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Higher-order factors of the Big Five predict conformity: Are there neuroses of health?

Colin G. DeYoung[a], Jordan B. Peterson[a,*], Daniel M. Higgins[b]

[a]*Department of Psychology, University of Toronto, 100 St. George Street, Toronto, Ontario, Canada M5S 3G3*
[b]*Department of Psychology, Harvard University, 33 Kirkland Street, Cambridge, Massachusetts, USA 02138*

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Abstract

In a university sample ($n=245$) and a community sample ($n=222$), we replicate the higher-order factor solution for the Five Factor Model (Big Five) reported by Digman (Digman, J. M. (1997). Higher-order factors of the Big Five. *Journal of Personality and Social Psychology*, *73*, 1246–1256). We present a biologically predicated model of these two personality factors, relating them to serotonergic and dopaminergic function, and we label them *Stability* (Emotional Stability, Agreeableness, and Conscientiousness) and *Plasticity* (Extraversion and Openness). Based on this model, we hypothesize that Stability will positively predict conformity (as indicated by socially desirable responding) and that Plasticity will negatively predict conformity. A structural equation model indicates that conformity is indeed positively related to Stability (university sample: $\beta=0.98$; community sample: $\beta=0.69$; $P<0.01$ for both) and negatively related to Plasticity (university sample: $\beta=-0.48$, $P<0.07$; community sample: $\beta=-0.42$, $P<0.05$). These findings suggest that there are pros and cons of conformity, such that the most thorough conformists will tend to be stable but also rigid, less able to adjust to novelty or change.

Keywords: Personality; Big Five; Higher-order factors; Social desirability; Conformity

> Are there perhaps—a question for psychiatrists—neuroses of health? (Nietzsche, 1886/1966a, p. 26).

1. Introduction

The reliability and validity of the standard Five Factor Model of personality (commonly known as the Big Five) have been reasonably established (Costa & McCrae, 1992a; Digman, 1990;

* Corresponding author. Tel.: +1-416-978-7619; fax: +1-416-978-4811.
E-mail address: jpeterson@psych.utoronto.ca (J.B. Peterson).

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McCrae & John, 1992). However, it is not yet obvious that five factors constitute the simplest and broadest possible level of personality description (Becker, 1999; Digman, 1997), in part because the five traits have consistently been found to be intercorrelated (e.g. Costa & McCrae, 1992b; Goldberg, 1993; Norman, 1963). Digman (1997) assessed the pattern of correlations reported in 14 studies employing various Big Five instruments and both self- and observer-ratings, and he demonstrated the emergence of two consistent higher-order factors, which he labelled *Alpha* and *Beta*. Digman suggested that Alpha, incorporating Emotional Stability, Agreeableness and Conscientiousness, might be regarded as a socialization factor, while Beta, consisting of Extraversion and Openness, might be considered a factor of personal growth. Following Becker (1999), we will refer to the higher-order factors, or metatraits, as the *Big Two*.[1]

The discovery of a consistent higher-order factor solution for the Big Five is an important observation of statistical regularity. Two relevant questions, following this discovery, are how these higher-order factors should be interpreted and whether consideration of them can advance our understanding of personality. To address these questions, we first offer a theoretical model of the Big Two, informed by neuropsychology, neural network modelling theory, and psychology of myth and religion. Then we present two studies, designed (1) to assess the replicability of the Big Two factor structure, and (2) to determine if this structure is meaningfully related to social conformity, as our theoretical model suggests.

1.1. What might the Big Two represent?

Digman's interpretation of the Big Two as socialization and personal growth allows him to associate these factors intelligibly with constructs drawn from classic theories of personality. However, the terms "socialization" and "personal growth" suggest outcomes rather than basic tendencies or traits. This connotation is problematic, first, because the heritability of the Big Five traits ranges from approximately 0.40 to 0.50 (Bouchard, 1994; Reimann, Angleitner, & Strelau, 1997) and second, because aspects of the Big Two structure appear very early in life.

Digman himself observed that there are almost certainly individual differences in the ease with which people are socialized, resulting from "genetic endowment, prenatal, or early life circumstances" (Digman, 1997, p. 1250), and the tendency to undergo personal growth seems likely to be similarly influenced. Abe and Izard (1999) recently demonstrated that 18-month-olds' facial expressions of emotion in the strange situation paradigm (Ainsworth, Blehar, Waters, & Wall, 1978) predicted parent-ratings of Big Five traits at 3.5 years, in a manner entirely consistent with the Big Two model. Negative emotional expression predicted Emotional Stability, Agreeableness, and Conscientiousness, while strong positive emotional expression predicted Extraversion and Openness. Because the Big Two appear to reflect traits that are inherited or instantiated very early in ontogeny, we feel that a more basic, biologically predicated, interpretation of the Big Two might be justified.

[1] Though Becker's Big Two factors of *mental health* and *behavior control* at first glance appear theoretically distinct from Digman's *socialization* and *personal growth*, an examination of his circumplex model of personality (Becker, 1999) reveals that factors of *social adaptation* and *self actualization*, bearing obvious similarity to Digman's constructs, appear obliquely in his model, and he notes specifically that he rotated the results of his initial factor analysis 45° to obtain the mental health and behavior control factors.

The shared variance of Emotional Stability (reversed Neuroticism), Agreeableness, and Conscientiousness appears to reflect stability in emotional, social, and motivational domains. Emotional Stability (a term already consistent with this claim) primarily reflects comparative freedom from negative affect and behavioral or motivational withdrawal (Carver, Sutton, & Scheier, 2000; Costa & McCrae, 1992b; Larsen & Ketelaar, 1991; Watson & Clark, 1992). Agreeableness, which covers such lower-level traits as trust, straightforwardness, and altruism, entails the maintenance of stable social relationships, with the negative end of the scale characterized by traits such as mistrust and hostility (Costa & McCrae, 1992b; Graziano & Eisenberg, 1997). Conscientiousness, consisting of traits such as self-discipline, orderliness, and achievement-striving (Costa & McCrae, 1992b), appears to reflect motivational stability—the tendency to set goals and work toward them in an organized fashion. That these three traits vary together suggests an underlying connection in the processes through which humans maintain stability. Such a connection might well be biologically mediated through the functions of the ascending rostral serotonergic system.

