



Motivational individual reaction norms underlying the Five-Factor model of personality: First steps towards a theory-based conceptual framework

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ABSTRACT

In spite of its popularity, the Five-Factor Model (FFM) has been criticized for being too descriptive to provide a theoretical model of personality. The current article conceptualizes the FFM as stable individual differences in people's motivational reactions to circumscribed classes of environmental stimuli. Specifically, extraversion was conceptualized as individual differences in the activation of reward system in social situations, agreeableness as differences in the motivation to cooperate (vs. acting selfishly) in resource conflicts, conscientiousness as differences in the tenacity of goal pursuit under distracting circumstances, neuroticism as differences in the activation of the punishment system when faced with cues of social exclusion, and openness for experiences as differences in the activation of reward system when engaging in cognitive activity. We devised a questionnaire that is consistent with these motivational conceptualizations. This questionnaire turned out to differ from an established FFM questionnaire in terms of content but it did not interfere with the factorial, structural, and predictive validity of the FFM. The resulting theoretical framework may help to bridge the traditional divide between structure- and process-oriented approaches in personality psychology.

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1. Introduction

According to the *Five-Factor Model of Personality* (FFM), most human personality differences can be summarized in five dimensions: Extraversion, neuroticism, conscientiousness, agreeableness, and openness to experience. An impressive body of empirical work has demonstrated the usefulness and scope of the FFM, as it can be used to organize a large variety of personality psychological constructs (including abnormal personality; Markon, Krueger, & Watson, 2005) into an overarching taxonomic framework (Costa & McCrae, 1995). On the downside, however, the conceptualization of the FFM dimensions remains mainly descriptive (Block, 1995), limiting their potential as building blocks of a fundamental model of personality structure. For example, McAdams (1992) criticized the FFM domains to “exist as polyglot generic arenas with fuzzy, overlapping boundaries” (pp. 339–340). In a highly influential critique of the FFM, Block (1995) stated:

[...] serious theorizing and the construction of an improved set of scientifically useful and consensually understood personality dimensions should be taken up actively, sustainedly, and systematically [...] Such close conceptual reflection, further informed by focused empiricism, will spiral our field forward. (p. 210).

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Over 10 years after Block formulated his critique, we believe that the FFM remains a too descriptive summary to qualify as a true theoretical model of personality. The current article tries to improve the conceptual underpinnings of the FFM by presenting a conceptual model of the FFM dimensions as *stable individual differences in people's motivational reactions to circumscribed classes of environmental stimuli*. Based on a review of the literature, we will focus on plausible conceptualizations of the FFM dimensions. We then constructed a questionnaire consistent with these conceptualizations. In the empirical part of the paper, we first evaluate the match between this questionnaire and our conceptual model and compare it to the performance of an established FFM measure. Second, we evaluate the psychometric properties of this questionnaire to see whether it constitutes a feasible way of measuring the FFM.

1.1. Assessing traits as motivational constructs

For a long time, personality psychology has been divided into two schools of thought (Mischel & Shoda, 1994). On the one hand, the so-called structural view has mainly been occupied with studying the structure of personality, addressing such questions as the number of personality traits and their interrelations. On the other hand, the process-oriented view has chiefly investigated the associations between situational characteristics and behavior, and the cognitive processes that mediate them (Revelle, 1995). Unfortunately, both schools of thought still exist very much without reference to each other's findings (for an important exception, see Fleeson, 2001). For example, McAdams (1992, pp. 342–343) characterizes them as “average levels of behaviors as aggregated across situations” that “pay virtually no homage to contextual variables of any kind”. This is reflected by the finding that 44% of the items of standard personality measures lack any situational reference (Werner & Pervin, 1986).

One way to bridge this divide may be to define the FFM dimensions as stable individual differences in people's reactions to circumscribed situational cues. In this sense, we follow in the footsteps of theorists like Tellegen (1991, p. 17), who defined traits as dispositions “to exhibit reaction R under condition S” (also see Revelle, 1995). Such a position is very much akin to Mischel and Shoda's (1995) claim that personality can be understood in terms of individual differences in patterned responses to situational features (if-then dispositions) that form a “signature of personality”. The notion of differential sensitivities nicely dovetails a fairly recent development in behavioral ecology, where researchers have begun to acknowledge the systematic limits personality puts on behavioral plasticity (Sih, Bell, Johnson, & Ziemba, 2004). As a consequence, the behavioral ecological concept of *reaction norms* has recently been extended to personality dimensions (Penke, Denissen, & Miller, 2007a; Sih et al., 2004). An individual reaction norm is the set of phenotypes that a given genotype would produce if exposed to a definite set of environments (Via et al., 1995). Applied to behavior, it describes the genetic disposition of an organism for specific behavioral categories, contingent on the environmental situation.

What lies behind individual differences in “sensitivities” to certain classes of situations? Recently, Kammrath and her colleagues (2005) showed that people use information about patterns in people's reactions to particular situational features (if-then signatures) to judge the level of agreeableness (but not extraversion) of other people. Interestingly, participants' attributions of motivational processes mediated the path from observed patterns of reactivity to environmental situations to traits judgments. Such a finding is reminiscent of Henry Murray's theory of personality as being driven by psychological needs. Indeed, there is a striking similarity between the view that traits represent different sensitivities to situational cues and Murray's (1938) definition of a need as a “potentiality or readiness to respond in a certain way under certain given circumstances” (p. 124).

The FFM dimensions and psychological needs are not just conceptually but also empirically related. Costa and McCrae (1988) noted that “trait psychologists should consider the explicitly motivational aspects of their constructs” (p. 264) and proceeded by showing that the FFM dimensions can be identified in factor analyses of a questionnaire that assesses Murray's 22 needs (see also Ashton, Jackson, Helmes, & Paunonen, 1998). In the current paper we will argue that the FFM dimensions can be successfully conceptualized as need-like constructs that motivate people to respond in a certain way to environmental circumstances (cf. Winter, John, Stewart, Klohnen, & Duncan, 1998).

Goals constitute another motivational construct that has been linked to personality traits. However, traits and goals are usually assessed at different levels of specificity, with traits being conceptualized as broader and more abstract entities than goals (Kaiser & Ozer, 1994). Second, there is a difference between the content of a person's goals and his or her style of trying to achieve these goals. For example, in the present paper we argue that the trait of conscientiousness is related to the tenacity with which people pursue their goals, whereas we are silent about the kinds of goals conscientious individuals are more likely to select. By comparison, Roberts and Robins (2000) studied associations between the FFM traits and the importance that people attach to a set of relatively broad life goals and found that all Big Five traits were predictive of the importance of at least one cluster of goals. Such associations have also been demonstrated on the within-subject level (Heller, Komar, & Lee, 2007).

The advantage of conceptualizing traits as motivational constructs is that it explicitly recognizes traits as interacting with environmental features to give rise to behavior aimed at satisfying certain needs. In this sense, the *motivational purpose* of a behavioral act is more important than its *idiosyncratic form* (the latter category is more akin to mutually substitutable habits; Eysenck, 1967). Notwithstanding, only 20% of the items of standard personality measures refer to affective preferences against no less than 40% that refer to *specific behaviors* that are thought of as representative of the trait in question (Werner & Pervin, 1986; for example, a NEO-PI-R conscientiousness item reads “Sometimes I cheat when I play solitaire”). According to a study by Pytlik Zillig, Hemenover, and Dienstbier (2002), this is especially evident in scales tapping into conscientious-

ness and extraversion, which on average contain 53% and 68% behavioral items. When such idiosyncratic behaviors are used in questionnaire items, the factorial invariance of the resulting scales can be questioned (Nesselroade, 2006), since their aggregates do not describe a person in a meaningful manner (Molenaar, 2004). The current paper will try to conceptualize the FFM factors without referring to specific behaviors, instead tapping into motivational processes that may be both nomothetic and homogeneous enough to be meaningfully aggregated.

