**Cross-Dimensional Framework:
A Way to Integrate Social Context on Personality Assessment¹**

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Cross-Dimensional Framework:

A Way to Integrate Social Context on Personality Assessment

Despite various advances in methods, personality scale development still tends to focus on traits, leaving social context out of the equation. To address this, *Cross-Dimensional Framework (Cross D)* was devised to systematically integrate social context on every item of a personality scale. The framework was used to develop the *Cross-Dimensional Conscientiousness Scale (XC)*. After standardization, XC was administered to 304 Filipino college students along with the Conscientiousness scale items from the *International Personality Item Pool Representation of the NEO PI-R (IPIP NEO)*, and *Big Five Inventory (BFI)*. Statistical analyses were performed to see whether (1) the theoretical assumptions of Cross D are true and if the framework does not compromise the (2) reliability and (3) validity of the test created. The majority of the results support all the theoretical assumptions of Cross D including its effect on reliability and validity of the test, thereby providing evidence of the framework's utility. Besides the novelty of integrating social context on trait measurement, the framework also paves way for the possible quantification of trait's consistent expression across social context.

Keywords: Big Five; personality; test development; social context; social pressure; persona

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Personality assessment had gone far from its association with humors in circa 370 BCE, to phrenology in 1780s (OpenStax, 2016), then the birth of psychoanalysis in 1895 (Feist & Feist, 2008). Despite this, personality scales as popularly known today – self-report tests – only rose to popularity towards the early 1900s.

This shift from client-tailored interviews of psychoanalysis to the pen-and-paper inventories was marked by the creation of Personal Data Sheet (Cohen & Swerdlik, 2009) which exemplified (1) standardization of trait measurement, and the (2) time-efficient group administration – utility advantages inherent of its format.

To gain these pros, most of the succeeding personality inventories adapted this survey format as well. Nevertheless, the format also comes with the cons of poor adaptability to the diverse and complex nature of personality – a trade-off for giving up the client-tailored probing for a fixed set of generalized statements. This shortcoming tends to dismiss crucial factors which affect personality – such as social context (Bandura, 1997; Rotter, 1982; London & Oldham, 1977; Johnson & Chang, 2006; Gardner, Gabriel, & Lee, 1999). In response to this, Cross-Dimensional Framework (Cross D), was created to incorporate social context on the items of personality scales (Mercado, 2019a).

Although the framework was successfully adapted to develop the Cross-Dimensional Conscientiousness Scale (or XC read as “Cross C”) (Mercado, 2019b), its assumptions are yet to be put to test. To address this need, the paper aimed to evaluate the framework’s assumptions: (1) Social factors, namely Social Stipulation and Social Interaction, influences the expression of a trait, and Cross D does not compromise the (2) reliability and the (3) validity of a test constructed based on it. This investigation was expected to aid in establishing the validity of the assumptions which thereby define the utility of the framework.

Personality Structure and Measurement

Across paradigms, the idea of personality as a construct has been long focused on its characteristic as a pattern of behavior and thought that occurs consistently across situations; asserting that personality is an internal characteristic rather than a mere reaction to the environment.

This emphasis on the internality of personality is evident in how George Allport, proposed a revision for one of his finest definition of personality – “the dynamic organization within the individual of those psychophysical systems that determine his unique adjustments to his environment” (Allport, *Personality: A psychological interpretation*, 1937, p. 48). He later changed the phrase “*that determine his unique adjustments to his environment*” into “*that determine his characteristic behavior and thought*” (Allport, *Pattern and growth in personality*, 1961, p. 28) to make the point that personality is not only reactive but is also proactive and expressive pattern of thought and behavior (Feist & Feist, 2008, p. 378).

Believing that personality is mostly internal, the search for these universal *characteristic patterns of behaviors and thoughts* – more commonly called “traits” – had been the trend and theme of the succeeding factor analytical paradigm. With leading proposals such as the Sixteen Personality Factor (Cattell, 1949), triad model of Psychoticism, Extraversion and Neuroticism (Eysenck & Eysenck, 1975), and Five-Factor Model (McCrae & Costa, 2003), the community of personality psychology had been on a debate of which and how many factors or traits are necessary and sufficient to cover the whole spectral domain of personality (Feist & Feist, 2008).

Five-Factor Model

So far, the most commonly used and widely accepted factorial structure of personality is

the *Five-Factor Model* (FFM) by Paul Costa Jr. and Robert McCrae (Feist & Feist, 2008) owing its scientific reputation from the empirical studies that support its universality and stability of its measurement across culture (Gurven, von Rueden, Massenkoff, Vie, & Kaplan, 2013; Katigbak, Church, Guanzon-Lapena, Carlota, & del Pilar, 2002; McCrae, et.al., 2005; Schmitt, et al., 2007; McCrae, 2002). FFM summarizes personality into five traits namely Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism which are popularly known as the “Big Five”. For this paper, Conscientiousness, one of the Big Five traits was used as the common trait measured by the three personality scales which served as the research instruments.

Influence of Social Context with Personality

While personality tests continuously grow in number, most only factor in traits. This is despite the prevailing notions that personality is affected by social context as put forward by the Triadic Reciprocal Causation of Albert Bandura, and by the Cognitive Affective Personality Theory of Walter Mischel, and Yuichi Shoda (Feist & Feist, 2008).

This notion was also supported by researches under various social setting including industries with shared incentive (London & Oldham, 1977), corporate community with individual workloads (Johnson & Chang, 2006), and typical daily interaction of students from collectivist and individualist cultures (Gardner, Gabriel, & Lee, 1999) which found changes in behavior depending on its social context and perceived consequences.

At the time of writing, only few related studies regarding the use of social situation in personality assessment were found and none of them directly address the purpose of Cross D – to categorized social situations and use that category as settings where expression of a trait may vary. The works of Ziegler, Horstmann, and Ziegler (2019) and Rauthmann, et al. (2014) identified factors that measures the characteristics of a situation

itself, rather than the personality traits across situations. In fact, later part of these studies also found discriminating correlations between the situation factors and the Big Five, a property that Cross D aims to avoid as its aims for universal application across personality traits. Another approach on quantifying personality traits is through situational judgement (Mussel, Gatzka, & Hewig, 2018) but this approach does not use a taxonomy of situation and did not adapt Likert format.

Cross-Dimensional Framework

To fill in this gap, Cross D proposed a way to integrate social context on the assessment of personality by sampling behavioral manifestations of traits across social settings. First, the framework identified the four Social Dimensions wherein the behaviors are assumed to vary due to social context. Next, it adds this layer of Social Dimension to the existing structure of trait targeted to be quantified. In doing so, it dissects the trait into context-sensitive units called Cross-Dimensions.

Besides the actual increase in the number of subscales, it also makes item writing more specific. Thus, the stems with Cross D application ask more specific and measurable behaviors (e.g. “I fix my bed right after I wake up.” from XC), in contrast with the traditionally all-encompassing stems (e.g. “I like order.” from IPIP NEO).