The ascending rostral serotonergic system consists of a neuronal group whose cell bodies originate primarily in the midbrain and rostral pons and project extensively upwards, to the cerebral cortex, limbic system, and basal ganglia (Spoont, 1992; Tork, 1990). Its functions are typical of both a neurotransmitter and a neuromodulator (Tork, 1992), and its extended distribution affords influence over a wide array of brain functions. Meltzer (1990) observed, for example, that the serotonergic system plays a vital role in the regulation of emotional, motivational and circadian processes disturbed in the affective disorders, and Vogt (1982) hypothesized that the serotonergic system is central to the control of helplessness and depression (low Emotional Stability). This is in keeping with repeated observations linking reductions in brain stem serotonin metabolite 5HIAA to violent suicidal tendencies (Mann, Arango, & Underwood, 1990). Similarly, individuals high in aggressiveness (low Agreeableness) and impulsiveness (low Conscientiousness and low Emotional Stability) are characterized by reduced levels of cerebro-spinal fluid 5HIAA. These reductions have been observed in a number of populations, all of whom seem accurately characterized by a lack of stability, including children who display severe cruelty toward animals (Kruesi, 1989) or who are otherwise aggressive (Kruesi et al., 1990), individuals who score highly on the MMPI psychopathic deviate scales (Brown et al., 1982), or who have extensive histories of aggressive behavior (Brown et al., 1982; Brown, Goodwin, Ballenger, Goyer, & Major, 1979), individuals with poor impulse control (Leyton et al., 2001; Linnoila, DeJong, & Virkkunen, 1989; Linnoila, Virkkunen, Scheinin, Nuutila, Rimon, & Goodwin, 1983), and criminal recidivists who commit violent crimes (Virkkunen, De Jong, Bartko, Goodwin, & Linnoila, 1989). Serotonin agonists, furthermore, are effective antidepressants and antianxiety agents (e.g. Hidalgo & Davidson, 2001; Shelton & Brown, 2001), and supplementation with the serotonin precursor l-tryptophan reduces aggressive displays in very aggressive psychiatric patients (Morand, Young, & Ervin, 1983; Volavka et al., 1990). In her review of serotonergic function, Spoont (1992) hypothesized that the ascending rostral serotonergic system is vital to behavioral and emotional constraint and control, processes that clearly contribute to the general stability of the person.

The shared variance of Extraversion and Openness, by contrast, appears to reflect the tendency to explore or to engage voluntarily with novelty and may, in consequence, be associated with plasticity or flexibility in behavior and cognition. Extraversion classically brings to mind sociability (McCrae & Costa, 1987; Watson, Clark, & Harkness, 1994), but it has been more broadly

linked with positive affectivity, incentive reward sensitivity, approach behavior and novelty/excitement seeking (Carver et al., 2000; Costa & McCrae, 1992b; Depue & Collins, 2000; Lucas, Diener, Grob, Suh, & Shao, 2000; Watson & Clark, 1997). The alternate label Surgency (Goldberg, 1992, 1993) is intended to capture the active, exploratory sense of this factor more strongly. Similarly, Costa and McCrae (1992a; McCrae, 1987) proposed the term Openness to Experience to replace arguably narrower conceptions such as Intellect (Digman & Inouye, 1986; Goldberg, 1992, 1993) or Culture (Tupes & Christal, 1961/1992). Openness reflects "the recurrent need to enlarge and examine experience"—curiosity and imagination, and flexibility in considering novel ideas, behaviors, or feelings (McCrae & Costa, 1997, p. 167). The two related traits of Extraversion and Openness might be considered different aspects of a more basic disposition—one associated with the function of the central dopaminergic (DA) system.

The central DA system originates in the ventral tegmental area of the midbrain and projects to the limbic system, motor output centers, the anterior cingulate, and the prefrontal cortex. It mediates approach behavior, positive affect, and incentive reward sensitivity (Ashby, Isen, & Turken, 1999; Panksepp, 1999). The relation between Extraversion and DA function has been extensively reviewed by Depue and Collins (2000). Both Extraversion and Openness have been linked to reductions in latent inhibition (Peterson & Carson, 2000; Peterson, Smith, & Carson, in press), an alteration in attention associated with increased DA neurotransmission (Gray, Moran, Grigoryan, Peters, Young, & Joseph, 1997; Lubow, 1989). Providing a further conceptual link between DA and Openness, Ashby et al. (1999) review evidence that DA activity in the prefrontal cortex and anterior cingulate mediates cognitive flexibility. The DA system is associated with response to novelty (Gray, 1982; Panksepp, 1999). It seems reasonable to propose that extraverts are more likely to explore or investigate novelty in the concrete, behavioral sense (perhaps associated with the limbic/motor system DA projections), while individuals high in Openness are more likely to explore abstractly (perhaps associated with the anterior cingulate/prefrontal DA projections), altering current categories and reconceptualizing or renovelizing the world in that manner.

In light of the above review, we suggest that the Big Two might be better labelled *Stability* and *Plasticity*. Our hypotheses that Stability is associated with individual differences in serotonergic functioning and Plasticity with individual differences in dopaminergic functioning should not be viewed as exclusive; other brain systems may also contribute to the two metatraits. We believe, however, that evidence is particularly strong for the claim that these two biological systems are important sources of variance in the Big Two.

The terms *Stability* and *Plasticity* are derived from work on computer modeling of neural networks. Grossberg (1987) observed that classification-oriented neural network models that had achieved reliable classification outputs frequently collapsed when presented with a novel object combining elements of previously discrete entities. He therefore postulated that any information processing system designed for stable classification but capable of adapting to novel inputs must necessarily be composed of two distinct subsystems: one responsible for stability (capable of maintaining category and output across context and time); the other responsible for plasticity (capable of processing novel information and adjusting categories without causing destabilization). Though Grossberg provides evidence for his claim mainly in terms relevant to computer science, the information processing demands placed on humans by their complex and ever-changing environments must also require both capacities: maintenance of stability, but also plasticity, adaptation to novelty.