1.2. Plausible motivational reaction norms underlying the Big Five

In search of plausible motivational reaction norms underlying each of the FFM dimensions, we reviewed the theoretical literature addressing the nature and content of the FFM framework and extracted conceptualizations for each of the Big Five domains. Table 1 summarizes nine theorists' conceptualizations. Of these, Buss (1991, 1996), Hogan (1996), McAdams (1992), and McAdams and Pals (2006) viewed the dimensions of the FFM as evolutionarily adaptive categories of person perception, while MacDonald (1995, 1998) and Nettle (2006) applied evolutionary theorizing to explain the FFM dimensions as equally viable behavioral strategies. Holmes starts from a taxonomy of interpersonal situations to deduce the existence of relational traits. van Lieshout (2000) uses developmental domains as the starting point of his analysis. Finally, Ashton and Lee (2001, 2007) conceptualize traits as stable differences in interpersonal valence and domain-specific intensity of behavior, and McCrae and Costa (1996) as endogenous dispositions influencing patterns of thoughts, feelings, and behaviors.

1.2.1. Extraversion

In Table 1, three clusters of conceptualizations of extraversion emerge. First, van Lieshout (2000) conceptualizes this factor as reflecting a person's activation vs. inhibition of impulses, which is somewhat similar to MacDonald's (1995, 1998) notion of extraversion as reflecting individual differences in behavioral approach. Both views are consistent with Lucas, Diener, Grob, Suh, and Shao (2000), who hypothesized that extraversion is positively associated with the sensitivity of individuals' reward system. Because these authors view positive affect as a proxy of the activity of the general reward system, this hypothesis can also account for the high correlations between extraversion and individual differences in positive affect (Watson & Clark, 1997), even when controlling for social activity (Watson, Clark, McIntyre, & Hamaker, 1992).

A second cluster of explanations of the extraversion factor is the notion that this trait is involved in people's hierarchical proclivity (Buss, 1991), leadership potential (Hogan, 1996), or disposition to wield power (McAdams, 1992). In addition, the disposition for dominance vs. submission in accessing resources is one of the two social dimensions that can be mapped onto extraversion in Holmes' (2002) model. However, a problem with this account is that differences in dominance seem to be confounded by differences in competitive resources such as physical prowess, mental ability, material wealth, and social alliances, which depend not only on extraversion but also on other personality factors, such as general problem-solving ability and persistence in reaching goals.

Third, extraversion has been linked to the motivational predisposition to experience social interactions as rewarding (Ashton & Lee, 2001; McCrae & Costa, 1987). Insofar as this predisposition motivates people to seek out the company of others, this view is consistent with Holmes' (2002) second possible conceptualization of extraversion as tapping into people's level of assertiveness vs. passivity in initiating social contacts. In an empirical study, Ashton, Lee, and Paunonen (2002) presented evidence for this position, showing that a "tendency to engage and enjoy social attention" (p. 246) correlates very highly (.74) with traditional extraversion measures. Ashton et al. (2002) reasoned that extraversion can be adaptive because it is correlated with people's "social attention-holding power" (Gilbert, 1989), allowing for the exertion of group influence and the attraction of possible mates (Campbell, Simpson, Stewart, & Manning, 2003; Nettle, 2005, 2006). In the current paper, we take this latter explanation as a plausible conceptualization of extraversion, though other explanations (e.g., as differences in general reward sensitivity) might also be consistent with the empirical evidence.

1.2.2. Agreeableness

In Table 1, two clusters of conceptual interpretations for agreeableness can be discerned (the conceptualization by Ashton & Lee, 2001, is directed at a rotational variant of this factor and will not be considered here). First of all, several theorists regard agreeableness as fostering intimate relationships, conceptualizing it as enjoyment of other people's company (Hogan, 1996), facilitation of intimate family relationships and parental investment (MacDonald, 1995), or dispositional love (McAdams, 1992). This conceptualization is consistent with the hypothesized social nature of personality traits. However, Hogan's (1996) notion of enjoyment of other people's company is difficult to differentiate from sociability, a key feature of extraversion. In addition, MacDonald's (1995) emphasis on the facilitation of intimate family relationships and parental investment is not consistent with findings by Graziano, Jensen-Campbell, and Hair (1996) that the effects of agreeableness on reactions to interpersonal conflict with non-kin individuals do not consistently differ from reactions to conflicts with kin.

A second cluster of conceptualizations of agreeableness focuses on this factor's role in human cooperative behavior, with Buss (1991) relating it to people's willingness to cooperate, Holmes (2002) to acting cooperative vs. competitive, Nettle (2006) to empathy and trust vs. self-interest, and van Lieshout (2000) to the coordination vs. opposition of joint interests. This conceptualization is consistent with game-theoretical research on reputations of cooperation vs. competition in resource dilemma's (Rasmusen, 2006) and with research by van Lange and colleagues (van Lange, 1999; van Lange, De Bruin, Otten, & Joireman, 1997) regarding the existence of individual differences in social value orientation. Finally, Koole, Jager, van den Berg, Vlek, and Hofstee (2001) showed that agreeableness is related to altruistic behavior when playing a variant

Table 1
Existing conceptualizations of the FFM dimensions

Reference	Conceptualization				
	Extraversion	Neuroticism	Openness	Conscientiousness	Agreeableness
Ashton and Lee (2001, 2007)	Engagement in social behaviors	Low forgiveness, high empathy	Engagement in idea-related behaviors	Engagement in task-related behaviors	High forgiveness, high empathy
Buss (1991, 1996)	Hierarchical proclivity	Ability to handle stress	Propensity for innovation, astuteness in solving problems	Capacity for reliable work and enduring commitment	Willingness to cooperate
McCrae and Costa (1996, 1997)	Enjoyment of others' company	Negative affect, disturbed thoughts and behaviors	Permeability, breadth, and depth of consciousness; need to enlarge and examine experience	Adherence to plans, schedules, and requirements	Lack of antagonism against others
Hogan (1996)	Leadership potential	Facilitating performance under pressure	Solving technical problems confronting the group	Trustworthiness and dependability	Enjoying other people's company
Holmes (2002)	Dominance vs. submission in accessing resources; Assertiveness vs. passivity in initiating social contacts	Anxiety about partners' responsiveness in meeting one's goals	Coping with incomplete information or uncertain future	Promotion of immediate vs. distant goal striving	Acting cooperative vs. competitive
McAdams (1992), McAdams and Pals (2006)	Power	Affect	Intellect	Work	Love
MacDonald (1995, 1998)	Behavioral approach	Affect intensity	Intrinsically motivated curiosity, creativity	Monitoring possible environmental threats, including non-attainment of goals	Facilitation of intimate family relationships and parental investment
Nettle (2006)	Risky mating and exploration	Vigilance and status striving	Creative attractiveness and unusual thinking	Orientation towards long-term vs. short-term fitness benefits	Empathy and trust
van Lieshout (2000)	Activation level	Self-domain, affect regulation	Intellectual/creative domain, cognition	Performance domain, executive regulation	Coordination vs. opposition of joint interests in the interpersonal domain

of the public goods game. Consistent with this evidence, we propose that agreeableness can be plausibly conceptualized as individual differences in this tendency to display altruistic behavior.

1.2.3. Conscientiousness

All theorists listed in Table 1 agree that conscientiousness is involved in task-related behaviors. Specifically, McAdams (1992) conceptualizes this factor as involved in work-related behaviors, MacDonald (1995) as the monitoring of non-attainment of goals, van Lieshout (2000) as executive regulation in the performance domain, Ashton and Lee (2001) as the intensity of engagement in task-related behaviors, Buss (1991) as the capacity for reliable work and enduring commitment, and Hogan (1996) as trustworthiness and dependability. Holmes (2002) and Nettle (2006) are arguably most successful in capturing the positive aspects of both poles of the conscientiousness continuum by describing it as the promotion of immediate vs. distant goal striving. This conceptualization nicely maps onto lifespan-theoretical insights regarding individual differences in the tenacity of goal pursuit (Brandtstädter, Wentura, & Rothermund, 1999). In the current paper, we adopt the view of these various authors that conscientiousness can be plausibly conceptualized as differences in the tenacity of goal pursuit.