The Structure of Cross D

At present, the Cross D is composed of four hierarchical Social Dimensions that was anchored from Kapwa and Pakikipagkapwa of Enriquez (1978a; 1997), but instead of treating the two categories of Kapwa – *Ibang-tao* (outsider) and *Hindi-ibang-tao* (one-of-us) – as a dichotomy, the Cross D sees it as a continuum through the spectrum of Pakikipagkapwa or social interaction.

As shown in Table 1, Cross D, restructured the concept of Kapwa by dividing each of its categories into two, and, at the same time, narrowing down the eight (8) levels of Pakikipagkapwa, into four Social Dimensions (Mercado, 2019a). This was done by investigating the factor that differentiates the two types of Kapwa (which was called *Social Stipulation*) and naming another factor that can further divide the levels of Pakikipagkapwa into two (which is *Social Interaction*). The presence or absence of these two distinguishing factors defined the four Social Dimensions.

Social Stipulation (SS). The primary role of Social Stipulation is to separate reactive behavior from proactive behavior. In a nutshell, behaviors that spring solely due to Social Stipulation is reactive, while behaviors that were done without the influence of Social Stipulation are proactive in nature.

Thus, Social Stipulation can be defined as an external demand of a social setting or consequence inherent of a certain behavior that pressures a person to act accordingly. Examples of this are monetary reward, career advancement, and social status. Internal reinforcements such as self-improvement, serving the common welfare, or self-expression do not count as Social Stipulation as they are proactive behaviors rather than reactive (Allport, 1961).

Within the framework, Social Stipulation exists in two Social Dimensions, namely: Individual and Professional, and absent on the other two: Personal and Relational. In Individual Dimension, the Social Stipulation is marked by the consequence of one's action to self, while in Professional Dimension, it is apparent with an action's effect towards self and others. The difference in Social Stipulation between Individual and Professional Dimensions lies in the presence or absence of another factor, Social Interaction.

Table 1.*Comparison of Social Dimension to Levels of Kapwa and Pakikipagkapwa*

Social Dimension ^a	Social Factors ^a		Kapwa ^b	Pakikipagkapwa ^c	Language of Interpersonal Relationship ^d	Cultural Attributes ^e
	Social Stipulation	Social Interaction				
Professional	Present	Present	Ibang-tao	Pakikitungo (civility with) Pakikisalamuha (interaction with) Pakikilahok (participating with)	Level of amenities ----- -----	Vertical Collectivism
Individual	Present	Absent	Ibang-tao	Pakikibagay (in-conformity with) Pakikisama (being along with)	Level of conforming Level of adjusting	Vertical Individualism
Relational	Absent	Present	Hindi-ibang-tao	Pakikipagpalagayang-loob (understanding)	Level of mutual trust	Horizontal Collectivism
Personal	Absent	Absent	Hindi-ibang-tao	Pakikisangkot (getting involved) Pakikiisa (being one with)	----- Level of full trust	Horizontal Individualism

Based on: ^a Mercado (2019a), ^b Enriquez (1978a), ^c Santiago & Enriquez (1976), ^d Santiago (1976), and ^e Triandis & Gelfand (1998)

Social Interaction (SI). The second factor that defines the Social Dimensions is Social Interaction. It refers to the necessary cooperation, collaboration, or communication with others as required by the nature of the behavior, or due to the inherent impact of the behavior on others. Social Interaction also exists once another person was set as the object or receiver of the behavior, even if there is no cooperation, collaboration, or verbal communication required – such as in the case of Relational Dimension.

Social Interaction is present in two Social Dimensions, namely: Professional and Relational, and absent on the other two: Personal and Individual. In Professional Dimension, Social Interaction exists as a reaction to external demand such as deadline, standard of quality, or inevitability of teamwork; as opposed to Relational Dimension, where Social Interaction is proactive or internally motivated. The difference between the two lies in the presence or absence of the first factor, Social Stipulation. Social Dimensions was also matched with related concepts from existing related literature (Triandis & Gelfand, 1998; Santiago, 1976) for additional context.

Assumptions of Cross D

Despite literatures that find differences in behavior under varied situational context (London & Oldham, 1977; Johnson & Chang, 2006; Gardner, Gabriel, & Lee, 1999), none of these explicitly supported the postulates of the current framework – that social context affects the way personality traits manifest. Being new and untested, the Cross D lacks backup research to assess its claims and benefits. As a response, this paper aims to evaluate the utility of Cross D by testing its assumptions specifically:

- (1) Social context influences the expression of a trait thus:
 - (a) Role difference exist.
 - (b) Social Stipulation influences behavior.
 - (c) Social Interaction influences behavior.
- (2) Cross-Dimensional framework does not compromise the reliability of the test.

- (3) Cross-Dimensional framework does not compromise the validity of the test.

Methodology

To answer these inquiries, Cross D was used to develop Cross-Dimensional Conscientiousness Scale (Mercado, 2019b), a personality inventory that measures Conscientiousness as defined in Five-Factor Model. The newly developed inventory was administered to college students from a Philippine city university along with IPIP NEO, and Big Five Inventory. Data gathered from this was interpreted and analyzed in line with the theoretical basis of Cross D.

Data Gathering

A total of 304 respondents, were gathered from February 2018 to February 2019 through convenient sampling. The majority of them are Filipino college students at a city university in the Philippines with typical ages ranging from 18 to 22².

They were asked to take the XC (Mercado, 2019b) and the Conscientiousness scales of IPIP NEO (International Personality Item Pool, 2019), and BFI (John, Naumann, & Soto, 2008) within the same day in either online or pen-and-paper format. All scores and responses from the tests were matched and tallied unless a criterion in their respective test manual (e.g. questionable test-taking time) suggests that the result is likely to be invalid.

Instruments

This study used a total of three personality tests namely Cross-Dimensional

² Demographic information such as age and gender were made optional to assure anonymity during small group test administration.

Conscientiousness Scale (or XC), International Personality Item Pool (or IPIP NEO), and Big Five Inventory (or BFI). Each of these will be introduced alongside their psychometric properties in the succeeding sections.

The first one, XC, served as the experimental scale where the framework was used. On the other hand, the Conscientiousness scales of IPIP NEO and BFI served as the control scales or the baseline tests that do not use Cross D. Comparisons on their psychometric properties (based on responses from similar respondents) were done so that the relative impact of using the framework can be evaluated.

Cross-Dimensional Conscientiousness Scale (XC)

XC is a scale for Conscientiousness that used Cross D to factor in social context on the expression of the said trait. It has internal reliability of 0.96 (n=415) as piloted on Filipino college students (Mercado, 2019b). The test works under the assumption that social context is not a trait to be measured in itself, but is instead, a factor to be considered for the expression of the traits (Mercado, 2019a).

The assumption was materialized by intentionally aligning the Social Dimensions of Cross D – Personal, Individual, Professional, and Relational – as settings on where the four trait components of Conscientiousness – Aptitude, Orderliness, Commitment, and Deliberation – are expressed as behavior. Thus, each item has a designated Social Dimension and is also categorized under a Trait Component. As a result, the system created a four-by-four matrix of 16 Cross-Dimensions on where each item falls under (see Table 2).

From this test, a set of 25 scores per examinee (composed of 4 Trait Components, 4 Social Dimensions, 16 Cross-Dimensions, and one overall score for

Conscientiousness) was gathered for the study. The association of the said scores was summarized on the table below:

Table 2.

