2020

Finding Agreeableness: A Replication of its Lower Order Factor Structure and An Exploration of Cognitive and Psychopathology

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FINDING AGREEABLENESS: A REPLICATION OF ITS LOWER ORDER FACTOR STRUCTURE AND AN EXPLORATION OF COGNITIVE AND PSYCHOPATHOLOGY OUTCOMES

A dissertation submitted in partial fulfillment
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

to the faculty of the

DEPARTMENT OF PSYCHOLOGY

of

ST. JOHN'S COLLEGE OF LIBERAL ARTS AND SCIENCES

at

ST. JOHN'S UNIVERSITY
New York
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ABSTRACT

FINDING AGREEABLENESS: A REPLICATION OF ITS LOWER ORDER FACTOR STRUCTURE AND AN EXPLORATION OF COGNITIVE AND PSYCHOPATHOLOGY OUTCOMES

Gerald Armando Pantoja

Although some effort has been made to reach an empirical consensus on the structure of agreeableness (Crowe, Lynam, & Miller, 2017; Davies, 2014), research exploring how facets of agreeableness relate to important psychological outcomes is lacking. Two studies were conducted to address these issues. In Study 1, in a large sample of 722 participants, we carried out an exploratory factor analysis and confirmatory factor analysis on agreeableness items from the International Personality Item Pool (IPIP; Goldberg, 2006) to determine the lower-order structure of agreeableness and examined whether the facets were differentially related to cognitive outcomes. In Study 2, in an international Amazon Mturk sample of 610 individuals, we used a five-factor model of agreeableness to examine broad- and facet-level relationships among agreeableness, its facets, psychopathology subfactors, and personality disorder domains in a smaller set of items from the IPIP NEO and IPIP HEXACO. Results from both studies highlight the potential importance of the facet of compassion in the realm of cognitive abilities. Study 2 demonstrated several positive and negative relationships among facets and psychopathology. Implications on the significance of facet-level analysis are discussed from both applied and basic research perspectives.

ACKNOWLEDGEMENTS

In the beginning of this dissertation, I had little hope that I would ever muster enough energy and courage to write it. It seemed incredibly daunting, like an unsurpassable mountain that I could never climb. Obstacle after obstacle presented themselves to me in the early stages, the cause, I imagine, of recurring dreams of me remaining in graduate school forever. As I type this section after finishing the dissertation for publication by my institution, it seems surreal. I think foremost of everyone who has been with me on this journey.

First, I want to thank Christopher Polanco, my partner. He has been with me during each part of my process, from my moments of success to my moments of despair. He has supported me in every way I could possibly think, and I'm guessing by this point he has just had enough of me saying the word dissertation in every one of our conversations. Well, hopefully, this will be the last time I ever mention working on it! A special thanks also goes to our golden retriever, Lila, who has provided much love, laughter, comfort, and stress relief.

My deep gratitude goes to members of my cohort, especially Robert Lane, Rachel Venezia, Carmen Mootz, and Yea Seul Pyun. We have shared many of our hopes, fears, tears, and successes together. We have commiserated along the way, and there have been so many moments when you all helped me get through my toughest ruts of being stuck in the mud of writing. I cannot thank all of you enough, for even those littlest moments together.

I also wish to thank my mentors, Wilson McDermut and Kate Walton. They have served as my inspirations since my first year in graduate school. Above all, they have

continued to keep me focused on my path, while also being flexible and giving space when I may not have ever asked directly for it. I cannot even write how much I appreciated the reminders to stay on track, when it was hardest for me. You have been my anchors, even if you never knew it. A special thank you also goes to the remaining members of my committee, Bill Chaplin and Dawn Flanagan. Your feedback has helped create the work that is here, and I hope, in your own ways, you feel just as accomplished as I do with this dissertation.

A special thank you goes to my family. I appreciate many of them for having practiced some acceptance with me moving to New York. I thank my father, stepmother, and brother for providing me a place when I first moved and their continued support throughout my graduate school career. However, my deepest gratitude goes to my grandmother, who raised me singlehandedly. She encouraged me to read and to think deeply, and without her, I would not have achieved as much as I have in my young adulthood.

There are many more individuals who deserve mention, from the department faculty, psychology office staff, the clinic staff, and all of my supervisors who have been there. There aren't just enough words to thank everyone, because in truth, every joke, every smile, and every word of encouragement helped. Thank you all.

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INTRODUCTION

Agreeableness, one of the Big Five broad personality traits, has been conceptualized as an interpersonal trait incorporating characteristics such as being friendly, respectful, compassionate, and accepting (Goldberg, 1992; Granziano & Eisenberg, 1997; Soto, 2018). Highly agreeable individuals tend to focus on their relationships with other people (Graziano & Tobin, 2002) and engage in more prosocial behaviors, such as proactive teamwork, than disagreeable individuals (Graziano & Eisenberg, 1997; LePine & Van Dyne, 2001). Antagonism or disagreeableness describes the lower end of the spectrum of this trait. Disagreeableness is associated with a wide range of maladaptive behaviors. For example, low levels of agreeableness have been linked to all Dark Triad traits (narcissism, psychopathy, and Machievallianism), criminal behavior, aggression, and sexual deviancy (Jakobwitz & Egan, 2006; Laursen, Pulkkinen, & Adams, 2002; Paulhus & Williams, 2002; for a recent review, see Graziano & Tobin, 2017).

From both theoretical and empirical points of view, agreeableness serves a clear function in social survival. Agreeableness is an often-mentioned, "attractive" trait from an evolutionary perspective, seen as a key factor in the success of social groups, reproductive strategies, and stable, satisfying relationships (e.g., Kamal, Tiwari, Behera, & Hasan, 2018; Miller, 2007; Nettle, 2006). Laursen et al. (2002) identified having higher levels of agreeableness in combination with other traits, such as conscientiousness, serves as a protective factor for well-being and social and financial outcomes in adulthood. Two different sets of recent findings support this line of research. From a recent latent profile analysis study with an international sample of over 3 million

individuals, Fisher and Robie (2019) identified a “highly adaptive” profile class, defined by higher scores of agreeableness, conscientiousness, extraversion, and emotional stability, which was linked to positive life and job satisfaction, self-efficacy, and values. Similarly, a healthy personality profile was also identified by Bleidorn et al. (2019) in a sample of over 3,000 individuals using all of the lower-level facets of the five factors from the NEO Personality Inventory-Revised (NEO-PI-R; Costa & McCrae, 1992). This profile was strongly characterized by a specific lower-level facet of agreeableness, straightforwardness, which emphasizes honesty and assertive communication. However, there are possibly some negative outcomes of being too highly agreeable. As Nettle (2006) pointed out, extremely high scores of different aspects of agreeableness, such as dependency and/or gullibility, lead to being taken advantage of by others. A set of three studies also identified lower levels of agreeableness being one of many traits associated with career success in terms of upward mobility and successful salary negotiation (Judge, Higgins, Thoreson, & Barrick, 2006). Four different studies conducted by Judge, Livingston, and Hurst (2012) and a follow-up by Matz and Gladstone (2018) demonstrated that being disagreeable leads to higher income earnings for men but not women, particularly for people within lower-income brackets. In sum, although agreeableness has many adaptive benefits in our social world, being highly agreeable may not be fruitful for everyone nor in every arena.

Despite the trait’s significance, from a structuralist view, agreeableness could also be considered ill defined (e.g., Davies, 2014; Granziano & Tobin, 2002, 2017). The aspects which define it have ranged in number from three (Drasgow et al., 2012) to ten (Davies, 2014). Graziano and Tobin (2017) provided some further criticisms of the

structural model that are worthy to note. For example, it is understood that agreeableness involves traits such as friendliness but also prosocial behaviors and altruism; yet, these issues beg the question of what and how these facets relate directly to human behavior. One might ask, instead, why focusing on lower-level aspects of a Big Five trait has any continued value at all. Although broad domains remain the simplest way to explain relationships (DeYoung, Quilty, & Petersen, 2007), an appreciable amount of literature has suggested facets can predict over and above their broad trait (Anglim & Grant, 2014, 2016; Paunonen & Ashton, 2001; Soto & John, 2017). The question of weighing broad-level efficiency against narrow-level precision remains a highly debated topic in the research of the Big Five traits, with a growing shift toward focusing on lower-order structure of traits (Baumert et al., 2017). For example, some researchers even argue that "nuances" (i.e., two-three item parcels) are useful for describing and understanding individual differences and have incremental validity (Mõttus, Kandler, Bleidorn, Riemann, & McCrae, 2017). We hope to clarify both the structure and explanatory power of agreeableness at the broad and facet levels of the hierarchy. The primary goals of this research were (1) to add to the literature on the structure of agreeableness, and (2) to understand the relationships between the facets of agreeableness and cognitive and clinical outcomes.

Hierarchical Personality Structure and the Structure of Agreeableness

Terms associated with agreeableness originally emerged from a study of approximately 18,000 adjectives found in a dictionary of the English language (Allport and Odbert, 1936). Subsequent factor analyses of adjective lists continuously identified five stable traits commonly known as the Big Five or the Five Factor Model (FFM) were

named: agreeableness, conscientiousness, extraversion, neuroticism, and openness to experience (see John, Angleitner, & Ostendorf, 1988, for a complete historical account). These five factors have been conceptualized as bipolar spectra, sometimes subdivided into lower-level facets. Research within the last few decades has determined that the structure of personality is decidedly hierarchical (Markon, Krueger, & Watson, 2005). The general personality factor (GPF), often described as the "Big One," divides traits into negative and positive poles (Goldberg & Somer, 2000; Musek, 2007; Stankov, 2005; for a meta-analysis, see Van der Linden, te Nijenhuis, & Bakker, 2010) and rests at the top of the personality hierarchy. Digman's (1997) study of intercorrelations among personality characteristics defined two higher-order factors, alpha and beta, which have been identified across several studies (Block & Block, 1980; Chang, Connelly, & Geeza, 2012; Markon et al., 2005). These factors have been interpreted as stability and plasticity, respectively, in current research and theory (DeYoung, 2006; DeYoung, Peterson, & Higgins, 2001). Stability/alpha is defined by broad conscientiousness, agreeableness, and emotional stability factors, and plasticity/beta is defined by broad openness to experience and extraversion factors. The majority of research in personality psychology focuses on broad domains like those of the FFM, but below them are facets, which Costa and McCrae (1995) defined as groups of covarying cognitive, affective, and behavioral tendencies within a larger domain. However, different trait models define the lower-order facets in various ways either derived from quantitative, data-driven and/or theoretical methods.

Of interest to this study is the trait of agreeableness. There are several models all proposing differing, multidimensional structures of agreeableness. For example, in the

NEO Personality Inventory-Revised (Costa & McCrae, 1992), agreeableness is described with six facets, whereas the Big Five Inventory has just two facets (Soto & John, 2009). Two large studies, which guide this current research, have been carried out to reach some consensus on the lower-order facet structure of agreeableness. In an unpublished dissertation, Davies (2014) conducted several meta-analyses in order to identify how many pure facets defined agreeableness. She gathered reliability measures of facets of agreeableness and compared these estimates with the reliabilities of global agreeableness measures within each inventory that she examined. After having ruled out facets that had subpar reliabilities, she compared divergent validity by examining correlations between facets with global agreeableness and other Big Five traits. Any facet that correlated strongly with another trait besides agreeableness was deemed to not be a unique facet of agreeableness. As the final step, she examined the intercorrelations of the remaining facets and their items with each other and carried out an exploratory factor analysis to establish structure. She extracted ten possible facets of agreeableness; however, a five-factor model fit best, characterized by the following lower-level traits of agreeableness: cooperation, lack of aggression, modesty, nurturance, and non-manipulativeness. Most recently, in a large general population sample, Crowe, Lynam, and Miller (2017) administered participants 121 items from 22 agreeableness scales. Items were first removed based on redundancy by examining item intercorrelations. Crowe and colleagues then followed the steps described by Goldberg (2006) as the "Bass-Ackwards" approach. This approach is highlighted by retaining all of the factor scores in every extracted factor solution, particularly to identify when certain facets emerge and then fail to appear. Principal axis factor analysis with promax rotation was used to explore

structure. Five factors appeared to emerge as the most stable solution. Table 1 shows facet-level structure of agreeableness in several personality inventories as well as the structures uncovered in Davies's (2014) and Crowe and colleagues' (2017) studies. Many of these facet scales were established through factor analytic procedures, with some differences in approach. For example, the NEO-PI-R facet scales were formed by factor analyzing items from the NEO-PI-R. However, the number of six facets was chosen for sake of attempting to not overcomplicate interpretation, rather than objectively identifying the number of facets emerged (Costa & McCrae, 1995). The TAPAS agreeableness facets, similar to research by Davies (2014) and Crowe et al. (2017), involved factor analyzing facet scale scores from several agreeableness inventories. Other approaches, such as those involved in the FI-FFM (Simms, 2009; Watson, Nus, & Wu, 2019), involved a series of reiterative factor analyses of items to obtain a reliable number of facets. On the other hand, facets such as those observed by Saucier and Ostendorf (1999) replicate the approaches of Allport and Odbert (1936)—emerging based on clustering adjectives to determine thematic facets to describe the underlying personality traits of agreeableness. In brief, there are a variety of ways one could potentially take to identify the groups of classified traits of agreeableness, which all appear to yield a wide range of answers.

On the Importance of Facets in Prediction

The fact that there is little consensus on the lower-order structure of agreeableness puts the field at a disadvantage. Broad traits have the advantage of summarizing large amounts of information, whereas narrow facets provide specificity and potentially incremental validity (Ones & Viswesvaran, 1996; Paunonen & Ashton, 2001; Salgado et

al., 2014). A notable flaw of broad trait summaries is an obfuscation of more specific relationships and information about outcomes. For example, describing an individual's level of conscientiousness as high provides us with little context about in what specific areas he or she exhibits conscientious behaviors. Recent research has shown precisely this problem with the assumption of men historically described as being more extraverted than women on average, when in fact, women have higher scores than men on certain extraversion facets (Chen et al., 2012). Furthermore, facets not only provide more specific information, but can also distinguish among similar outcomes that would be difficult to parse out at the broader level. For example, at the broad level, openness to experience has been found to have negligible relationships with nearly every mental disorder in a large meta-analysis (Kotov et al., 2010), including more frequently studied disorders such as major depressive disorder, obsessive compulsive disorder, and generalized anxiety disorder. However, two studies have shown that individuals meeting diagnostic criteria for obsessive compulsive disorder, for example, have unique associations with certain facets of openness to experience. In one study, low scores on the action facet of openness to experience (as well as high scores on the anxiety and vulnerability facets of neuroticism and the tender-mindedness facet of agreeableness) distinguished individuals with obsessive compulsive disorder from those with major depressive disorder (Rector et al., 2002). Severity differences in obsessive symptoms compared to compulsive symptoms are further highlighted by lower scores on the ideas and actions facets of openness to experience (Rector, Richter, & Bagby, 2005). Depression and positive emotionality facets of neuroticism and extraversion, respectively, have shown some ability to distinguish between mood disorders and

multiple anxiety disorders (Naragon-Gainey et al., 2009; Rector, Bagby, Huta, & Ayearst, 2012). Similar research has demonstrated facets' important relationships with broad psychopathology dimensions (Walton, Pantoja, & McDermut, 2017). Specifically, the substance use disorder dimension was distinguished by high levels of excitement seeking from extraversion and low self-discipline from conscientiousness, whereas the internalizing dimension comprising fear and distress disorders was distinguished by different facets from all five FFM traits. What we can conclude is that lower-order facets may be uniquely important in identifying individual differences and may also predict outcomes over and above broad-level traits.

Agreeableness and its Associations with Cognitive and Psychopathology Domains

As mentioned above, agreeableness is associated with a host of outcomes. In the current studies, we will focus on two of these areas; in Study 1, we examine associations with cognitive factors, and in Study 2, we examine associations with psychopathology. These two outcomes remain of notable interest to clinicians on the applied side of psychiatry, psychology, social work, and counseling fields.

Cognitive Ability and Agreeableness

Although the extant research on the link between agreeableness and cognitive factors is sparse and at times contradictory, largely due to a lack of strong theoretical connections to cognition (Curtis et al., 2015), there appears to be some relationship between agreeableness and two cognitive areas - executive control and cognitive ability. Executive control encompasses multiple mental processes such as self-regulatory behaviors, attention, set-shifting, and emotion regulation. Block and Block (1980) found that agreeableness plays a key role in ego resiliency, which is defined as both emotion

regulation in changing environmental contexts and appropriate emotional expression. Caspi and Silva (1995) provided evidence suggesting that aspects of temperament, such as persistence, contribute to the development of agreeableness in adulthood. Evidence across the lifespan continues to show that agreeableness entails a distinct element of self-control. The expression of prosocial behaviors is the trademark of agreeableness. Behaviors related to empathy and aggression emerge around the first year of life and are strongly impacted by the child's social environment beginning at the age of 3 (Knafo & Plomin, 2006a, 2006b). Other behaviors such as child cooperation and expression of affect have been related to agreeableness, suggesting a strong, early link to controlling one's own behavior in social situations (Ahadi & Rothbart, 1994; Eisenberg et al., 2005). Both Soto et al. (2011) and de Haan et al. (2017) investigated the stability of agreeableness facets altruism and compliance from young childhood to adulthood. While there appears to be a small decline, on average, during the mid-late teen years, these traits generally steadily increase into adulthood. Jensen-Campbell, Knack, and Gomez (2010) completed a review demonstrating that agreeableness is related to increased cognitive dissonance to interpersonal conflict and disagreeable behavior and positive school performance. In adulthood, these outcomes are usually discussed in terms of set-shifting and inhibition, and there has been some research demonstrating potential positive relationships with agreeableness using a Stroop task (Jensen-Campbell et al., 2002). Some facet-level positive correlations have been shown with general executive functioning, namely with trust, altruism, compliance, and tender-mindedness from the NEO PI-R (Williams, Suchy, & Kraybill, 2010). These findings are consistent with research linking lower levels of agreeableness with the presence of both cognitive

impairment and attention deficit/hyperactivity disorder symptoms for both younger and older samples (Donati et al., 2013; Martel, Nigg, & von Eye, 2009), both of which implicate executive control.

Aside from executive control, findings are unclear regarding relationships of agreeableness with intelligence and cognitive abilities, with few studies examining facet-level relationships. When discussing cognitive abilities, we are more directly referring to the broad- and narrow-stratum abilities defined by contemporary Cattell-Horn-Caroll (CHC) theory (Carroll, 1993; McGrew, 2009). An early meta-analysis with 19 personality traits from several inventories identified non-significant associations between broad agreeableness and all cognitive abilities measured (general intelligence, crystallized intelligence, ideational fluency, knowledge and achievement, learning and memory, speed, visual perception, closure, fluid intelligence, and math-numerical skills; Ackerman & Heggestad, 1997). However, recent studies have identified more than negligible relationships. Broad agreeableness was found to be negatively correlated with crystallized intelligence, or one's knowledge gained through formal educational experiences, and scores of agreeableness tend to increase in concert with general cognitive decline (Baker & Bichsel, 2006). In contrast to these findings, a study demonstrated that NEO PI-R agreeableness and its facets (except compliance and modesty) had positive, small but significant correlations with verbal learning and working memory (Aiken-Morgan et al., 2012). A longitudinal design has also shown that overall childhood intelligence is positively related to agreeableness at an older age (Furnham & Cheng, 2015). In a cohort comparison of middle and older-aged adults, global agreeableness was also positively related to processing speed changes in later life,

despite the opposite effect observed during middle-aged years. In an additional cross-lagged analysis within that study, lower scores of agreeableness at old age were directly associated with higher baseline processing speed and fluid intelligence, abilities associated with problem solving, pattern recognition, and adapting to novel situations (Wettstein, Tauber, Kuźma, & Wahl, 2017). However, another longitudinal study using data from a competence test administered to students and adults in Germany found no significant relationships between agreeableness and verbal or numerical ability constructs, even when controlling for employment and education level (Rammstedt, Danner, & Martin, 2016). Lastly, in a recent meta-analysis, Stanek (2019) looked at associations among Big Five traits and both broad- and narrow-stratum cognitive abilities. A general overview revealed weak relationships among agreeableness, its facets, and cognitive ability constructs. Broad trait-level agreeableness was not significantly related to any ability. At the facet-level, findings were mixed. Stanek (2019) reported larger, positive correlations between compassion and most cognitive abilities, followed by the other nine facets measured sharing small, near-zero relationships with the other cognitive abilities. Some negative correlations emerged, for example, between warmth and fluid intelligence abilities ($\hat{\rho}$ = -.10; for more detail, see Tables 93-112, Stanek, 2019). In sum, this research offers some evidence that agreeableness is more complex than a trait merely associated with "niceness." Indeed, it could be linked to important aspects of behavioral and emotional self-control and inhibition, as well as cognitive abilities. However, the field could benefit from more examination of specific, facet-level relationships to answer the question of how agreeableness is related to cognitive outcomes.