1.2.4. Neuroticism/emotional stability

As can be seen in Table 1, almost all theorists link neuroticism to individual differences in affect regulation, conceptualizing this factor as differences in the ability to handle stress (Buss, 1991), facilitation of performance under pressure (Hogan, 1996), affect regulation (McAdams, 1992; van Lieshout, 2000), and affect intensity (MacDonald, 1995; the conceptualization by— Ashton et al., 2004, will not be considered because it concerns a rotation of this factor). These conceptualizations all regard neuroticism as the sensitivity of a domain-general system to respond to environmental threats. Various studies have also linked neuroticism to individual differences in general differential reactivity to negative events or stressors (Gross, Sutton, & Ketelaar, 1998; Marco & Suls, 1993; Rusting & Larsen, 1997; Suls, Green, & Hillis, 1998).

By comparison, other conceptualizations treat neuroticism as a trait that is especially activated in situations in which people's social relationships are threatened. For example, Matthews (2004) pointed out that "individual differences in human anxiety revolve primarily around *social* fears such as being criticized or rejected, rather than physical threats" (p. 260, italics added). Support for this conceptualization comes from research by Bolger and colleagues (1989), who found that interpersonal stressors were more important in causing negative mood than non-social ones, such as transportation problems or work overload. Similarly, Denissen and Penke (in press) found that neuroticism was particularly correlated with the intensity of people's negative reactions to social threats. The only conceptualizations in Table 1 that explicitly includes a reference to the social context are those by Nettle (2006) and Holmes (2002). While Nettle (2006) relates neuroticism loosely to both vigilance to environmental hazards and to striving for social status, Holmes (2002) argues more specifically for neuroticism as individual differences in the chronic anxiety about one's partner's responsiveness in meeting one's goals. This conceptualization is reminiscent of Leary and Baumeister's (2000) Sociometer Theory (SMT) of self-esteem, which proposes that humans have an evolved sensitive device for the assessment of one's potential for social exclusion. The current paper proposes that neuroticism can be plausibly conceptualized as individual differences in people's sensitivity to signs of social exclusion, although we note that competing (non-social) conceptualizations may be valid as well.

1.2.5. Openness to experience/intellect/culture

As can be seen in Table 1, several clusters of conceptualizations exist for the openness to experience factor. All conceptualizations converge in their conceptualization of this trait as involving a high level of cognitive activity, as indicated by having a broad, deep, and permeable consciousness (McCrae & Costa, 1997), a high propensity for innovation and solving problems (Buss, 1991; Hogan, 1996), engagement in the intellectual and creative domain (McAdams & Pals, 2006; Nettle, 2006; van Lieshout, 2000), processing incomplete information (Holmes, 2002), and intrinsically motivated curiosity facilitating the development of cognitive competence (MacDonald, 1995). In trying to make sense of this factor, however, openness should be distinguished from psychometric intelligence, which is correlated with openness but not identical to it (McCrae & Costa, 1987; also see Penke et al., 2007a).

A parallel distinction was made by Ackerman (1996), who noted the difference between *maximum* and *typical* levels of intelligence: whereas the former is identical to operationalizations of psychometric intelligence, the latter has been shown to correlate very highly with openness to experience (Goff & Ackerman, 1992). This conceptualization is almost identical to Cacioppo and colleagues' (1996) construct of need for cognition, which they defined as "a stable individual difference in people's tendency to engage in and enjoy effortful cognitive activity" (p. 198). Empirically, this view is supported by Berzonsky and Sullivan (1992), who found a correlation of .78 between need for cognition and the NEO-PI-R openness to ideas scale (though the correlation with other openness facets was lower). Accordingly, we propose that openness can be plausibly conceptualized as differences in the reward value of engaging in cognitive activity.

1.3. The present study

In order to evaluate the empirical performance of this framework, the conceptualizations of the FIRN model were translated into a questionnaire, the Five Individual Reaction Norms Inventory (FIRNI). In a series of studies, we sought to establish the validity of this new FFM questionnaire by comparing it to existing FFM scales. Comparative validity can be evaluated according to at least two dimensions: (a) content vs. predictive validity, and (b) convergent vs. incremental validity. Crossing

these two dimensions, one gets four cells: (1) convergent content validity (two scales tap into the same semantic space), (2) incremental content validity (a scale taps more closely into a hypothesized latent construct than another scale) (3) convergent predictive validity (two scales predict the same amount of variance in a criterion), and (4) incremental predictive validity (a scale predicts more variance in a criterion than another scale). In this paper, we expect to find evidence for the first three kinds of comparative validity. In contrast, we see no clear basis for predicting incremental predictive validity. The reason is that traditional Big 5 scales are based on extensive factor analytical work, starting from a large pool of items and selecting those with high factor loadings. This ensures a highly accurate representation of the latent factor space. Because we expect the FIRNI to tap into the same latent factor space (see Cell 1) and because these latent factors should be responsible for the observed predictive correlations between FFM scales and manifest behavior, we think it would be unrealistic to expect a higher level of precision of the FIRNI. In other words, we expect the FIRNI to tap into the same variance as traditional FFM measures. In that regard, the FIRNI can be regarded as an alternative FFM measure, though it has the advantage of being more explicitly connected to our underlying motivational theory.

2. Study 1: Content validity of the FIRNI

To ensure that the FIRNI items are maximally focused on the hypothesized content domain, we let independent raters judge the similarity between our theoretical model and the resulting operationalization. To provide a standard of comparison, we also let participants judge the similarity between our hypothesized content domains and the items of an established FFM questionnaire: the BFI. We not only expected that the FIRNI scales would be rated as similar to the corresponding content domains (i.e., similarity ratings above the scale midpoint) but would also outperform the BFI (significant differences in similarity).

2.1. Method of Study 1

2.1.1. Participants

The rating sample consisted of individuals who completed a German online version of the FIRNI and the BFI. At the end of this questionnaire, they were asked to take part in an additional rating study into the content of these questionnaires. Thirty individuals took part in this additional study (20 females, M age = 35.3, SD = 12.4).

2.1.2. Instruments

2.1.2.1. Construction of the FIRNI. For each FFM domain, 10 items were written to correspond as closely as possible to the cognitive or affective reactions to circumscribed situations that were listed above. Item formulations also avoided references to correlated behaviors (Watson, Clark, & Harkness, 1994). Scales were developed and revised in nine online studies (total N = 6,491) that served to maximize factorial and convergent validity (unpublished data available from the first author). Sample items include “I feel best when I have a lot of people around me” (extraversion), “In conflicts of interest with others, I always try to take out the maximum for myself” (agreeableness, reverse scored), “When I have set myself a goal I pursue it very persistently” (conscientiousness), “I often have doubts about the stability of my social relationships” (neuroticism), and “I really like to engage in mental activity” (openness). See [Appendix](#) for the full list of items.

2.1.3. Procedure

Participants rated the similarity between all FIRNI and BFI items and the corresponding motivational descriptors: Extraversion: “I enjoy interacting with other people”, agreeableness: “I do not tend to be selfish in conflicts about resources”, conscientiousness: “I pursue my goals very tenaciously”, neuroticism: “I am easily afraid to lose social relationships”, and openness: “I enjoy cognitive activity”. Each sentence was displayed next to the corresponding reference construct, with answering categories ranging from 1 (“absolutely dissimilar”) to 5 (“fully similar”). For negatively worded items, the degree of similarity with the negation of the reference construct was rated. The cross-rater reliability of the aggregate similarity judgment was excellent (α = .97, ICC testing for absolute agreement = .92).

2.2. Results of Study 1

Averaged across raters, similarity ratings between the hypothesized motivational constructs and the FIRNI items ranged between 2.57 and 4.60 (M = 3.67), with only 7 items falling below the scale midpoint, though these deviations were not statistically significant (i.e., ≥ 1.96 standard errors). By comparison, similarity ratings for the BFI items ranged between 1.50 and 4.30 (M = 2.83), with no less than 23 items falling below the scale midpoint, a difference that was statistically significant in 17 cases. [Table 2](#) displays the mean similarity ratings across FFM scales. As can be seen, the FIRNI scales were rated on average as 3.65 in similarity, against an average value of only 2.54 for the BFI, $t(30) = 8.77$, $p < .01$, $d = 1.39$. All FIRNI Big Five scales were rated as significantly more similar than the scale midpoint, whereas this was only the case for the BFI openness scale. All FIRNI scales were rated at least one standard deviation more similar to the hypothesized constructs than the corresponding BFI scales, except for openness to experience, in which case the difference was rather small ($d = .25$). However, for all comparisons, the FIRNI was rated as significantly more similar to the hypothesized construct domains than the BFI (when applying a one-tailed significance test).