The Interaction of Social Dimensions, Trait Components and Cross-Dimensions

<div>Trait Component Social Dimension</div>	Aptitude ^b	Orderliness ^b	Commitment ^b	Deliberation ^b
Personal (Conscientiousness) ^a	Personal Aptitude ^c	Personal Orderliness ^c	Personal Commitment ^c	Personal Deliberation ^c
Individual (Conscientiousness) ^a	Individual Aptitude ^c	Individual Orderliness ^c	Individual Commitment ^c	Individual Deliberation ^c
Professional (Conscientiousness) ^a	Professional Aptitude ^c	Professional Orderliness ^c	Professional Commitment ^c	Professional Deliberation ^c
Relational (Conscientiousness) ^a	Relational Aptitude ^c	Relational Orderliness ^c	Relational Commitment ^c	Relational Deliberation ^c
Total score: Conscientiousness ^d				

^a Social Dimension, ^b Trait Component/sub-trait, ^c Cross-Dimension, ^d General score/trait

In this paper, the term *Social Scales* was used to refer to the four Social Dimensions and the 16 Cross-Dimensions since they are the subscales that directly consider the social factors. In the same manner, the term *Trait Scales* was used to collectively refer to four Trait Components (or the sub-traits) and Conscientiousness (which is the trait or the general score) being the subscales that focus on the theoretical structures of the trait itself (see Figure 1) . Despite the perspective taken by the Trait Scales, it must still be kept in mind that they are still modified by the framework through their social context-specific items.

Figure 1. Structure of Cross-Dimensional Framework as integrated on a personality test

Scores from each of the 25 subscales presented were recorded as raw scores. Responses per item itself were also gathered (with negatively keyed item reverse scored) and used as the database for examining the reliability measures and validity correlations.

International Personality Item Pool Representation of the NEO PI-R (IPIP NEO)

IPIP NEO is a 50-item Big-5 inventory from the International Personality Item Pool. Each trait in the Five-Factor Model has 10 items that use 5-point Likert scale. Based on a study with 811 Greek adults, representative of their population, the test has an internal reliability of 0.875 and acceptable concurrent validity values for the Conscientiousness scale (Ypofanti, et al., 2015).

Big Five Inventory (BFI)

Similar to IPIP NEO, the BFI also measures all five traits from the Five-Factor Model (John & Srivastava, 1999). It has 44 items that come with a 5-point Likert

scale; nine of which measures Conscientiousness. The test was reported to have good internal reliability at 0.89 upon running on 343 Malaysian nurses (Hee, 2014).

While IPIP NEO and BFI measure all five traits in the Five-Factor Model, only the items dedicated to Conscientiousness were used for the interest of the study. This particular trait was chosen to match the scope of XC, and thus serve as a controlled variable. The tests themselves, the IPIP NEO and BFI, served as the control setups where Cross D was not applied.

Organization and Analysis of the Data

Presentation of analysis can be divided into three parts: (1) gathering evidence of the interaction between social context and the expression of a trait, (2) examining the relative effect of adding Social Dimension on test reliability, and (3) examining the relative effect of adding Social Dimension on test validity. All of these parts document, test, and quantify the validity of the frameworks' assumptions and framework's relative utility in comparison with the current practice and standards.

For within-test comparison, Trait Scales, which are more trait-focused, were used as the controlled while Social Scales served as the experimental. As for the between-tests comparison, IPIP NEO and BFI served as the baseline, being the scales developed with traditional non-Cross D process. Cutoff values were also collected from literature to serve as standards.

The common trait measured by the tests, Conscientiousness, was held constant throughout the process and was not evaluated on its own. Rather, the paper was focused on how Cross D affects the quality of a personality scale.

Part 1: Social context influences the expression of a trait.

The first part of the analysis is a search for evidence if social context influences the

expression of a trait. This assumption can be divided into three premises: (1) Role difference exists, (2) Social Stipulation influences behavior, and (3) Social Interaction influences behavior.

Testing these premises was conducted on two levels. The first is on the trait level, through the broader four Social Dimensions, while the second is on sub-trait level, through the more specific 16 Cross-Dimensions.

First Premise: Role difference exists.

Role difference was defined in this paper as the divergence of a person's behavior across social circumstances due to the interaction of personality and social factors. To examine if role difference exists, the scores on scales measuring a common construct (e.g. Aptitude) but across Social Dimensions (e.g. Personal Aptitude, Individual Aptitude, Professional Aptitude, and Relational Aptitude.) were compared using test of difference. Significant differences theoretically prove that social context affects the expression of personality traits.

Role Difference on Social Dimensions. The presence of role difference was tested using Friedman's Test across the four Social Dimensions with Wilcoxon Signed-rank Test paired with Bonferroni correction as post hoc. Significant differences across Social Dimensions prove the influence of social context on the expression of a trait, and consequently, the existence of role difference across social settings on trait level.

Role Difference on Cross-Dimensions. For the sub-trait level, Friedman test was conducted on four Cross-Dimensions that share the same Trait Component. After which, Wilcoxon Signed-rank Test with Bonferroni correction served as post hoc. Thus, the method required four Friedman tests, one for each Trait Component, and a

set of Wilcoxon Signed-rank Tests as post hoc for every significant Friedman test result. Differences from these tests consequently shows evidence of role difference on sub-trait level.

Since social context is defined by the presence or absence of Social Stipulation and Social Interaction (as summarized in Table 1), empirical evidences of their existence and influence should also be evaluated; separately as the second and third premises.

Second Premise: Social Stipulation influences behavior.

To test whether SS influences behavior, test of difference was conducted between Social Dimensions with opposing occurrence of SS but has the same SI occurrence. Thus, Wilcoxon Signed-rank Test was conducted between scores in Personal Conscientiousness and Individual Conscientiousness (both of which lacks SI), and between Relational Conscientiousness and Professional Conscientiousness (both of which has SI). The first subscale for each pair is characterized by the absence of SS, while the second is characterized by its presence.

To quantify the stability of its influence, correlations between Social Dimensions with similar occurrence of SS were gathered. For this, Spearman rho correlation was performed between Personal Conscientiousness and Relational Conscientiousness (since both lack SS), and between Individual Conscientiousness and Professional Conscientiousness (since both have SS).

Parallel tests were conducted for the sub-trait level by using analogous Cross-Dimensions of each Trait Components instead of the broader Social Dimensions.

Third Premise: Social Interaction influences behavior.

Likewise, to test if SI influences behavior, Wilcoxon Signed-rank Test was conducted between scores in Personal Conscientiousness and Relational Conscientiousness

(both of which lacks SS), and between Individual Conscientiousness and Professional Conscientiousness (both of which has SS). For each pair mentioned, the former is characterized by the absence of SI, while the latter is characterized by its presence.

To test the stability of Social Interaction's influence, correlation of Social Dimensions that have similar occurrence of SI were gathered. For this purpose, Spearman rho correlation was performed between Personal Conscientiousness and Individual Conscientiousness (since both lack SI), and between Professional Conscientiousness and Relational Conscientiousness (since both have SI).