Psychopathology and Agreeableness

In addition to having associations with cognitive factors, agreeableness is known to be linked with psychopathology. Aspects of agreeableness on both sides of the spectrum have been identified as not only key factors of early maladaptive relational patterns (Young, Klosko, & Weishaar, 2003), but also as traits associated with the development of psychopathology over time (Millon, 1996). The recent shifts in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013) with dimensional models of mental disorders, such as schizophrenia, include examining how FFM traits fit to personality disorders. This model is explained in some detail by Trull and Widiger (2013), where high and low levels of agreeableness and other traits define maladaptive personality traits. For example, some maladaptive traits from agreeableness include (low) deceitfulness as well as (high) gullibility and unhealthy dependence on others. Of the Big Five, neuroticism continues to show the strongest relationship with psychopathology overall; yet, there has been growing interest in the other FFM traits. In four separate meta-analytic reviews, personality traits from the FFM have been found to have notable associations with psychopathology and personality disorders. Malouff and colleagues (2005) carried out a meta-analysis of 33 studies, and agreeableness was related to all mental disorders with an average effect size of d = -.38. Ruiz et al. (2008) examined populations with substance abuse disorders and antisocial personality disorder, and both exhibited low agreeableness (d = -.41 and -.82, respectively). In Kotov and colleagues' (2010) meta-analysis, agreeableness showed nearly negligible effect sizes to most disorders except for substance abuse disorders (d = -.27). Regarding personality disorders, Saulsman and Page

(2004) found that agreeableness had significant negative mean effect sizes with antisocial personality disorder, paranoid personality disorder, narcissistic personality disorder, borderline personality disorder, and schizotypal personality disorder. In sum, at the broad-trait level, agreeableness appears to have notable, negatively correlated relationships with a wide range of clinical diagnostic areas.

The facets of agreeableness, however, seem to have complex connections with psychopathology. Across meta-analytic studies with externalizing pathology (Ruiz et al., 2008) and large empirical studies with internalizing and externalizing outcomes (Crowe et al., 2017; Walton et al., 2017), facets related to trust appear to be positively related to internalizing disorders. On the other hand, tendermindedness generally tends to be positively related to internalizing disorders but negatively related to externalizing behavioral outcomes. Many of the studies until recently have noted weaker relationships for agreeableness facets (Bienvenu et al., 2004; Rector et al., 2002) in predicting psychopathology in general. Meta-analytic findings show there are strong negative relationships with trust, compliance, altruism, and straightforwardness, while the relationships with other facets, modesty and tendermindedness, are small and positive (Ruiz et al., 2008). More recent comprehensive research has demonstrated consistently negative correlations with aggression and criminal behavior at the facet level, with substance abuse being negatively correlated with all facets except compassion (Crowe et al., 2017). Compared to global agreeableness, many of the facets in this study also revealed stronger correlations to the outcomes, such as affability with forms of aggression, and morality with criminal behavior. Samuel and Widiger (2008) reported NEO PI-R facet-level relationships with several personality disorders. One facet of

agreeableness, tendermindedness, lacked significant weighted mean effect sizes. Findings regarding other facets of agreeableness were mixed. Facets such as trust, straightforwardness, compliance, and altruism had significant weighted mean effect sizes in the negative direction with most personality disorders, whereas modesty had a mixture of weighted mean effect sizes in both directions, with one significant positive effect related to avoidant personality disorder. Notably, histrionic personality disorder had non-significant (but positive) effect sizes with altruism and tendermindedness. Now, rising trends lean toward bringing FFM personality assessment to clinical research and treatment due to the relationships shared among personality, psychopathology, and health (Bagby et al., 2016; Costa & McCrae, 2010; Lengel et al., 2016). For example, a meta-analysis of personality traits and psychotherapy treatment (Bucher, Suzuki, & Samuel, 2019) examined how the Big Five relate to a variety of aspects of clinical outcomes. Higher levels of agreeableness were implicated in better therapeutic alliance and better outcomes in longer-term treatment; however, high agreeableness was also related to symptom severity at the beginning of treatment. The researchers go on to suggest further that the study of facets, specifically, could help identify the explanatory relationship between the Big Five domains and clinical outcomes. Overall, studies to date seem to underline the importance of further examination of the facet-level relationships with mental disorders and personality disorders, especially given some surprising associations with disorders only seen at the facet level.

Current Study

Agreeableness has many important social, cognitive, and psychological outcomes, but its lower-order structure is not well defined or understood. In the current study, we sought to further investigate the structure of agreeableness and identify whether and how its facets differentially relate to important outcomes. Crowe and colleagues (2017) and Davies (2014) have provided a foundational lower-order structure of agreeableness, and we plan to replicate and extend their work by examining clinical and cognitive variables associated with the lower-order facets. As an exploratory venture, we plan to lay some groundwork of exploring the questions of *how* and *why* the facets relate to these outcomes more so than their broad trait, in line with the current push in the field to examine the specificity of personality relationships to behavioral and emotional phenomena (Baumert et al., 2017). As one method to tackle this question, we wished to explore models where facets acted as the intermediate variables between agreeableness and its outcomes. In Study 1, we examined the hierarchical and bifactor models of agreeableness, replicating work done by Davies (2014) and Crowe and colleagues (2017) and examined the facets' associations with cognitive factors such as crystallized and fluid intelligence, quantitative reasoning, retrieval ability, and visual-spatial ability. In Study 2, we sought to replicate the factor structure fit in Study 1 and include additional important psychological outcomes, specifically variables related to psychopathology and personality disorders.

Study 1

In Study 1, we examined the lower-order structure of agreeableness in an archival data set and then examined the resulting facets' associations with cognitive outcomes.

Hypothesis 1a: A factor analysis of agreeableness-related items is expected to yield at least five facets (Crowe et al., 2017).

Hypothesis 1b: The broad trait of agreeableness will have small, positive associations with crystallized intelligence and fluid intelligence factors (Stanek, 2019).

Hypothesis 1c: Facets encompassing items tapping into inhibition-related aspects of agreeableness, such as compliance and straightforwardness, will be more positively related to cognitive outcomes than other aspects of agreeableness (Williams, Suchy, & Kraybill, 2010), and specifically, compassion-related facet(s) will likely have larger associations with cognitive outcomes (Stanek, 2019).

Hypothesis 1d: Facets are expected to predict cognitive outcomes over and above the broad trait.

Method

Participants

Participants were 722 college students across the United States from Phase I of a large study carried out by the Educational Testing Service. This study was funded by U.S. ARI Contract W91WAW-07-C-0025. The sample was(50.0%), ranging in age from 17 to 59 years (M = 21.6, SD = 5.6). Approximately 64% of the students were Caucasian, 16% were African American, 10% were Hispanic, and 4% were Asian. Four percent identified as multiracial. There was also a measure of male and female parent/caregiver educational attainment, ranging from 1 (Grade school or less) to 10 (I don't know). The majority of male caregivers had an attainment of high school diploma or equivalent (24%), followed by a four-year degree (18%), some college (16%), a graduate degree (12%), associate's degree (7%), unknown (7%), some high school (6%), business or trade school (5%), grade school or less (3%), and some graduate school (2%). The majority of female caregivers had an educational attainment of high school or equivalent (25%), followed by some college (18%), a four-year degree (18%), associate's degree (12%), graduate or professional degree (11%), some high school (6%), business or trade school (3%), unknown (3%), some graduate school (3%), and grade school or less (2%). Students from 14 colleges or universities were involved from all regions of the United States. Additional details are described by Rikoon and colleagues (2016) and MacCann et al. (2014).

Measures

Measures were administered online from an email link over a one-month period. Participants were able to complete the battery of assessments and surveys with an option

to pause following completion of a subtest section. After completing the entire battery, they were provided a small cash compensation.

Agreeableness

Items from the International Pool of Personality (IPIP; Goldberg et al., 2006) measuring the Big Five were administered to participants. One hundred two of these items measure agreeableness. Item content and scale origin are reported in Table 2. Participants rated items on a 5-point Likert scale ranging from "Not at all like me" to "Very much like me." The average inter-item reliability of these scales is $\alpha = .80$.

Cognitive Ability

A battery of fifteen cognitive tests from the Kit of Factor-Referenced Cognitive Tests (Ekstrom et al., 1976) and test items from other tests developed by the Educational Testing Service were administered to participants online. These tests purportedly measure five different broad cognitive abilities including crystallized intelligence (*Gc*), fluid intelligence (*Gf*), quantitative reasoning (*Gq*), long-term retrieval ability (*Glr*), and visual-spatial ability (*Gv*). These tests are described clearly in detail by MacCann et al. (2014) and are reproduced in this manuscript (see Table 3). All of the cognitive ability tests were timed and presented in either multiple-choice or open-ended choice formats. If respondents did not complete a subtest within the time limit, any unanswered responses were scored as incorrect, and the participant moved on to the next portion of the test.

Data Analysis

All data analysis was performed in R (R Core Team, 2019) in both Study 1 and Study 2, primarily with the *psych* (Revelle, 2018) and *lavaan* (Rosseel, 2012) packages. Our procedure mostly replicates that of Crowe et al. (2017); however, there are some

exceptions in our approach due to our contrasting goal to find the most ideal, cleanest structure of agreeableness. Foremost, we treated the Likert-scaled items as being ordinal yet underlying continuous latent variables, indicating the use of the polychoric correlation matrix in all factor analytic procedures (e.g., Forero, Maydeu-Olivares, & Gallardo-Pujol, 2009; Holgado-Tello, Chacón-Moscoso, Barbero-García, & Vila-Abad, 2010; Muthén & Kaplan, 1985). Also, we chose to use confirmatory factor analysis factor fit indices as the primary tool to retain a final solution rather than the full Bass-Ackwards approach. Before beginning analyses, the dataset was examined for missing data or any item responses exceeding the minimum or maximum of the Likert scale. Five cases were identified with missing their entire response set to the agreeableness items and were removed from the entire dataset. The remaining 722 cases were included in all analyses moving forward. No variables were transformed; however, the kurtosis of several agreeableness items was significant, as suggested by *z*-score tests, further indicating more accurate results achieved by using the polychoric correlation matrix with the ordinal varaibles (Muthén & Kaplan, 1985). First, the polychoric correlation matrix of the IPIP agreeableness items was examined for correlations ≥ .65. Three item pairs were found with correlations meeting this criterion, and one item from each pair was randomly chosen for deletion. A principal components analysis (PCA) was conducted to identify how the items loaded onto a single, unrotated factor. Items with a factor loading of < .30 were considered for removal, and the PCA was rerun until no items loaded < .30. Thirty total items were deleted after this procedure. Sixty-nine items were selected for the exploratory and confirmatory factor analyses. To identify the range of factors to extract, results were compared between a parallel analysis (Horn, 1965) and Velicer's (1976)

minimum average partial (MAP) test obtained from the Very Simple Structure (*vss*) syntax from the *psych* package in R. The *vss* was conducted using principal axis factoring with promax rotation with an assumption of 10 maximum factors. The parallel analysis suggested approximately 10 factors and six components, as indicated by the intersection of the plots of eigenvalues from the expected and simulated data (Fig. 1). The MAP test suggested a likely maximum of six factors (MAP value = .0055), compared to higher MAP values on either side of the five- (MAP value = .0056) and seven-factor (MAP value = .0057) solutions. Considering the results of Davies (2014), exploratory factor solutions with 5-10 factors were considered. Items were removed from solutions to achieve simple structure based primarily on three criteria: tolerating cross loadings no more than .20, having a primary factor loading ≥ .40, and achieving communalities as close to ≥ .50 as possible (e.g., Tabachnick & Fidell, 2007). Along with reporting the variance accounted for by the items with their respective factor, we also reported Cronbach's alpha reliability estimates based on recommendations of previous research (Ponterotto & Ruckdeschel, 2007; Zinbarg et al., 2005)

Confirmatory factor analysis was then conducted with viable solutions using the diagonally weighted least squares (DWLS) or "robust WLS" estimator in *lavaan*, comparing three nested structural models—correlated traits, hierarchical, and bifactor. This approach is similar to the method used with other Big Five traits such as conscientiousness (e.g., Rikoon et al., 2016). The motive for this approach is due to the primary interest of these studies to explore the predictive power of facets over the global trait. The first indicator of each latent variable was fixed to 1 in all models, except for two-item factors in bifactor models. Because of the forced orthogonal structure, models

were not identified in the case of two-item factors; therefore, both items were fixed to 1. Model fit was evaluated using the Satorra-Bentler chi-square difference test among nested models, the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual index (SRMR). Factor scores were then saved from the model with the best fit given the data and then used in the hierarchical regression models described below.

After the lower-order structure of agreeableness was determined, data analysis focused on the cognitive subtests with the total scores of each subtest. Past research has extracted five of the broad stratum abilities of CHC theory from these subtests, particularly *Gc, Gf, Glr, Gq, and Gv* (MacCann, Joseph, Newman, & Roberts, 2014; Rikoon et al., 2016). However, there is some debate about verbal analogies tests cross-measuring narrow stratum abilities within *Gc* and *Gf* factors (e.g., Schrank & Wendling, 2012). To test this, we intended to compare models with the analogies subtest included within its suggested placement with the crystallized intelligence tests or removed entirely. Subtest total scores were treated for univariate normality issues by Winsorizing, using the interquartile range as a determination of removing outliers. Given our interest in the prediction of broad stratum abilities, confirmatory factor analysis focused only on identifying fit of a correlated trait model of broad stratum abilities alone. The robust maximum-likelihood estimator (MLR) using full-information maximum likelihood was used in *lavaan* due to continued issues noted with skewness and kurtosis that would otherwise be difficult to remedy. Additionally, because of the use of different subtests to estimate latent cognitive variables, the variances among latent factors were fixed to 1, allowing the individual indicators freedom to vary.

The relationships among the agreeableness facets, cognitive factors, and covariates of age, gender, and parents' education levels were evaluated first with correlational analyses to determine if certain covariates needed to be dropped from the model. Missing data was evaluated and determined more in line with being missing completely at random for a subset of both the cognitive ability scores and the demographic covariates ($\chi^2(30) = 37.10$, $p = .17$). Given the sizeable amount of missing data in the father's education level ($n = 48$) and mother's education level ($n = 22$) variables, multiple imputation was considered to retain as much data as possible in other variables. Predictive mean matching multiple imputation was used to complete data (Van Buuren & Groothuis-Oudshoorn, 2011), with the results pooled for further analysis. Five separate hierarchical regression models were compared, with each cognitive ability as an outcome variable. Step 1 included covariates of age, gender, and caretakers' education level, Step 2 included covariates with global agreeableness, and Step 3 included the covariates, global agreeableness, and its facets together. Change in R^2 (sr^2) was used to measure predictive power of facets over global agreeableness. Ordinary least squares assumptions were evaluated using plots with residuals and standardized residuals vs. fitted values, standardized residuals vs. leverage values, and QQ plots. This process was assisted primarily with the *car* package (Fox & Weisberg, 2019). Cases with unusual observations were also considered for deletion by comparison of Mahalanobis distance, Cook's distance, and leverage. If a case was considered highly influential according to at least two of these measures, it was considered for deletion. Due to the large sample size relative to the number of predictors, regression analyses were compared with and without outliers present in two subsets of data. If there were any notable differences or if

assumptions continued to be violated even with unusual cases removed, transformations and alternative regression models were considered. All alternative regressions and transformations were compared to the original regression models by comparing if terms dropped or altered in significance. Bootstrapping was performed as a non-parametric remedy in order to further smooth out any concerns about outliers, skewness, and kurtosis. Significance tests of coefficients, semipartial correlations, model R^2, and change in R^2 were evaluated with bias-corrected accelerated bootstrapped confidence intervals.

Results

Exploratory Factor Analysis of Agreeableness Items

Only five-, six-, and seven-factor solutions were viable, with at least two items per factor. In attempts to run eight-, nine-, and 10-factor solutions, the last factor(s) contained single items that were descriptive and unable to stabilize the factor. For example, in the eight-factor solution, item 76 ("I sacrifice myself for others") defined the last factor alone. The retained factor solutions and the standardized loadings for each item are reported below (Tables 4-6). The first factor from the five-factor solution was similar to NEO-PI-R straightforwardness and IPIP morality scales. This factor was defined by 12 items such as the reverse-coded "I speak ill of others" and "I insult people." The variance explained by the relationship between the items and this factor yielded a R^2 of .90. The average interitem correlation was .34. The reliability estimate reached .86 (95% CI = [.85, .87]). The second factor defined aspects of compassion and sympathy, as indicated by nine items such as "I sympathize with others' feelings" and "I am upset by the misfortunes of strangers." The scores and this factor had an R^2 of .90. The average interitem correlation was .36. The reliability estimate reached .83 (95% CI = [.81, .85]). The third factor contained eight agreeableness items related to prosocial behaviors and friendliness, such as "I am an extremely loyal person" and "I show my gratitude." The scores and this factor had an R^2 of .88. The average interitem correlation was .36. The reliability estimate reached .82 (95% CI = [.80, .84]). The fourth factor contained three items that appear to reflect aspects of NEO-PI-R compliance and IPIP cooperation scales, such as "I am trusted to keep secrets" and "I am able to cooperate with others." The scores and this factor have an R^2 of .77. The average interitem correlation was .43.

Cronbach's alpha was .69 (95% CI = [.66, .72]). The last factor was defined by two items, "I trust what people say" and "I believe others have good intentions," indicating a sense of the interpersonal trust scales from the IPIP and NEO-PI-R. The scores and this factor had a R^2 of .72. The average interitem correlation was .46. Reliability estimates of Cronbach's alpha achieved a score of .63 (95% CI = [.59, .67]). Any further analyses with these last two facets should be interpreted with caution.

The extracted factors of the six-factor solution mimicked the five-factor solution, apart from the emergent sixth factor. The first factor, straightforwardness, contained 10 entirely reverse-coded items. The variability explained between the items and this factor yielded an R^2 of .90. The average interitem correlation was .34. Reliability estimates of Cronbach's alpha reached a score of .84 (95% CI = [.82, .86]). The second factor, compassion, contained nine items. It had an R^2 among factor and items equal to .90. The average interitem correlation was .36. The Cronbach's alpha reached a score of .83 (95% CI = [.81, .85]). The third factor, friendliness, contained six items. The R^2 between the factor and its items was .87. The average interitem correlation was .37. The reliability estimate was .78 (95% CI = [.76, .80]). The fourth factor, compliance, contained the same three items from the five-factor solution. The R^2 between the factor and its items was .77. The average interitem correlation was .43. The Cronbach's alpha reached a score of .69 (95% CI = [.66, .72]). The fifth factor, trust, also contained its original two items. The R^2 between the factor and its items was .73. The average interitem correlation was .46. The reliability estimate yielded a score of .63 (95% CI = [.59, .67]). The sixth factor was defined by three items related to morality and self-sacrifice, such as "I sacrifice myself for others" and "I think of others first." The R^2 among factor and items was .73. The

average interitem correlation was .32. The Cronbach's alpha reached a score of .58 (95% CI = [.54, .62]). We would recommend interpreting results with these last three factors with caution.

The seven-factor solution resulted in somewhat similar factors to its predecessors; however, there were more two-item factors, making the overall solution less than ideal. The first factor, straightforwardness, possessed seven, reverse-coded items. The variance explained between the factor and its items yielded an R^2 of .84. The average interitem correlation was .33. Cronbach's alpha was calculated to .77 (95% CI = [.75, .79]). The second factor emerged differently with six items and seemed thematically similar to politeness or IPIP/NEO-PI-R modesty, with examples such as "I respect others" and "I hate to seem pushy." The R^2 among the factor and its scores was 0.86. The average interitem correlation was .35. The reliability estimate of Cronbach's alpha yielded a score of .76 (95% CI = [.73, .78]). The third factor was composed of five items and seemed to be purely like NEO-PI-R tendermindedness. Example item content included "I am upset by the misfortunes of strangers" and "I am interested in others' problems." The R^2 among factor and items was .83. The average interitem correlation was .36. The Cronbach's alpha reached a score of .74 (95% CI = [.71, .77]). The fourth factor was a two-item scale that only retained two items from the formerly named compliance scale. The R^2 among factor and items was .83. The average interitem correlation was .48. The Cronbach alpha was .65 (95% CI = [.61, .69]). The fifth factor was another two-item scale that included altruistic behaviors, such as "I know how to comfort others" and "I make people feel at ease." Its R^2 among factor and items was .83. The average interitem correlation was .47. The Cronbach's alpha among items was .64 (95% CI = [.60, .68]). The sixth factor was

also a two-item scale defined solely by reverse-coded items related to forgiveness, such as "I find it hard to forgive" and "I do things out of revenge." The R^2 among factor and scale items was .73. The average interitem correlation was .44. Reliability estimates indicated a Cronbach's alpha of .61 (95% CI = [.57, .65]). The seventh factor extracted two items related to feelings of love: "I know someone whom I really care about as a person" and "I can express love to someone else." The R^2 among factor and scale items was .69. The average interitem correlation was .30. Reliability estimates yielded a Cronbach's alpha of .46 (95% CI = [.40, .51]). These last three factors and their subsequent analyses discussed below should be interpreted with caution.