Table 2
Similarity ratings between Big Five conceptualizations and questionnaire items

	FIRNI		BFI		<i>t</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Extraversion	3.44	0.80	2.66	0.77	9.40**	1.00
Agreeableness	3.79	0.88	2.60	0.85	7.14**	1.37
Conscientiousness	3.90	0.82	3.02	0.82	6.85**	1.07
Neuroticism	3.57	1.13	2.21	0.96	6.95**	1.30
Openness	3.67	1.04	3.41	1.05	1.97*	0.25
Overall (across scales)	3.65	0.86	2.54	0.74	8.77**	1.39

Note. *N* = 30.

* *p* < .05 (one-tailed).

** *p* < .01.

2.3. Discussion of Study 1

In Study 1, we let participants rate the similarity of the FIRNI items with descriptions of the underlying motivational processes of each FFM factor. As indicated by the average similarity ratings, the FIRNI outperformed the BFI in this regard, suggesting that it is better able to tap into the hypothesized motivational constructs than established measures. It is more difficult to evaluate the similarity between the FIRNI and the underlying theoretical framework in absolute terms. On the one hand, the average similarity ratings of the FIRNI were above the scale midpoint, indicating more similarity than similarity, whereas the average BFI similarity ratings did not exceed the scale midpoint, except in the case of openness. On the other hand, the average similarity ratings of the FIRNI did not approach a value of 5 that would indicate the scales were perceived as “absolutely similar” to the underlying motivational constructs.

While the general pattern of results should be regarded as an example of incremental content validity, an obvious follow-up question then becomes whether the different content of FIRNI interferes with the measurement of the FFM dimensions as operationalized in traditional questionnaires. For this purpose, Studies 2–4 were carried out.

3. Study 2: Factorial and structural validation of the FIRNI

As a second step of evaluating the conceptualization of the FFM as representing motivational differences in people’s reactions to certain classes of environmental stimuli, the construct validity of the new FIRNI scales was compared to that of more traditional FFM questionnaires. To qualify as a feasible conceptualization to the FFM, three conditions have to be met: (1) the factor structure of the FIRNI should consist of five approximately orthogonal factors matching the well-known structure of the FFM (primary loadings >.40, secondary loadings near zero), (2) its scales should be internally consistent (alpha reliability >.70), (3) FIRNI scales should show a high degree of convergence with corresponding scales from established FFM questionnaires, including discriminant validity with regard to the other four (Campbell & Fiske, 1959).

3.1. Method of Study 2

3.1.1. Instruments

Besides completing the FIRNI, participants completed two established FFM measures, both of them rooted in the lexical Big Five tradition. First, they completed the five 12-item German bipolar adjective scales (ADJ; Ostendorf, 1990). In addition, participants completed the Big Five Inventory (BFI), which consists of 7–10 items per scale.

3.1.2. Sample

Participants were internet users that completed the various versions of the FIRNI online. As an incentive, participants received a personality profile after completion of the study. The final version of the questionnaire was accessed by 3909 participants between May and August 2005. Of this initial sample, 2923 individuals contributed some data (75%). Of these, 5 did not show any variance in their responses, and 33 individuals stated they did not fill out the questionnaire in an honest way. Furthermore, 112 subjects were excluded because they took longer than an hour to fill out the questionnaire (median time online = 25 min), 81 because they used an already existing user name (i.e., potential double participations), and 579 because they were under 16. Accordingly, the final sample size for the factor analyses was 2113 (i.e., 72% of all individuals who provided some data), though sample sizes for construct validation were slightly smaller. Of the final sample, 71% were female. The average age was 22.2 (*SD* = 8.0, range 16–63). The sample was diverse in terms of education: 48% did not have a high school degree (German Abitur), and 77% never visited college or university (German Hochschule).

3.1.3. Procedure

The questionnaire started with the FIRNI, followed by the bipolar adjectives scales and the BFI. The FIRNI and BFI items were answered on a 5-point rating scale, with the poles labeled “not at all” and “completely” indicating the degree

of agreement with the item statement. The bipolar adjectives were rated on a 6-point scale, from 1 (“only the left pole applies to me”) to 6 (“only the right pole applies to me”). About 1853 participants completed the full questionnaire package consisting of FIRNI, adjective scales, and BFI, whereas 1980 participants completed both the FIRNI and the adjective scales.

3.2. Results of Study 2

3.2.1. Factor structure and internal consistency of the FIRNI

The scree plot of a principal component factor analysis with VARIMAX rotation on the raw scores indicated a clear drop in eigenvalues after the fifth factor, though the sixth factor also showed a discernable, but much more minor leap. The emergence of such weaker, additional factors is not uncommon in factor analysis and may represent individual differences in response style (McCrae, Herbst, & Costa, 2001). To control for such biases, raw item responses were ipsatized for each individual participant (for all other analyses, scale scores based on non-ipsatized scores were used). Principal component factor analysis with VARIMAX rotation was applied to on all 50 ipsatized FIRNI items. Inspection of the scree plot indicated a clear drop in eigenvalues after the fifth factor. Parallel analyses that were conducted using 100 random data sets indicated that only the eigenvalues from the first five factors were higher than expected by chance. The Five-Factor structure was consistent with the a priori item categorization, with primary loadings between .34 and .81 (average .61) and absolute secondary loadings between .00 and .30 (average .07).

Composite scales were highly reliable, with alphas ranging from .78 for neuroticism to .90 for extraversion ($M = .84$; see Appendix). This is comparable to the internal consistencies of the established FFM instruments, which ranged from .77 to .90 ($M = .84$) in the case of the BFI and from .86 to .95 ($M = .90$) in the case of the adjectives (to correct for the different number of items, we calculated the expected reliability of the BFI and adjectives if they would also have 50 items like the FIRNI, using the Spearman–Brown formula; the corresponding mean consistencies were .86 and .88, respectively). Item-total correlations of the FIRNI were uniformly high, ranging from .34 to .77, with an average value of .54.

3.2.2. Convergent and divergent validity with established FFM indices

To assess the convergent and divergent validity of the FIRNI compared to established FFM measures, a multi-trait multi-method analysis (Campbell & Fiske, 1959) was carried out. As seen in Table 3, raw correlations between the FIRNI and BFI scales averaged .67 (range .59–.76). Corrected for attenuation, these correlations increased to an average value of .79 (range .71–.85). Correlations with the ADJ scales were similar in size, with an average raw correlation of .65 (range .54–.83) and a corrected one of .75 (range .61–.90). Convergent correlations between parallel scales of the FIRNI and the two established FFM instruments were substantially higher than the correlations that resulted when scales with different content were paired across instruments (e.g., between BFI-extraversion and FIRNI-agreeableness), with average absolute heterotrait-hetero-method correlations of .18 and .15 with the BFI and the adjectives, respectively. Also, the convergent validity correlations were higher than the correlations between different scales of the same instrument, with average absolute heterotrait-mono-method correlations (i.e., between different scales of the same instrument) of .15 for the FIRNI, .22 for the BFI, and .19 for the adjectives. Accordingly, the average absolute correlation between scales was somewhat smaller for the FIRNI than for the traditional FFM measures, with the difference between FIRNI and BFI being statistically significant, $z = -2.20$, $p = .01$, suggesting superior discriminate validity for the former.