For the sub-trait level, similar tests were conducted with corresponding Cross-Dimensions of each Trait Components instead of the broader Social Dimensions.

Results supporting the first part consequently prove that social factors exist (first premise) and social context (as defined by SI and SS) affects behavior (second and third premise). This also establishes the validity of the social factors as constructs in line with the criteria of Borsboom, Mellenbergh, & van Heerden (2004) and thus, supports the conceptual foundation of Cross D as applied on a trait scale.

Part 2: Cross-Dimensional framework does not compromise the reliability of the test.

As a framework for psychometric tests, Cross D should also prove that it can help on improving reliability, or at the very least, does not compromise it. As such, its impact on internal reliability was tested by conducting (1) *within-test*, (2) *between-tests*, and (3) *against-the-standard* comparisons. Average proportional distance (APD) was used as the measure for the purpose since this measure is not affected by the number of items (Sturman, Cribbie, & Flett, 2009). In APD, lower values reflect better reliability.

To see whether the framework improved the reliability of the test, within-test, and between-tests comparisons were conducted. For the former, the APD values of each Social Scale were compared with that of Trait scales. For the later, APD values of XC scales were compared to Conscientiousness scales from IPIP NEO and BFI.

Judging whether the framework improves the internal reliability of a test was based on the percentage of the times when the Social Scales (for within-test comparison), and the XC scales (for between-tests comparison) received favorable results (lower APD). A percentage greater than 50% was considered as a sign of better reliability, while 60% and above is set as the threshold for significant improvement.

To know whether the application of Cross D framework compromised the reliability of the test created or not, against-the-standard comparison was performed. Cutoffs for average proportional distance were set at .30, .25, and .20 for average, very good, and excellent consistency, respectively (Sturman, Cribbie, & Flett, 2009). Any value higher than .30 reflects low reliability and was interpreted as a compromise on reliability.

Part 3: Cross-Dimensional framework improves the validity of the test.

Since the framework proposed an additional aspect to measure – social factors, its effect on validity is also of concern. To tell whether the Cross D improved the test's validity, (1) *within-test* and (2) *between-tests comparison* was conducted. To see whether it did not compromise validity, (3) *against-the-standard* item validity was also done.

Within-test Comparison of Concurrent Validity

For within-test comparison, the concurrent validity (Cronbach & Meehl, 1955, p.

282) of Social Scales was compared to that of Trait Scales. Correlations were anchored to IPIP NEO and BFI Conscientiousness scale scores as the external criterion. While a stronger positive correlation necessarily equates to better concurrent validity, the differences between values were still evaluated for statistical significance using the work of Lenhard and Lenhard (2014).

For between and against-the-standard comparison, the *item validity* values were gathered and treated as an extension of construct validity (Campbell & Fiske, 1959). In this measure, higher correlation means better fit of the item to the construct it is supposed to measure, thereby providing a value that is comparable to factor loading of construct validity (Clark & Watson, 1995, p. 314; Campbell & Fiske, 1959).

Item validity (Parry & Crossley, 1950), was quantified using the item-total correlation for the subscale. To account for the rise in correlation due to the inclusion of item-score, the total subscale scores were operationalized as the respective scale raw score, less the score from the item of concern (Howard & Forehand, 1962, p. 731)

Between-tests Comparison of Average Item Validity

In between-tests comparison, the mean item validity of each XC scale was gathered and compared to parallel values of IPIP NEO and BFI Conscientiousness scales. Since there are only two baselines, the XC scales need to have better item validity at least once in these comparisons to say that the framework aided on validity.

Against-the-standard Comparison of Item Validity

To see whether the framework compromised the test's validity, item validity values were evaluated based on the standards used by various literatures (Wolfenbarger & Gilly, 2003; Hinkin, 1995; Nurosis 1994; Cristobal, Flavián, & Guina, 2007). Cutoffs

were set at .30, .40, and .50 for average, good, and excellent item validity respectively. Values lower than .29 were considered as low.

Results

This section summarizes the findings from the analysis. The first part examines the assumptions of Cross D, followed by the observation of its effect on (2) reliability and (3) validity. Each of these parts were further divided into more specific topics as represented by an assumption (for Part 1) or a particular point of comparison (for Part 2 and Part 3).

Part 1: Social context influences the expression of trait.

This part focuses on the evidences of social context and its influence on the expression of a trait as shown by the scores. This was further divided into three subsections, each summarizing the evaluation of a premise on both trait and sub-trait level.

First Premise: Role difference exist.

To see if role difference exists and affects behavior, Social Dimensions (for trait level) or Cross-Dimensions (for sub-trait level) was tested for difference with Friedman test and Wilcoxon Signed-rank tests with Bonferroni correction as post hoc.

As shown on Appendix A.1, there are significant differences ($p < .001$) between Social Dimensions and Cross-Dimensions with moderate effect ranging from .243 to .490. Upon performing post hoc tests (see Appendix A.2), it was found that at trait level, all six paired comparison have significant differences ($p < .001$), while for the sub-trait level, 21 out of 24 paired comparisons were also significant ($p < .001$) even with the Bonferroni correction's LDS p-value of .008. In general, these

findings support the premise that role difference exist, both on trait and sub-trait level.

Second Premise: Social Stipulation influences behavior.

For the second premise, Wilcoxon Signed-rank test and Spearman rho were conducted between pairs of Social Dimensions (for trait level) or Cross-Dimensions (for sub-trait level) matched in such way that differences can theoretically be attributed to the influence of Social Stipulation while correlations statistically represent the stability of this influence (see complete results on

Appendix B).

On trait level, large significant differences were found ($z = -12.75$, $p < .001$, $r_{\text{(equivalent)}} = -0.52$ and $z = -12.58$, $p < .001$, $r_{\text{(equivalent)}} = -0.51$) along with equally large and significant correlations ($r_s = .841$, $p < .001$, $z' = 1.22$ and $r_s = .725$, $p < .001$, $z' = 0.92$). These results support the second premise at trait level.

For the sub-trait level, all eight comparisons yield statistically significant differences ($p < .001$) with moderate to strong practical effect ($r_{\text{(equivalent)}} = -0.25$ to -0.55). This was paired by correlations ($r_s = .382$ to $.703$) that are all statistically significant at the alpha of .001 and has moderate to large effect size ranging from 0.40 to 87. All these findings support the assumptions of Social Stipulation at sub-trait level.

Altogether, scores were found to behave in line with how Cross D predicted Social Stipulation to exist and influence behavior. Evidences are more stable and more pronounced on the trait level than on sub-trait.

Third Premise: Social Interaction influences behavior.

For the third premise, Wilcoxon Signed-rank Test and Spearman rho was conducted between pairs of Social Dimensions (for trait level) or Cross-Dimensions (for sub-trait level) matched in such way that differences can be ascribed as the influence of Social Interaction while correlation represent the stability of this influence (see complete results on

Appendix C).

For the trait level, statistically significant differences with moderate effect size were found ($z = -11.22$, $p < .001$, $r_{(\text{equivalent})} = -0.46$ and $z = -10.84$, $p < .001$, $r_{(\text{equivalent})} = -0.44$). The correlations were also significant with large effect size ($r_s = .819$, $p < .001$, $z' = 1.15$ and $r_s = .764$, $p < .001$, $z' = 1.01$). These results all support the third premise at trait level.