Peterson (1999) has proposed a historically predicated theoretical framework, based in part on analysis of narrative structure in myth and religion, in which the necessity of maintaining stability or order and the need to adapt to novelty or change constitute the most basic challenges to human adaptation. Given the fundamental nature of these needs, it is sensible that they should be reflected in the most basic level of personality description. Narrative accounts of the world, devoted to dramatic representation of phenomenological reality, consistently portray human experience as consisting of a domain of order (representing all that remains constant) and a domain of chaos (representing variability or novelty). While this representational structure has been most abstractly presented in the Taoist conception of experience (emphasizing the balance between yin and yang), similar conceptions underlie ancient Mesopotamian, Jewish and Christian worldviews (Eliade, 1978; Peterson, 1999). These sources also clearly indicate that the processes of adapting to novelty and maintaining stability are mutually dependent, as adaptation to novelty is necessary for the continued integrity of the domain of order, while stability is necessary if contact with the domain of chaos is not to result in the destruction of order.

Though Stability and Plasticity may, at first glance, seem semantically opposed, they can in fact be complementary, as both Grossberg's (1987) analysis and the narrative material imply. In a changing environment, plasticity is necessary for the maintenance of stability. Likewise, stable social relationships and motivational/emotional tendencies afford the individual a solid foundation upon which to base his or her explorations. It is certainly possible to imagine someone both stable and plastic, capable of remaining secure and composed, while adapting readily to new situations. Conversely, it is possible to imagine someone rigid and unstable, unwilling or unable to change a situation in which he or she feels unhappy and incapable. The opposite of plasticity is not stability but rigidity, while the opposite of stability is not plasticity but instability. While extreme plasticity could potentially render stability more difficult (and vice versa), in general the two traits should be considered mutually supportive—separable, but positively related.

1.2. Stability, plasticity, and conformity

If the Big Two model is to be regarded as anything but another addition to psychology's endless profusion of terminology, it must prove empirically and parsimoniously related to other trait and behavioral phenomena of interest. We believe that such relationships are particularly likely to emerge with regard to issues of conformity and individuality. These constructs are central to human psychology, and have a long history of conceptualization within philosophy and personality theory. Individuals need to express themselves in their own unique manners, but society strives to impose its values and goals, its moral ideals, on those who compose it. In relation to this conflict, Nietzsche pondered the possibility of "neuroses of health," a phrase which calls to mind his contention that conformity with the moral ideals of society is not always, in fact, ideal (Nietzsche, 1886/1966b). Nietzsche's observation is particularly apropos in the case of clearly pathological societies, like those of Nazi Germany or the Stalinist USSR. Freud pondered similar notions. In his view, the ego—individual consciousness—clashed inescapably with the often tyrannical superego—the internalization of social order. Jung, strongly influenced by Nietzsche, likewise discussed the necessity (and difficulty) of separating the self, creative individuality, from the persona, the publicly displayed mask of social identity.

Despite its conflict with individuality, however, conformity cannot be considered a purely negative quality. Human beings are social animals and depend heavily on society for their safety and well-being. We must comply with social expectations to some unspecified degree, if we are to exist peaceably with others. Nonconformists are likely to receive reduced social support, or to be penalized for their peculiarities, regardless of their individual merits, as they pose a threat to the integrity of the current social order, concretely or conceptually (Peterson, 1999; cf. Dodge & Frame, 1982). Nonconformists, therefore, seem likely to experience more difficulty in maintaining the stability of their lives. Furthermore, many of the traits that make up Stability constitute important preconditions for adherence to cultural moral strictures. Individuals who are disagreeable, unhappy, anxious and unreliable may well be less motivated or even less able to meet societal expectations. Plasticity, by contrast, should be opposed to conformity, because it is theoretically related to the tendency to engage flexibly and creatively with novelty, while conformity denies expression of unsanctioned ideas and engagement in behaviors beyond those prescribed by society. Our hypotheses, then, are that Stability will be positively and Plasticity negatively related to conformity, meaning that the most thorough conformists should be stable but rigid (and therefore most prone to ''neuroses of health'').

In order to assess the tendency to conform, we used self-report measures drawn from the extensive literature on socially desirable responding. Factor analyses of social desirability scales have identified two distinct response patterns (Paulhus & John, 1998; Raskin, Novacek, & Hogan, 1991). One is characterized by the tendency to claim heightened abilities, especially social and intellectual; the other is characterized by the tendency to claim heightened conformity with moral ideals and to deny impulses deviating from these. Paulhus and John (1998) identified these response patterns as representing ''egoistic'' and ''moralistic'' bias, while Raskin et al. (1991) identified ''narcissistic'' and ''conformist'' personality styles. To obtain estimates of conformity, we employed Paulhus' (1991) Impression Management scale and the Lie scale from Eysenck's Personality Questionnaire (Eysenck, Eysenck, & Barrett, 1985), both of which ask participants to report manifestations of common immoral behaviors, such as lying, gossiping, cheating, and littering.

The names of these scales (Impression Management and Lie) reflect the fact that they were originally designed to control for the response bias of people likely to exaggerate socially desirable qualities on personality questionnaires. However, these ''response bias'' scales appear to be associated with more genuine variance than bias, particularly when responses are anonymous (Borkenau and Amelang, 1985; McCrae & Costa, 1983; Piedmont, McCrae, Riemann, & Angleitner, 2000). Although social desirability measures are correlated with discrepancies between self-reports and observer ratings of personality (Paulhus & John, 1998), Borkenau and Amelang (1985) and Piedmont et al. (2000) have demonstrated that controlling for them tends to decrease, rather than increase the correlation between self-reports and observer ratings of personality. Furthermore, controlling for socially desirable responding does not appear to improve criterion-related validities of personality predictors of job performance (Hough, Eaton, Dunnette, Kamp, & McCloy, 1990; Ones, Viswesvaran, & Reiss, 1996).