Table 3

Multitrait-multimethod matrix showing the means, standard deviations, reliabilities, convergent validities, and divergent validities of the FIRNI, BFI, and adjective scales

		M	SD	FIRNI					BFI					ADJ					
				E	A	C	N	O	E	A	C	N	O	E	A	C	N	O	
FIRNI (1–5)	E	3.35	0.79	(.90)															
	A	3.51	0.64	.15	(.83)														
	C	3.24	0.68	.17	.03	(.85)													
	N	3.03	0.67	-.36	.00	-.34	(.78)												
	O	3.60	0.68	-.02	.04	.22	-.16	(.82)											
BFI (1–5)	E	3.36	0.83	.76	.02	.31	-.46	.11	(.90)										
	A	3.44	0.65	.36	.59	.15	-.22	.00	.21	(.85)									
	C	3.27	0.68	.10	.10	.73	-.26	.13	.22	.24	(.77)								
	N	3.03	0.79	-.31	.00	-.39	.64	-.14	-.40	-.27	-.26	(.85)							
	O	3.76	0.63	.08	.04	.23	-.12	.59	.26	.06	.15	-.10	(.83)						
ADJ (1–6)	E	4.25	1.09	.83	.13	.22	-.42	.01	.88	.36	.15	-.37	.16	(.95)					
	A	4.16	0.77	.13	.60	.07	-.07	.03	-.05	.76	.15	-.17	.05	.13	(.87)				
	C	4.01	0.87	.00	.01	.54	-.15	.11	.09	.12	.82	-.13	.10	.05	.09	(.92)			
	N	3.29	0.99	-.33	.02	-.39	.65	-.11	-.41	-.26	-.27	.86	-.08	-.42	-.18	-.16	(.92)		
	O	4.83	0.63	.15	.01	.33	-.23	.54	.35	.12	.28	-.23	.66	.28	.11	.26	-.23	(.86)	

Note. Reliabilities are displayed in brackets, convergent correlations in bold.

3.3. Discussion of Study 2

Results of Study 2 showed that the FIRNI questionnaire that was derived from this conceptualization can be described by a clear Five-Factor structure, resembling the traditional FFM dimensions. Second, the scales of the FIRNI turned out to be highly internally consistent, showing that the goal of deriving content-homogeneous from our a priori conceptualizations was reached. Third, the FIRNI scales evidenced a high level of convergent validity with established FFM scales from the adjective-based lexical tradition, with only two correlations (between the FIRNI and adjective conscientiousness and agreeableness scales) trailing slightly behind the set criterion value of .70. All in all, these results suggest that the FFM dimensions can be feasibly assessed by an instrument that taps into individual differences in people's motivational reactions to circumscribed classes of environmental stimuli specific motivational.

4. Study 3: Predictive validity of the FIRNI

Critics of the trait approach to personality have argued that associations between personality traits merely reflect individuals' implicit personality theories. Evidence against this position comes from the fact that the FFM domains are related to real-life, consequential outcomes (Ozer & Benet-Martínez, 2006). Though Study 2 showed the convergence of the FIRNI model with the established FFM, the generalizability of the predictive validity to the new FFM conceptualization has still to be demonstrated. Accordingly, in Study 3 we conducted a series of hierarchical regression analyses to compare the predictive validity of the FIRNI compared to traditional FFM instruments. Recall that we expect the FIRNI to demonstrate a similar level of predictive validity (i.e., Cell 3), but not necessarily a higher level of incremental predictive validity (i.e., Cell 4), as the FIRNI should tap into the same latent factor space that is responsible for the observed predictive correlations between FFM scales and manifest behaviors.

4.1. Method of Study 3

After completing the FIRNI, BFI, and bipolar adjectives scales, around 70% of the participants of Study 2 (i.e., 1472 out of the 2113 participants) filled out the self-reported behavior measures. Attrition analyses indicated that participants who contributed behavioral data did not differ with regard to gender from those who did not, $\chi^2 = .23$, $p = .64$. However, on all three questionnaires, Study 3 participants rated themselves as significantly more extraverted ($d = .49$ – $.51$, $F_s > 54$, $ps < .01$) and somewhat less neurotic ($d = .12$ – $.25$, $F_s > 6$, $ps \leq .01$) than dropouts. Study 3 participants also judged themselves as somewhat lower in conscientiousness when assessed by the BFI or the adjective scales ($d = .16$ – $.17$, $F_s > 7$, $ps \leq .01$), and somewhat higher in agreeableness when assessed by the BFI ($d = .18$, $F = 10$, $p < .01$). Finally, Study 3 participants ($M = 21.5$) were somewhat younger than dropouts ($M = 23.7$, $d = .27$, $F = 34$, $p < .01$). Except for the attrition effect on extraversion, these effect sizes are small and reached statistical significance only because of the large sample size.

Participants provided data on 25 outcome variables (exact items can be provided from the first author). Included in this list were 10 of the 12 variables that Paunonen (2003) found to be significantly related to the FFM domains. Self-ratings of intelligence were not included because they are only weakly related to measured intelligence (Paulhus, Lysy, & Yik, 1998). Dating variety was also not included because the "dating" concept is not clearly established in German culture. Finally, because the current sample was educationally diverse, the questionnaire departed from Paunonen (2003) in asking about participants' "professional/academic success" instead of GPA. In addition, 15 behavioral items with theoretical relevance to the FIRNI model conceptualization of the FFM were added. For example, the frequency of telephone and email contacts was added to tap into the sociability of extraverted individuals, whereas the amount of time spent on consuming news coverage should tap into open individual's need for cognition.

4.2. Results of Study 3

4.2.1. Predictive validity

In a series of hierarchical regression analyses, the order of predictors was systematically alternated in order to disentangle the initial from the incremental predictive ability of the different FFM instruments. In one series of analyses (Model I), the FIRNI scales were entered as a first block, followed by the BFI or the ADJ scales. In Models II and III, the BFI and ADJ scales were entered as a first block, respectively, followed by the FIRNI scales. All FFM scales were able to predict a significant portion of the variance in most of the 25 outcome variables (a table with the detailed information regarding the performance of each scale can be obtained from the first author). Specifically, when entered as a first block, the FIRNI, BFI, and ADJ scales accounted for 21, 23, and 20 significant effects, respectively. On average, all three instruments explained between 5% and 6% of the variance when entered as a first block. When entered as a second block, the incremental contribution of the FIRNI was significant in 14 and 17 cases when entered after the BFI and ADJ scales, respectively. By comparison, the incremental contribution of the BFI and ADJ scales after controlling for the FIRNI was significant in 13 and 10 cases, respectively. On average, all three instruments explained 2% of incremental variance when entered as a second block. Accordingly, the FIRNI scale can be considered empirically equivalent to the established FFM scales in explaining behavioral and self-perception outcomes.

4.3. Discussion of Study 3

In line with our expectations, the results of Study 3 demonstrate the convergent predictive validity of the FIRNI (i.e., Cell 3), as it was just as capable as established FFM measures of predicting important real-life outcomes, such as occupational success, having sleepless nights, and attending parties. In addition, an inspection of the pattern of associations between single FFM domains and outcome variables shows that the predictive pattern of the conceptualization underlying the FIRNI is highly similar to that of more traditional FFM measures. This is all the more remarkable given the fact that the so-called bandwidth-fidelity trade-off (Ashton, 1998) predicts that operationalizing the FFM dimensions as a list of relatively fuzzy and general adjectives should result in a broader range of prediction than the fairly specific process operationalizations of the FIRNI. Instead, it seems that the FIRNI is able to combine predictive power with an explicit psychological theory of what processes are responsible for producing the observed empirical correlations. By comparison, the FIRNI did not show a superior level of incremental predictive validity vis-à-vis established FFM instruments (i.e., Cell 4), which we had expected given that the FIRNI should tap into the same latent FFM factor space that is responsible for its predictive correlations (i.e., Cell 1, Study 2).

5. Study 4: Associations between the FIRNI scales and facets of the FFM domains

Up to now, critics might still object that the FIRN model is too narrow to replace the seemingly more comprehensive FFM dimensions and only taps into specific facets of the FFM domains. For example, the conceptualization of extraversion in the FIRN model as the reward value of social interactions might primarily tap into the gregariousness facet of the extraversion NEO-PI-R scale, whereas the conceptualization of neuroticism as the sensitivity to signs of social exclusion might merely be a correlate of the NEO-PI-R neuroticism facet of vulnerability. According to Lucas et al. (2000), linking broad personality dimensions to more specific facets is important, since identifying a core construct that is able to tie together a personality factor's constituent facets is a first step towards developing a parsimonious theory of the fundamental features of a higher order personality factor. This is especially important for our conceptualization of the FFM domains as fundamental individual reaction norms, since they should serve as developmental antecedences of all their facets. In the current study, we applied this framework by looking at the correlations between the FIRNI scales and the FFM facets as proposed by Costa and McCrae's (1992).