For the sub-trait level, six out of eight comparisons yield statistically significant differences ($p < .001$) with varied degree of practical effect ($r_{(\text{equivalent})} = -0.01$ to -0.55). However, correlations ($r_s = .351$ to $.635$) are all statistically significant ($p < .001$) and has moderate to strong effect size ranging from 0.37 to 0.75 . The great majority these findings validates the assumptions of Social Interactions at sub-trait level.

In summary, the majority of results are in line with how Cross D predicted Social Interaction to manifest in scores, thereby supporting the third premise – Social Interaction influences behavior. Evidences are more pronounced on trait level than on sub-trait.

Part 2: Cross-Dimensional framework does not compromise the reliability of the test.

The impact of the framework on internal reliability was tested by conducting (1) within-test, (2) between-tests and (3) against-the-standard comparisons using APD values.

Within-test Comparison

For the first part, APD values of Social Scales scale were compared to Trait Scale's. Results were gathered as frequency and was converted to percentage.

As shown in Figure 2, Cross-Dimensions outperformed the whole test and Trait Components while Social Dimensions tied with the whole test and comes close to Trait Components. This shows that

Figure 2. Summary of APD values comparisons per group of scales of XC

reliability tends to be better when the scale is trait-focused than when it is social-context-focused. However, specificity in content, thereby regrouping the items into smaller units (i.e. Cross-Dimensions), tends to increase the reliability more dramatically.

Between-tests Comparison

Similar to the first part, APD values were compared, gathered as frequency then converted to percentage, but this time, XC scales were compared to IPIP NEO and BFI.

Figure 3. Summary of APD values comparisons between XC, IPIP NEO and BFI

As summarized in Figure 3, IPIP NEO have far much better reliability (62.50% to 100%) than XC scales. Nevertheless, XC scales shows comparable (50.00%) to considerably better (68.75%) reliability than BFI. This implies that to some extent, Cross D improves the reliability of the test as compare to traditional trait-focused approach on test development.

Against-the-standard Comparison

To see if Cross D application compromised reliability, APD values were also evaluated in comparison to the standards (see p. 18).

As what can be seen in Figure 4, all XC scales have APD values greater than the average range. Straightforwardly, this says that Cross D does not compromise

the test's reliability; more so, it improves the test's reliability as supported by findings from within-test and between-test comparisons.

Figure 4. Distribution of APD values per group of scales of XC

Part 3: Cross-Dimensional framework improves the validity of the test.

To tell whether the Cross D improved the test's validity, (1) within-test and (2) between-tests comparisons were conducted and to see if it did not compromised validity, (3) against-the-standard comparison of item validity was also performed.

Within-test Comparison (of Concurrent Validity)

After the comparison of concurrent validity values, results were collated as frequency and converted into percentage. Statistically significant differences ($p < 0.05$) were also separated from non-significant.

Figure 5. Summary of concurrent validity values comparisons with IPIP NEO (left) and BFI (right) Conscientiousness scale as criterion

As displayed in Figure 5, Trait Scales (in green) have better concurrent validity values as compared to Social Scales considering both significant and non-significant results. Thus, this reflects that Cross D could have decreased the validity of the test. However, it is interesting to note that scales with similar number of items – Social Dimensions and Trait Components – have almost equal validity.

Between-tests Comparison (of Item Validity)

For the second part, average item validity values of XC were compared to IPIP NEO's and BFI's. Similar to previous comparisons, the results were summarized as percentage.

Figure 6. Summary of average item validity comparisons between XC scales and IPIP NEO (left) and BFI (right) Conscientiousness scale

Based on Figure 6, IPIP NEO and BFI have better average item validity than XC scales, but their leads are only significant with Cross-Dimensions. Nevertheless,

this still supports the previous finding that says Cross D decreases the validity of the test in comparison to traditionally developed tests.

Against-the-standard Comparison (of Item Validity)

To see if the Cross D compromised the validity of the test with the reference to the standards (see p.19) . Results were presented in percentage on Figure 7.

Figure 7. Distribution of item validity per group of scales

Based on this, up to 86.2% of (or 69 out of 80) XC items have acceptable item validity. This proportion makes the pool of items of XC acceptable in general.

For comparison, the XC scales have better ratio of items with excellent validity than IPIP NEO and BFI. However, all items of both IPIP NEO and BFI have acceptable item validity in contrast to XC with 13.8% to 17.5% items with poor validity. This implies that Cross D might have reduced the validity of the items.

Discussion

Ever since survey-type tests outdated lengthy interviews in the 1900s (Cohen & Swerdlik, 2009), the advances in personality test development leaned towards statistical methods and exploration of traits to be included on standardized personality tests. As a result, the tradeoffs on using fixed sets of statements – specifically, the dismissal of social context, were left unchecked. This went on amidst the rise of personality theories which factors in the situation (Bandura, 1997; Rotter, 1982), researches showing disparities in behavior as its social consequences change

(London & Oldham, 1977; Johnson & Chang, 2006; Gardner, Gabriel, & Lee, 1999), and studies dissecting behavioral changes during human interaction (Santiago & Enriquez, 1976; Santiago, 1976).

As a resolution, Cross-Dimension Framework (Cross D) was devised to serve as a guide on incorporating social factors – namely, Social Stipulation and Social Interaction – on a personality inventory. After successful adaptation on a test named, Cross-Dimensional Conscientiousness Scale (XC), this paper examined the empirical basis of its (1) theoretical assumptions and its effect on (2) reliability and (3) validity of the test.

Cross D and the Assumptions of Its Constructs

As hypothesized in the first premise (p. 15), differences in scores were noted between scales that measure similar content (i.e., trait or sub-trait) but concern different Social Dimensions. Within the framework, these differences were credited to the unique combination of social factors in each Social Dimension and serve as proof of role difference. Such difference in expression of personality across social context was also suggested by literatures factoring in social circumstance (Bandura, 1997; Rotter, 1982), consequences of behavior (London & Oldham, 1977; Johnson & Chang, 2006; Gardner, Gabriel, & Lee, 1999), and degree of interactions (Santiago & Enriquez, 1976; Santiago, 1976). Moreover, these differences also show that the Social Dimensions are not only theoretical but also manifest on actual scores.

Interestingly, the scales with similar occurrence of a social factor (i.e. Social Stipulation or Social Interaction) were also found to be correlated despite the differences in scores (second and third premise, p.16-16). Using the proposed structure of Cross D to interpret these results, the similarity can be deduced as the shared social factors while the differences rose from the distinct combinations of these social factors. This consequently

implies that the trait measured is not a mere lump of a whole but is a continuum with more specific, but not completely distinct parts.

Effect of Cross D on Reliability

It was also observed that the APD values improves as the unit becomes more specific (i.e. from whole test to Cross-Dimension) which is in line with the theoretical increase in homogeneity as the scope narrows down. Considering that XC items were grouped based on their content (which is a theory-based approach) rather than item statistic during the test development phase (Mercado, 2019b), this increase in reliability suggest that the structure of the scales (see Table 2 and Figure 1) are not only theoretical but are also statistically relevant. Additional research can be conducted to see if this specificity on content also increases the test-retest and inter-rater reliability.