This seemingly paradoxical pattern of results suggests that although some of the variance in social desirability scores may be due to overstatement, the larger portion is genuine. Paulhus and John (1998, p. 1048) note that ''self-perceptions are often exaggerations of a kernel of truth.'' Someone who is genuinely agreeable, for example, may see him or herself as a bit more agreeable

than the truth would warrant. McCrae and Costa (1983) pointed out that the most genuine adherents of morality will be identified as most prone to a biased response style, if high scores on social desirability measures are always assumed to be exaggerated. They concluded that measures of social desirability reflect "more substance than style." Further justification for confidence in our measures of conformity comes from experimental demonstrations that people high in socially desirable responding are particularly susceptible to the expectations of their social environment (Millham & Jacobson, 1978; Strickland & Crowne, 1962).

2. Method

2.1. Participants

We recruited two groups of participants through posters advertising the study. Sample 1 consisted of 245 university students (76 male, 169 female) ranging in age from 18 to 38 ($M = 21$, S.D. = 3.1). Sample 2 was a community sample of 222 individuals (77 male, 144 female), recruited from the region of Toronto, Ontario around the University of Toronto and ranging in age from 15 to 59 ($M = 24.5$, S.D. = 7.0).

2.2. Measures

As part of a larger battery of cognitive and personality measures, both samples completed Goldberg's (1992) Trait Descriptive Adjectives scale (TDA), a common and reliable measure of the Big Five. Responses were given on a 7-point Likert scale. Sample 1 also completed another Big Five measure, the Revised NEO Personality Inventory (NEO PI-R; Costa & McCrae, 1992a, 1992b), which provides scores for 30 facet-level traits, six of which make up each of the Big Five. Responses were given on a 5-point Likert scale.

Both samples also completed the Impression Management scale from the Balanced Inventory of Desirable Responding (BIDR; Paulhus, 1991) and the Lie scale from Eysenck's Personality Questionnaire (Eysenck et al., 1985). Responses to the BIDR are given on a 7-point Likert scale ranging from *not true* to *very true*. Traditionally only extreme responses (6 or 7; 1 or 2 for reversed items) are scored, as indicators of bias (Paulhus, 1991). Because we were interested in genuine conformity and nonconformity, we computed standard Likert scores from the full range of the scale. Alpha coefficients were 0.79 for Sample 1 and 0.82 for Sample 2. The Lie scale consists of 12 items very similar to those of Impression Management but requires *yes* or *no* answers. Internal reliability scores on this scale range from 0.73 to 0.82 (Eysenck et al., 1985).

3. Results

Tables 1 and 2 display means, standard deviations, and interscale correlations for the Big Five and social desirability scales for Samples 1 and 2, respectively. In Sample 1, significant gender differences appeared for TDA Agreeableness, TDA Emotional Stability and NEO Neuroticism (TDA Agreeableness: Men: $M = 102.1$, S.D. = 14.6; Women: $M = 106.2$, S.D. = 14.9; $t = -2.02$,

Table 1
Sample 1: means, standard deviations, and interscale correlations[a]

	1	2	3	4	5	6	7	8	9	10	11	12
1. Impression Management	–											
2. Lie Scale	0.53**	–										
3. TDA Surgency	−0.05	0.03	–									
4. TDA Agreeableness	0.33**	0.36**	0.23**	–								
5. TDA Conscientiousness	0.33**	0.33**	0.19**	0.47**	–							
6. TDA Emotional Stability	0.36**	0.24**	0.27**	0.40**	0.27**	–						
7. TDA Intellect	0.01	0.04	0.21**	0.18**	0.15*	−0.07	–					
8. NEO Neuroticism	−0.37**	−0.31**	−0.39**	−0.46**	−0.39**	−0.83**	−0.08	–				
9. NEO Extraversion	−0.05	0.04	0.74**	0.38**	0.20**	0.22**	0.15*	−0.37**	–			
10. NEO Openness	−0.10	−0.13*	0.23**	0.16*	−0.11	−0.04	0.58**	−0.04	0.34**	–		
11. NEO Agreeableness	0.42**	0.31**	−0.01	0.63**	0.15*	0.31**	−0.03	−0.29**	0.15*	0.15*	–	
12. NEO Conscientiousness	0.38**	0.39**	0.16*	0.34**	0.82**	0.24**	0.18**	−0.43**	0.17**	−0.07	0.20**	–
Mean	69.8	2.9	91.19	104.93	96.76	72.56	110.07	149.49	164.29	179.84	161.73	155.21
(S.D.)	(16.53)	(2.33)	(19.22)	(14.88)	(19.14)	(19.69)	(13.29)	(26.82)	(21.02)	(18.89)	(17.84)	(22.80)

*$P<0.05$ **$P<0.01$ (two-tailed)

[a] $n=245$, TDA, trait descriptive adjectives (Goldberg, 1992); NEO, NEO Personality Inventory-Revised (Costa & McCrae, 1992b).

$P < 0.05$; Emotional Stability: Men: $M = 77.2$, S.D. = 21.5; Women: $M = 70.5$, S.D. = 18.5; $t = 2.48$, $P < 0.05$; Neuroticism: Men: $M = 142.8$, S.D. = 27.5; Women: $M = 152.5$, S.D. = 26.0; $t = -2.66$, $P < 0.01$). In Sample 2, men scored significantly higher on Emotional Stability than women (Emotional Stability: Men: $M = 77.6$, S.D. = 16.0; Women: $M = 71.7$, S.D. = 14,1; $t = 2.80$, $P < 0.01$). There were no gender differences in either of the conformity measures. Controlling for gender did not affect the analyses, so we have not reported any further gender effects. There was no significant difference between samples for any of the TDA Big Five scales, but Sample 2 did score significantly higher on both conformity measures (Impression Management: Sample 1: $M = 69.8$, S.D. = 16.5; Sample 2: $M = 74.0$, S.D. = 18.3; $t = -2.58$, $P < 0.05$; Lie: Sample 1: $M = 2.9$, S.D. = 2.3; Sample 2: $M = 3.5$, S.D. = 2.5; $t = -2.63$, $P < 0.01$).