5.1. Method of Study 4

The sample for Study 4 consisted of 99 individuals from the general population, aged 16 to 62 ($M = 29.9$, $SD = 11.6$). Of these individuals, 62 (63%) were female, and 57 (58%) had a high school degree (German Abitur). Participants received a questionnaire battery that included the NEO-PI-R (German version by Ostendorf & Angleitner, 2004), the FIRNI, and some demographic questions. As an incentive to participate, participants received a personal feedback profile based on their responses to the NEO-PI-R questionnaire.

The dimensions of the FIRN model were assessed with an earlier version of the FIRNI that was highly similar to the final version, with only six items (3 agreeableness, 2 neuroticism, 1 conscientiousness) that were modified in subsequent revision stages. Reliabilities of the FIRNI scales were good to excellent, ranging from .71 (self-rated neuroticism) to .90 (peer-rated extraversion). The NEO-PI-R composite scales, consisting of 48 items each, had excellent reliabilities, ranging from .86 (neuroticism) to .92 (openness). Using the Spearman-brown formula, it can be calculated that the reliability of the composite NEO-PI-R scales would only range from .56 to .68 if they would consist of only 10 items. This reinforces the notion that the FIRNI taps into more homogeneous processes than scales that include behavioral references, such as the NEO-PI-R. The 30 NEO-PI-R facets, consisting of only 8 items per scale, had an average reliability of .72, though some facets were problematic (particularly openness: values, and conscientiousness: order and deliberation; see Table 4 for a full overview).

5.2. Results of Study 4

5.2.1. Convergent validity

There was a high level of convergence between the FIRNI and the NEO-PI-R scales, with an average correlation of .72. When these correlations were attenuated for unreliability, they increased to .85, indicating a very high level of convergent validity. Convergence was only lower in the case of openness, with an uncorrected correlation of .54 (corrected: .60).

5.2.2. Facet analyses

To compare the comprehensiveness of the FIRNI and NEO-PI-R domain scales, both were correlated with the NEO-PI-R facets. To avoid predictor-criterion overlap, each NEO-PI-R facet was only correlated with the average of all other facets of the same factor. Results of these analyses are shown in Table 4 and are discussed below for each factor separately.

Table 4
Reliabilities of NEO-PI-R facets and their correlations with FIRNI and NEO total scales

Facet #	Extraversion			Neuroticism			Openness			Conscientiousness			Agreeableness		
	NEO Facet α	FIRNI Scale r	NEO Scale r	NEO facet α	FIRNI sccale r	NEO scale r	NEO facet α	FIRNI scale r	NEO scale r	NEO facet α	FIRNI scale r	NEO scale r	NEO facet α	FIRNI scale r	NEO scale r
1	.84	.70**	.62**	.72	.50**	.72**	.82	.58**	.34**	.75	.63**	.70**	.74	.57**	.53**
2	.65	.80**	.60**	.66	.37**	.55**	.81	.64**	.49**	.38	.57**	.60**	.59	.28**	.38**
3	.67	.19	.32**	.71	.42**	.62**	.86	.64**	.42**	.75	.71**	.77**	.84	.63**	.54**
4	.64	.62**	.61**	.56	.52**	.55**	.52	.11	.10	.51	.53**	.55**	.52	.29**	.23*
5	.61	.36**	.34**	.56	.13	.16	.82	.77**	.47**	.78	.82**	.77**	.75	.43**	.54**
6	.83	.72**	.73**	.73	.47**	.56**	.45	.65**	.46**	.48	.34**	.34**	.80	.67**	.61**
Average	.72	.60	.55	.66	.41	.55	.75	.59	.39	.64	.62	.64	.72	.49	.48

Note. $N = 99$. All averages after Fisher r -to- z transformation and back-transformation. Facet labels: extraversion, E1: warmth, E2: gregariousness, E3: assertiveness, E4: activity, E5: excitement-seeking, E6: positive emotions; neuroticism, N1: anxiety, N2: angry hostility, N3: depression, N4: self-consciousness, N5: impulsiveness, N6: vulnerability; openness, O1: fantasy, O2: aesthetic, O3: feelings, O4: actions, O5: ideas, O6: values; conscientiousness, C1: competence, C2: order, C3: dutifulness, C4: achievement striving, C5: self-discipline, C6: deliberation; agreeableness, A1: trust, A2: straightforwardness, A3: altruism, A4: compliance, A5: modesty, A6: tender-mindedness.

* $p < .05$.

** $p < .01$.

5.2.2.1. *Extraversion*. As can be seen in Table 4, the FIRNI self-rated extraversion scale correlated on average .60 with the NEO-PI-R facets, whereas these correlated .55 with the NEO-PI-R domain scale. In addition, this pattern of FIRNI and NEO-PI-R domain scale correlations with individual facets was highly similar (Tucker's $\phi = .99$).

5.2.2.2. *Neuroticism*. As can be seen in Table 4, the average correlation between the FIRNI neuroticism scale and the NEO-PI-R facets was only .41 on average. This difference is slightly though significantly lower than the corresponding average correlation of .55 found for the NEO-PI-R domain scale, $t(5) = -3.22$, $p = .02$ (tested with a t -test on the vector columns of the corresponding Fisher-transformed correlations). The pattern of associations was highly similar between the FIRNI and NEO-PI-R ($\phi = .99$).

5.2.2.3. *Openness*. On average, the correlation between the FIRNI openness scale and the different facets was .59, which is significantly higher than the .39 found for the corresponding NEO-PI-R domain scale, $t(5) = 4.14$, $p = .01$. The pattern of associations was highly consistent between the FIRNI and NEO-PI-R scales ($\phi = 1.00$).

5.2.2.4. *Conscientiousness*. The FIRNI conscientiousness scale correlated on average .62 with the NEO-PI-R facets, compared to a correlation of .64 found for the NEO-PI-R domain scale. The pattern of associations between the NEO-PI-R and FIRNI scales and the NEO-PI-R facets was highly similar ($\phi = 1.00$).

5.2.2.5. *Agreeableness*. Finally, the average facet correlation was .49 for the FIRNI agreeableness scale vs. .48 for the NEO-PI-R domain scale. The pattern of associations for the FIRNI and NEO-PI-R domain scale was again strikingly similar ($\phi = .99$).

5.2.3. Intercorrelations between NEO-PI-R facets

We also examined the squared correlations between pairs of NEO-PI-R facets (belonging to the same factor), with and without controlling for the corresponding FIRNI scale. If the FIRNI adequately represents the "glue" that binds together the facets, then the squared partial correlations (controlling for the FIRNI) should drop substantially in magnitude when compared to the raw correlations, if not be reduced to zero. Results indicated that without controlling for the corresponding FIRNI scales, the NEO-PI-R facets share on average 16%, 11%, 23%, 14%, and 21% of variance, respectively. Controlling for the FIRNI, this was reduced to 1%, 2%, 4%, 7%, and 5%, respectively. In all cases, a t -test of the Fisher-transformed correlation columns indicated that the reduction was significant. Only in the cases of extraversion and agreeableness, however, the average partial correlation was statistically indistinguishable from zero. By comparing the ratios of the R^2 values, it becomes possible to quantify how much of the "glue" that hold together the NEO-PI-R facets is captured by the FIRNI. The corresponding figures are 93%, 85%, 84%, 51%, and 78% for the extraversion, agreeableness, conscientiousness, neuroticism, and openness scales, respectively.