Confirmatory Factor Analysis of Agreeableness Items

Fit indices among the factor solutions and their nested models are reported below (Table 7). Within each solution, the correlated trait and bifactor models generally yielded more desirable fit indices than the hierarchical models. Among the five-factor solutions, the bifactor model appeared better fit to the data than both the correlated trait model (Satorra-Bentler $\chi^2(23) = 98.81$, $p < .01$) and the hierarchical model (Satorra-Bentler $\chi^2(5) = 57.66$, $p < .01$). Similar results were found for the six-factor solution in favor of the bifactor model to the correlated trait (Satorra-Bentler $\chi^2(17) = 17.32$, $p < .01$) and the hierarchical (Satorra-Bentler $\chi^2(9) = 108.41$, $p < .01$) models. Among the seven-factor solutions, the correlated traits model was better fit compared to the bifactor model (Satorra-Bentler $\chi^2(1) = 64.03$, $p < .01$) and the hierarchical model (Satorra-Bentler $\chi^2(14) = 282.51$, $p < .01$). The final decision was among the bifactor model of the five-factor model, the bifactor model of the six-factor model, and the correlated traits model of the seven-factor solution. We were hesitant to choose the seven-factor model due to the lack

of stability of factors from the fixed variance among multiple indicators, as well as the poorer reliability estimates in the seven-factor solution overall. Furthermore, a correlated traits model would not allow the testing of Hypotheses 1b and 1d. The fit indices between the bifactor models demonstrate that the bifactor model of the five-factor solution ($\chi^2(494) = 1233.88$, $p < .01$, CFI = .99, TLI = .98, RMSEA = .05, SRMR = .05) offered a marginally better fit to the data than the bifactor model of the six-factor solution ($\chi^2(463) = 1217.59$, $p < .01$, CFI = .98, TLI = .98, RMSEA = .05, SRMR = .05). Factor scores were extracted from the bifactor model from the five-factor solution as best representation of relationships among facets and the general factor (Table 8).

Confirmatory Factor Analysis of Cognitive Subtests

Descriptive information and correlations among the cognitive subtests are reported below (Tables 9-10). The model without verbal analogies fit the data better ($\chi^2(67) = 231.58$, $p < .01$, CFI = .95, TLI = .94, BIC = 61584.21, RMSEA = .06, SRMR = .04) than the model including the verbal analogies subtest ($\chi^2(80) = 333.07$, $p < .01$, CFI = .94, TLI = .92, BIC = 65400.33, RMSEA = .07, SRMR = .04). However, it should be noted that some of the model fit indices, such as the RMSEA of both models, were not the most ideal according to agreed "good" fit minimums (e.g., Hu & Bentler, 1999). Factor scores were extracted from the model not including the analogies subtest. Standardized factor loadings are reported below (Table 11).

Correlations and Hierarchical Regression Analyses

Table 12 displays the correlations among age, sex, and parents' education levels, agreeableness factors, and broad cognitive abilities. In this sample, women tended to be slightly older than men ($r = .08$, $p = .03$). Women also possessed higher crystallized

intelligence scores (r = .09, p < .01) and retrieval ability scores (r = .09, p = .02). Women also tended to have higher overall scores on agreeableness (r = .25, p < .01), straightforwardness (r = .19, p < .01), and compassion (r = .17, p < .01). Older individuals tended to have higher scores of crystallized intelligence (r = .12, p < .01). Within agreeableness, age had significant, positive relationship noted with broad agreeableness (r = .11, p < .01) and straightforwardness (r = .21, p < .01). Younger individuals tended to be more trusting of others (r = -.11, p < .01). Both parents' education levels were positively related to all cognitive abilities (rs = .19-.23, p < .01). The relationships among agreeableness and its facets, however, were more nuanced. Broad agreeableness shared positive relationships with all its facets (rs = .07-.24), but the relationship with compliance was not significant. Straightforwardness was significantly and negatively related to compassion (r = -.24, p < .01) and trust (r = -.12, p < .01). Compassion was negatively correlated with friendliness (r = -.28, p < .01) and compliance (r = -.15, p < .01). Compassion also shared a small, positive relationship with trust (r = .10, p = .01). Friendliness was also negatively correlated with compliance (r = -.17, p < .01) and trust (r = -.19, p < .01). Regarding the cognitive abilities, the factors shared strong, positive correlations among each other (rs = .71-.94, p < .01). Broad agreeableness was positively related to all cognitive abilities (rs = .14-.22, p < .01). Higher scores in crystallized intelligence were more specifically related to higher factor scores in straightforwardness (r = .07, p = .04) and compassion (r = .13, p < .01). Fluid intelligence also shared a positive relationship with compassion (r = .08, p = .04). Higher scores in quantitative knowledge were related to higher scores in friendliness (r = .08, p = .03). Higher scores in retrieval ability were related to higher scores in compassion (r =

.10, $p < .01$). The cognitive ability *Gv* did not share any significant relationships among the agreeableness facets.

After noting that age had zero or near-zero correlations with most cognitive abilities, it was considered for possible removal from the regression models. Indeed, after fitting models with age, age had a suppression effect. We presume this is likely because of restricted range of age of these collegiate participants in this dataset, with very few individuals representing ages older than 23. Additionally, in many of the models, there were continued issues with skewness and kurtosis even with problematic outliers removed. In the model of crystallized intelligence regressing on covariates, agreeableness, and the agreeableness facets, there was some concern with heteroscedasticity. As a remedy in all cases, square-root, log-, and Box-Cox transformations were compared, as well as robust standard errors, weighted regression, and robust regression models when deemed appropriate. In all models, no change or drop in significance was noted among the predictors, and in fact, standard errors remained within range of the unaltered ordinary least squares model. Therefore, the final regression models reported below are the unaltered models with age and outliers removed, in addition to bootstrapping with resampling applied with 95% bias-corrected accelerated confidence intervals (Tables 13-17). In all models, agreeableness remained a significant positive predictor of cognitive abilities, even after controlling for its facets and the demographic covariates (sr^2s = .01-.02). The relationship with the facets, however, continues to demonstrate their complexity. Compassion was a significant predictor of crystallized intelligence ($sr^2 = .02$), even after controlling for broad agreeableness and its fellow facets ($\Delta R^2 = .02$, 95% CI [.01, .05]). Although compassion also appeared to

significantly predict fluid intelligence ($B = .41$, $p < .05$) and long-term retrieval ability ($B = .41$, $p < .05$), the confidence intervals around the change in R^2 for those regression models suggest that there is no true incremental prediction occurring. No other facet significantly predicted cognitive ability.

Brief Discussion

This study paves the groundwork for beginning to understand how a prosocial trait has rather complex relationships with cognitive ability at both broad- and facet-levels. Only two hypotheses were directly supported. In support of Hypothesis 1a, a five-factor model provided the best fit to the agreeableness items, and a bifactor model was the best fit among the nested models. Our tests of this hypothesis also showed that some agreeableness facets, such as trust, were not well-represented compared to others. It is unclear if this finding would replicate across samples or if current inventories lack breadth in measuring these parts of agreeableness. Contrary to Hypothesis 1b, agreeableness had uniform, significant, and positive relationships with the broad-stratum cognitive abilities as measured by the Kit of Factor-Referenced Tests and older GRE tests. Furthermore, the only facet that significantly predicted cognitive abilities was an identified compassion facet. There is some partial support for Hypothesis 1c, as suggested by the positive, bivariate correlation between straightforwardness and crystallized intelligence. In the regression model of crystallized intelligence, compassion did predict over and above broad agreeableness, as predicted by Hypothesis 1d.

The findings, overall, are somewhat surprising. There has yet to be much research defining a solid link between agreeableness aspects and cognitive abilities, although some relationships between them have been observed in large sample studies (Baker & Bichsel, 2006; Furnham & Cheng, 2015; Stanek, 2019). As noted by scholars in the field, cognitive theories often are not inclusive of agreeableness (Curtis et al., 2015). However, the consistency of broad-trait agreeableness relationships to cognitive ability suggests there is a role in prosocial personality and aspects of intelligence. We can provide some

working explanation for this. What first comes to mind is that there may be possible overlap with other Big Five traits that was not tested here, which could be clarified by looking at traits within a circumplex model (Hofstee, de Raad, & Goldberg, 1992). Given that we know how well other traits, such as openness to experience and conscientiousness, predict cognitive abilities, various facet melds of agreeableness, openness to experience, and/or conscientiousness, may better explain the relationships that occur with broad agreeableness alone. Using a circumplex model tends to allow for more robust relationships to show within analyses, particularly with facets. Another approach in this context would be to look at higher-level trait structure. A newer circumplex model called the Circumplex of Personality Metatraits (CPM; Strus & Cieciuch, 2017) incorporates other traits outside of personality at the more general level, such as temperament, values, and mental health areas such as emotion regulation. Perhaps looking at broader personality descriptions in the CPM, by examining an aggregate of many personality traits and temperament traits, may provide clearer reasons why agreeableness demonstrated the relationship it has with cognitive traits in the literature. This model requires more validation, however, before we can make solid conclusions about this explanation. This leads to our second, simpler explanation; Agreeableness, in some shape or form, is directly related to cognitive ability. We cannot ignore that, apart from the identified trust facet, the facets maintained positive, if not always significant, relationships with cognitive ability. Of note is the relationship of the compassion facet to crystallized intelligence, quantitative intelligence, and retrieval ability. Perhaps it is likely that those individuals who demonstrate more prosocial, sympathetic traits also tend to be intelligent in various domains. Some evidence for this

explanation comes from a recent a study examining the mediating role of empathy and morality between intelligence and prosocial behavior (Guo et al., 2019). In a pool of 516 college students, there were significant positive relationships indicating intelligence and prosocial behaviors, perspective taking, concern for others, and morality. Given what we know about the development of agreeableness from a young age (Knafo & Plomin, 2006a, 2006b), an additional explanation is that developing a higher level of cognitive abilities, particularly crystallized intelligence, may lead to higher development of traits associated with agreeableness. Learning more about the world early in development, for example, may help develop compassion, understanding, and prosocial behaviors.

However, what is certain from the results of this study is that these relationships would benefit from further investigation. Foremost, it is difficult to extrapolate these results to the general population given the use of a college student sample in this database. One cannot ignore the possibility that perhaps this sample within this age demographic was simply intelligent and agreeable enough for these findings to appear! We hope that Study 2's findings will bring more clarity to this confound overall. It is also challenging to discuss the findings directly due to frequent trends of studies using broader measures of Big Five traits or fewer item parcels to define facets. We believe that there is evidence enough to say that we do not have a clear picture of broad trait agreeableness and its structure; we hope that this can stimulate additional research on replicating the facet structure to better understand agreeableness and its relationship to outcomes of interest. Lastly, regarding the cognitive factors, we do feel like we may better understand the relationship agreeableness has with these scales if more regularly updated, norm-referenced measures are used for comparison to the results achieved here.

Study 2

Our goal with Study 2 was to extend the work of Study 1 to examine relationships of agreeableness facets with psychopathology and personality disorder domains to gain further understanding of the distinct prediction of the facets. Prediction of the lower-order structure of agreeableness in this study followed from what was derived from Study 1 (see Hypothesis 1a). An overarching goal was to determine how consistent these facets and thematic elements of agreeableness emerge, given a more general sample and a smaller set of items. Furthermore, we conceptualize psychopathology within a dimensional framework, in line with growing support for the Hierarchical Taxonomy of Psychopathology (HiTOP; see Kotov et al., 2017, Krueger & Markon, 2006; Watson, 2005). This taxonomy, based on strong, often redundant, relationships shared among symptoms, classifies symptom clusters within higher "subfactors"—such as distress, fear, and substance use disorders—which are under broader "spectra" of internalizing and externalizing disorders. It is a notable move away from the DSM categories within abnormal psychology, which have shifted from psychoanalytic and medical models in terms of classification. Below we present our hypotheses with HiTOP as a guide for understanding our measure of mental disorders.

Hypothesis 2a: The broad trait of agreeableness will be negatively related to externalizing disorders (e.g., substance abuse disorders, Kotov et al., 2010; Walton et al., 2017). It will also be negatively related to antagonism and disinhibition, personality disorder domains conceptually related to externalizing disorders, and substance use disorders (Krueger, Derringer, Markon, Watson, & Skodol, 2012)

Hypothesis 2b: Agreeableness facets will have significant negative relationships with substance use disorders, externalizing disorders, and internalizing disorders. Facets resembling tendermindedness or compassion will have positive relationships with internalizing disorders and externalizing disorders, respectively, in contrast to other facets (Ruiz et al., 2008; Walton et al., 2017). Significant negative relationships are expected between personality disorder domains and facets resembling trust, compliance, straightforwardness, and altruism. Facets that resemble modesty will have positive relationships with personality disorder domains tapping into avoidant personality traits, such as detachment (e.g., Samuel & Widiger, 2008).

Hypothesis 2c: Facets are expected to have stronger associations with psychopathology and personality disorder outcomes than the broad trait.

Method

A priori Power Analysis

Power analyses for each outcome variable were estimated with G*Power (Faul, Erdfelder, Lang, & Buchner, 2018). The analyses below were completed with two assumptions. Foremost, we will use a five-facet model. Second, all predictors (global agreeableness, five agreeableness facets, and an estimated four control/covariate variables) were included in the regression models. The largest effect size identified in the literature for the outcome variables assessed in Study 2 was -.45, the averaged correlation observed between the trust facet and paranoid personality disorder (Saulsman & Page, 2004). To achieve a power of at least 80% as recommended by Cohen (1988), this suggests a required sample size of at least 73. Estimating a sample:item ratio of a minimum of 5:1 (Bryant & Yarnold, 1995) suggests approximately 1200 participants would be needed. However, a pool of at least 600 viable participants was a more attainable goal for this study. This sample size would achieve an estimated 40% power if adhering to a sample size requirement of 1200.

Participants

A sample of 710 participants was recruited via a HIT posting on Amazon MTurk. These participants received $2.00 USD in their Amazon.com account for completing the task, consistent with the reimbursement given in one of the published studies we aimed to replicate (Crowe et al., 2017). Participants completed a series of self-report questionnaires, given a maximum time limit of three hours. The HIT posting was specified to ensure a diverse sample within the parameters of MTurk's participant population, with the caveat that they were 18 years or older. Participants were kept de-

identified. Three items were placed throughout the survey, intended to gauge attentiveness to answers and screen out bots/spammers. Participants were asked to provide a specific response option (e.g., "Please choose Strongly Agree to this question") to the prompt. If participants failed two out of three responses, their responses were deleted. Out of the 710 individuals, 76 cases were deleted for failing the screening cutoff. Twenty-four additional cases were removed for missing more than 50% of their responses on either set of agreeableness items included in this survey. The final sample included 610 individuals (57.2% male, 42.1% female, 0.6% identified as genderfluid, transgender, or other; age $M = 35.4$, $SD = 12.4$, range = 19-95). Two individuals did not report their gender or age. In terms of racial-ethnic identity, the sample was mostly White (60.0%), followed by South Asian (19.3%), Black or African-American (6.9%), Latino, Latina, or Latinx (4.9%), Native American or Alaskan Native (3.3%), multiracial (2.0%), East Asian (1.3%), Pacific Islander (1.0%), West Indian (0.7%), Middle Eastern (0.3%), Other (0.2%), and one individual did report their race. 75.1% of individuals were employed full-time, 14.1% were employed part-time, 10.20% were unemployed, and two individuals did not respond. In terms of any history of diagnosis of a mental illness by a mental health practitioner, a majority of participants (65.2%) had never received any mental illness diagnosis. This question was asked in a yes-no format and was controlled for in all regression analyses described below.

Measures

Agreeableness

Items were obtained from agreeableness scales included in the IPIP (Goldberg et al., 2006), which are a plethora of personality scales available to the public. Items were

chosen based on notable overlap of items appearing on scales from items retrieved from the IPIP in Study 1—with most items originating from the IPIP NEO and IPIP HEXACO scales. After items were gathered, they were checked for cross-scale redundancy, and if any pair of items was identified, one of them was randomly removed. The final set of items presented to participants included 60 items from the IPIP NEO (Maples, Guan, Carter, & Miller, 2014; agreeableness α = .90, with facets ranging from .73 to .82) and 68 items from the IPIP HEXACO agreeableness and honesty-humility scales (Lee & Ashton, 2004; agreeableness α = .92, with facets ranging from .72 to .88, and honesty-humility α = .88, with facets ranging from .69 to .80). During administration, participants were asked to respond to how well items described them in general, with a 5-point Likert scale ranging from Strongly Disagree to Strongly Agree. In our sample, the IPIP NEO items achieved a Cronbach's alpha of .95. IPIP HEXACO agreeableness items achieved a Cronbach's alpha of .93, and IPIP HEXACO honesty-humility items achieved a Cronbach's alpha of .94.

Psychopathology

The Psychiatric Diagnostic Screening Questionnaire (PDSQ) is a self-report scale developed to screen for the most common DSM-IV Axis I disorders (Zimmerman & Mattia, 2001). The PDSQ assesses for major depressive disorder (MDD), bulimia/binge eating disorder, post-traumatic stress disorder (PTSD), panic disorder, agoraphobia, social phobia, alcohol abuse/dependence, drug abuse/dependence, generalized anxiety disorder, somatization disorder, hypochondriasis, and psychosis. It contains 126 questions, presented in a dichotomous (Yes-No) format according to "how you have been acting, feeling, or thinking" during the past 2 weeks or 6 months, depending on the

symptom cluster. Higher scores indicate more symptoms. Diagnostic scales can be derived from the sum of scores within each symptom cluster aligning with their appropriate DSM-IV category. The validity of this measure has been tested with several validation samples in over 3,000 medical and psychiatric settings. The PDSQ has also demonstrated good divergent and convergent validity. In the final validation study, Cronbach's alphas ranged from .66 to .94 and averaged .81. This range was well replicated in this sample, with Cronbach's alphas ranging from .71 to .94, with an average of .85.

Personality Disorders

The Personality Inventory for DSM-5 Brief Form (PID-5-BF) is a self-report questionnaire consisting of 25 items designed to measure the maladaptive "excess" of the broad domains of the Big Five consistent with the emerging dimensional conceptualization of personality disorders (APA, 2013). These items form a shortened version of The Personality Inventory for DSM-5 (Krueger, Derringer, Markon, Watson, & Skodol, 2012), originally consisting of 220 items. Each item is rated on a 4-point Likert scale, ranging from 0 (Very False or Often False) to 3 (Very True or Often True). The PID-5-BF scales encompass the five broad negative personality domains - negative affectivity, detachment, antagonism, disinhibition, and psychoticism. In the representative sample of the validation study, Cronbach's alphas were: negative affect (α = .93), detachment (α = .96), antagonism (α = .95), disinhibition (α = .84), and psychoticism (α = .96). In this study, the Cronbach's alphas were as follows: negative affect (α = .84), detachment (α = .85), antagonism (α = .90), disinhibition (α = .91), and psychoticism (α = .89).

Data Analysis

A large part of the data analysis of the agreeableness items mimics that of Study 1. We began by examining the 102 agreeableness items for polychoric correlations ≥ .65. 37 item pairs were found with correlations meeting this criterion, and one item from each pair was randomly chosen for deletion. PCA was conducted to identify how the items loaded onto a single, unrotated factor. Items with a factor loading of < .30 were considered for removal, and the PCA was rerun until no items loaded < .30. Forty items were deleted after this procedure. Twenty-five items remained. To ensure that a five-factor solution was stable given this number of items, a parallel analysis was run. The parallel analysis suggested a maximum of five factors and two components, as indicated by the intersection of the plots of eigenvalues from the expected and simulated data (Figure 2). Following this procedure, the polychoric correlation matrix was entered in exploratory factor analysis, using principal axis factoring with promax rotation. Items were removed to achieve simple structure based primarily on the three criteria described in Study 1. The final set of agreeableness items included 21 items.

For all scales, confirmatory factor analysis was used to explore structural models. Pairwise deletion was used to retain as much data as possible, after most item sets were confirmed to be better fit to a MCAR model (agreeableness items $\chi^2(511) = 636.44$, $p < .01$; PDSQ scales $\chi^2(47) = 41.48$, $p = .70$; PID-5-BF items $\chi^2(564) = 472.76$, $p = .99$). As a note, we compared listwise and pairwise deletion results for CFA of agreeableness items and did not find any notable change in fit, loadings, or standard errors of coefficients in spite of the finding of data missing not at random. Confirmatory factor analysis was then conducted with the five-factor solution using the DWLS estimator in

lavaan, comparing three nested structural models—correlated traits, hierarchical, and bifactor. The first indicator of each latent variable was fixed to 1 in all models. Model fit was evaluated using the same model fit indices from Study 1. Factor scores were then saved from the model with the best fit given the data and then used in the hierarchical regression models described below.

After the factor scores for agreeableness were extracted, data analysis focused on the PDSQ items. Confirmatory factor analysis with the PDSQ in line with current theory of psychopathology structure has extracted three factors (Walton et al., 2017). A two-factor internalizing-substance use disorder domains model was also compared. Additionally, given Kotov et al.'s (2017) recent findings with the HiTOP taxonomy, the PDSQ offers enough scales to also fit a four-factor model with subfactors (distress, fear, somatoform, and substance use disorders). To test this, we attempted to carry out exploratory and confirmatory factor analyses with the items of the PDSQ using tetrachoric correlations. However, even after attempting item parceling, CFA models required significant model modification due to cross-loadings and shared covariances within and outside of factors. We propose this effort may be better achieved with a larger sample to account for the item:sample ratio or a different set of items that allows for other mental disorder domains to be tested (e.g., bipolar disorder). Therefore, in this study, CFA was conducted with summated scale scores. The binge-eating and psychosis symptom scales were not included in analyses due to not having enough additional symptom scales to measure dimensional factors. Prior to analysis, scales were tested for univariate normality issues. No outliers were detected based on interquartile range. CFA was conducted with the MLR estimator using full-information maximum likelihood.