Varied results were gathered from between-test APD comparison, but upon taking a closer look, the results can be best explained by the ratio of item retained to the initial item pool. The 50-item IPIP NEO was from 858 initial items, 44 items of BFI were from 300, while the 80 items of XC are from 500. Considering their APD values which are .081, .143, and .157 respectively, it can be observed that lower item retention rate leads to better APD value. This can be due to a wider selection for the best items to be included in the final form. Nonetheless, against-the-standard comparison showed that XC did not compromise the reliability of the test since all of its scales have acceptable APD values.

Effect of Cross D on Validity

It was also found that the test produced lower concurrent and item validity values than those developed in traditional way. Despite this, the values still generally meet the standard cutoffs. While this seems to be a drawback, in hindsight, it is theoretically inevitable. Since social factors can be considered as constructs themselves, infusing them

to a personality scale will “reduce” the scale’s validity. That is because, strictly speaking, the Cross D-aligned items do not measure what it is “only” supposed to measure (i.e. the trait); the items also consider the social aspects of the behavior. Within Domain-Sampling Theory, Cross D can be seen as an “expansion” on a construct that traditionally developed tests cover. This expansion creates a mismatch in scope which shows as lower validity values.

This explanation was also supported by the comparisons of concurrent validity favorable to the Trait Scales over Social Scales as shown in Figure 5. It can be recalled that Trait Scales has characteristics closer to traditional tests since it focuses on the trait more than the social context (p. 11).

Perhaps, a more appropriate research design can shed a light on this in the future; one which can compare a single trait as repeatedly measured by a traditionally developed test but across social settings and as measured by a Cross D-based test. Such study will also further evaluate the evidence for construct validity (Cronbach & Meehl, 1955) of Cross D social factors and social settings.

Limitations and Recommendations

Overall, this study showed indications of the framework’s capacity to integrate social factors on personality assessment. It also provided statistical evidence for the framework’s assumptions and efficiency by attesting to the existence of social factors and to the efficiency of its proposed social setting taxonomy.

The systematic incongruence found on scores across Social Dimensions also challenges the mindset that personality only changes over time and pushes for escalation of social factors as an inevitable component on personality assessment (rather than an extraneous variable) – a matter that can be addressed through Cross D application.

Replication of the study with other traits and using a larger sample representative of the population can best reevaluate these conclusions.

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Appendices

Appendix A: Test of Difference between Social Dimensions and Cross-Dimensions

Appendix A.1

Friedman Tests Statistics between Social Dimensions and Cross-Dimensions

Statistics	Trait level ^a	Sub-trait level ^b			
	Conscientiousness	Aptitude	Orderliness	Commitment	Deliberation
Chi-Square	447.13	241.98	351.89	221.17	358.17
Df	3	3	3	3	3
Asymp. Sig.	< .001	< .001	< .001	< .001	< .001
Kendall's W	.490 ^{••}	.265 ^{••}	.386 ^{••}	.243 ^{••}	.393 ^{••}

^a with Social Dimensions as groups

^b with Cross-Dimensions as groups

• Small effect •• Moderate effect ••• Strong effect

n=304

Appendix A.2

Post Hoc: Wilcoxon Signed-Rank Tests Statistics between Social Dimensions and Cross-Dimensions

Trait level: Between Conscientiousness Social Dimensions				
	1	2	3	4
1. Personal Conscientiousness		-12.75 ^{a***}	-14.63 ^{a***}	-11.22 ^{a***}
2. Individual Conscientiousness			-10.84 ^{a***}	-4.37 ^{b***}
3. Professional Conscientiousness				-12.58 ^{b***}
4. Relational Conscientiousness				
Sub-trait level: Between Aptitude Cross-Dimensions				
	1	2	3	4
1. Personal Aptitude		-7.29 ^{a***}	-6.33 ^{a***}	-12.68 ^{a***}
2. Individual Aptitude			-0.37 ^b	-8.39 ^{a***}
3. Professional Aptitude				-8.98 ^{a***}
4. Relational Aptitude				
Sub-trait level: Between Orderliness Cross-Dimensions				
	1	2	3	4
1. Personal Orderliness		-8.26 ^{a***}	-13.77 ^{a***}	-4.30 ^{a***}
2. Individual Orderliness			-11.69 ^{a***}	-5.15 ^{b***}
3. Professional Orderliness				-12.94 ^{b***}
4. Relational Orderliness				
Sub-trait level: Between Commitment Cross-Dimensions				
	1	2	3	4
1. Personal Commitment		-6.17 ^{a***}	-12.01 ^{a***}	-4.21 ^{a***}
2. Individual Commitment			-8.97 ^{a***}	-2.20 ^{b*}
3. Professional Commitment				-10.06 ^{b***}
4. Relational Commitment				
Sub-trait level: Between Deliberation Cross-Dimensions				
	1	2	3	4
1. Personal Deliberation		-10.55 ^{a***}	-13.53 ^{a***}	-0.14 ^a
2. Individual Deliberation			-7.63 ^{a***}	-10.02 ^{b***}
3. Professional Deliberation				-13.60 ^{b***}
4. Relational Deliberation				

Note: in bold text are results significant at LDS p-value of .008 (using Bonferroni correction)

^a Based on positive ranks; mean rank of row item < mean rank of column item

^b Based on negative ranks; mean rank of row item > mean rank of column item

* p < .05, ** p < .01, *** p < .001

• Small effect •• Moderate effect ••• Strong effect

n=304

Appendix B.

Statistical Indications of Social Stipulation (SS) on Trait Expression for Trait and Sub-trait Level

Trait level: Conscientiousness Social Dimensions					
	Wilcoxon SRT		Spearman rho		Supports SS assumptions?
	Z	r (equivalent)	r _s	z'	
Individual Cons. - Personal Cons.	-12.75 ^{a***}	-0.52 ^{***}			Yes
Relational Cons. - Professional Cons.	-12.58 ^{b***}	-0.51 ^{***}			Yes
Relational Cons. - Personal Cons.			.841 ^{***}	1.22 ^{***}	Yes
Professional Cons. - Individual Cons.			.725 ^{***}	0.92 ^{***}	Yes
Sub-trait level: Aptitude Cross-Dimensions					
Individual Apt. - Personal Apt.	-7.29 ^{a***}	-0.30 ^{**}			Yes
Relational Apt. - Professional Apt.	-8.98 ^{a***}	-0.36 ^{**}			Yes
Relational Apt. - Personal Apt.			.550 ^{***}	0.62 ^{***}	Yes
Professional Apt. - Individual Apt.			.703 ^{***}	0.87 ^{***}	Yes
Sub-trait level: Orderliness Cross-Dimensions					
Individual Ord. - Personal Ord.	-8.26 ^{a***}	-0.33 ^{**}			Yes
Relational Ord. - Professional Ord.	-12.94 ^{b***}	-0.52 ^{***}			Yes
Relational Ord. - Personal Ord.			.592 ^{***}	0.68 ^{***}	Yes
Professional Ord. - Individual Ord.			.557 ^{***}	0.63 ^{***}	Yes
Sub-trait level: Commitment Cross-Dimensions					
Individual Com. - Personal Com.	-6.17 ^{a***}	-0.25 ^{**}			Yes
Relational Com. - Professional Com.	-10.06 ^{b***}	-0.41 ^{**}			Yes
Relational Com. - Personal Com.			.656 ^{***}	0.79 ^{***}	Yes
Professional Com. - Individual Com.			.526 ^{***}	0.58 ^{***}	Yes
Sub-trait level: Deliberation Cross-Dimensions					
Individual Del. - Personal Del.	-10.55 ^{a***}	-0.43 ^{**}			Yes
Relational Del. - Professional Del.	-13.60 ^{b***}	-0.55 ^{***}			Yes
Relational Del. - Personal Del.			.592 ^{***}	0.68 ^{***}	Yes
Professional Del. - Individual Del.			.382 ^{***}	0.40 ^{**}	Yes