3.1. Exploratory factor analysis

Scores from the Big Five instruments were factor analyzed using the exploratory method employed by Digman (1997). For Sample 1, NEO PI-R and TDA scores were analyzed separately—in a joint analysis, the strong correlations between each pair of redundant scales would lead to factors simply containing these pairs (i.e. Surgency and Extraversion, Agreeableness and Agreeableness, etc.). We also analyzed composite Big Five scores for Sample 1, consisting of averaged standardized scores for the two scales measuring each trait. Factor extraction was by principal axis factoring (also known as common factor analysis) with two iterations, followed by varimax rotation.

In all four analyses, two higher-order factors with eigenvalues greater than one were extracted, accounting for 61–63% of the variance (Table 3). The higher-order factor loadings were very similar to Digman's (1997) report of mean higher-order factor loadings across nine studies of adults (Table 3). The one unusual feature of our results is that TDA Extraversion for Sample 1 loads more heavily on Stability than on Plasticity. Nonetheless, both NEO PI-R Extraversion and composite Extraversion, for the same sample, load more heavily on Plasticity.

Table 2
Sample 2: means, standard deviations, and interscale correlations[a]

	1	2	3	4	5	6	7
1. Impression Management	–						
2. Lie Scale	0.63**	–					
3. TDA Surgency	−0.06	−0.05	–				
4. TDA Agreeableness	0.22**	0.23**	0.21**	–			
5. TDA Conscientiousness	0.26**	0.16*	0.25**	0.36**	–		
6. TDA Emotional Stability	0.22**	0.13	0.07	0.24**	0.30**	–	
7. TDA Intellect	0.03	0.00	0.42**	0.28**	0.26**	−0.06	–
Mean	74.0	3.5	90. 3	106.7	99.9	73.8	109.2
(S.D.)	(18.34)	(2.52)	(16.23)	(13.64)	(16.57)	(15.02)	(14.72)

*$P < 0.05$ **$P < 0.01$ (two-tailed)

[a] $n = 222$. TDA, trait descriptive adjectives (Goldberg, 1992).

As predicted, weighted factor scores calculated from these analyses by the regression method were significantly positively correlated, with correlations between Stability and Plasticity ranging from 0.18 to 0.28 ($P < 0.01$ for all; Table 3). These correlations are fairly low, but this may be due, in part, to use of varimax rotation (following Digman, 1997), which creates factors that are as orthogonal as possible. Given the nature of this procedure, it is revealing that any significant correlations should appear.

3.2. Structural equation model

The exploratory factor analyses support the Big Two model, yielding two positively correlated factors, one marked by Emotional Stability, Agreeableness, and Conscientiousness and the other by Extraversion and Openness. To provide a further confirmation of this result and to assess the ability of the Big Two to predict conformity, we designed a structural equation model, which was tested using both Amos 4.0 (Arbuckle, 1999) and LISREL 8.3 (Jöreskog & Sörbom, 1999) with maximum likelihood estimation. The two programs yielded identical results (Figs. 1 and 2). In this model, Stability and Plasticity are latent variables, the former consisting of the shared variance of Emotional Stability, Agreeableness, and Conscientiousness, and the latter consisting of the shared variance of Extraversion and Openness. A latent Conformity variable was derived from the Impression Management and Lie scales. The Impression Management scale was split into two halves of ten items each (labeled "A" and "B" in Figs. 1 and 2), so as to produce a more reliable latent variable (Marsh, Hau, Balla, & Grayson, 1998). Each half consisted of five positively and five negatively keyed items.

While it would have been an attractive possibility to use the two measures of each Big Five trait for Sample 1 in order to create a hierarchical factor model, with latent variables for Stability and Plasticity derived from latent variables for each of the Big Five, the many intercorrelations among the 10 Big Five scales rendered such a model impractical. Instead, we used the composite

Table 3
Higher-order factor loadings of the Big Five compared with mean loadings reported by Digman (1997)

	S1 NEO PI-R		S1 TDA		S1 Composite		S2 TDA		Digman	
	Stability	Plasticity	Stab.	Plasticity	Stability	Plas.	Stab.	Plas.	Alpha	Beta
Emotional Stability	0.69	0.17	0.61	−0.09	0.67	0.11	0.53	−0.06	0.64	0.20
Agreeableness	0.34	0.19	0.66	0.25	0.56	0.17	0.46	0.32	0.57	0.08
Conscientiousness	0.59	−0.06	0.52	0.25	0.53	0.06	0.54	0.32	0.47	0.20
Extraversion	0.34	0.53	0.33	0.26	0.34	0.48	0.13	0.56	0.17	0.60
Openness	−0.03	0.56	0.05	0.49	0.02	0.48	0.06	0.66	0.07	0.57
Correlation between factors	0.18**		0.28**		0.27**		0.23**		(not reported)	

** $P < 0.01$ (2-tailed).

Note. S1 Sample 1; S2 Sample 2; TDA, Trait Descriptive Adjectives (Goldberg, 1992); NEO, NEO Personality Inventory Revised (Costa & McCrae, 1992b). For consistency, NEO PI-R Neuroticism has been reversed and labeled Emotional Stability, and TDA Surgency and Intellect have been labeled Extraversion and Openness.

Big Five scores as indicators of the Big Two for Sample 1. This technique had the advantage of allowing us to compare identical models across the two samples.

Following the advice of Anderson and Gerbing (1988), we did this analysis in two steps, first performing a confirmatory factor analysis (CFA) to ensure that the indicators were related satisfactorily to the latent variables. Correlations were allowed between latent variables, and all other correlations were fixed at 0.0. After fitting the CFA, we assessed the structural model, in which Stability and Plasticity are predictors of Conformity. All loadings of indicator variables and all fit statistics were identical for the CFA and the structural model in each sample (Figs. 1 and 2; Table 4).