Because of the use of summed scores to estimate latent variables, the variances among factors were fixed to 1, allowing the individual indicators freedom to vary. Model fit indices were poor when originally running the analysis, so model modification indices were used as a tool to assist in achieving better fit. Some residual covariances were specified between certain scales, such as agoraphobia and PTSD, social phobia and generalized anxiety disorder, and OCD and substance use disorders. Although this would be considered post-hoc model modification, a wealth of peer-reviewed literature indicates that comorbidity of mental illness diagnostic categories is certainly nothing new (for a review, see Wardenaar, Huang, Wojtyniak, & de Jonge, 2018). We would consider the specification of these covariances more accurate in reflecting functioning ability of diagnostic labels; however, we also acknowledge the need to be conservative with altering models in such a fashion. Covariance modifications were specified only until model fit indices of error were within acceptable range (RMSEA $\leq .07$, SRMR $< .05$; Hu & Bentler, 1999).

Confirmatory factor analysis was also used to form a structural model of the PID-5-BF items. Other studies have shown that the five scales obtained from the shortened questionnaire replicate well in factor analysis studies within the US (Anderson, Sellbom, & Salekin, 2018) and large, international samples (Bach, Maples-Keller, Bo, & Simonsen, 2016; Fossati et al., 2017; Gongora & Castro Solano, 2017; Thimm, Jordan, & Bach, 2016). For comparison purposes, three models were created with the items - the original correlated five factors, an orthogonal five-factor structure, and a unidimensional model. Models were estimated using the DWLS estimator, and models were compared in the same way as the agreeableness item set. Because items were all on the same scale, the

first indicator of each factor was fixed to 1. Factor scores from the best fit model were saved and entered into the regression models described below as separate, dependent variables.

The relationships among the agreeableness facets, psychopathology subfactors, personality disorder domains, and covariates were evaluated first with correlational analyses to determine if certain covariates needed to be dropped from the model. As noted above, three cases were missing age and PID-5-BF factors, and two cases were missing mental illness status. Missing data were evaluated and determined more in line with being missing completely at random for all variables included in analyses ($\chi^2(47) = 44.97$, $p = .56$). As done in Study 1, multiple imputation was performed to retain as much data as possible in other variables. Predictive mean matching multiple imputation was used to complete data, with the results pooled for further analysis. Nine separate hierarchical regression models were compared, with psychopathology factors and personality disorder domains as outcome variables. Step 1 included covariates of gender, age, and mental diagnosis status, Step 2 included covariates with global agreeableness, and Step 3 included the covariates, global agreeableness, and its facets together. Change in R^2 (sr^2) was used to measure predictive power of facets over global agreeableness. Ordinary least squares assumptions were evaluated using plots with residuals and standardized residuals vs. fitted values, standardized residuals vs. leverage values, and QQ plots. This process was assisted primarily with the *car* package in R. Cases with unusual observations were also considered for deletion by comparison of Mahalanobis distance, Cook's distance, and leverage. If a case was considered highly influential according to at least two of these measures, it was considered for deletion. Due to the

large sample size for the number of predictors, regression analyses were compared with and without outliers present in two subsets of data. If there were any notable differences or if assumptions continued to be violated even with unusual cases removed, transformations and alternative regression models were considered. All alternative regressions and transformations were compared to the original regression models by comparing if terms dropped or altered in significance. Bootstrapping was performed as a non-parametric remedy in order to further smooth out any concerns about outliers, skewness, and kurtosis. Significance tests of coefficients, semipartial correlations, model R^2, and change in R^2 were evaluated with bias-corrected accelerated bootstrapped confidence intervals.

Results

Factor Analysis of Agreeableness Items

After item deletion procedures, only 20 reverse-coded items remained. The first factor, containing mostly items from IPIP HEXACO tolerance, had eight items. The R^2 among factor and items was .92. The average interitem correlation was .51. Reliability estimates indicated a Cronbach's alpha of .89 (95% CI = [.88, .90]). The second factor contained items mostly from IPIP NEO cooperation and totaled four items. The R^2 among the factor and its scores was .87. The average interitem correlation was .51. Reliability estimates indicated a Cronbach's alpha of .81 (95% CI = [.79, .83]). The third factor, a clear trust factor, was composed of three items. The R^2 among factor and items was .85. The average interitem correlation was .56. Reliability estimates indicated a Cronbach's alpha of .79 (95% CI = [.77, .81]). The fourth factor, compassion, was a three-item scale that merged a couple of scales from the IPIP NEO (sympathy and altruism). Its R^2 among factor and items was .85. The average interitem correlation was .52. Reliability estimates indicated a Cronbach alpha of .76 (95% CI = [.73, .79]). The fifth factor originally resulted in three items, a positive and reverse-coded item from IPIP NEO modesty in addition to a reverse-coded item from HEXACO honesty-humility scales. The resulting reliability estimate was $\alpha = .17$. Examination of changes in reliability if an item was dropped indicated a significant increase if the positive item was dropped. Thus, our final fifth factor was a two-item scale that contained reverse-coded items from both IPIP NEO modesty and HEXACO honesty-humility modesty scales. Its R^2 among factor and items was .77. Its average interitem correlation was .49. Reliability estimates indicated a Cronbach alpha of

.66 (95% CI = [.62, .70]). We would still advise to regard results from our fifth factor, modesty, with caution.

The confirmatory fit indices for the three previously tested, nested models were acceptable. The correlated traits model had a reasonably good fit ($\chi^2(160) = 288.32$, $p < .01$, CFI = .99, TLI = .99, RMSEA = .04, RMSEA 95% CI = .029-.042, SRMR = .04). The hierarchical model had a slightly poorer fit ($\chi^2(165) = 484.90$, $p < .01$, CFI = .99, TLI = .99, RMSEA = .06, RMSEA 95% CI = .051-.062, SRMR = .05). The bifactor model also had an acceptable fit (χ^2 (151) = 447.17, $p < .01$, CFI = .99, TLI = .99, RMSEA = .06, RMSEA 95% CI = .051-.063, SRMR = .05). The correlated traits model fit better than the bifactor model (Satorra-Bentler $\chi^2(9) = 151.37$, $p < .01$) and the hierarchical model (Satorra-Bentler $\chi^2(5) = 108.37$, $p < .01$). However, due to this study's focus on examining broad- vs. facet-level relationships, we chose to use the correlated traits model only for comparison. To note, the bifactor model of agreeableness items fit better than the hierarchical model (Satorra-Bentler $\chi^2(14) = 44.94$, $p < .01$). Factor scores were extracted from the bifactor model as best representation of relationships among facets and the general factor (Table 18).

Confirmatory Factor Analysis of PDSQ Scales and PID-5-BF Items

Descriptive information and correlations among the PDSQ scales are reported below (Table 19). The resulting CFA fit indices are reported following this table below, comparing two-factor, three-factor, and four-factor models (Table 20). All models were able to achieve acceptable fit indices following modification. However, both the three-factor and four-factor models specifying only the subfactors ($\chi^2(19) = 75.34$, CFI = .99, TLI = .97, BIC = 24154.50, RMSEA = .07, RMSEA 95% CI = (.054 - .087), SRMR =

.02; $\chi^2(33) = 110.44$, CFI = .99, TLI = .98, BIC = 27414.94, RMSEA = .06, RMSEA 95% CI = (.049 - .075), SRMR = .02, respectively) and an overarching internalizing factor ($\chi^2(19) = 75.34$, CFI = .99, TLI = .97, BIC = 24154.50, RMSEA = .07, RMSEA 95% CI = (.054 - .087), SRMR = .02; $\chi^2(34) = 111.37$, CFI = .99, TLI = .98, BIC = 27409.45, RMSEA = .06, RMSEA 95% CI = (.049 - .074), SRMR = .02, respectively) provided a better fit to the data. Among the three-factor nested models, there was no difference in fit indices for the subfactor only and internalizing models, and the unidimensional model was a better fit than both models (Satorra-Bentler $\chi^2(1) = 2.26$, $p = 1.00$). A follow-up chi-square difference test found no significant difference between the same two nested models of the four-factor structure (Satorra-Bentler $\chi^2(1) = .60$, $p = .44$), but they both performed better than the unidimensional model (Satorra-Bentler $\chi^2(3) = 20.54$, $p < .01$). These results suggest some slight favor for the four-factor model over the three-factor model, given that we do not expect a unidimensional psychopathology factor to be the most informative. We also chose to be more conservative and focus on the subfactors only model. Both unstandardized and standardized loadings for the chosen four-factor subfactors model are reported below (Table 21).

Table 22 provides the descriptive and correlational analyses for the PID-5-BF summed scales. The CFA fit indices are reported in the subsequent table (Table 23). The correlated PID-5-BF scales had good fit indices ($\chi^2(265) = 536.33$, CFI = 1.00, TLI = 1.00, RMSEA = .04, RMSEA 95% CI = (.036 - .046), SRMR = .04), whereas specifying orthogonal covariances was a poor fit ($\chi^2(275) = 16618.66$, CFI = .28, TLI = .21, RMSEA = 1.00, RMSEA 95% CI = (.994 - 1.001), SRMR = .52). The correlated scales model fit

better than a unidimensional comparison model (Satorra-Bentler $\chi^2(10) = 309.57$, $p < .01$). Factor loadings for the correlated PID-5-BF scales are reported below (Table 24).

Correlations and Hierarchical Regression Analyses

Table 25 displays the correlations among covariates, agreeableness factors, psychopathology factors, and personality domain factors. Gender was coded 0 = male, 1 = female, 2 = genderfluid or transgender. Mental illness was coded 0 = no, 1 = yes. In this sample, female and genderfluid individuals tended to be older ($r = .15$, $p < .01$). Older individuals also demonstrated higher scores in cooperation ($r = .12$, $p < .05$) and global agreeableness ($r = .21$, $p < .01$). Younger individuals tended to have higher scores in all psychopathology domains (rs = -.19-21, $p < .01$) and all personality disorder domains (rs = -.22-26, $p < .01$). Gender was positively related to having a mental illness diagnosis ($r = .12$, $p < .01$), cooperation ($r = .13$, $p < .01$), compassion ($r = .13$, $p < .01$), modesty ($r = .09$, $p < .05$), global agreeableness ($r = .09$, $p < .05$). Gender was negatively related to tolerance ($r = -.16$, $p < .01$), trust ($r = -.09$, $p < .05$), antagonism ($r = -.11$, $p < .01$), disinhibition ($r = -.10$, $p < .05$), and psychoticism ($r = -.09$, $p < .05$). Mental illness diagnosis was positively related to modesty ($r = .10$, $p < .05$) and all psychopathology and personality disorder domains (rs = .23-.47, $p < .01$). Having a mental illness diagnosis was negatively related to tolerance ($r = -.16$, $p < .01$), trust ($r = -.14$, $p < .01$), and broad agreeableness ($r = -.25$, $p < .01$). Agreeableness was positively related to all of its facets (rs = .10-.22). Modesty was not significantly associated with global agreeableness, but they were positively correlated. Tolerance was negatively related to cooperation, compassion, and modesty (rs = -.25-.43, $p < .01$) as well as all psychopathology (rs = -.11-.25, $p < .01$) and personality disorder domains (rs = -.12-.30, $p < .01$). Cooperation was negatively

related to trust (r = -.31, p < .01) and positively related to modesty (r = .19, p < .01). Cooperation was also negatively related to all psychopathology domains (rs = -.11-.21, p < .01) and personality disorder domains (rs = -.11-.27, p < .01). Trust was only positively related to antagonism (r = .10, p < .05). Trust was negatively related to both compassion and modesty (rs = -.27-.30, p < .01), distress (r = -.10, p < .05), fear (r = -.08, p < .05), and detachment (r = -.13, p < .01). Compassion was negatively related to somatoform disorders (r = -.10, p < .05) and substance use domains (r = -.18, p < .01). Compassion was also negatively related to all personality disorder domains (r = -.12-.23, p < .01). Modesty was positively related to distress (r = .09, p < .05) and detachment (r = .10, p < .05). However, it was negatively related to antagonism (r = -.12, p < .01). The global factor of agreeableness was negatively related to all psychopathology (rs = -.57-.61, p < .01) and personality disorder domains (rs = -.79-.83, p < .01). All psychopathology and personality disorder domains were positively correlated with each other (rs = .61-.99, p < .01).

Following correlation analyses, all three examined covariates (age, gender, and mental illness diagnosis) were entered into hierarchical regression models. Similar to Study 1, skewness and kurtosis persisted in two of the models despite removal of problematic outlier cases. Using log transformation on broad agreeableness and age in regressions of somatoform and substance use disorders assisted in ameliorating these issues. However, the models involving the PID-5-BF factors did not benefit from any transformation in terms of reduction of residuals. As was done in Study 1, we compared models with transformations and robust regressions; predictors did not alter notably in significance. We reported the hierarchical regressions below (Tables 26-34). Bootstrapping with 1000 resamples was applied with 95% bias-corrected accelerated confidence intervals. In all

models, the inclusion of agreeableness significantly added to the base model with covariates only. Furthermore, the additional step including the facets significantly added variance in predicting all psychopathology domains, accounting for an additional 2% of variance, on average (ΔR^2s = .01-.03). Regarding the models regressing the psychopathology subfactors on covariates, agreeableness, and its facets, findings mirrored those of Study 1. As a log transformation of age and agreeableness created better fit in two of the psychopathology regression models, the interpretation of the coefficients will be different. For example, in the regression involving somatoform disorders, for every one-percent increase in agreeableness, somatoform scores decrease by approximately 1.34 units. Agreeableness remained a significant, negative predictor, even after controlling for its facets and the demographic covariates (sr^2s = .10-.16). In all models, including the step with the facets led to a 1% increase to overall R^2, except for the model involving the fear subfactor. Within the facets, cooperation remained a consistent, negative predictor of distress, somatoform, and substance use subfactors, even after controlling for broad agreeableness and other facets (sr^2s = .01). Tolerance also significantly predicted distress (sr^2 = .01) and also significantly predicted somatoform disorders; however, the effect size for somatoform disorders was negligible. Compassion only was a significant, negative predictor of substance use disorders (sr^2 = .01). Modesty was only significant in the model involving distress, as the sole positive predictor among the facets of this subfactor; however, much like tolerance, its effect size was essentially zero (sr^2 = .00). Trust did not significantly predict any psychopathology subfactors.

Some notable comparisons emerged between regression models of psychopathology and personality disorder domains. Agreeableness appeared to be a

stronger predictor of personality disorder symptoms than psychopathology, as it remained a constant negative predictor in all final steps of the models with a higher amount of variance added to the model fit (sr^2s = .25-.32). The additional step including the facets significantly added variance in predicting all personality disorder domains, accounting for an additional 2.40% of variance on average (ΔR^2s = .02-.03). Although many of the facets are positive predictors of these maladaptive traits, their confidence intervals include zero. Cooperation significantly predicted disinhibition (sr^2 = .01); however, the other effect sizes were zero, despite also significantly predicting negative affect and psychoticism. Compassion was a constant, negative predictor of all traits (sr^2s = .00-.01). Tolerance significantly predicted detachment, negative affect, and psychoticism (sr^2s = .00-.01). The two remaining facets possessed both positive and negative relationships with personality disorder domains, when controlling for the covariates, broad agreeableness, and facets. Trust was a significant, positive predictor of antagonism symptoms (sr^2 = .00) and a significant, negative predictor of detachment symptoms (sr^2 = .01). Modesty was a significant, positive predictor of detachment (sr^2 = .00) and a negative predictor of negative affect (sr^2 = .00).

General Discussion

In Study 1, we aimed to demonstrate that at least five facets would emerge from a large pool of agreeableness items. Furthermore, we anticipated that specifying the facets as independent predictors of cognitive abilities would show unique relationships that are obfuscated by simple examination at the broad trait level of agreeableness. In Study 2, we aimed to determine if the structure of agreeableness was replicable in a general population sample with a different set of items. We conceptualized these studies as both forms of replication and extensions of current research on the structure of agreeableness. The literature examining the relationships among Big Five personality traits, cognitive abilities, psychopathology, and personality disorders is vast; on the other hand, when it comes to agreeableness specifically, there is little to no research examining how this trait relates to outcomes comparing the broad and facet level.

However, we can appreciate why little attention has been given to this interpersonal trait. Agreeableness has been largely understood as a trait related to human behaviors ranging from prosociality to humility. Across studies, its structure has varied, but its facets have been generally derived from theory and empirical follow up. The meta-analysis by Davies (2014) summarizes what traits have emerged to date: trust, modesty, cooperation, being not outspoken, lack of aggression, non-manipulativeness, nurturance, tolerance, warmth, and interpersonal sensitivity. Of these ten, five were found to be more reliable and unique when compared to their relations with other agreeableness facets: cooperation, lack of aggression, modesty, nurturance, and non-manipulativeness. The recent, large study by Crowe et al. (2017) uncovered a structure of five facets as well via factor analysis: trust, compassion, affability, morality, modesty. Compared to these

results, our studies established that some, but not all, of these facets consistently appear in large sets of agreeableness items. In Study 1, which included 102 agreeableness items from several IPIP scales, five facets were the most stable structure—straightforwardness, compassion, friendliness, compliance, and trust. In Study 2, a combination of items from the IPIP HEXACO and IPIP NEO scales identified tolerance, cooperation, trust, compassion, and modesty facets. What we can glean is that certain facets consistently appear. Interpersonal trust, modesty, and compassion or nurturance appear to be the most stable. Two facets also have some consistency but less so than the aforementioned three facets. An aspect of what Davies referred to as non-manipulativeness seems to be analogous to item clusters such as straightforwardness, compliance, and perhaps morality. Another analogous pair of facets would be affability, friendliness, and lack of aggression. Lastly, we feel it important to recognize again that some of these factors (such as trust) were more item parcels or "nuances" rather than true factors. Based on these findings, we suggest that these items need more research and may need to be better defined to yield more robust factors. Another simple explanation would be that item parcels / nuances referred to by Mõttus et al. (2017) are also worth additional investigation, particularly in their ability to predict over and beyond the broad trait.

The studies presented here not only add to the literature on structural models of agreeableness but also pave the way for further exploration of applied (and especially clinical) significance of these models. In Study 1, we wanted to further understand if and how agreeableness related to broad-stratum cognitive abilities. We designed Study 2 to test whether agreeableness and its facet have almost no statistically significant relationship to psychopathology as meta-analytic results (Kotov et al., 2010) have shown.

Study 1's results provide some evidence that agreeableness has significant relationships with cognitive abilities. There was also evidence for incremental prediction of crystallized intelligence by the facet compassion. However, consistent with the findings of Stanek (2019), our effect sizes for the associations of agreeableness facets to cognitive factors were small and mostly positive. In Study 2, some notable findings are worth mentioning. Comparable to Study 1's results, agreeableness maintained a significant, negative relationship with both HiTOP psychopathology subfactors as defined by PDSQ scales and the PID-5-BF personality disorder domains. As gathered from the weight of the semipartial correlations, low levels of broad agreeableness were the strongest predictor of both psychopathology and personality disorder domains. Both findings fully support Hypothesis 2a. However, we believe it is worthy to look at the results at the facet level. Bivariate Pearson correlations revealed some of the differing relationships among the facets. Although most facets, particularly tolerance, cooperation, and compassion, had consistent negative correlations with most psychopathology subfactors and personality disorder domains, other facets did not. High scores of trust covaried with high scores of antagonism ($r = .10$, $p < .05$). Modesty was positively related to the distress subfactor ($r = .09$, $p < .05$) and detachment symptoms ($r = .10$, $p < .05$). These findings provide partial support to Hypothesis 2b. In regression models, the step including facets was significant in all models, adding approximately 2% increase to predicted variance. However, there was no evidence from either zero-order correlations or semipartial correlations that any of the facets added more variance to overall R^2 than broad agreeableness itself. Thus, there is no support for Hypothesis 2c.

We believe, however, there is something to be said for a close examination of the "scatter profile" of relationships of the facets. In Study 1, there was a clear, positive pattern to the facets, with compassion significantly predicting three different cognitive abilities even when controlling for agreeableness. Study 2 showed more mixed results. Whereas some facets had strong, negative relationships that persisted despite controlling for multiple variables in predicting psychopathology and personality disorders (tolerance, cooperation), other facets had positive correlations in some cases (modesty). The weights of the semipartial correlations, however small, were statistically significant. Looked at together, these results suggest that separating gestalt agreeableness from its parts may be a worthy endeavor. Below, we expand on the implications of our findings.