Note: r_s = Spearman rho with Fisher's z as effect size

Wilcoxon Signed-rank Test with r_(equivalent) as effect size based on Rosenthal (1994)

^a Based on positive ranks; mean rank of former > mean rank of later

^b Based on negative ranks; mean rank of former < mean rank of later

* p < .05, ** p < .01, *** p < .001

• Small effect •• Moderate effect ••• Strong effect

n=304

Appendix C.

Statistical Indications of Social Interaction (SI) on Trait Expression for Trait and Sub-trait level

Trait level: Conscientiousness Social Dimensions					
	Wilcoxon SRT		Spearman rho		Supports SI assumptions?
	Z	r	r _s	z'	
Relational Cons. - Personal Cons.	-11.22 ^{a***}	-0.46 ^{••}			Yes
Professional Cons. - Individual Cons.	-10.84 ^{a***}	-0.44 ^{••}			Yes
Individual Cons. - Personal Cons.			.819 ^{***}	1.15 ^{•••}	Yes
Relational Cons. - Professional Cons.			.764 ^{***}	1.01 ^{•••}	Yes
Sub-trait level: Aptitude Cross-Dimensions					
Relational Apt. - Personal Apt.	-12.68 ^{a***}	-0.51 ^{•••}			Yes
Professional Apt. - Individual Apt.	-0.37 ^b	-0.02			No
Individual Apt. - Personal Apt.			.635 ^{***}	0.75 ^{•••}	Yes
Relational Apt. - Professional Apt.			.515 ^{***}	0.57 ^{•••}	Yes
Sub-trait level: Orderliness Cross-Dimensions					
Relational Ord. - Personal Ord.	-4.30 ^{a***}	-0.17			Yes
Professional Ord. - Individual Ord.	-11.69 ^{a***}	-0.47 ^{••}			Yes
Individual Ord. - Personal Ord.			.508 ^{***}	0.56 ^{•••}	Yes
Relational Ord. - Professional Ord.			.523 ^{***}	0.58 ^{•••}	Yes
Sub-trait level: Commitment Cross-Dimensions					
Relational Com. - Personal Com.	-4.21 ^{a***}	-0.17			Yes
Professional Com. - Individual Com.	-8.97 ^{a***}	-0.36 ^{••}			Yes
Individual Com. - Personal Com.			.579 ^{***}	0.66 ^{•••}	Yes
Relational Com. - Professional Com.			.553 ^{***}	0.62 ^{•••}	Yes
Sub-trait level: Deliberation Cross-Dimensions					
Relational Del. - Personal Del.	-0.14 ^d	-0.01			No
Professional Del. - Individual Del.	-7.63 ^{d***}	-0.31 ^{••}			Yes
Individual Del. - Personal Del.			.351 ^{***}	0.37 ^{••}	Yes
Relational Del. - Professional Del.			.549 ^{***}	0.62 ^{•••}	Yes

Note: r_s = Spearman rho with Fisher's z as effect size

Wilcoxon Signed-rank Test with r_(equivalent) as effect size based on Rosenthal (1994)

^a Based on positive ranks; mean rank of former > mean rank of later

^b Based on negative ranks; mean rank of former < mean rank of later

* p < .05, ** p < .01, *** p < .001

• Small effect •• Moderate effect ••• Strong effect

n=304

Appendix D.

APD and Average Item Validity of XC, IPIP NEO, and BFI

Scale	No. of items	APD		Average item validity	
		Value	Description	Value	Description
Social Dimensions					
Personal Conscientiousness	20	.081	Excellent	.429	Good
Individual Conscientiousness	20	.113	Excellent	.416	Good
Professional Conscientiousness	20	.206	Very good	.392	Average
Relational Conscientiousness	20	.203	Excellent	.420	Good
Trait Components					
Aptitude	20	.096	Excellent	.447	Good
Orderliness	20	.155	Excellent	.390	Average
Commitment	20	.127	Excellent	.390	Average
Deliberation	20	.162	Excellent	.384	Average
Cross-Dimensions					
Personal Aptitude	5	.054	Excellent	.294	Low
Personal Orderliness	5	.086	Excellent	.347	Average
Personal Commitment	5	.058	Excellent	.288	Low
Personal Deliberation	5	.132	Excellent	.365	Average
Individual Aptitude	5	.043	Excellent	.562	Excellent
Individual Orderliness	5	.111	Excellent	.270	Low
Individual Commitment	5	.142	Excellent	.309	Average
Individual Deliberation	5	.171	Excellent	.137	Low
Professional Aptitude	5	.067	Excellent	.384	Average
Professional Orderliness	5	.293	Average	.224	Low
Professional Commitment	5	.271	Average	.145	Low
Professional Deliberation	5	.240	Very good	.357	Average
Relational Aptitude	5	.140	Excellent	.224	Low
Relational Orderliness	5	.156	Excellent	.346	Average
Relational Commitment	5	.053	Excellent	.329	Average
Relational Deliberation	5	.033	Excellent	.377	Average
Conscientiousness	80	.157	Excellent	.434	Good
IPIP NEO ^a	10	.081	Excellent	.440	Good
BFI ^a	9	.143	Excellent	.456	Good

APD = Average Proportional Distance

XC = Cross-Dimensional Conscientiousness Scale

IPIP NEO = International Personality Item Pool Representation of the NEO PI-R

BFI = Big Five Inventory

^a Conscientiousness scale only

n = 304

Appendix E.

Concurrent Validity of XC scales

Scale	No. of items	Criterion	
		IPIP NEO ^a	BFI ^a
Social Dimensions			
Personal Conscientiousness	20	.565	.585
Individual Conscientiousness	20	.436	.481
Professional Conscientiousness	20	.358	.464
Relational Conscientiousness	20	.464	.483
Trait Components			
Aptitude	20	.577	.606
Orderliness	20	.438	.492
Commitment	20	.423	.472
Deliberation	20	.395	.461
Cross-Dimensions			
Personal Aptitude	5	.521	.476
Personal Orderliness	5	.442	.516
Personal Commitment	5	.416	.455
Personal Deliberation	5	.505	.501
Individual Aptitude	5	.544	.612
Individual Orderliness	5	.397	.414
Individual Commitment	5	.318	.348
Individual Deliberation	5	.069	.087
Professional Aptitude	5	.463	.518
Professional Orderliness	5	.220	.311
Professional Commitment	5	.247	.352
Professional Deliberation	5	.231	.335
Relational Aptitude	5	.381	.383
Relational Orderliness	5	.350	.345
Relational Commitment	5	.400	.395
Relational Deliberation	5	.408	.482
Conscientiousness	80	.497	.549

APD = Average Proportional Distance

XC = Cross-Dimensional Conscientiousness Scale

IPIP NEO = International Personality Item Pool Representation of the NEO PI-R

BFI = Big Five Inventory

^a Conscientiousness scale only

n = 304

Appendix F.