5.3. Discussion of Study 4

The conceptualizations of the general FFM dimensions as representing contextualized motivational constructs were found to converge substantially with the ones underlying the NEO-PI-R. Specifically, correlations corrected for attenuation indicated an almost perfect level of convergence between both instruments' extraversion, conscientiousness, and agreeableness scales. The level of convergence was only somewhat lower for self-rated openness, though it came close the .70 level that was used as a criterion in Study 2. Another goal of Study 4 was to address the concern that our new FFM conceptualization taps into specific facets instead of broad, inclusive domains. To evaluate this possibility, the facet correlations of the FIRNI scales were compared with those of the NEO-PI-R. The results support our prediction that the FIRNI covers the FFM facets just as well as the more established NEO-PI-R, with an average facet correlation of .55 for the FIRNI against a value of .53 for the NEO-PI-R. For all FFM dimensions except neuroticism, the average facet correlation of the FIRNI scale was at least as high as that of the NEO-PI-R. In addition, the *pattern* of associations was highly similar in all cases, with congruence coefficients easily exceeding the .90 threshold for structural equivalence (van de Vijver & Poortinga, 2002). It should be noted, however, that this did not preclude a somewhat uneven picture of facet correlations. Specially, very high correlations ($>.70$) were found between the FIRNI extraversion scale and the NEO-PI-R warmth, gregariousness, and positive ideas facets; between the FIRNI openness scale and the NEO-PI-R openness to ideas facet; and between the FIRNI conscientiousness scale and the NEO-PI-R dutifulness and self-discipline facets. In this regard, however, the FIRNI did not differ from the NEO-PI-R total scales, which also showed an uneven pattern of correlations.

Finally, an analysis of the squared intercorrelations between NEO-PI-R facets with and without controlling for the corresponding FIRNI scales indicated that the FIRNI accounts for the bulk of the variance that is shared between NEO facets, except in the case of neuroticism, of which half of the common variance is explained by other sources. Overall, these results suggest that the new conceptualization of the FFM as embodied in the FIRNI is sufficiently inclusive to tap into a broad range of more specific facets.

6. General discussion

Although the FFM has become an increasingly accepted integrative framework for personality research, it has been criticized because of its primarily descriptive nature (e.g., Block, 1995; McAdams, 1992). This article aimed to develop the FIRNI

model, which conceptualizes the FFM dimensions as stable individual differences in people's motivational reactions to circumscribed classes of environmental stimuli. Based on a review of nine theories regarding the nature of the FFM, we selected plausible conceptualizations for each of the FFM factors. Specifically, extraversion was conceptualized as the reward value of social interactions, agreeableness as a disposition to react cooperatively (vs. selfishly) in resource conflicts, conscientiousness as the tenacity of goal pursuit in the face of distracting circumstances, neuroticisms as differences in the sensitivity to signs of social exclusion, and openness to experiences as the reward value of cognitive activity. These conceptualizations served as the starting point for a rationally created FFM instrument: the FIRNI.

In four empirical studies, this new instrument was compared to measures that were created by the more traditional empirical approach. First of all, we demonstrated that our rational questionnaire indeed focuses more specifically on the hypothesized motivational conceptualizations of the FFM factors than the BFI. Second, our results suggest that assessing the Big Five in this manner does not reduce the validity of the FFM approach when compared with more traditional descriptive FFM measures. Specifically, the FIRNI showed a clear Five-Factor structure (Study 2) and its scales were comparable to established FFM measures with regard to their internal consistency and construct validity (Study 2), predictive validity (Study 3), and broadness (Study 4).

6.1. Implications of the global theoretical framework

The FIRN model starts from the assumption of stable individual differences in people's motivational reactions to circumscribed classes of environmental stimuli. One plausible reason why the FFM appears so fundamental is that it captures individual differences in reactions to basic human life tasks: affiliation, social inclusion, cooperation, goal pursuit, and dealing with transmitted culture and novelty. The situation-dependent nature of the FFM is consistent with the notion that dimensions of personality are analogous to the dimensions of the situations people face in their daily lives, a position that converges with classical definitions of personality that stress the contextual nature of personality traits (Mischel & Shoda, 1999; Sullivan, 1953). By circumscribing the classes of environmental stimuli that the FFM dimensions are hypothesized to be attuned to, the current approach offers a powerful heuristic to predict in what kinds of situations traits influence behavior (so-called diagnostic situations; Snyder & Ickes, 1985).

We formulated our list of basic life tasks on the basis of a thorough review of the literature. To the best of our knowledge, only one author (Holmes, 2002) has thus far suggested links between a-priori classes of situations and the Big Five, though he did not provide an empirical test of the feasibility of his conceptualization. Furthermore, his model is only based on interpersonal situations, whereas we do not believe that such situations are equally involved in all Big Five traits. In our view, only extraversion, neuroticism, and agreeableness can be primarily regarded as social traits dealing with the establishment of social relationships, the prevention of their dissolution, and the regulation of reciprocity, respectively. We do not necessarily believe that the common social nature of these traits gives rise to correlations between traits. Rather, we believe that the situational features involved in the Big Five are basically orthogonal and that correlations between factors are more likely rooted in communalities in terms of the their neurophysiological infrastructure (e.g., the dopamine system in the case of extraversion and openness; see Markon et al., 2005). In addition, two conceptualizations did not include a specific social focus. Although openness involves an individual's dealing with established socio-cultural knowledge, this trait is not directly interpersonal in nature. We also do not regard conscientiousness as a social trait but as an aspect of human volition, which is consistent with the fact that this trait has not been demonstrated in non-human animals (Gosling, 2001).

A second feature of the current conceptualization of the FFM is the focus on motivational processes. This focus is reminiscent of Murray's (1938) description of a need as a "potentiality or readiness to respond in a certain way under certain given circumstances" and is consistent with Kammrath, Mendoza-Denton, and Mischel's (2005) finding that observed patterns of reactivity to environmental situations lead to traits judgments by influencing attributions of motivational processes. In the current study, our conceptualization of traits as latent, motivational constructs converged very well with traditional lexical (BFI; Goldberg, 1992) and questionnaire-based (NEO-PI-R) approaches. In spite of the more narrow focus of the current operationalization, however, neither the scope nor the power of prediction of the FIRNI proved inferior to the relatively fuzzy, general conceptualizations underlying more traditional measures. Notably, this predictive ability was achieved without the inclusion of items referring to specific behaviors, therefore avoiding problems of predictor-outcome overlap and allowing for a sufficient degree of content homogeneity to meaningfully aggregate across items.

From a theoretical perspective, the individual reaction norms of the different motivational mechanisms with distinct genetic, neurocognitive and developmental origin would provide the most meaningful and promising level of analysis for personality psychology (Penke et al., 2007a, Penke, Denissen, & Miller, 2007b). However, as long as these mechanisms are not identified, the FFM represents a reasonable orientation on a descriptive level. In an interim attempt to bridge these levels, we developed specific descriptions of the psychological mechanisms behind the FFM domains. Our results showed that these concrete mechanisms are as broad (in terms of encompassing facet traits) and as valid in predicting behavioral outcomes as the descriptive factors from the classic FFM.

6.1.1. Limitations

Although we could show that our questionnaire is consistent with our conceptualization of the FFM as motivational individual reaction norms in general and the conceptualization of the five individual FFM domains in particular, we did

not provide a strong and direct test of the validity of this underlying theory. In part, such a test awaits further empirical data that allow more clear-cut answers than the cross-sectional, self-report data of the current studies (see below). In the process, criteria will have to be developed when to call a construct “motivational” (as opposed to “non-motivational”) and when a specified motivational process can be declared “basic” (as opposed to “peripheral”) to a certain trait.

A second limitation is that the current studies relied on self-reports to operationalize our conceptualizations of the FFM dimensions. This is a problem in most studies of personality assessment (but see Buss & Craik, 1981), though it might be especially problematic here, since the FIRN model conceptualizations of the FFM domains tap into fundamental tendencies to respond to abstract situational stimuli that may be too subtle or complex for individuals to comment on (Nisbett & Wilson, 1977). For example, it can be asked whether extraverted individuals *know* that they react highly positive to social stimuli based on their observations of their past record of affective reactions or whether they merely *assume* that their tendency to frequent social interactions are caused by an affective preference (i.e., akin to a cognitive dissonance effect; Festinger & Carlsmith, 1959).