Limitations and Future Directions

We believe there are many points to be made about these two studies. One of the primary issues we noticed was the low intercorrelations among global agreeableness and its facets in both Study 1 and Study 2. These issues may have arisen out of the choice to predict factor scores from the CFA model, which are still subject to measurement error. There are a number of alternative analytic methods which may have provided more robust estimates (see Devlieger, Mayer, & Rosseel, 2016, for example); however, given the focus of these hypotheses to measure predictive value of facets over and above the global trait, we feel confident in stating that hierarchical regression with factor scores still yielded the needed information. We hope that future studies can explore more robust methods, such as more refined structural equation modeling, to address these questions. Foremost, at the broader level, there was no comparison done between agreeableness and other personality traits. These comparisons may have served as an important reference for

validity purposes as well as given room for additional testing of hypotheses (e.g., mixing facets together to better predict outcomes). Particularly, research with the HiTOP model is moving to include personality traits within psychopathology subfactors (Kotov et al., 2017; Wright & Simms, 2015). We believe this shift in the field is better representative of the strong covariance among mental illness diagnoses and personality traits. We echo the support of others in the field to further explore dimensional models in mental health research (Conway et al., 2019). We also note that the research done here is all based on self-report data, with the exception of the performance-based cognitive tests. The goal, although idealistic, of this type of psychological research is to be able to extrapolate results based on nomothetic approaches to individual behaviors. We would recommend future research to deviate from the structuralist approach we took here and begin to explore actual behaviors. We cannot verify in this study if people are truly as agreeable or disagreeable as they report here. As such, our conclusions about personality and its relations should be scrutinized with a proverbial grain of salt. Lastly, we were remiss for not being able to fully assess psychopathology subfactors due to the use of the PDSQ and not wishing to overwhelm our participants. As far as the researchers know, there is no current psychopathology symptom measure that fully reflects the DSM-5 update that also would be able to be administered online to participants. In the most ideal situation, we would recommend using several symptom scales and factor analyzing at the item level. However, due to Study 2's limitations, we were unable to get a full representation of current HiTOP taxonomy particularly within the thought disorder and externalizing subfactors. We believe it would be valuable to examine facet-level associations with psychopathology across the entire spectra and subfactors.

Conclusion

We conclude that it is meaningful to examine facet-level relationships of agreeableness. Agreeableness itself shared positive associations with cognitive ability variables, and it shared negative associations with psychopathology subfactors and personality disorder domains. However, when examining facet-level relationships, these aggregate relationships diverged, particularly in Study 2. From a basic research perspective, this urges the personality and abnormal psychology fields to determine if these findings can be replicated and better understood. From a clinical perspective, it offers another avenue to better understand and target specific personality traits. This approach is already being considered in mental health assessment and outcome research (see Thalmayer, 2018). Based on our findings here, we would advocate the use of several measures with the more stable facets that were identified in these studies and past ones. We suggest going one step further and suggesting that it may be useful to consider potential personality change interventions directly in treatment plans, based on past research of this somewhat controversial phenomenon (Roberts et al., 2017; Roberts & Mroczek, 2008; Roberts, Walton, & Viechtbauer, 2006). These suggestions, of course, remain within the purview of continuing the investigations of personality, cognitive ability, and abnormal psychology. We would hope that the work never stops here, and that psychologists both within research and applied realms continue finding just where agreeableness, and its Big Five sibling factors, belong.

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Table 1.

Agreeableness facets across current inventories and studies

Inventory	Facets
NEO Personality Inventory-Revised	Trust
(NEO PI-R;	Straightforwardness
Costa & McCrae, 1992)	Altruism
	Compliance
	Modesty
	Tender-mindedness
Crowe, Lynam, & Miller, 2017	Trust
	Compassion
	Affability
	Morality
	Modesty
Davies, 2014	Trust
	Modesty
	Cooperation
	Not Outspoken
	Lack of Aggression
	Non-Manipulative
	Nurturance
	Tolerance
	Warmth
	Interpersonal Sensitivity

Table 1.

(continued)

Inventory	Facets
Tailored Adaptive Personality Assessment System (TAPAS; Drasgow et al., 2012)	Cooperation
	Consideration
	Selflessness
International Personality Item Pool (IPIP; Goldberg et al., 2006)	Trust
	Morality
	Altruism
	Cooperativeness
	Modesty
	Sympathy
Big Five Inventory (BFI; John & Srivastava, 1999)	Trust
	Straightforwardness
	Altruism
	Compliance
	Modesty
	Tender-mindedness
HEXACO (Lee & Ashton, 2004)	Forgivingness
	Gentleness
	Flexibility
	Patience
Saucier & Ostendorf (1999)	Warmth-affectionate
	Gentleness
	Generosity
	Modesty

Table 1.

(continued)

Inventory	Facets
Faceted Inventory of the Five Factor Model (FI-FFM; Simms, 2009; Watson, Nus, & Wu, 2019)	Trust Empathy Straightforwardness Modesty

Table 2.

List of agreeableness items from IPIP scales

Item #	Item Detail	IPIP Scale
1	I accept others' weaknesses.	TCI
2	I acknowledge others' accomplishments.	CPI
3	I admit when I am wrong.	VIA
4	I am a good listener.	VIA
5	I am able to cooperate with others.	CPI
6	I am afraid of providing criticism.	16PF
7	I am an extremely loyal person.	VIA
8	I am concerned about others.	7F, AB5C, EI, NEO, TCI
10R	I am easily offended.	CPI
11	I am easy to satisfy.	AB5C, HPI, NEO
12	I am embarrassed easily.	NEO
13	I am good at working with a group.	VIA
14R	I am hard to convince.	HEXACO
15	I am interested in other people`s problems.	7F, BFI, AB5C, HPI, JPI-R, NEO, TCI
16R	I am more capable than most others.	HEXACO
17R	I am only kind to others if they have been kind to me.	VIA
18	I am polite to strangers.	CPI
19	I am strongly influenced by the good moods of others.	EI
20	I am trusted to keep secrets.	VIA
21	I am upset by the misfortunes of strangers.	EI
22R	I back out at the last moment.	CPI
23	I believe crying helps me feel better.	AB5C
24R	I believe that I am better than others.	AB5C, CAT-PD, HEXACO, JPI-R, NEO

Table 2.

(continued)

Item #	Item Detail	IPIP Scale
25	I believe that others have good intentions.	16PF, NEO, TCI
26	I can be trusted to keep my promises.	VIA
27	I can express love to someone else.	VIA
30	I change myself to suit others.	6FPQ, 7F
31	I conform to others' opinions.	7F, JPI-R
32	I consider myself an average person.	16PF, AB5C, CPI, HEXACO, NEO
33R	I criticize others' shortcomings.	AB5C, HEXACO
34R	I cut conversations short.	CPI
35R	I demand a lot from others.	AB5C
36R	I do things out of revenge.	MPQ, TCI
37	I do what others want me to do.	TCI
38	I feel I must respect the decisions made by my group.	VIA
39R	I feel like a loser if I compromise.	VIA
40	I feel sympathy for those who are worse off than myself.	AB5C, EI, NEO, TCI
41	I feel thankful for what I have received in life.	VIA
42R	I feel that people have a hard time understanding me.	CPI, HPI, MPQ, TCI
43R	I find it easy to manipulate others.	6FPQ, JPI-R
44R	I find it hard to forgive others.	16PF, AB5C, CPI, HEXACO, HPI, JPI-R, TCI
45	I find it necessary to please the people who have power.	HEXACO
46R	I get impatient when others talk to me about their problems.	VIA
49	I hate to seem pushy.	AB5C, CPI, NEO, TCI
50R	I have a strong need for power.	6FPQ, CAT-PD, HEXACO

Table 2.

(continued)

Item #	Item Detail	IPIP Scale
51	I inquire about others' well-being.	BFI, AB5C, HPI
52R	I insult people.	7F, AB5C, BFI, CAT-PD, NEO
53	I know how to comfort others.	BFI, 16PF, AB5C, HPI
54	I know someone whom I really care about as a person.	VIA
55	I let other people take the credit for my work.	6FPQ
56R	I lie to get myself out of trouble.	VIA
57R	I like competing with others.	CPI
58	I like movies with happy Hollywood endings.	TCI
59	I like to please others.	AB5C
60	I like to talk about myself.	VIA
61R	I love to be complimented.	6FPQ
62	I love to help others.	BFI, NEO
63	I love to make other people happy.	VIA
64R	I make demands on others.	AB5C, CAT-PD, NEO
65	I make people feel at ease.	7F, 16PF, AB5C, BFI, CPI, NEO
66R	I make people feel uncomfortable.	NEO
67R	I misuse power.	PAS, TCI
69R	I overestimate my achievements.	AB5C
70R	I pretend to be more than I am.	HEXACO
71	I respect authority.	6FPQ, 16PF, AB5C, CAT-PD, CPI, HPI, TCI
72	I respect others' feelings.	AB5C
73	I respect others.	AB5C, NEO, TCI
74	I respect the opinions of others.	CPI, TCI

Table 2.

(continued)

Item #	Item Detail	IPIP Scale
75	I return extra change when a cashier makes a mistake.	CPI, HEXACO, JPI-R, PAS, TCI
76	I sacrifice myself for others.	TCI
77R	I see other people as my competitors.	CPI, TCI
78	I seek support.	6FPQ, HEXACO, HPI
79	I show my anger.	EI
80	I show my fear.	EI
82	I show my gratitude.	AB5C, BFI, HPI
83	I show my sadness.	EI, HEXACO
84R	I speak ill of others.	HEXACO, HPI
85	I support my teammates.	VIA
86R	I switch my loyalties when I feel like it.	HEXACO
87	I sympathize with others' feelings.	7F, AB5C, BFI, CPI, NEO, TCI
88R	I take advantage of others.	7F, CAT-PD, NEO, VIA
89	I take others' interests into account.	AB5C, CPI
90R	I talk badly to outsiders about my own group.	VIA
91R	I tend to brag about my accomplishments.	VIA
92R	I tend to complain.	6FPQ, CPI, HEXACO, HPI, MPQ, NEO
93	I think of others first.	AB5C, BFI, JPI-R
94	I treat all people equally.	NEO, VIA
95R	I treat people as inferiors.	AB5C, CAT-PD, CPI, HPI, TCI
96	I trust others.	16PF, AB5C, CPI, HPI, MPQ, NEO, TCI
97	I trust what people say.	16PF, AB5C, HPI, MPQ, NEO, TCI
98R	I try to avoid doing favors for others.	VIA

Table 2.

(continued)

Item #	Item Detail	IPIP Scale
99R	I try to fool others.	TCI
100	I try to respond with understanding when someone treats me badly.	VIA
101	I understand people who get emotional.	AB5C, CPI, HEXACO, JPI-R, NEO
103R	I use flattery to get ahead.	CPI, HEXACO, NEO, PAS, TCI
104	I want to be liked.	6FPQ, HEXACO, HPI
105R	I want to be told I am right.	7F, AB5C
106R	I want to control the conversation.	CPI
107	When interacting with a group of people, I am often bothered by at least one of them.	HEXACO
108	I would be upset if I saw an injured animal.	EI
109R	I would like to have more power than other people.	HEXACO
110	I support my fellow group members.	VIA

Note. Total items = 102. Item numbers are as shown in original dataset. R following the item number indicates a reverse-coded item. IPIP scales containing these items are as follows: 6FPQ = Six Factor Personality Questionnaire, 7F = Seven Factor, 16PF = 16 Personality Factor Questionnaire, AB5C = Abridged Big-Five Dimensional Circumplex, BFI = Big Five Inventory, CAT-PD = Computerized Adaptive Test of Personality Disorders, CPI = California Psychological Inventory, EI = Emotional Intelligence, HEXACO = HEXACO Personality Inventory, HPI = Hogan Personality Inventory, JPI-R = Jackson Personality Inventory-Revised, MPQ = Multidimensional Personality Questionnaire, NEO = NEO-PI-R-based scales, PAS = Personal Attribute Survey, TCI = Temperament and Character Inventory, VIA = Values in Action.

Table 3.

Description of cognitive ability tests in Study 1

Test name	Description	Ability Measured
Letter sets	Each item of this 15-item test presented five sets of four letters each, where four of the letter sets were alike according to some specific rule. Participants identified the set that did not fit with the rule (e.g., "QPPQ; HGHH; TTTU; DDDE; MLMM"; answer: QPPQ).	Fluid intelligence (*Gf*)
Figure classification	Test takers were presented with 14 stimuli, where each stimulus consisted of two to three groups of three geometric figures, labeled Group 1, Group 2, or Group 3. The figures in each group were alike in some way. For each stimulus, test takers classified eight additional geometric figures into Group 1, Group 2, or Group 3, based on whether the figure also shared the characteristic common to the group.	Fluid intelligence (*Gf*)
Calendar test	This 20-item, multiple-choice test presented participants with a depiction of a yearly calendar and seven sentences outlining seasonal changes and work days (e.g., "A circled number is a holiday"; "The first day of Summer is June 21"). Participants were then asked to work out which date was represented by a specific set of directions (e.g., "In the month whose 12th is on a Tuesday, what is the fifteenth working day? (a) 22nd; (b) 23rd; (c) 24th; (d) 27th; (e) Not given"; answer: a.	Fluid intelligence (*Gf*)
Vocabulary	In this 36-item, multiple-choice test, each item presented test takers with a target word followed by four possible synonyms (e.g., "Chef—(a) cheese; (b) style; (c) head cook; (d) candle"; answer: c.	Crystallized intelligence (*Gc*)
Analogies	This 30-item, multiple-choice test presented participants with an initial set of two words that bore a particular relationship to each other. Participants were then asked to select which of five other word-pairs demonstrated the same relationship (e.g., "OSTRICH: BIRD—(a) caterpillar:moth; (b) lizard:frog; (c) bud:leaf; (d) tiger:cat; (e) gust:storm"; answer: d.	Crystallized intelligence (*Gc*)

Table 3.

(continued)

Test name	Description	Ability Measured
Sentence completion	In this 30-item, multiple-choice test, each item presented test takers with a sentence that was missing a key group of words. Test takers were required to select which of four possible word groups would best complete the sentence (e.g., "The decimal numeral system is one of the _____ ways of expressing numbers: (a) useful most world's; (b) world's most useful; (c) useful world's most; (d) most world's useful"; answer: b.	Crystallized intelligence (*Gc*)
Mathematics aptitude	This task presented 15 multiple-choice questions that required the application of algebraic concepts to obtain a solution (e.g., "What is the largest sum that can be thrown with 11 dice, if no number appears more than three times? (a) 26, (b) 51, (c) 66, (d) 84, (e) 122"; answer: b.	Quantitative knowledge (*Gq*)
Necessary mathematics operations	This task presented 15 multiple-choice mathematics word problems where test takers were required to identify the numeric operations required to solve each problem (e.g., "A sweater marked $40 was sold for $29.95 during a sale. What was the percent reduction? (a) divide and add; (b) subtract and divide; (c) multiply and subtract; (d) add and divide"; answer: b.	Quantitative knowledge (*Gq*)
Subtraction-multiplication	A series of 60 items asked participants to subtract two-digit numbers from two-digit numbers or to multiply two-digit numbers by single-digit numbers (e.g., 73 X 8; answer: 584)	Quantitative knowledge (*Gq*)
Cube comparison	Each of 42 items presented test takers with two drawings of a cube, where each side of the cube showed a different design, number, or letter. Test takers decided whether the two pictures represented the same cube, or two different cubes.	Visual ability (*Gv*)

Table 3.

(continued)

Test name	Description	Ability Measured
Hidden patterns	In this task, participants were shown a geometric figure followed by 200 complex patterns that may or may not have this geometric figure embedded within them. The participants' task was to decide whether or not each pattern contained this geometric figure. They were given 3 min to complete the task.	Visual ability (*Gv*)
Surface development	This 60-item test required respondents to visualize how a piece of paper could be folded to form a kind of object. Drawings were presented of solid forms that were made with paper. Accompanying each drawing was a diagram showing how the paper might be cut and folded in order to create the solid form. One part of the diagram was marked with dotted lines or numbered edges to correspond to the same area in the drawing (marked by letters), and respondents were asked to indicate which lettered edges in the drawing corresponded to the numbered edges or dotted lines in the diagram.	Visual ability (*Gv*)
Word endings	In this task, participants were given 3 min to write as many words as they could think of ending with the letters AY. They were then given 3 minutes to write as many words as they could think of ending with the letters OW.	Long-term storage and retrieval (*Glr*)
Word beginnings	In this task, participants were given 3 min to write as many words as they could think of beginning with the letters PRO. They were then given 3 minutes to write as many words as they could think of beginning with the letters SUB.	Long-term storage and retrieval (*Glr*)
Opposites	In this task, participants were asked to generate up to six antonyms for each of eight words (e.g., "Write as many words as you can (up to six) that mean the opposite or nearly opposite of the words below: CALM").	Long-term storage and retrieval (*Glr*)

Table 4.

Five-factor solution from Study 1 exploratory factor analysis of agreeableness items (*N* = 722)

Item #	Sf	Fr	Ps	Cp	Tr	h2	u2	com
52	**.75**	.05	-.17	.13	.22	.64	.36	1.40
67	**.70**	.06	-.20	.22	.03	.54	.46	1.40
99	**.65**	.05	.07	-.12	-.08	.44	.56	1.10
84	**.64**	-.18	-.09	.20	.15	.46	.54	1.50
95	**.63**	.20	-.11	.01	.01	.44	.56	1.30
91	**.61**	-.02	.04	.05	-.21	.40	.60	1.30
33	**.60**	.06	-.01	.07	.01	.42	.58	1.00
36	**.60**	-.16	.12	.05	.18	.48	.52	1.40
88	**.59**	.00	.30	-.15	.00	.55	.45	1.60
70	**.56**	-.09	.05	.06	-.10	.33	.67	1.20
24	**.55**	.15	.05	-.20	-.14	.35	.65	1.60
56	**.53**	-.10	.16	-.06	-.07	.32	.68	1.30
87	.05	**.83**	.01	.03	-.06	.69	.31	1.00
15	-.08	**.77**	-.18	.06	.04	.49	.51	1.10
40	.04	**.69**	.04	.03	-.02	.53	.47	1.00
51	.02	**.60**	-.07	.29	-.01	.52	.48	1.50
21	-.05	**.60**	-.06	-.08	.03	.29	.71	1.10
101	.00	**.54**	.09	-.03	.11	.42	.58	1.10
108	.06	**.51**	.02	-.17	-.03	.24	.76	1.30
1	.08	**.44**	.19	-.03	.12	.45	.55	1.60
63	-.01	**.43**	.16	.21	.09	.50	.50	1.90
41	.02	-.19	**.79**	.05	.09	.55	.45	1.20
73	.15	-.03	**.62**	.03	.12	.57	.43	1.20
54	-.08	.03	**.61**	.09	-.04	.38	.62	1.10
7	-.04	-.01	**.60**	.20	-.12	.42	.58	1.30
82	-.02	.18	**.57**	.05	-.05	.47	.53	1.20
74	.14	.06	**.54**	-.07	.21	.54	.46	1.50
2	-.01	.26	**.52**	-.01	-.03	.48	.52	1.50
65	-.18	.13	**.49**	.19	.07	.41	.59	1.80
20	.10	.11	.15	**.64**	-.20	.56	.44	1.40
26	.03	.03	.23	**.64**	-.14	.54	.46	1.40
5	.10	.13	.13	**.46**	.17	.56	.44	1.70
97	.02	.03	.05	-.16	**.68**	.45	.55	1.10
25	.08	.08	.16	-.11	**.57**	.45	.55	1.30

Note: Item *n* = 34; Sf = Straightforwardness, Fr = Friendliness, Ps = Prosocial Behaviors, Cp = Compliance, Tr = Trust, h2 = Communality, u2 = Uniqueness, com = Factor Complexity.

Table 5.

Six-factor solution from Study 1 exploratory factor analysis of agreeableness items (*N* = 722)

Item #	Sf	Fr	Ps	Cp	Tr	Ss	h2	u2	com
52	**.75**	.08	-.09	.11	.20	-.15	.63	.37	1.40
67	**.74**	.06	-.15	.20	.03	-.12	.55	.45	1.30
95	**.66**	.18	-.06	-.02	.01	-.07	.46	.54	1.20
99	**.65**	.07	.08	-.11	-.07	-.09	.41	.59	1.20
33	**.63**	.05	.02	.04	.01	-.05	.44	.56	1.00
91	**.63**	-.13	-.02	.03	-.19	.18	.44	.56	1.50
84	**.62**	-.20	-.06	.19	.15	-.01	.43	.57	1.60
70	**.57**	-.16	.02	.06	-.06	.06	.33	.67	1.20
24	**.56**	.04	.01	-.22	-.14	.18	.39	.61	1.70
88	**.56**	.00	.27	-.12	.01	-.01	.51	.49	1.50
87	.07	**.91**	.03	.03	-.10	-.12	.72	.28	1.10
15	-.07	**.74**	-.23	.05	.03	.11	.50	.50	1.30
40	.04	**.70**	.03	.02	-.05	-.01	.52	.48	1.00
51	.02	**.61**	-.13	.29	-.05	.10	.53	.47	1.60
101	.02	**.59**	.09	-.03	.09	-.08	.43	.57	1.10
21	-.07	**.52**	-.06	-.10	.02	.16	.30	.70	1.30
108	.05	**.48**	.06	-.19	-.05	.04	.24	.76	1.40
1	.06	**.44**	.19	-.03	.10	.04	.45	.55	1.50
63	-.02	**.43**	.15	.21	.07	.03	.50	.50	1.80
41	-.05	-.14	**.84**	.08	.08	-.05	.58	.42	1.10
54	-.11	.11	**.66**	.09	-.07	-.08	.41	.59	1.20
73	.13	.00	**.63**	.05	.13	-.05	.57	.43	1.20
74	.14	.07	**.57**	-.06	.24	-.07	.57	.43	1.60
82	-.03	.17	**.52**	.06	-.05	.07	.46	.54	1.30
7	-.08	-.05	**.50**	.24	-.09	.19	.43	.57	1.90
26	.01	.01	.20	**.65**	-.14	.06	.55	.45	1.30
20	.11	.08	.11	**.64**	-.18	.06	.56	.44	1.30
5	.10	.16	.11	**.46**	.16	-.03	.56	.44	1.70
97	-.01	.00	.07	-.14	**.66**	.04	.42	.58	1.10
25	.04	-.07	.12	-.11	**.64**	.22	.51	.49	1.40
76	-.17	.03	-.05	.05	.10	**.71**	.49	.51	1.20
93	.05	.11	-.16	.13	.25	**.49**	.47	.53	2.10
75	.13	-.07	.10	-.02	.09	**.41**	.28	.72	1.50

Note: Item *n* = 37; Sf = Straightforwardness, Fr = Friendliness, Ps = Prosocial Behaviors, Cp = Compliance, Tr = Trust, Ss = Self-Sacrifice, h2 = Communality, u2 = Uniqueness, com = Factor Complexity

Table 6.