By a number of different criteria, listed in Table 4, the model fits both samples very well. Although in both cases the discrepancy χ^2 is significant at $P<0.05$, which indicates that the covariance matrix predicted by the model differs significantly from the observed matrix,[2] it is widely

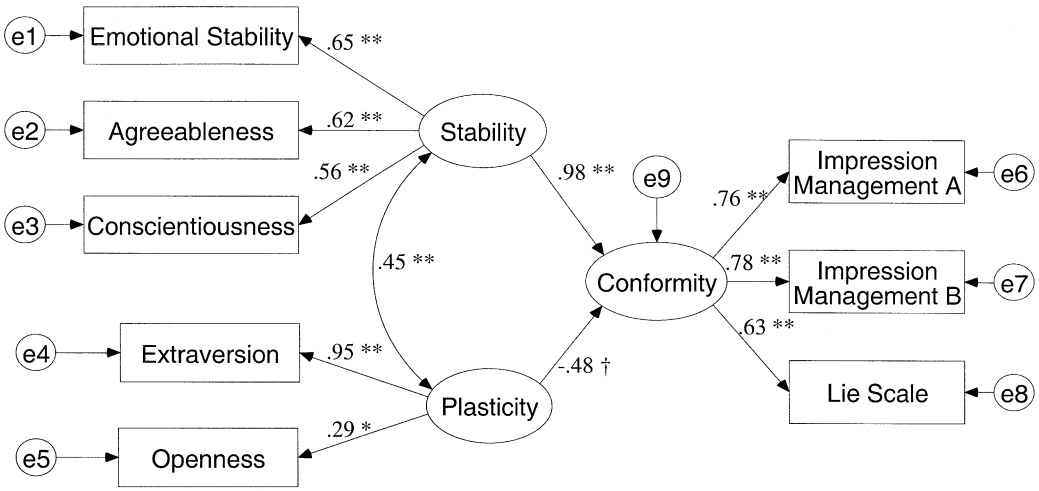

Fig. 1. Structural equation model for university sample (Sample 1). Stability and Plasticity predict conformity. Standardized solution. Note. *$P<0.05$, **$P<0.01$, † $P=0.067$, (two-tailed); $n=245$; Impression Management A, items 1–10; Impression Management B, items 11–20; e1–e9, error variances.

[2] Utilizing the modification indices provided by Amos, we determined that, for both samples, allowing the error variances of Openness (e5) and Emotional Stability (e1) to covary produced a model that was not significantly different from the observed data [Sample 1: Chi-square = 24.16, d.f. = 16 ($P=0.086$); Sample 2: Chi-square = 16.85, d.f. = 16 ($P=0.395$)]. The correlation between these error variances was −0.21 for Sample 1 and −0.32 for Sample 2 ($P<0.001$ for both). We have not reported this model in detail because we made no a priori prediction that Openness should be negatively related to Emotional Stability. As a post hoc explanation of this finding, however, it does not seem unreasonable to suggest that greater Openness might allow one to consider more negative possibilities or even to get oneself into more potentially threatening situations, which could account for decreased Emotional Stability. Note that it is the variance in Openness not associated with Extraversion (which, in our model, is contained in the error variance, e5) that is negatively related to Emotional Stability. The positive correlation between the Big Two indicates that the variance in Openness associated with Extraversion is positively related to Emotional Stability. This pattern of relations might account for findings from previous studies, in which Openness has been found to be positively related to negative as well as positive emotionality (McCrae & Costa, 1991; Watson & Clark, 1992; reported in Abe & Izard, 1999). It also explains the lack of any zero-order correlation between Emotional Stability and Openness (Tables 1 and 2).

accepted that such a strict null hypothesis is unnecessary in structural equation modeling (Arbuckle & Wothke, 1999; Hoyle, 1995). With a reasonably large sample, the odds that any model will produce a significant χ^2 are high. Other indices of fit that are relatively insensitive to sample size, such as the adjusted goodness of fit index (AGFI; Jöreskog & Sörbom, 1984), the non-normed fit index (NNFI; Bentler & Bonett, 1980), and the root mean square error of approximation (RMSEA; Steiger, 1990), have been developed to take this into account. An AGFI or NNFI value above 0.90 (which indicates that the model accounts for more than 90% of the observed covariance) is considered a good fit (Bentler & Bonett, 1980), and the traditional guideline for RMSEA is that a value less than 0.08 indicates a good fit (Schumaker & Lomax, 1996), although Hu and Bentler (1999) have recently argued that RMSEA should be less than 0.06 for a good model. For both samples, the χ^2 is fairly close to non-significance, and the other fit indices are within the desired range (Table 4).

The loadings of the Big Five on the latent variables Stability and Plasticity appear reasonably consistent with those derived by the exploratory analyses. The one obvious discrepancy between the two sets of results is that Extraversion loads much more heavily than Openness on Plasticity

Table 4
Fit indices and squared multiple correlations for the structural equation model[a]

	χ^2 (d.f. = 17)	P	AGFI	NNFI	RMSEA	R^2 for Conformity
Sample 1	29.75	0.028	0.94	0.95	0.055	0.76
Sample 2	29.03	0.034	0.94	0.95	0.057	0.34

[a] AGFI, adjusted goodness of fit index; NNFI, non-normed fit index; RMSEA, root mean square error of approximation.

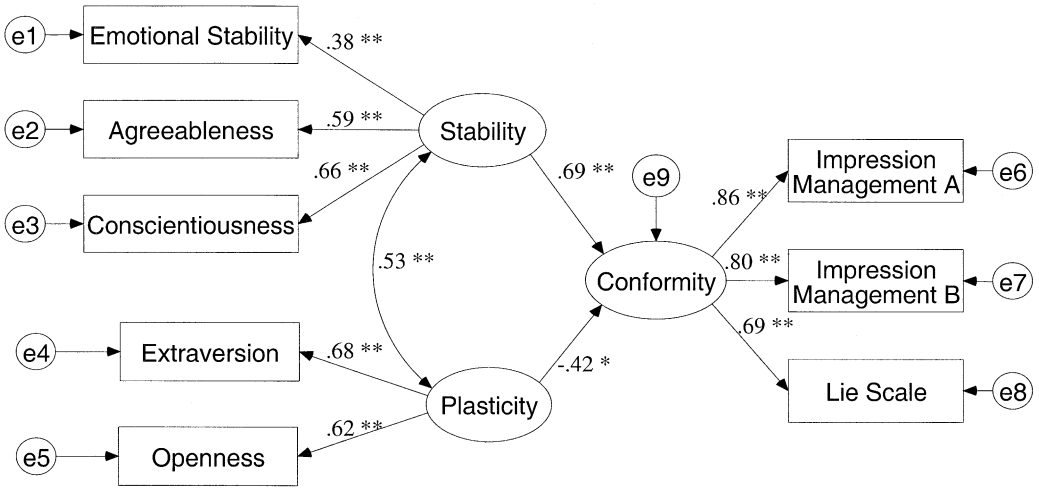

Fig. 2. Structural equation model for community sample (Sample 2). Stability and Plasticity predict conformity. Standardized solution. *$P < 0.05$, **$P < 0.01$, (two-tailed); $n = 222$; Impression Management A, items 1–10; Impression Management B, items 11–20; e1–e9, error variances.