6.1.2. Future directions

Even though the items of the FIRNI were rationally constructed using an a-priori theoretical framework instead of generated on an a-theoretical basis by inspecting the factor loadings of a large pool of possible sentences/adjectives, we managed to create an instrument that is as valid as established FFM instruments. Doing so, we believe that we have created scales that tap into plausible core motivational purposes of the behaviors underlying the five FFM traits instead of their idiosyncratic forms. Because the form of behavior may change superficially in spite of a continuity of its underlying trait (heterotypic continuity), we believe that the FIRNI will easier translated into other languages than questionnaires that are based on either idiosyncratic behaviors (e.g., the *solitaire* item of the NEO-PI-R cited above) or adjectives from a Germanic language, such as German or English. The FIRNI will also be helpful in averting claims of circularity that have plagued personality researchers by allowing for a clear distinction between latent motivational constructs (i.e., the FIRNI scales) and manifest behaviors (i.e., behavioral criteria).

Another major goal for future research will be to conduct laboratory studies tracking individuals' actual reactions to specific categories of environmental stimuli. The main advantage of the FIRN model is that it exactly specifies the kinds of situations that should be relevant for a given personality trait. For extraversion, this could be a situation in which people face the option of approaching attractive social vs. non-social rewards; for agreeableness, when facing the option to sacrifice resources for the sake of others vs. to maximize one's own outcomes; for conscientiousness, when facing the option between giving up on a goal and pursuing attractive short-term options vs. persisting at a goal-related task; for neuroticism, when facing the option between zooming in on cues of social rejection vs. ignoring them; and in the case of openness to experience, when facing the choice between processing cognitively demanding stimuli vs. opting to pay attention to more predictable stimuli.

7. Conclusion

Where does all this lead us? At the very least, the current paper was intended to be a theoretical call-to-arms: The FFM, in order to become a truly scientific model of personality, needs substantial theoretical elaboration and conceptual refinement. By defining the FFM dimensions as stable individual differences in people's motivational reactions to circumscribed classes of environmental stimuli, we hope to contribute to a renaissance of motivational approaches to explain human personality (Murray, 1938). In addition, we hope that our emphasis of traits as contextualized constructs helps to bridge the traditional divide between structure- and process-oriented approaches in personality psychology, which may inform research on how people use observations of situationally contingent behavior to form trait judgments (Kammrath et al., 2005). We tried to implement this conceptualization by zeroing in on promising motivational features underlying each of the FFM dimensions and devising a questionnaire that is consistent with the corresponding processes. We hope that our conceptualization of the FFM, as well as the approach that led to it, will spark new research and inspire researchers to further investigate these ideas. As Block (1995, p. 210) correctly stated, “alternative conceptual and empirical analyses of these and related dimensions are required, followed by constructive disputation and efforts at concept calibration”. The current paper proposes both a theoretical and a methodological framework to compare such alternative conceptualizations to the current one and other models. Regardless of the outcomes of such a process, we believe that the FFM badly needs these kinds of conceptual and theoretical battles, which will indeed, as Block wrote in 1995, “spiral our field forward”.

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Appendix

Content, means, standard deviations, factor loadings, and communalities of the FIRNI items

Item	M	SD	Factor loadings					λ
			E	C	O	A	N	
<i>Extraversion</i>								
Interacting with people generally gives me a lot of energy	3.61	1.00	.71					.53
I feel best when I am alone	3.29	1.09	-.74					.56
I like to meet a lot of people and have fun with them	3.69	1.19	.78					.63
When I am together with a lot of people I prefer to stay in the background	2.97	1.15	-.63					.48
Talking with other people motivates me and brings out the best in me	3.59	0.95	.62					.45
I usually prefer to do things alone	2.90	1.08	-.66					.45
I always find it fun to meet new people	3.70	1.10	.73					.57
Being with other people is often exhausting for me	3.44	1.13	-.71					.58
I feel best when I have a lot of people around me	2.96	1.14	.81					.67
I do not quickly get enthusiastic about other people	3.37	1.12	-.59					.37
<i>Conscientiousness</i>								
When I am working on something, I am easily distracted	3.22	1.10		-.56				.33
When I have a plan I do everything to achieve it	3.65	0.89		.65				.47
When I encounter difficulties in implementing a plan I tend to give up quickly	3.38	1.05		-.67				.53
I would not have a problem working hard for something that only pays off after a relatively long time	3.50	1.11		.54				.32
I often do not implement my plans to the end	3.22	1.06		-.75				.62
When I am acting on a plan I do not easily let myself be distracted by short-term needs	3.06	0.98		.54				.30
I have often set myself a goal without really trying to reach it	3.10	1.19		-.70				.52
When I have set myself a goal I pursue it very persistently	3.34	1.01		.80				.66
It is very difficult for me to follow a plan if it requires setting aside my momentary concerns	3.03	0.98		-.58				.36
I can also motivate myself for a tedious job without regular performance incentives	2.93	1.00		.50				.31
<i>Openness to experience</i>								
I enjoy thinking of new ways to solve problems	3.43	1.12		.26	-.51			.36
For me, thinking is not connected with fun	3.76	1.14			.40			.18
I like to think about how society could look like in the future	3.27	1.23			-.53			.29
I don't like to think about things when there is no clear need to do so	3.62	1.17			.70			.49
I love to think about complex issues such as the purpose of life or world affairs	3.63	1.29			-.72			.53
I don't like to engage in thought experiments	3.94	1.00			.62			.38
I really like to engage in mental activity	3.85	0.96			-.67			.49
I'd rather occupy myself with daily things than think about theoretical problems	3.22	0.97			.65			.44
I feel best when I am intellectually challenged	3.53	0.96		.26	-.66			.51
I don't like to think about unconventional ideas	3.69	0.98			.58			.33
<i>Agreeableness</i>								
I would rather share something than to compete with other people for having it all myself	3.60	1.07				.64		.42
My own well-being is more important to me than the problems of other people	3.50	1.03				-.66		.45
I'd rather put aside my own interests when they conflict with the feelings of other people	3.21	1.03				.58		.38
I am reluctant to help other people if that leads to disadvantages for me	3.48	1.06				-.63		.44
I like to be generous without expecting a service in return	3.68	0.94				.64		.43
In conflicts of interest with others, I always try to take out the maximum for myself	2.93	0.97				-.34	.30	.31
When I share something with others I don't mind if others get more than I	3.34	1.07				.61		.39
I don't like to do someone a favor when I know he or she will not give me something back in the future	3.64	1.09				-.60		.38
I would still help other people when I have serious problems of my own	3.96	0.93				.58		.40
I would not have a problem asserting my own interests at the expense of other people	3.68	1.11				.65		.43
<i>Neuroticism</i>								
I seldom fear that other people may not like me	3.12	1.22					.59	.37
When I meet with friends I sometimes have the feeling that they talk badly about me afterwards	2.19	1.12	-.26				-.52	.35
I never doubt that I deserve to be accepted by others	2.53	1.18	.26				.45	.31

(continued on next page)

Appendix. (continued)

I often have doubts about the stability of my social relationships	2.90	1.21	-.44	.27
I never worry if my personal qualities are good enough to be accepted to the groups I am interested in	3.09	1.19	.53	.32
When I do not hear from a person for a long time I quickly start to question my relationship with him/her	3.02	1.20	-.60	.40
If a person who is important to me somehow behaves strangely, I seldom presume that this is related to me	3.38	1.04	.54	.30
If other people signal that they do not like something about me, my mood can quickly become clouded	3.42	1.13	-.61	.43
When people close to me react negatively towards me, I do not automatically question the quality of my relationship with them	3.09	1.08	.48	.24
When I pick up signs of rejection by other people, I am immediately alarmed and speculate about the possible cause	3.56	1.15	-.70	.51
% of explained variance by the factor			10.72	8.91
			7.81	7.72
			7.20	

Note. E = extraversion, C = conscientiousness, A = agreeableness, O = openness to experience, N = neuroticism, λ = communalities. Item responses were ipsatized before being factor analyzed. The German items were translated into English by the current authors and checked by three English native speakers. Factor loadings are taken from Study 2, using the German version of the FIRNI. Loadings smaller than .25 are not displayed. The pattern of factor loadings of the English solution was highly similar to that of the German one, with congruence coefficients (Tucker's Phi) ranging between .94 and .97 (unpublished data from 625 English-speaking Internet users, available on request from the first author).

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