List of Cross-Dimensional Conscientiousness Scale Item Validity

Item code	Item key	Item-total correlation			
		Social Dimension	Trait Component	Cross-Dimension	Whole test
Personal Aptitude #1	Positive	0.42	0.36	0.26	0.39
Personal Aptitude #2	Positive	0.23	0.29	0.14	0.26
Personal Aptitude #3	Positive	0.38	0.37	0.32	0.38
Personal Aptitude #4	Positive	0.51	0.49	0.44	0.48
Personal Aptitude #5	Positive	0.46	0.49	0.31	0.49
Personal Orderliness #1	Positive	0.51	0.55	0.38	0.56
Personal Orderliness #2	Positive	0.55	0.52	0.44	0.55
Personal Orderliness #3	Positive	0.37	0.30	0.34	0.39
Personal Orderliness #4	Positive	0.49	0.44	0.35	0.54
Personal Orderliness #5	Positive	0.31	0.29	0.23	0.33
Personal Commitment #1	Positive	0.38	0.37	0.21	0.40
Personal Commitment #2	Positive	0.61	0.57	0.44	0.64
Personal Commitment #3	Positive	0.36	0.42	0.32	0.43
Personal Commitment #4	Positive	0.46	0.37	0.29	0.44
Personal Commitment #5	Positive	0.27	0.33	0.19	0.36
Personal Deliberation #1	Positive	0.51	0.40	0.38	0.53
Personal Deliberation #2	Positive	0.49	0.47	0.41	0.50
Personal Deliberation #3	Positive	0.39	0.39	0.34	0.41
Personal Deliberation #4	Positive	0.38	0.35	0.32	0.45
Personal Deliberation #5	Positive	0.50	0.43	0.38	0.48
Individual Aptitude #1	Positive	0.58	0.62	0.60	0.60
Individual Aptitude #2	Positive	0.53	0.59	0.57	0.58
Individual Aptitude #3	Positive	0.56	0.58	0.55	0.60
Individual Aptitude #4	Positive	0.54	0.52	0.52	0.54
Individual Aptitude #5	Positive	0.64	0.60	0.57	0.63
Individual Orderliness #1	Positive	0.59	0.53	0.47	0.57
Individual Orderliness #2	Positive	0.53	0.55	0.51	0.54
Individual Orderliness #3	Positive	-0.15	-0.12	-0.25	-0.11
Individual Orderliness #4	Positive	0.35	0.30	0.22	0.36
Individual Orderliness #5	Positive	0.59	0.59	0.40	0.62
Individual Commitment #1	Negative	0.60	0.53	0.44	0.62
Individual Commitment #2	Positive	0.56	0.48	0.33	0.56
Individual Commitment #3	Negative	0.02	-0.03	-0.04	-0.02
Individual Commitment #4	Negative	0.52	0.55	0.42	0.58
Individual Commitment #5	Negative	0.47	0.50	0.40	0.50
Individual Deliberation #1	Positive	0.49	0.47	0.16	0.54
Individual Deliberation #2	Positive	-0.12	-0.02	0.07	-0.06
Individual Deliberation #3	Positive	0.56	0.53	0.16	0.59
Individual Deliberation #4	Positive	0.02	-0.02	0.05	0.00

Individual Deliberation #5	Positive	0.45	0.47	0.23	0.50
Professional Aptitude #1	Positive	0.47	0.44	0.45	0.47
Professional Aptitude #2	Positive	0.43	0.35	0.31	0.44
Professional Aptitude #3	Positive	0.62	0.56	0.49	0.61
Professional Aptitude #4	Positive	0.40	0.48	0.31	0.48
Professional Aptitude #5	Positive	0.40	0.50	0.35	0.52
Professional Orderliness #1	Positive	0.57	0.56	0.36	0.62
Professional Orderliness #2	Positive	0.45	0.44	0.21	0.49
Professional Orderliness #3	Positive	-0.08	-0.05	-0.03	-0.08
Professional Orderliness #4	Positive	0.16	0.16	0.18	0.12
Professional Orderliness #5	Positive	0.60	0.66	0.40	0.67
Professional Commitment #1	Negative	0.27	0.31	0.14	0.33
Professional Commitment #2	Negative	0.49	0.57	0.29	0.59
Professional Commitment #3	Negative	0.17	0.04	-0.04	0.08
Professional Commitment #4	Positive	0.15	0.20	0.05	0.22
Professional Commitment #5	Negative	0.61	0.43	0.29	0.52
Professional Deliberation #1	Positive	0.32	0.33	0.14	0.41
Professional Deliberation #2	Positive	0.10	0.07	0.07	0.02
Professional Deliberation #3	Positive	0.67	0.60	0.64	0.56
Professional Deliberation #4	Positive	0.44	0.44	0.36	0.46
Professional Deliberation #5	Positive	0.62	0.56	0.58	0.53
Relational Aptitude #1	Positive	0.42	0.38	0.26	0.38
Relational Aptitude #2	Positive	0.43	0.35	0.26	0.40
Relational Aptitude #3	Positive	0.32	0.29	0.15	0.37
Relational Aptitude #4	Positive	0.28	0.27	0.20	0.30
Relational Aptitude #5	Positive	0.36	0.43	0.25	0.41
Relational Orderliness #1	Positive	0.44	0.46	0.30	0.52
Relational Orderliness #2	Positive	0.42	0.41	0.28	0.41
Relational Orderliness #3	Positive	0.50	0.47	0.37	0.53
Relational Orderliness #4	Positive	0.38	0.32	0.34	0.41
Relational Orderliness #5	Positive	0.46	0.43	0.44	0.47
Relational Commitment #1	Positive	0.47	0.50	0.43	0.50
Relational Commitment #2	Positive	0.40	0.42	0.24	0.45
Relational Commitment #3	Positive	0.37	0.35	0.26	0.38
Relational Commitment #4	Positive	0.53	0.54	0.47	0.59
Relational Commitment #5	Positive	0.40	0.35	0.25	0.41
Relational Deliberation #1	Positive	0.55	0.54	0.49	0.58
Relational Deliberation #2	Positive	0.46	0.46	0.33	0.49
Relational Deliberation #3	Positive	0.23	0.27	0.21	0.28
Relational Deliberation #4	Positive	0.54	0.55	0.53	0.56
Relational Deliberation #5	Positive	0.44	0.39	0.32	0.49

Item validity here is the item-total correlation while the item-score is excluded from the total (Howard & Forehand, 1962, p. 731)