctors don't understand.
3. When I am upset, I don't know if I am sad, frightened, or angry.
4. I am often puzzled by sensations in my body.
5. I have feelings I can't quite identify.
6. I often don't know what's going on inside me.
7. I often don't know why I am angry.
8. It is difficult for me to find the right words for my feelings.
9. I am able to describe my feelings easily.
10. I find it hard to describe how I feel about people.
11. People tell me to describe my feelings more.
12. It is difficult for me to reveal my innermost feelings, even to close friends.
13. I prefer to analyze problems rather than just describe them.
14. I prefer to just let things happen rather than to understand why they turned out that way.
15. Being in touch with emotions is essential.
16. I prefer talking to people about their daily activities rather than their feelings.
17. I prefer to watch "Light" entertainment shows rather than psychological dramas.
18. I can feel close to someone, even in moments of silence.
19. I find examination of my feelings useful in solving personal problems.
20. Looking for hidden meanings in movies or plays distracts from their enjoyment.

**Psychological Mindfulness Scale: Factor 4 Describing/labeling with words**

1. I am good at finding the words to describe my feelings.
2. I can easily put my beliefs, opinions, and expectations into words.
3. I'm good at thinking of words to express my perceptions, such as how things taste, smell, or sound.
4. It's hard for me to find the words to describe what I'm thinking.
5. I have trouble thinking of the right words to express how I feel about things.
6. When I have a sensation in my body, it's hard for me to describe it because I can't find the right words.
7. Even when I'm terribly upset, I can find a way to put it into words.
8. My natural tendency is to put my experiences into words.
9. I can usually describe how I feel at the moment in considerable detail.
10. It is easy for me to keep track of my thoughts and feelings.

# APPENDIX C: IRB APPROVAL FORM

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

# Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
**FWA00000351, IRB00001138**

To: **Matthew LaPalme** and Co-PIs: **Wei Wang**

Date: **June 17, 2014**

Dear Researcher:

On 6/17/2014, the IRB approved the following activity as human participant research that is exempt from regulation:

| | |
|---|---|
| Type of Review: | Exempt Determination |
| Project Title: | Big Five Personality Survey |
| Investigator: | Matthew LaPalme |
| IRB Number: | SBE-14-10373 |
| Funding Agency: | |
| Grant Title: | |
| Research ID: | N/A |

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Kanille Cha

IRB Coordinator

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

# Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
**FWA00000351, IRB00001138**

To: **Matthew LaPalme** and Co-PI: **Wei Wang**

Date: **January 05, 2015**

Dear Researcher:

On 01/05/2015, the IRB approved the following activity as human participant research that is exempt from regulation:

| | |
|---|---|
| Type of Review: | Exempt Determination |
| Project Title: | Attitudes and Affect |
| Investigator: | Matthew LaPalme |
| IRB Number: | SBE-14-10750 |
| Funding Agency: | |
| Grant Title: | |
| Research ID: | N/A |

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Kanille Chay

IRB Coordinator

# APPENDIX D: EXPLANATION OF RESEARCH

EXPLANATION OF RESEARCH

Title of Project: Big Five Personality Survey

Principal Investigator: Matthew LaPalme

Co-Investigator: Dr. Wei Wang, Ph.D

Faculty Supervisor: Dr. Wei Wang, Ph.D.

You are being invited to take part in a research study. Your participation is voluntary.

The purpose of this study is to test a personality scale and to provide testing feedback. You will be asked to answer a series questions about your personality. At the end of the survey, a personality profile will be provided based on your responses. This personality survey will take approximately 60 minutes.

You must be 18 years of age or older to take part in this research study.

**Study contact for questions about the study or to report a problem:** If you have questions, concerns, or complaints talk to: Matthew LaPalme, Graduate Student, Department of I/O Psychologye, by email at m.lapalme@knights.ucf.edu or Dr.Wei Wang, Faculty Supervisor, Department of I/O Psychology by email at wei.wang@ucf.edu.

**IRB contact about your rights in the study or to report a complaint:** Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

EXPLANATION OF RESEARCH

Title of Project: Attitudes and Affect Survey

Principal Investigator: Matthew LaPalme

Co-Investigator: Dr. Wei Wang, Ph.D

Faculty Supervisor: Dr. Wei Wang, Ph.D.

You are being invited to take part in a research study. Your participation is voluntary.

The purpose of this study is to gather information about how you feel on a day-to-day basis. You will be asked to report how you feel each day by answering a short series of questions. At the beginning of the survey, you will be required to provide a cell phone number which will be used to deliver the survey questions. The survey link will be sent to you via SMS text message each day for five days. At the end of the five days, you will be asked a few demographics, personality, and verbal ability questions.This survey will take approximately 60 minutes to complete and you will receive class credit for your participation.

You must be 18 years of age or older to take part in this research study. You must also have a cell phone with SMS messaging capabilities to participate.

**Study contact for questions about the study or to report a problem:** If you have questions, concerns, or complaints talk to: Matthew LaPalme, Graduate Student, Department of I/O Psychologye, by email at m.lapalme@knights.ucf.edu or Dr.Wei Wang, Faculty Supervisor, Department of I/O Psychology by email at wei.wang@ucf.edu.

**IRB contact about your rights in the study or to report a complaint:** Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

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