Seven-factor solution from Study 1 exploratory factor analysis of agreeableness items (*N* = 722)

Item #	Md	Sf	Tm	Cp	Al	Fg	Lv	h2	u2	com
91	**.75**	-.09	-.10	.12	.05	-.10	-.05	.47	.53	1.20
24	**.73**	.07	.03	-.13	.09	-.20	-.05	.43	.57	1.30
70	**.55**	-.19	-.06	.07	.02	.10	.10	.36	.64	1.50
33	**.55**	.12	-.03	.02	.09	.09	-.06	.45	.55	1.20
95	**.52**	.18	.18	.04	-.10	.03	-.09	.46	.54	1.70
99	**.51**	.06	.01	-.09	-.02	.13	.05	.36	.64	1.20
67	**.49**	-.04	.07	.20	-.15	.27	-.05	.53	.47	2.20
73	.07	**.67**	-.08	.06	-.05	-.13	.31	.66	.34	1.60
38	-.04	**.63**	-.05	-.12	.03	.07	-.09	.29	.71	1.20
74	.11	**.62**	-.01	.02	.05	-.16	.21	.60	.40	1.50
72	.03	**.58**	.20	.11	.12	-.01	-.05	.71	.29	1.40
49	.02	**.50**	.04	-.01	-.06	.01	-.04	.24	.76	1.10
71	-.08	**.49**	-.03	.09	-.06	.23	.06	.41	.59	1.60
21	-.09	.00	**.69**	-.02	-.14	.00	.04	.38	.62	1.10
40	-.05	.05	**.64**	.05	.01	.12	.06	.59	.41	1.10
108	.10	-.07	**.59**	-.13	-.08	-.08	.17	.32	.68	1.50
87	.07	.10	**.58**	.13	.20	-.03	-.12	.67	.33	1.60
15	-.06	-.04	**.53**	.04	.26	.04	-.11	.43	.57	1.60
20	.09	-.08	-.04	**.92**	-.01	-.12	-.01	.70	.30	1.10
26	.00	-.01	-.01	**.68**	-.04	.01	.09	.50	.50	1.00
53	.16	-.07	-.03	-.09	**.87**	-.02	.15	.77	.23	1.20
65	-.14	.20	-.03	.11	**.42**	.06	.14	.46	.54	2.20
44	.01	.04	.04	-.03	.00	**.65**	-.05	.43	.57	1.00
36	.30	.06	-.12	-.15	.07	**.58**	.11	.59	.41	1.90
54	-.03	.11	.04	.06	.07	-.07	**.56**	.47	.53	1.20
27	-.04	-.14	.15	-.01	.23	.10	**.44**	.38	.62	2.10

Note: Item total = 26 items; Md = Modesty, Sf = Straightforwardness, Tm = Tendermindedness, Cp = Compliance, Al = Altruism, Fg = Forgiveness, Lv = Love, h2 = Communality, u2 = Uniqueness, com = Factor Complexity

Table 7.

Confirmatory factor analysis fit indices for agreeableness items from Study 1 (*N* = 722)

Model	Chi-square (*df*)	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR
Five factors						
Correlated traits	1445.57 (517)	.98	.98	.05	(.047 - .053)	.05
Hierarchical	1625.29 (522)	.98	.98	.05	(.051 - .057)	.06
Bifactor	1233.88 (494)	.99	.98	.05	(.042 - .049)	.05
Six factors						
Correlated traits	1259.10 (480)	.98	.98	.05	(.044 - .051)	.05
Hierarchical	1548.22 (489)	.98	.98	.06	(.052 - .058)	.06
Bifactor	1217.59 (463)	.98	.98	.05	(.044 - .051)	.05
Seven factors						
Correlated traits	605.39 (278)	.99	.99	.04	(.036 - .045)	.05
Hierarchical	1111.64 (292)	.97	.97	.06	(.059 - .066)	.06
Bifactor	939.02 (277)	.98	.97	.06	(.054 - .062)	.06

Note. All chi-square tests are significant at $p < .01$

Table 8.

Factor loadings for five-factor bifactor model of agreeableness items from Study 1

Factor	Item #	*B*	*β*	SE	*z*	Sig.
Straightforwardness	24	1.00	.46	-	-	-
Straightforwardness	33	1.07	.49	.10	1.91	$p < .01$
Straightforwardness	36	1.13	.52	.10	11.79	$p < .01$
Straightforwardness	52	1.21	.55	.11	1.87	$p < .01$
Straightforwardness	56	1.11	.51	.11	1.33	$p < .01$
Straightforwardness	67	1.19	.54	.10	11.74	$p < .01$
Straightforwardness	70	1.14	.52	.11	1.67	$p < .01$
Straightforwardness	84	1.18	.54	.11	1.83	$p < .01$
Straightforwardness	88	1.11	.50	.10	11.20	$p < .01$
Straightforwardness	91	1.23	.56	.10	12.91	$p < .01$
Straightforwardness	95	1.02	.46	.10	1.49	$p < .01$
Straightforwardness	99	1.20	.55	.11	11.44	$p < .01$
Compassion	1	1.00	.29	-	-	
Compassion	15	2.01	.58	.27	7.51	$p < .01$
Compassion	21	1.66	.47	.22	7.40	$p < .01$
Compassion	40	1.63	.46	.21	7.86	$p < .01$
Compassion	51	1.26	.36	.18	7.21	$p < .01$
Compassion	63	.98	.28	.18	5.61	$p < .01$
Compassion	87	1.92	.55	.24	8.08	$p < .01$
Compassion	101	1.41	.40	.19	7.51	$p < .01$
Compassion	108	1.24	.36	.20	6.37	$p < .01$
Friendliness	2	1.00	.06	-	-	-
Friendliness	7	3.20	.19	3.59	.89	$p = .37$
Friendliness	41	6.00	.35	6.87	.87	$p = .38$
Friendliness	54	5.93	.35	7.05	.84	$p = .40$
Friendliness	65	1.18	.07	1.44	.82	$p = .41$
Friendliness	73	4.79	.28	5.27	.91	$p = .36$
Friendliness	74	3.54	.21	3.91	.91	$p = .37$
Friendliness	82	3.78	.22	4.09	.92	$p = .36$
Compliance	5	1.00	.19	-	-	-
Compliance	20	2.19	.41	.46	4.74	$p < .01$
Compliance	26	3.62	.67	1.34	2.70	$p = .01$
Trust	25	1.00	.58	-	-	-
Trust	97	1.00	.58	-	-	-

Table 8.

(continued)

Factor	Item #	*B*	*β*	SE	*z*
Agreeableness	1	1.00	.61	-	-
Agreeableness	2	1.12	.68	.06	**18.08**
Agreeableness	5	1.13	.69	.07	**17.50**
Agreeableness	7	.95	.58	.07	**14.58**
Agreeableness	15	.64	.39	.06	**1.88**
Agreeableness	20	.95	.58	.06	**15.87**
Agreeableness	21	.47	.29	.06	**7.80**
Agreeableness	24	.45	.27	.06	**7.44**
Agreeableness	25	.83	.50	.06	**14.39**
Agreeableness	26	.92	.56	.07	**13.91**
Agreeableness	33	.71	.43	.06	**12.28**
Agreeableness	36	.72	.44	.06	**12.24**
Agreeableness	40	.93	.56	.06	**16.85**
Agreeableness	41	1.03	.63	.07	**14.35**
Agreeableness	51	.96	.58	.06	**16.61**
Agreeableness	52	.87	.53	.06	**14.86**
Agreeableness	54	.87	.53	.07	**12.04**
Agreeableness	56	.43	.26	.06	**7.11**
Agreeableness	63	1.05	.64	.06	**17.86**
Agreeableness	65	.97	.59	.06	**15.60**
Agreeableness	67	.71	.43	.06	**11.66**
Agreeableness	70	.40	.24	.06	**6.52**
Agreeableness	73	1.20	.73	.07	**17.28**
Agreeableness	74	1.19	.72	.07	**18.32**
Agreeableness	82	1.07	.65	.06	**16.61**
Agreeableness	84	.55	.33	.06	**9.01**
Agreeableness	87	1.05	.64	.05	**2.50**
Agreeableness	88	.82	.50	.06	**13.45**
Agreeableness	91	.42	.25	.06	**6.93**
Agreeableness	95	.75	.46	.06	**12.66**
Agreeableness	97	.59	.36	.06	**1.25**
Agreeableness	99	.56	.34	.06	**9.42**
Agreeableness	101	.85	.52	.05	**16.18**
Agreeableness	108	.49	.30	.06	**7.75**

Note. Bold indicates $p < .01$.

Table 9.

Descriptive statistics and Pearson correlations for the cognitive subtests from Study 1 (*N* = 705)

Cognitive Subtest	Mean	SD	Min	Max
Analogies	13.44	5.30	2	28
Calendar	11.20	4.24	0	20
Cube Comparison	21.69	5.24	9	35
Figure Classification	98.97	2.12	50	135
Hidden Patterns	141.31	26.04	88	200
Letter Sets	9.06	3.36	0	15
Math Aptitude	4.01	1.88	1	8
Math Operations	6.59	2.49	2	12
Opposites	9.65	4.31	0	19
Sentence Completion	25.30	4.91	14	30
Subtraction-Multiplication	16.31	7.29	5	33
Surface Development	24.48	13.50	0	60
Vocabulary	21.78	6.00	6	36
Word Beginnings	2.50	8.72	5	44
Word Endings	3.33	9.21	6	53

Note. Around 2.2% of the data was missing on average for every subtest.

Table 10.

Pearson correlations among cognitive subtests from Study 1 (*N* = 705)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.AN	-														
2.CA	.60	-													
3.CC	.15	.25	-												
4.FC	.34	.43	.27	-											
5.HP	.44	.52	.21	.41	-										
6.LS	.52	.62	.20	.38	.49	-									
7.MA	.32	.39	.26	.25	.29	.35	-								
8.MO	.40	.48	.23	.33	.35	.34	.34	-							
9.OP	.38	.43	.23	.28	.28	.36	.25	.29	-						
10.SC	.60	.66	.17	.35	.44	.58	.34	.41	.48	-					
11.SM	.21	.34	.12	.14	.22	.29	.28	.34	.26	.26	-				
12.SD	.49	.57	.40	.46	.55	.50	.35	.42	.31	.40	.22	-			
13.VO	.71	.55	.14	.27	.40	.45	.29	.33	.40	.65	.18	.39	-		
14.WB	.46	.40	.15	.24	.34	.42	.20	.31	.46	.44	.29	.34	.46	-	
15.WE	.35	.30	.17	.17	.25	.31	.14	.22	.35	.34	.25	.27	.34	.53	-

Note: All values are significant at $p < .01$. AN = Analogies, CA = Calendar, CC = Cube Comparison, FC = Figure Classification, HP = Hidden Patterns, LS = Letter Sets, MA = Math Aptitude, MO = Math Operations, OP = Opposites, SC = Sentence Completion, SM = Subtraction-Multiplication, SD = Surface Development, VO = Vocabulary, WB = Word Beginnings, WE = Word Endings.

Table 11.

Confirmatory factor analysis loadings among cognitive subtests from Study 1

Factor	Subtest	*B*	*β*	SE	*z*
Gc	Sentence Completion	4.32	.88	.17	25.83
Gc	Vocabulary	4.46	.74	.20	22.29
Gf	Calendar	3.54	.84	.11	31.23
Gf	Figure Classification	1.89	.53	.75	14.56
Gf	Letters	2.47	.74	.10	24.78
Gq	Math Aptitude	1.05	.55	.07	14.05
Gq	Math Operations	1.66	.66	.10	16.89
Gq	Subtraction-Multiplication	3.69	.49	.32	11.45
Glr	Opposites	2.81	.65	.18	15.53
Glr	Word Beginnings	6.66	.76	.33	2.37
Glr	Word Endings	5.72	.62	.37	15.43
Gv	Cube Comparison	2.20	.42	.23	9.56
Gv	Hidden Patterns	18.05	.69	.84	21.46
Gv	Surface Development	1.88	.81	.48	22.70

Note. All z-scores are significant at $p < .01$.

Table 12.

Zero-order correlations among factor scores and covariates from Study 1 (*N* = 722)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gen	-												
2. Age	**.08**	-											
3.PED	-.03	**-.09**	-										
4. *Gc*	**.09**	**.12**	**.19**	-									
5. *Gf*	.07	.06	**.22**	**.92**	-								
6. *Gq*	.02	.04	**.22**	**.81**	**.94**	-							
7. *Glr*	**.09**	.05	**.19**	**.84**	**.81**	**.79**	-						
8. *Gv*	.03	-.01	**.23**	**.74**	**.93**	**.89**	**.71**	-					
9.AGR	**.25**	**.11**	.01	**.22**	**.19**	**.14**	**.17**	**.15**	-				
10.STR	**.19**	**.21**	-.02	**.07**	.06	.03	.01	.03	**.12**	-			
11.CMPA	**.17**	-.04	-.03	**.13**	**.08**	.03	**.10**	.02	**.19**	**-.24**	-		
12.FRI	.06	-.00	.06	.07	.07	**.08**	.05	.05	**.24**	-.04	**-.28**	-	
13.CMPL	.02	.01	-.01	.01	.03	.03	.00	.04	.07	.04	**-.15**	**-.17**	-
14.TRU	-.01	**-.11**	.02	-.03	-.01	-.01	-.00	.02	**.08**	**-.12**	**.10**	**-.19**	**-.15**

Note. Bold indicates $p < .05$. Gen = Gender, PED = Parents' education level, *Gc* = Crystallized intelligence, *Gf* = Fluid intelligence, *Gq* = Quantitative reasoning, *Glr* = Long-term storage and retrieval ability, *Gv* = Visual ability, AGR = Agreeableness, STR = Straightforwardness, CMPA = Compassion, FRI = Friendliness, CMPL = Compliance, and TRU = Trust.

Table 13.

Hierarchical regression of Gc on covariates and agreeableness facets from Study 1 ($N = 713$)

Predictor	B	95% CI	β	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Gender	**.16**	[.03, .31]	.09	[.02, .16]	.01	[.00, .03]		
PED	**.16**	[.10, .22]	.19	[.12, .26]	.04	[.02, .07]		
							R^2 = **.04**	
							95% CI[.02,.08]	
Gender	.07	[-.07, .20]	.04	[-.04, .11]	.00	[.00, .01]		
PED	**.16**	[.10, .21]	.19	[.12, .26]	.04	[.02, .07]		
Agreeableness	**.35**	[.22, .47]	.21	[.14, .28]	.04	[.02, .07]		
							R^2 = **.09**	ΔR^2 = **.04**
							95% CI[.05,.13]	95% CI[.02, .08]
Gender	.00	[-.15, .13]	.00	[-.08, .07]	.00	[.00, .01]		
PED	**.16**	[.10, .21]	.19	[.12, .25]	.04	[.01, .06]		
Agreeableness	**.27**	[.13, .42]	.17	[.08, .25]	.02	[.00, .05]		
Straightforwardness	.19	[.00, .38]	.08	[.00, .15]	.01	[.00, .02]		
Compassion	**.68**	[.30, 1.05]	.16	[.07, .24]	.02	[.00, .04]		
Friendliness	2.00	[-1.03, 4.73]	.06	[-.03, .15]	.00	[.00, .01]		
Compliance	.21	[-.35, .79]	.03	[-.05, .11]	.00	[.00, .01]		
Trust	-.06	[-.25, .11]	-.03	[-.10, .05]	.00	[.00, .01]		
							R^2 = **.11**	ΔR^2 = **.02**
							95% CI[.07,.16]	95% CI[.01, .05]

Note. Bold indicates $p < .05$. The CI columns indicate a lower- and upper-bound bias-corrected accelerated bootstrapped confidence interval. PED = Caregivers/Parents' aggregated education level.

Table 14.

Hierarchical regression of Gf on covariates and agreeableness facets from Study 1 ($N = 709$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Gender	**.15**	[.01, 28]	.08	[.01, .15]	.01	[.00, .02]		
PED	**.19**	[.13, .24]	.22	[.15, .29]	.05	[.02, .08]		
							R^2 = **.06**	
							95% CI[.03,.09]	
Gender	.06	[-.07, .19]	.03	[-.04, .10]	.00	[.00, .01]		
PED	**.18**	[.13, .24]	.22	[.16, .28]	.05	[.03, .08]		
Agreeableness	**.32**	[.20, .43]	.19	[.12, .26]	.03	[.01, .06]		
							R^2 = **.09**	ΔR^2 = **.04**
							95% CI[.06,.14]	95% CI[.02, .06]
Gender	.02	[-.13, .17]	.01	[-.07, .09]	.00	[.00, .01]		
PED	**.19**	[.13, .24]	.22	[.15, .28]	.05	[.02, .08]		
Agreeableness	**.27**	[.13, .41]	.16	[.08, .25]	.02	[.00, .04]		
Straightforwardness	.13	[-.05, .32]	.05	[-.02, .13]	.00	[.00, .01]		
Compassion	**.41**	[.00, .81]	.09	[.00, .18]	.01	[.00, .02]		
Friendliness	1.28	[-1.62, 4.32]	.04	[-.05, .13]	.00	[.00, .01]		
Compliance	.29	[-.25, .84]	.04	[-.03, .11]	.00	[.00, .01]		
Trust	-.01	[-.19, .19]	.00	[-.08, .08]	.00	[.00, .01]		
							R^2 = **.10**	ΔR^2 = .01
							95% CI[.07,.15]	95% CI[.00, .03]

Note. Bold indicates $p < .05$. The CI columns indicate a lower- and upper-bound bias-corrected accelerated bootstrapped confidence interval. PED = Caregivers'/parents' aggregated education level.

Table 15.

Hierarchical regression of Gq on covariates and agreeableness facets from Study 1 ($N = 715$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Gender	.04	[-.09, .17]	.02	[-.05, .09]	.00	[.00, .01]		
PED	**.18**	[.12, .23]	.23	[.16, .29]	.05	[.03, .09]		
							R^2 = **.05**	
							95% CI[.03,.09]	
Gender	-.02	[-.16, .11]	-.01	[-.09, .06]	.00	[.00, .01]		
PED	**.17**	[.12, .22]	.22	[.15, .29]	.05	[.02, .08]		
Agreeableness	**.23**	[.12, .34]	.15	[.08, .22]	.02	[.01, .04]		
							R^2 = **.07**	ΔR^2 = **.02**
							95% CI[.04,.11]	95% CI[.01, .04]
Gender	-.05	[-.18, .09]	-.03	[-.10, .05]	.00	[.00, .01]		
PED	**.17**	[.12, .23]	.22	[.16, .29]	.05	[.02, .08]		
Agreeableness	**.19**	[.05, .31]	.12	[.04, .20]	.01	[.00, .03]		
Straightforwardness	.07	[-.11, .24]	.03	[-.05, .10]	.00	[.00, .01]		
Compassion	.22	[-.13, .59]	.05	[-.03, .14]	.00	[.00, .01]		
Friendliness	1.61	[-.96, 4.24]	.05	[-.03, .14]	.00	[.00, .01]		
Compliance	.22	[-.31, .69]	.03	[-.04, .10]	.00	[.00, .01]		
Trust	.01	[-.15, .18]	.00	[-.07, .08]	.00	[.00, .01]		
							R^2 = **.08**	ΔR^2 = .00
							95% CI[.05,.12]	95% CI[.00, .02]

Note. Bold indicates $p < .05$. The CI columns indicate a lower- and upper-bound bias-corrected accelerated bootstrapped confidence interval. PED = Caregivers/parents' aggregated education level.

Table 16.

Hierarchical regression of Glr on covariates and agreeableness facets from Study 1 ($N = 709$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Gender	**.16**	[.03, .29]	.09	[.02, .16]	.01	[.00, .03]		
PED	**.16**	[.11, .22]	.20	[.13, .27]	.04	[.02, .07]		
							R^2 = **.05**	
							95% CI[.02,.08]	
Gender	.09	[-.04, .22]	.05	[-.02, .12]	.00	[.00, .01]		
PED	**.16**	[.10, .21]	.20	[.13, .27]	.04	[.02, .07]		
Agreeableness	**.25**	[.14, .36]	.16	[.09, .23]	.02	[.01, .05]		
							R^2 = **.07**	ΔR^2 = **.02**
							95% CI[.04,.12]	95% CI[.01, .05]
Gender	.05	[-.08, .19]	.03	[-.05, .11]	.00	[.00, .01]		
PED	**.16**	[.10, .22]	.20	[.13, .27]	.04	[.02, .07]		
Agreeableness	**.20**	[.07, .33]	.13	[.04, .21]	.01	[.00, .03]		
Straightforwardness	.09	[-.09, .29]	.04	[-.04, .12]	.00	[.00, .01]		
Compassion	**.44**	[.11, .79]	.11	[.03, .19]	.01	[.00, .02]		
Friendliness	1.46	[-1.45, 4.17]	.05	[-.05, .14]	.00	[.00, .01]		
Compliance	.05	[-.47, .63]	.01	[-.07, .09]	.00	[.00, .01]		
Trust	.01	[-.16, .19]	.01	[-.07, .08]	.00	[.00, .01]		
							R^2 = **.08**	ΔR^2 = .01
							95% CI[.06,.13]	95% CI[.00, .03]

Note. Bold indicates $p < .05$. The CI columns indicate a lower- and upper-bound bias-corrected accelerated bootstrapped confidence interval. PED = Caregivers/parents' aggregated education level.