(0.95 vs. 0.29) in the structural model for Sample 1; this was not the case in the exploratory analyses, nor is it the case in the structural model for Sample 2. This discrepancy may be partially, but not entirely, attributed to the additional personality measure used in Sample 1 (i.e. the NEO PI-R). If the structural analysis is repeated using the TDA scores, rather than the composite scores (thus rendering the measures equivalent across samples), the loading of Extraversion on Plasticity is reduced to 0.72, while the loading of Openness remains 0.29.

In both samples, Stability was significantly positively related to Conformity [Sample 1: $\beta = 0.98$; Sample 2: $\beta = 0.69$; $P < 0.01$ (two-tailed) for both]. Plasticity, however, was significantly negatively related to Conformity [Sample 1: $\beta = -0.48$, $P < 0.05$ (one-tailed); Sample 2: $\beta = -0.42$, $P < 0.05$ (2-tailed)]. Although the path from Plasticity to Conformity in the model for Sample 1 does not quite achieve significance in a two-tailed test ($P = 0.067$), removing this path significantly decreases the model's fit (difference $\chi^2 = 34.35$, d.f. = 1, $P < 0.001$), which indicates that it should remain in the model. Further, a one-tailed test of significance is appropriate because we had predicted the direction of this relation. As indicated by squared multiple correlations, Stability and Plasticity explained 76% of the variance in Conformity in Sample 1 and 34% in Sample 2 (Table 4). In addition, as predicted, Stability and Plasticity were positively correlated [Sample 1: $r = 0.45$; Sample 2: $r = 0.53$; $P < 0.01$ (two-tailed) for both].

3.3. Facet analysis

For Sample 1, we were able to examine the 30 facet level traits of the NEO PI-R in relation to the measures of conformity (Table 5). An especially clear pattern emerged for traits subsumed by Stability. Impression Management was significantly correlated with every facet of Neuroticism, Agreeableness, and Conscientiousness, with the exception of one Agreeableness facet, Tender-Mindedness. Similarly, the Lie scale was significantly correlated with all facets of these three factors, excepting Tender-Mindedness and Modesty, another Agreeableness facet.

Correlations between the conformity measures and the facets of Extraversion and Openness were less consistent. Both Impression Management and the Lie Scale showed negative zero-order correlations with only one Extraversion facet, Excitement Seeking, and two Openness facets, Fantasy and Feelings. Our results indicate, however, that Stability is more strongly related to conformity than is Plasticity—twice as strongly, in fact, for Sample 1. Because Stability is also positively correlated with Plasticity, a negative correlation between any constituent trait of Plasticity and conformity will be suppressed. Partial correlations between Impression Management, the Lie Scale, and the facets of Extraversion and Openness, controlling for the scales that make up Stability (Emotional Stability, Agreeableness, and Conscientiousness), revealed significant negative correlations between Impression Management and/or the Lie scale and all six Extraversion facets, plus four Openness facets (Table 5).

4. Discussion

Two aspects of our results appear most noteworthy. First, the higher-order factor solution for the Big Five reported by Digman (1997) appears clearly replicable. Second, our hypothesis that both Stability and Plasticity would predict conformity was confirmed. People who were more

Table 5
Correlations between conformity scales and NEO PI-R facets, Sample 1[a]

	Neuroticism					
	Anxiety	Angry Hostility	Depression	Self-consciousness	Impulsiveness	Vulnerability
IM	−0.33**	−0.39**	−0.22**	−0.17**	−0.40**	−0.28**
EPQ-L	−0.24**	−0.27**	−0.20**	−0.18**	−0.36**	−0.25**
	Agreeablness					
	Trust	Straight-forwardness	Altruism	Compliance	Modesty	Tender-mindedness
IM	0.22**	0.54**	0.26**	0.30**	0.19**	0.11
EPQ-L	0.15*	0.35**	0.32**	0.20**	0.10	0.10
	Conscientiousness					
	Competence	Order	Dutifulness	Achievement striving	Self-discipline	Deliberation
IM	0.29**	0.17**	0.42**	0.19**	0.35**	0.32**
EPQ-L	0.31**	0.20**	0.41**	0.23**	0.37**	0.29**
	Extraversion					
	Warmth	Gregariousness	Assertiveness	Activity	Excitement seeking	Positive emotions
IM	0.09 (−0.20**)	−0.11 (−0.24**)	0.00 (−0.14*)	0.03 (−0.18**)	−0.24** (−0.25**)	0.01 (−0.24**)
EPQ-L	0.17** (−0.05)	−0.05 (−0.14*)	0.12 (0.02)	0.01 (−0.19**)	−0.13* (−0.11)	0.07 (−0.12)
	Openness to Experience					
	Fantasy	Aesthetics	Feelings	Actions	Ideas	Values
IM	−0.19** (−0.11)	−0.09 (−0.14*)	−0.20** (−0.23**)	0.00 (−0.10)	0.14* (0.08)	−0.09 (−0.18**)
EPQ-L	−0.22** (−0.13*)	−0.06 (−0.10)	−0.16* (−0.21**)	−0.01 (−0.07)	0.03 (−0.03)	−0.09 (−0.16*)

*$P < 0.05$ **$P < 0.01$ (two-tailed).