Table 17.

Hierarchical regression of Gv on covariates and agreeableness facets from Study 1 ($N = 711$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Gender	.07	[-.07, .20]	.04	[-.04, .11]	.00	[.00, .01]		
PED	**.19**	[.14, .25]	.24	[.17, .30]	.06	[.03, .09]		
							R^2 = **.06**	
							95% CI[.03,.09]	
Gender	.00	[-.13, .13]	.00	[-.07, .07]	.00	[.00, .01]		
PED	**.19**	[.13, .24]	.23	[.17, .30]	.05	[.03, .09]		
Agreeableness	**.24**	[.13, .35]	.15	[.08, .21]	.02	[.01, .04]		
							R^2 = **.08**	ΔR^2 = **.02**
							95% CI[.05,.12]	95% CI[.01, .05]
Gender	-.01	[-.15, .14]	.00	[-.08, .08]	.00	[.00, .01]		
PED	**.19**	[.13, .24]	.23	[.17, .29]	.05	[.03, .08]		
Agreeableness	**.23**	[.11, .36]	.14	[.07, .22]	.02	[.00, .04]		
Straightforwardness	.03	[-.17, .22]	.01	[-.07, .09]	.00	[.00, .01]		
Compassion	.03	[-.32, .38]	.01	[-.07, .09]	.00	[.00, .01]		
Friendliness	2.26	[-2.55, 2.93]	.01	[-.08, .10]	.00	[.00, .01]		
Compliance	.18	[-.39, .72]	.03	[-.05, .10]	.00	[.00, .01]		
Trust	.05	[-.13, .21]	.02	[-.06, .09]	.00	[.00, .01]		
							R^2 = **.08**	ΔR^2 = .00
							95% CI[.05,.13]	95% CI[.00, .02]

Note. Bold indicates $p < .05$. The CI columns indicate a lower- and upper-bound bias-corrected accelerated bootstrapped confidence interval. PED = Caregivers/parents' aggregated education level.

Table 18.

Confirmatory factor analysis factor loadings for agreeableness items in Study 2 (*N* = 610)

Fac	Item	*B*	*β*	SE	*z*
1	Become frustrated and angry with people when they don't live up to my expectations.	1.00	.29	.00	-
1	Am quick to judge others	.71	.21	.15	4.77
1	When interacting with a group of people, am often bothered by at least one of them.	.75	.22	.15	5.02
1	React strongly to criticism	1.39	.41	.22	6.30
1	Get upset if others change the way that I have arranged things.	1.40	.41	.22	6.48
1	Am annoyed by others' mistakes.	1.18	.35	.17	6.77
1	Can't stand being contradicted.	.96	.28	.16	5.96
1	Get irritated easily.	1.32	.39	.23	5.86
2	Have a sharp tongue.	1.00	.34	.00	-
2	Love a good fight.	1.03	.35	.24	4.30
2	Know how to get around the rules.	1.12	.38	.24	4.63
2	Get back at people who insult me.	.72	.24	.17	4.20
3	Suspect hidden motives in others.	1.00	.41	.00	-
3	Am wary of others.	1.10	.45	.17	6.44
3	Feel that most people can't be trusted.	1.05	.43	.15	7.19
4	Try not to think about the needy.	1.00	.47	.00	-
4	Am not interested in other people's problems.	.71	.33	.25	2.90
4	Believe people should fend for themselves.	.55	.26	.18	3.05
5	Think highly of myself.	1.00	.60	.00	-
5	Am more capable than most others.	1.00	.60	.00	-
A	Become frustrated and angry with people when they don't live up to my expectations.	1.00	.73	.00	-
A	Am quick to judge others	1.04	.76	.03	35.86
A	When interacting with a group of people, am often bothered by at least one of them.	.99	.72	.03	31.95
A	React strongly to criticism	.81	.59	.04	19.76
A	Get upset if others change the way that I have arranged things.	.86	.63	.04	22.47
A	Am annoyed by others' mistakes.	.95	.70	.03	29.71
A	Can't stand being contradicted.	.87	.63	.03	26.69
A	Get irritated easily.	.93	.68	.03	3.50
A	Have a sharp tongue.	.92	.67	.04	23.29
A	Love a good fight.	.92	.67	.04	25.13

Table 18.

(continued)

Fac	Item	*B*	*β*	SE	*z*
A	Know how to get around the rules.	.86	.63	.04	24.32
A	Get back at people who insult me.	1.01	.74	.03	31.08
A	Suspect hidden motives in others.	.96	.70	.04	25.65
A	Am wary of others.	.84	.61	.04	19.14
A	Feel that most people can't be trusted.	.90	.66	.04	2.45
A	Try not to think about the needy.	.92	.67	.03	27.25
A	Am not interested in other people's problems.	.93	.68	.03	26.46
A	Believe people should fend for themselves.	.90	.66	.03	25.75
A	Think highly of myself.	.54	.39	.04	12.44
A	Am more capable than most others.	.64	.47	.04	15.44

Note. All z-tests were significant at $p < .01$. Fac = Factor, Factor 1 = Tolerance, Factor 2 = Cooperation, Factor 3 = Trust, Factor 4 = Compassion, Factor 5 = Modesty, A = Agreeableness.

Table 19.

Descriptive statistics and Pearson correlations for the PDSQ scales in Study 2 (*N* = 610)

Scale	Mean	SD	min	max	% Missing
Agoraphobia	2.22	3.30	0	11	.00
Alcohol use disorder	1.61	1.95	0	6	.16
Binge-eating disorder	2.87	3.14	0	10	.16
Drug use disorder	1.29	1.82	0	6	.16
Generalized anxiety disorder	3.89	3.33	0	10	.00
Hypochondriasis (*Illness anxiety*) disorder	1.36	1.61	0	5	.16
Major depressive disorder	7.05	6.20	0	21	.00
Obsessive-compulsive disorder	1.78	2.06	0	7	.16
Panic disorder	2.38	2.56	0	8	.00
Posttraumatic stress disorder	2.72	4.13	0	14	.00
Psychosis	1.33	1.80	0	6	.00
Social phobia	5.61	4.59	0	15	.00
Somatization (*Somatic symptom*) disorder	1.54	1.55	0	5	.00
Total PDSQ Score	35.68	3.61	0	124	.00

Scale	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Agora	-												
2. AUD	.42	-											
3. BED	.52	.62	-										
4. DUD	.47	.78	.67	-									
5. GAD	.54	.47	.60	.52	-								
6. HD	.51	.69	.65	.73	.60	-							
7. MDD	.57	.63	.74	.66	.75	.72	-						
8. OCD	.54	.66	.72	.73	.56	.67	.68	-					
9. PD	.62	.63	.69	.67	.69	.73	.74	.70	-				
1. PTSD	.58	.43	.48	.45	.42	.48	.52	.49	.49	-			
11. Psych	.46	.77	.73	.85	.49	.72	.67	.81	.70	.49	-		
12. SP	.56	.54	.66	.54	.73	.60	.74	.61	.66	.42	.58	-	
13. SD	.55	.64	.67	.70	.67	.74	.72	.65	.73	.51	.69	.60	-

Note. All values are significant at $p < .01$. Missing cases were approximately .20% for each variable. Italics reflects current DSM-5 diagnostic categories that have replaced DSM-IV categories, which are scale symptom clusters in the PDSQ. Bold indicates $p < .01$. Agora = Agoraphobia, AUD = Alcohol use disorder, BED = Binge-eating disorder, DUD = Drug use disorder, GAD = Generalized anxiety disorder, HD = Hypochondriasis (*Illness anxiety*) disorder, MDD = Major depressive disorder, OCD = Obsessive-compulsive disorder, PD = Panic disorder, PTSD = Posttraumatic stress disorder, Psych = Psychosis, SP = Social phobia, SD = Somatization (*Somatic symptom*) disorder.

Table 20.

Confirmatory factor analysis fit indices for PDSQ scale scores from Study 2 (*N* = 610)

Model	Chi-square (*df*)	CFI	TLI	BIC	RMSEA	RMSEA 90% CI	SRMR
Two factors							
Subfactors only	155.23 (37)	.98	.97	27434.07	.07	(.061 - .084)	.03
Unidimensional	155.23 (37)	.98	.97	27434.07	.07	(.061 - .084)	.03
Three factors							
Subfactors only	75.34 (19)	.99	.97	24154.50	.07	(.054 - .087)	.02
With internalizing	75.34 (19)	.99	.97	24154.50	.07	(.054 - .087)	.02
Unidimensional	72.19 (20)	.99	.98	24144.94	.07	(.050 - .082)	.02
Four factors							
Subfactors only	11.44 (33)	.99	.98	27414.94	.06	(.049 - .075)	.02
With internalizing	111.37 (34)	.99	.98	27409.45	.06	(.049 - .074)	.02
Unidimensional	155.23 (37)	.98	.97	27434.07	.07	(.061 - .084)	.03

Note. All chi-square tests were significant at $p < .01$. The four factors category includes models with summed PDSQ scales representing symptom components of the somatoform, fear, distress, and substance use disorders subfactors of the HiTOP taxonomy (Kotov et al., 2017). Potential additional subfactors (e.g., thought disorder and eating pathology) and their associated symptom component scales in the PDSQ (psychosis and binge-eating disorder, respectively) were not included in all models due to only one predictor present to measure them. The three-factor category indicates models that were tested with the PDSQ scales previously (Walton, Pantoja, & McDermut, 2017), with only nine scales defining distress, fear, and substance use subfactors. The two-factor category includes models testing with only a broad spectrum of internalizing and a substance use disorder subfactor.

Table 21.

Confirmatory factor analysis factor loadings for PDSQ scales in Study 2 (N = 610)

Factor	Scale	*B*	*β*	SE	*z*
DIST	GAD	2.69	.81	.09	31.35
DIST	MDD	5.62	.91	.16	34.96
DIST	PTSD	2.38	.58	.18	13.33
FEA	AGORA	2.22	.68	.13	16.91
FEA	OCD	1.64	.80	.07	24.51
FEA	PAN	2.28	.89	.06	39.83
FEA	SOC	3.48	.76	.13	26.26
SOM	HYPO	1.39	.86	.04	33.14
SOM	SSD	1.33	.86	.04	32.82
SUD	AUD	1.66	.85	.06	28.41
SUD	DUD	1.66	.92	.06	29.84

Note. All z-tests were significant at $p < .01$. DIST = Distress, FEA = Fear, SOM = Somatoform, SUD = Substance Use Disorders, GAD = Generalized Anxiety Disorder, MDD = Major Depressive Disorder, PTSD = Posttraumatic Stress Disorder, AGORA = Agoraphobia, OCD = Obsessive-Compulsive Disorder, PAN = Panic disorder, SOC = Social Phobia, HYPO = Hypochondriasis/Illness Anxiety Disorder, SSD = Somatization Disorder/Somatic Symptom Disorder, AUD = Alcohol Use Disorder, DUD = Drug Use Disorder.

Table 22.

Descriptive statistics and Pearson correlations for PID-5-BF scales in Study 2 (*N* = 610).

Scale	Mean	SD	min	max
Antagonism	12.28	5.59	5	24
Detachment	13.72	5.11	5	25
Disinhibition	12.35	5.57	5	24
Negative affect	13.71	5.00	5	24
Psychoticism	12.53	5.45	5	24

Scale	1	2	3	4	5
1. Antagonism	-				
2. Detachment	**.68**	-			
3. Disinhibition	**.86**	**.72**	-		
4. Negative affect	**.72**	**.76**	**.74**	-	
5. Psychoticism	**.86**	**.74**	**.86**	**.78**	-

Note. No missing cases were found in these variables. All scale scores were significant at $p < .01$

Table 23.

Confirmatory factor analysis fit indices for PID-5-BF items from Study 2 (*N* = 607)

Model	Chi-square (*df*)	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR
Correlated factors	536.33 (265)	1.00	1.00	.04	.036 - .046	.04
Orthogonal factors	166186.59 (275)	.27	.21	1.00	.994 – 1.002	.52
Unidimensional	1067.78 (275)	1.00	1.00	.07	.065 - .073	.05

Note. All chi-square tests were significant at $p < .01$.

Table 24.

Confirmatory factor analysis factor loadings for PID-5-BF items in Study 2 (N = 607)

Factor	Item	*B*	*β*	SE	*z*
Antagonism	17	1.00	.88	.00	-
Antagonism	19	.92	.81	.02	52.27
Antagonism	20	.90	.79	.02	49.42
Antagonism	22	1.03	.90	.02	67.23
Antagonism	25	1.00	.88	.02	66.17
Detachment	4	1.00	.85	.00	-
Detachment	13	.90	.76	.03	27.41
Detachment	14	.84	.71	.03	25.14
Detachment	16	.89	.75	.03	27.50
Detachment	18	.92	.78	.03	27.33
Disinhibition	1	1.00	.90	.00	-
Disinhibition	2	.98	.88	.01	89.11
Disinhibition	3	.98	.88	.01	89.91
Disinhibition	5	.94	.84	.01	65.03
Disinhibition	6	.88	.79	.02	54.34
Negative affect	8	1.00	.66	.00	-
Negative affect	9	1.18	.78	.06	21.33
Negative affect	10	1.07	.71	.05	2.33
Negative affect	11	1.29	.86	.06	21.51
Negative affect	15	1.15	.76	.05	21.43
Psychoticism	7	1.00	.85	.00	-
Psychoticism	12	1.05	.89	.02	56.90
Psychoticism	21	.94	.80	.02	49.36
Psychoticism	23	.94	.80	.02	5.36
Psychoticism	24	.99	.84	.02	61.37

Note. All z-tests were significant at $p < .01$.

Table 25.

Correlations among covariates, agreeableness facets, PDSQ factor scores, and PID factors in Study 2 ($N = 610$)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	-											
2. Gen	**.13**	-										
3. MI	-.06	**.12**	-									
4. AGR	**.14**	**.09**	**-.25**	-								
5. TOL	-.05	**-.17**	**-.16**	**.23**	-							
6. COP	**.10**	**.13**	.01	**.18**	**-.44**	-						
7. TRU	.03	**-.09**	**-.13**	**.09**	.03	**-.31**	-					
8. COM	.01	**.13**	.06	**.14**	**-.29**	**-.10**	**-.28**	-				
9. MOD	.01	**.09**	**.11**	.05	**-.28**	**.13**	**-.31**	.07	-			
10. DIST	**-.12**	.06	**.47**	**-.57**	**-.25**	**-.11**	**-.10**	-.03	**.11**	-		
11. FEA	**-.13**	.05	**.47**	**-.59**	**-.21**	**-.13**	**-.08**	-.05	.06	**.97**	-	
12. SOM	**-.11**	.02	**.44**	**-.61**	**-.19**	**-.15**	-.05	**-.09**	.04	**.96**	**.98**	-
13. SUD	**-.10**	-.04	**.34**	**-.61**	**-.10**	**-.21**	.06	**-.17**	-.05	**.83**	**.85**	**.93**
14. ANT	**-.16**	**-.11**	**.23**	**-.83**	**-.12**	**-.26**	**.10**	**-.23**	**-.11**	**.61**	**.64**	**.67**
15. DET	**-.13**	-.06	**.32**	**-.79**	**-.29**	-.07	**-.13**	**-.13**	**.10**	**.68**	**.68**	**.68**
16. DIS	**-.16**	**-.10**	**.26**	**-.82**	**-.16**	**-.23**	.05	**-.20**	-.05	**.64**	**.66**	**.68**
17. NA	**-.14**	-.05	**.31**	**-.83**	**-.31**	**-.10**	-.08	**-.12**	.06	**.68**	**.69**	**.70**
18. PSY	**-.16**	**-.09**	**.27**	**-.83**	**-.19**	**-.21**	.03	**-.19**	-.04	**.66**	**.68**	**.70**

Table 25.

(continued)

Variable	13	14	15	16	17	18
13. SUD	-					
14. ANT	**.69**	-				
15. DET	**.64**	**.86**	-			
16. DIS	**.69**	**.98**	**.90**	-		
17. NA	**.66**	**.92**	**.97**	**.94**	-	
18. PSY	**.69**	**.98**	**.92**	**.99**	**.96**	-

Note. Bold indicates $p < .05$. Gen = Gender, MI = mental illness, TOL = tolerance, COP = cooperation, TRU = trust, COM = compassion, MOD = modesty, AGR = agreeableness, DIST = distress, FEA = fear, SOM = somatoform, SUD = substance use disorders, ANT = antagonism, DET = detachment, DIS = disinhibition, NA = negative affect, PSY = psychoticism

Table 26.

Hierarchical regression of distress on covariates and agreeableness facets from Study 2 (*N* = 603)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Age	**-.02**	[-.02, -.01]	-.15	[-.22, -.08]	.02	[.01, .04]		
Gender	.06	[-.07, .20]	.03	[-.04, .10]	.00	[.00, .01]		
Mental illness	**.92**	[.77, 1.05]	.45	[.38, .52]	.20	[.14, .26]		
							R^2 = **.24**	
							95% CI[.19,.31]	
Age	-.01	[-.01, .00]	-.06	[-.12, .00]	.00	[.00, .01]		
Gender	**.15**	[.05, .26]	.08	[.02, .14]	.01	[.00, .02]		
Mental illness	**.66**	[.54, .79]	.33	[.27, .39]	.10	[.06, .14]		
Agreeableness	**-.70**	[-.80, -.62]	-.50	[-.55, -.44]	.22	[.16, .27]		
							R^2 = **.46**	ΔR^2 = **.22**
							95% CI[.42,.52]	95% CI[.17, .27]
Age	**-.01**	[-.01, .00]	-.06	[-.12, -.01]	.00	[.00, .01]		
Gender	**.12**	[.02, .23]	.06	[.01, .12]	.00	[.00, .01]		
Mental illness	**.64**	[.50, .78]	.31	[.25, .38]	.09	[.05, .13]		
Agreeableness	**-.62**	[-.74, -.51]	-.44	[-.52, -.36]	.10	[.06, .14]		
Tolerance	**-.69**	[-1.19, -.24]	-.13	[-.23, -.05]	.01	[.00, .02]		
Cooperation	**-.57**	[-.96, -.17]	-.11	[-.19, -.03]	.01	[.00, .01]		
Trust	-.12	[-.40, .18]	-.03	[-.11, .05]	.00	[.00, .01]		
Compassion	-.17	[-.43, .10]	-.05	[-.13, .03]	.00	[.00, .01]		
Modesty	**.17**	[.02, .31]	.08	[.01, .14]	.00	[.00, .01]		
							R^2 = **.48**	ΔR^2 = **.02**
							95% CI[.43,.54]	95% CI[.01, .04]

Note. Bold indicates $p < .05$.

Table 27.

Hierarchical regression of fear on covariates and agreeableness facets from Study 2 ($N = 602$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Age	**-.02**	[-.02, -.01]	-.17	[-.23, -.10]	.03	[.01, .05]		
Gender	.04	[-.10, .18]	.02	[-.05, .09]	.00	[.00, .01]		
Mental illness	**.93**	[.79, 1.07]	.46	[.39, .52]	.20	[.15, .27]		
							R^2 = **.25**	
							95% CI[.20,.32]	
Age	**-.01**	[-.01, .00]	-.08	[-.13, -.02]	.01	[.00, .02]		
Gender	**.13**	[.03, .23]	.07	[.01, .12]	.00	[.00, .01]		
Mental illness	**.66**	[.54, .79]	.32	[.26, .39]	.10	[.06, .13]		
Agreeableness	**-.73**	[-.82, -.65]	-.52	[-.57, -.46]	.24	[.19, .29]		
							R^2 = **.49**	ΔR^2 = **.24**
							95% CI[.44,.55]	95% CI[.18, .29]
Age	**-.01**	[-.01, .00]	-.08	[-.13, -.03]	.01	[.00, .02]		
Gender	**.12**	[.00, .22]	.06	[.00, .12]	.00	[.00, .01]		
Mental illness	**.65**	[.52, .77]	.32	[.26, .38]	.09	[.06, .13]		
Agreeableness	**-.66**	[-.78, -.55]	-.47	[-.54, -.39]	.11	[.07, .15]		
Tolerance	**-.52**	[-.97, -.03]	-.10	[-.18, -.01]	.00	[.00, .01]		
Cooperation	**-.53**	[-.91, -.09]	-.10	[-.18, -.02]	.00	[.00, .01]		
Trust	-.05	[-.33, .24]	-.01	[-.09, .07]	.00	[.00, .00]		
Compassion	-.14	[-.38, .16]	-.04	[-.11, .04]	.00	[.00, .01]		
Modesty	.08	[-.06, .22]	.04	[-.03, .10]	.00	[.00, .01]		
							R^2 = **.50**	ΔR^2 = **.01**
							95% CI[.45,.56]	95% CI[.00, .03]

Note. Bold indicates $p < .05$.