[a] $n = 245$. IM, Impression Management; EPQ-L, Lie scale (from Eysenck's Personality Questionnaire). Correlations in parentheses are partial correlations controlling for Emotional Stability, Agreeableness, and Conscientiousness.

stable, as represented by the shared variance of Emotional Stability, Agreeableness, and Conscientiousness, were likely to be more conforming, while people who were more plastic, as indicated by variance common to Extraversion and Openness, were likely to be less conforming. Thus, the highest scores on conformity were found for individuals high in Stability but low in Plasticity.

4.1. Comparison of university and community samples

Results appear similar across two samples from different populations, and this gives us confidence in the general applicability of our findings. One difference between the two was in mean scores on the social desirability measures. It is probably not surprising to learn that univerisity students may be less conforming than the general population. Another potentially interesting difference between the samples lies in the amount of variance in conformity explained by the Big Two, with more than twice as much variance explained in Sample 1. Judging by the relative strengths of Stability as a predictor in the university versus the community sample, we may conclude tentatively that conformity is more strongly associated with Stability in the university population. Our samples are not large by the standards of structural equation modeling, however (Ding, Velicer, & Harlow, 1995; Schumaker & Lomax, 1996), and the extremely strong relation between Stability and Conformity in Sample 1 ($\beta = 0.98$) may also be due to some sample-specific idiosyncrasy. (Note that even if such a strong weight were found reliably in future, we could not conclude that Stability and Conformity were assessing identical constructs because Plasticity is positively related to Stability but negatively related to Conformity.) The fact that, in the structural models, Extraversion and Openness load differently on Plasticity across samples may also be the result of some irregularity. It is, of course, possible that Extraversion contributes more strongly than Openness to Plasticity in university students, but the fact that this was not demonstrated in the exploratory factor analyses warns against any strong conclusion here. On the whole, the similarities between the two samples are more salient than the differences: the Big Two model fits the data well, and both metatraits predict conformity.

4.2. Relevant issues for personality psychology

Because of the desirability of parsimony, the appropriate level of analysis in a hierarchically organized model of personality is the highest level that sheds light on the phenomenon being examined without obscuring variation in the levels below it. Our measures of conformity proved to be especially strongly related to Stability. Given that these measures were also moderately correlated with all three Big Five constituents of Stability and at least weakly correlated with virtually all of the NEO PI-R facets of these traits, the Big Two appears to be the appropriate level of description at which to consider conformity.

The fact that Stability showed a markedly stronger relation to conformity than did Plasticity helps to explain why negative correlations between conformity and the traits that contribute to Plasticity—Extraversion, Openness, and their facets—are not necessarily apparent in zero-order correlations (e.g. Tables 1, 2 and 5). The positive correlation between Stability and Plasticity will tend to suppress any negative correlation between conformity and Plasticity. This effect highlights the importance of isolating the independent variance associated with individual traits, when investigating the relation of the Big Five to other phenomena. If the Big Five were orthogonal, this would not be a problem. As they are regularly correlated, however, we must take their covariance into account, either through partial correlations or through regression models that include all five factors and indicate the unique contribution of each. This caveat also applies to the Big Two because of their correlation. Our results demonstrate that when the positive correlation between Stability and Plasticity is taken into account, a significant negative relation

between Plasticity and conformity appears, which is not otherwise obvious. In common-sense terms, this means that, if we compare two people of equal Stability, the one who is lower in Plasticity will tend to be higher in conformity.

4.3. The pros and cons of conformity

What do we learn about conformity through the discovery that it is positively related to Stability but negatively related to Plasticity? Simply put, there appear to be both pros and cons associated with conformity. On the one hand, conformity is strongly associated with increased Stability and thus seems indicative of relative freedom from distress, uncertainty, hostility, etc. On the other hand, conformity is associated with decreased Plasticity and may, therefore, indicate a relatively lesser capacity for adapting to varied circumstances. We believe the finding that the most thorough conformists are high in Stability but low in Plasticity may contribute to an explanation of some of the more problematic aspects of group identification.

The strong relation between Stability and conformity supports the idea that some degree of conformity may be healthy, affording the benefits of social integration. The danger in conformity, however—as represented by its traditional opposition to individuality—lies in the fact that it can supercede unique individual expression. That individuals higher in conformity tend to be lower in Plasticity suggests that they are likely to rely on conformity with what is socially desirable, rather than on their own capacity for exploration and reconceptualization, in order to adapt to novel situations. In neural network modeling, a system is unlikely to remain stable without also being plastic, and, given a non-plastic or rigid network, any sufficiently novel stimulus requires the programmer's intervention to prevent destabilization (Grossberg, 1987). One possible extrapolation from our findings is that culture can serve as the "programmer" for humans who are stable but not plastic, allowing them to rely on externally determined strategies for dealing with the vagaries of life. This reliance would, in principle, render such individuals particularly vulnerable to the pressures of society (an idea supported by findings of association between socially desirable responding and susceptibility to social pressure; Millham & Jacobson, 1978; Strickland & Crowne, 1962). When these pressures take a turn for the worse, the dangers inherent in conformity may make themselves manifest.

Lack of plasticity may lead to a problematically rigid stability—Nietzsche's "neuroses of health"—predicated on unthinking conformity, fear of the unknown, dislike of the new and strange. Reliance on culture for stability, rather than on one's own plasticity, may be a workable strategy if society itself is healthy, but in the long run it is likely to increase the risk of destabilization during periods of change and to restrict the growth of individuality. Further, such reliance might foster hatred or aggression toward individuals or groups not sharing the same moral structure. The pernicious effects of group identification are evident in the worldwide problems of nationalism and ethnic prejudice. As measures of authoritarianism and dogmatism have been found to be related not only to prejudice but also to socially desirable responding and conformity (Heaven, 1986; Ray, 1979; Rule & Hewitt, 1970), it is plausible that susceptibility to hostile tendencies toward the cultural "other" might be related to measures of conformity, and thus to a personality profile of high Stability and low Plasticity. According to our biological model of the Big Two, this profile should be correlated with relatively elevated serotonergic function and decreased dopaminergic function. These speculations provide ample material for further experimental investigation.

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