Table 28.

Hierarchical regression of somatoform on covariates and agreeableness facets from Study 2 ($N = 602$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
log(Age)	**-.64**	[-.92, -.38]	-.17	[-.24, -.10]	.03	[.01, .06]		
Gender	.01	[-.13, .15]	.00	[-.07, .08]	.00	[.00, .01]		
Mental illness	**.86**	[.70, 1.02]	.42	[.35, .49]	.17	[.12, .24]		
							R^2 = **.22**	
							95% CI[.17,.30]	
log(Age)	**-.26**	[-.47, -.06]	-.07	[-.12, -.02]	.00	[.00, .01]		
Gender	.10	[-.01, .20]	.05	[-.00, .11]	.00	[.00, .01]		
Mental illness	**.57**	[.44, .70]	.28	[.22, .34]	.07	[.04, .11]		
log(Agreeableness)	**-1.44**	[-1.60, -1.29]	-.56	[-.60, -.50]	.27	[.22, .33]		
							R^2 = **.50**	ΔR^2 = **.27**
							95% CI[.45,.55]	95% CI[.22, .33]
log(Age)	**-.25**	[-.45, -.05]	-.07	[-.12, -.01]	.00	[.00, .01]		
gender	.10	[-.01, .20]	.05	[-.00, .11]	.00	[.00, .01]		
Mental illness	**.57**	[.44, .69]	.28	[.22, .34]	.07	[.04, .10]		
log(Agreeableness)	**-1.31**	[-1.51, -1.10]	-.50	[-.58, -.43]	.13	[.09, .17]		
Tolerance	**-.54**	[-.97, -.09]	-.10	[-.19, -.02]	.00	[.00, .01]		
Cooperation	**-.63**	[-1.01, -.24]	-.12	[-.20, -.05]	.01	[.00, .02]		
Trust	.00	[-.27, .27]	.00	[-.08, .08]	.00	[.00, .00]		
Compassion	-.26	[-.51, .00]	-.07	[-.15, .00]	.00	[.00, .01]		
Modesty	.10	[-.04, .23]	.04	[-.02, .10]	.00	[.00, .01]		
							R^2 = **.51**	ΔR^2 = **.02**
							95% CI[.46,.57]	95% CI[.01, .03]

Note. Bold indicates $p < .05$.

Table 29.

Hierarchical regression of substance use disorders on covariates and agreeableness facets from Study 2 ($N = 606$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
log(Age)	**-.63**	[-.91, -.34]	-.17	[-.24, -.09]	.03	[.01, .05]		
gender	-.11	[-.26, .03]	-.06	[-.13, .01]	.00	[.00, .02]		
Mental illness	**.69**	[.53, .84]	.34	[.26, .41]	.11	[.07, .16]		
							R^2 = **.16**	
							95% CI[.11,.22]	
log(Age)	**-.22**	[-.44, -.01]	-.06	[-.12, .00]	.00	[.00, .01]		
Gender	-.01	[-.12, .09]	-.01	[-.06, .05]	.00	[.00, .00]		
Mental illness	**.39**	[.26, .54]	.19	[.13, .26]	.03	[.01, .06]		
log(Agreeableness)	**-1.51**	[-1.69, -1.35]	-.58	[-.63, -.53]	.30	[.24, .36]		
							R^2 = **.46**	ΔR^2 = **.30**
							95% CI[.41,.51]	95% CI[.24, .36]
log(Age)	-.21	[-.42, .01]	-.06	[-.11, .00]	.00	[.00, .01]		
Gender	.02	[-.09, .13]	.01	[-.05, .07]	.00	[.00, .00]		
Mental illness	**.42**	[.28, .56]	.21	[.14, .27]	.04	[.02, .07]		
log(Agreeableness)	**-1.39**	[-1.62, -1.20]	-.54	[-.61, -.47]	.16	[.12, .21]		
Tolerance	-.23	[-.67, .25]	-.05	[-.13, .05]	.00	[.00, .01]		
Cooperation	**-.61**	[-1.01, -.16]	-.12	[-.19, -.03]	.01	[.00, .02]		
Trust	.20	[-.07, .48]	.06	[-.02, .13]	.00	[.00, .01]		
Compassion	**-.36**	[-.61, -.11]	-.10	[-.18, -.03]	.01	[.00, .02]		
Modesty	.06	[-.08, .19]	.03	[-.03, .08]	.00	[.00, .01]		
							R^2 = **.48**	ΔR^2 = **.03**
							95% CI[.44,.54]	95% CI[.01, .05]

Note. Bold indicates $p < .01$.

Table 30.

Hierarchical regression of antagonism on covariates and agreeableness facets from Study 2 (*N* = 598)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Age	**-.02**	[-.03, -.01]	-.22	[-.30, -.14]	.05	[.02, .09]		
Gender	**-.18**	[-.30, -.04]	-.11	[-.18, -.03]	.01	[.00, .03]		
Mental illness	**.43**	[.29, .56]	.24	[.17, .31]	.06	[.03, .09]		
							R^2 = **.13**	
							95% CI[.08,.19]	
Age	**-.01**	[-.01, .00]	-.07	[-.12, -.03]	.00	[.00, .01]		
Gender	-.05	[-.13, .02]	-.03	[-.07, .01]	.00	[.00, .01]		
Mental illness	.06	[-.01, .14]	.03	[-.01, .08]	.00	[.00, .01]		
Agreeableness	**-1.03**	[-1.09, -.98]	-.83	[-.86, -.79]	.61	[.54, .66]		
							R^2 = **.73**	ΔR^2 = **.61**
							95% CI[.69,.77]	95% CI[.54, .66]
Age	**-.01**	[-.01, .00]	-.07	[-.12, -.03]	.00	[.00, .01]		
Gender	.00	[-.07, .06]	-.00	[-.04, .04]	.00	[.00, .00]		
Mental illness	**.10**	[.03, .17]	.06	[.01, .10]	.00	[.00, .01]		
Agreeableness	**-.98**	[-1.05, -.91]	-.78	[-.83, -.73]	.32	[.26, .37]		
Tolerance	-.11	[-.39, .17]	-.02	[-.08, .04]	.00	[.00, .00]		
Cooperation	**-.51**	[-.76, -.24]	-.11	[-.17, -.05]	.01	[.00, .01]		
Trust	**.22**	[.06, .40]	.07	[.02, .13]	.00	[.00, .01]		
Compassion	**-.33**	[-.49, -.16]	-.11	[-.16, -.05]	.01	[.00, .01]		
Modesty	-.04	[-.13, .04]	-.02	[-.06, .02]	.00	[.00, .00]		
							R^2 = **.77**	ΔR^2 = **.03**
							95% CI[.73,.80]	95% CI[.02, .05]

Note. Bold indicates p < .05.

Table 31.

Hierarchical regression of detachment on covariates and agreeableness facets from Study 2 ($N = 603$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Age	**-.02**	[-.02, -.01]	-.18	[-.25, -.10]	.03	[.01, .06]		
Gender	-.10	[-.22, .01]	-.06	[-.14, .01]	.00	[.00, .02]		
Mental illness	**.53**	[.43, .66]	.31	[.25, .39]	.10	[.06, .14]		
							R^2 = **.14**	
							95% CI[.10,.20]	
Age	.00	[-.01, .00]	-.04	[-.09, .01]	.00	[.00, .01]		
Gender	.01	[-.07, .09]	.00	[-.04, .05]	.00	[.00, .00]		
Mental illness	**.21**	[.13, .29]	.12	[.08, .17]	.01	[.01, .03]		
Agreeableness	**-.91**	[-.97, -.85]	-.77	[-.80, -.72]	.52	[.46, .58]		
							R^2 = **.67**	ΔR^2 = **.52**
							95% CI[.62,.72]	95% CI[.46, .58]
Age	.00	[-.01, .00]	-.05	[-.09, .00]	.00	[.00, .01]		
Gender	-.03	[-.11, .05]	-.02	[-.07, .03]	.00	[.00, .00]		
Mental illness	**.17**	[.10, .25]	.10	[.06, .15]	.01	[.00, .02]		
Agreeableness	**-.83**	[-.91, -.75]	-.70	[-.76, -.64]	.25	[.20, .30]		
Tolerance	**-.68**	[-.99, -.35]	-.16	[-.23, -.08]	.01	[.00, .02]		
Cooperation	-.28	[-.54, .03]	-.06	[-.13, .01]	.00	[.00, .01]		
Trust	**-.29**	[-.49, -.10]	-.10	[-.16, -.03]	.00	[.00, .01]		
Compassion	**-.31**	[-.48, -.14]	-.11	[-.17, -.05]	.01	[.00, .01]		
Modesty	**.17**	[.06, .27]	.09	[.03, .14]	.01	[.00, .02]		
							R^2 = **.70**	ΔR^2 = **.03**
							95% CI[.66,.74]	95% CI[.02, .06]

Note. Bold indicates $p < .05$.

Table 32.

Hierarchical regression of disinhibition on covariates and agreeableness facets from Study 2 ($N = 600$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Age	**-.02**	[-.03, -.01]	-.23	[-.30, -.16]	.05	[.02, .08]		
Gender	**-.16**	[-.29, -.05]	-.10	[-.17, -.03]	.01	[.00, .03]		
Mental illness	**.48**	[.35, .61]	.26	[.19, .33]	.07	[.04, .10]		
							R^2 = **.14**	
							95% CI[.09,.20]	
Age	**-.01**	[-.01, .00]	-.08	[-.13, -.04]	.01	[.00, .01]		
Gender	-.04	[-.11, .04]	-.02	[-.06, .02]	.00	[.00, .00]		
Mental illness	**.11**	[.03, .18]	.06	[.01, .10]	.00	[.00, .01]		
Agreeableness	**-1.05**	[-1.10, -.99]	-.81	[-.84, -.78]	.58	[.52, .64]		
							R^2 = **.72**	ΔR^2 = **.58**
							95% CI[.68,.76]	95% CI[.52, .64]
Age	**-.01**	[-.01, .00]	-.08	[-.12, -.04]	.01	[.00, .01]		
Gender	-.01	[-.08, .07]	-.00	[-.05, .04]	.00	[.00, .00]		
Mental illness	**.13**	[.06, .21]	.07	[.03, .11]	.00	[.00, .01]		
Agreeableness	**-.98**	[-1.05, -.91]	-.76	[-.81, -.71]	.30	[.24, .35]		
Tolerance	-.25	[-.56, .06]	-.05	[-.12, .01]	.00	[.00, .01]		
Cooperation	**-.54**	[-.81, -.25]	-.11	[-.17, -.05]	.01	[.00, .01]		
Trust	.14	[-.04, .34]	.04	[-.01, .10]	.00	[.00, .01]		
Compassion	**-.33**	[-.49, -.15]	-.10	[-.16, -.04]	.01	[.00, .01]		
Modesty	.04	[-.06, .13]	.02	[-.03, .06]	.00	[.00, .00]		
							R^2 = **.75**	ΔR^2 = **.02**
							95% CI[.71,.78]	95% CI[.01, .04]

Note. Bold indicates $p < .05$.

Table 33.

Hierarchical regression of negative affect on covariates and agreeableness facets from Study 2 (*N* = 603)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Age	**-.01**	[-.02, -.01]	-.19	[-.27, -.12]	.04	[.01, .07]		
Gender	-.07	[-.17, .02]	-.06	[-.13, .02]	.00	[.00, .02]		
Mental illness	**.41**	[.31, .50]	.30	[.23, .37]	.09	[.05, .13]		
							R^2 = **.14**	
							95% CI[.10,.20]	
Age	.00	[-.01, .00]	-.05	[-.10, -.01]	.00	[.00, .01]		
Gender	.02	[-.04, .07]	.01	[-.03, .06]	.00	[.00, .00]		
Mental illness	**.14**	[.08, .20]	.10	[.06, .15]	.01	[.00, .02]		
Agreeableness	**-.76**	[-.80, -.72]	-.81	[-.84, -.77]	.58	[.52, .63]		
							R^2 = **.72**	ΔR^2 = **.58**
							95% CI[.68,.77]	95% CI[.52, .64]
Age	.00	[-.01, .00]	-.06	[-.10, -.01]	.00	[.00, .01]		
Gender	-.01	[-.06, .05]	-.01	[-.05, .04]	.00	[.00, .00]		
Mental illness	**.12**	[.06, .18]	.09	[.04, .13]	.01	[.00, .02]		
Agreeableness	**-.69**	[-.74, -.64]	-.74	[-.79, -.68]	.28	[.23, .33]		
Tolerance	**-.56**	[-.78, -.33]	-.16	[-.23, -.10]	.01	[.00, .02]		
Cooperation	**-.28**	[-.48, -.07]	-.08	[-.14, -.02]	.00	[.00, .01]		
Trust	-.12	[-.25, .01]	-.05	[-.11, .01]	.00	[.00, .01]		
Compassion	**-.19**	[-.31, -.07]	-.08	[-.13, -.03]	.00	[.00, .01]		
Modesty	**.08**	[.01, .16]	.06	[.01, .11]	.00	[.00, .01]		
							R^2 = **.74**	ΔR^2 = **.02**
							95% CI[.71,.79]	95% CI[.01, .04]

Note. Bold indicates $p < .05$.

Table 34.

Hierarchical regression of psychoticism on covariates and agreeableness facets from Study 2 ($N = 600$)

Predictor	*B*	95% CI	*β*	95% CI	sr^2	95% CI	Model Fit	R^2 Change
Age	**-.02**	[-.03, -.01]	-.23	[-.31, -.15]	.05	[.02, .09]		
Gender	**-.14**	[-.25, -.02]	-.08	[-.15, -.01]	.01	[.00, .02]		
Mental illness	**.47**	[.34, .59]	.27	[.20, .33]	.07	[.04, .11]		
							R^2 = **.14**	
							95% CI[.10,.20]	
Age	**-.01**	[-.01, .00]	-.08	[-.13, -.04]	.01	[.00, .02]		
Gender	-.02	[-.08, .05]	-.01	[-.05, .03]	.00	[.00, .00]		
Mental illness	**.11**	[.04, .18]	.06	[.02, .10]	.00	[.00, .01]		
Agreeableness	**-1.00**	[-1.06, -.95]	-.82	[-.85, -.79]	.60	[.54, .66]		
							R^2 = **.74**	ΔR^2 = **.60**
							95% CI[.70,.78]	95% CI[.54, .65]
Age	**-.01**	[-.01, .00]	-.08	[-.12, -.04]	.01	[.00, .01]		
Gender	.00	[-.07, .06]	.00	[-.04, .04]	.00	[.00, .00]		
Mental illness	**.13**	[.06, .20]	.07	[.03, .12]	.00	[.00, .01]		
Agreeableness	**-.94**	[-1.00, -.87]	-.77	[-.82, -.72]	.31	[.25, .36]		
Tolerance	**-.35**	[-.65, -.06]	-.08	[-.14, -.01]	.00	[.00, .01]		
Cooperation	**-.47**	[-.72, -.22]	-.10	[-.16, -.05]	.00	[.00, .01]		
Trust	.07	[-.11, .27]	.02	[-.04, .09]	.00	[.00, .00]		
Compassion	**-.30**	[-.47, -.15]	-.10	[-.16, -.05]	.01	[.00, .01]		
Modesty	.02	[-.07, .12]	.01	[-.03, .06]	.00	[.00, .00]		
							R^2 = **.76**	ΔR^2 = **.02**
							95% CI[.72,.80]	95% CI[.01, .03]

Note. Bold indicates $p < .05$.

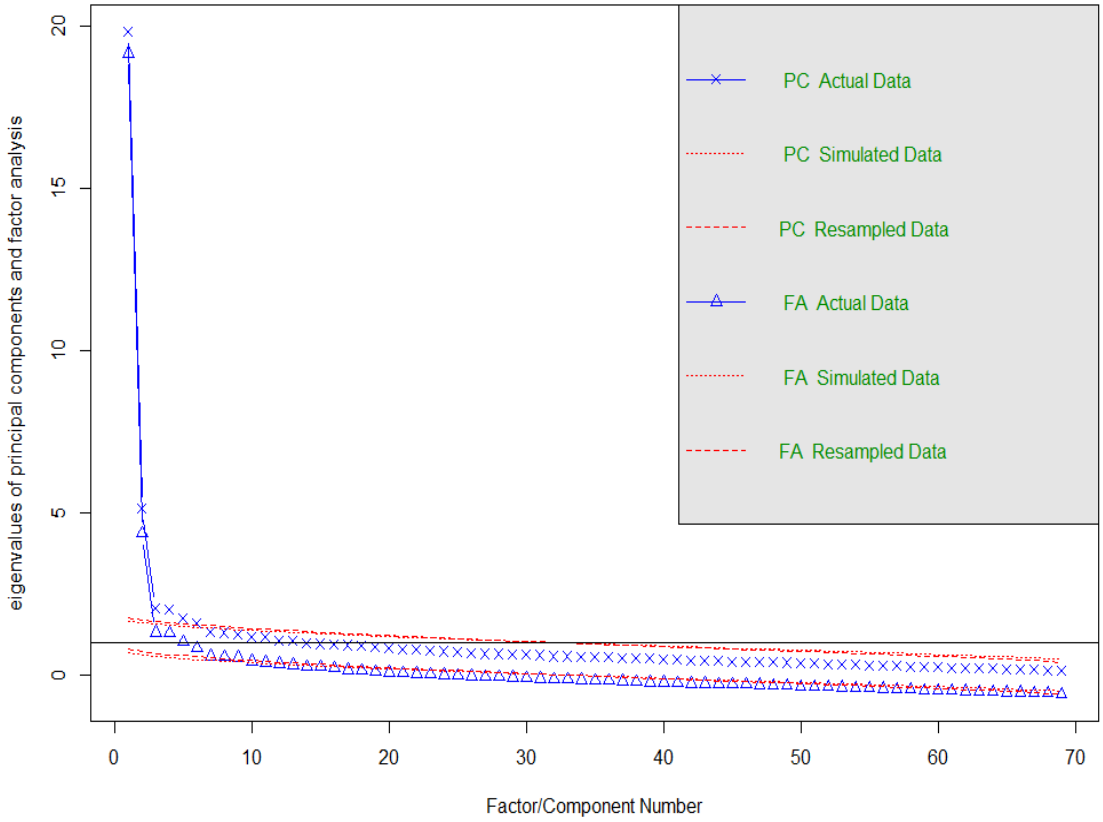

Figure 1. *Parallel analysis of IPIP agreeableness items from Study 1*

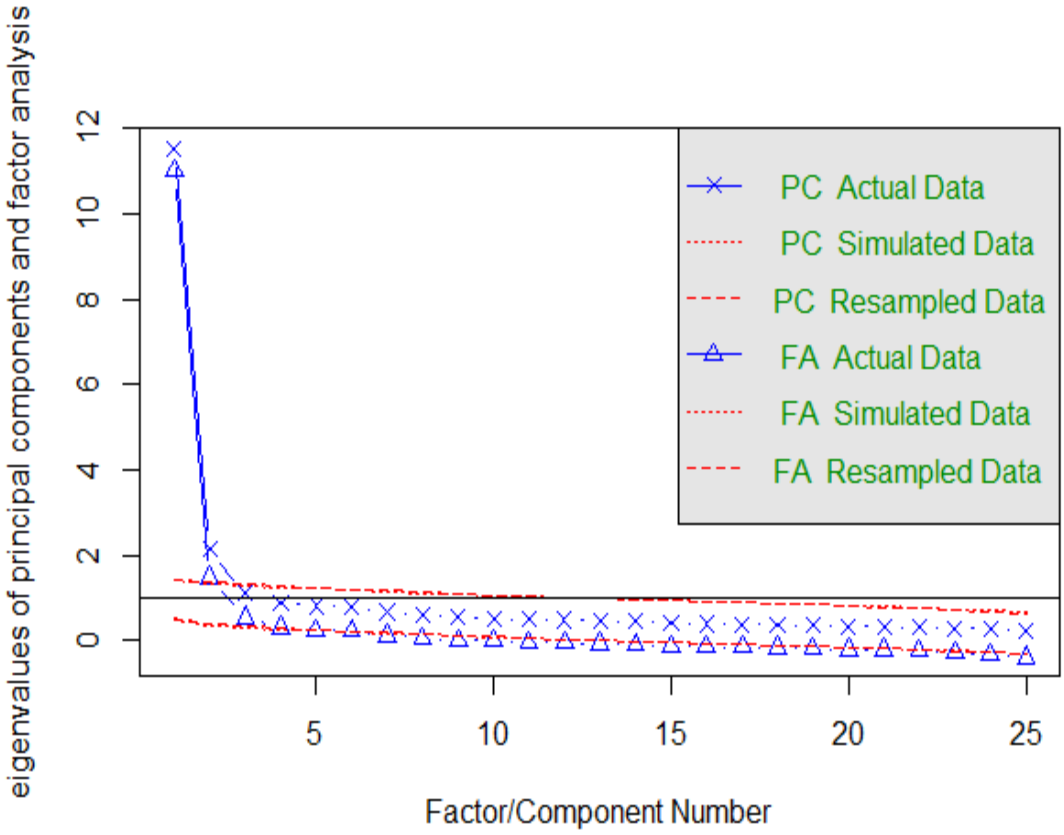

Figure 2. *Parallel analysis of IPIP agreeableness items from Study 2*

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