



# Developing a model for adult temperament <sup>☆</sup>

David E. Evans <sup>a,\*</sup>, Mary K. Rothbart <sup>b</sup>

<sup>a</sup> *H. Lee Moffitt Cancer Center and Research Institute, Tobacco Research and Intervention Program  
4115 E. Fowler Ave., Tampa, FL 33617, USA*

<sup>b</sup> *Psychology Department, University of Oregon, Eugene, OR 97403-1291, USA*

Available online 18 January 2007

---

## Abstract

Hierarchical relations among theoretically generated lower order scales of adult temperament were explored in two studies. In Study One, 258 undergraduates completed the Adult Temperament Questionnaire (ATQ). A five-factor model emerged from exploratory factor analysis, with factors labeled Orienting Sensitivity, Effortful Control, Extraversion, Affiliativeness, and Negative Affect. This model showed considerable convergence with the Big Five. Study Two, with a community sample of 700 participants, yielded a six-factor model, distinguishing aggressive negative affect from non-aggressive negative affect. Relations of the six temperament factors to Cloninger's TCI, the Five Factor Model, and the Multi-Language Seven were investigated, providing support for the discriminating power of the six-factor temperament model in understanding individual differences in adult temperament and personality.

© 2006 Elsevier Inc. All rights reserved.

*Keywords:* Temperament; Big Five; Personality

---

## 1. Introduction

There is general agreement that temperamental processes are rooted in biological systems, and that emotion is basic to temperament (see Goldsmith et al., 1987). Work by

---

<sup>☆</sup> This research was supported by the Emotion Research Training Grant 5 T32 MH18934 funded by NIMH and awarded to David Evans as a trainee, and by NIMH Grants MH43361 and MH40662 awarded to Mary Rothbart. We thank Doug Derryberry, Carmen Gonzalez, Catharina Hartman, Bertram Malle, Tommie Mobbs, Michael Posner, Myron Rothbart, Gerard Saucier, and anonymous reviewers for their helpful comments on previous drafts of this paper.

\* Corresponding author. Fax: +1 813 745 1755.

*E-mail address:* [evansde@moffitt.usf.edu](mailto:evansde@moffitt.usf.edu) (D.E. Evans).

Thomas and Chess (1977) and Rothbart and Derryberry (1981) has added individual differences in attentional capacities to the more commonly assessed emotional reactivity. Ongoing work in animal neurophysiology, human brain imaging, and molecular genetics has led to psychobiological models of temperament processes that are becoming increasingly comprehensive (Cloninger, 1998; Gray, 1990; Panksepp, 1998). To facilitate the development of temperament models and to investigate relations between temperament and personality, it is essential that psychometrically sound measures of temperament constructs be developed. In this paper, we explore the hierarchical relations among lower level constructs of temperament in an extension of Derryberry and Rothbart's (1988) original adult temperament scales. The resulting instrument, called the Adult Temperament Questionnaire (ATQ), is further related to Cloninger's Temperament and Character Inventory (TCI) and to the Five Factor and Multi-Language Seven models of personality traits.

### *1.1. Temperament and personality traits*

Temperament is seen as a subdomain of personality, but personality extends beyond temperament to include specific cognitions, beliefs and values. The contemporary view is that temperament includes dispositional attentional processes (e.g., effortful attention, Rothbart & Bates, 2006), but not specific cognitions. Specific cognitions may be influenced by temperament, as when an individual who is temperamentally fearful is biased toward developing pessimistic attitudes about the future, but the temperament and non-temperament personality domains remain separable.

A highly differentiated measure of temperament for adults based on Rothbart and colleagues' conceptualization of temperament is described in these studies. At the most general level motivational–emotional and attentional constructs are explored by defining more specific temperament constructs at lower levels (e.g., fear within the domain of negative affect). The structure of the emerging temperament model is then determined, with the structure related to models of personality traits.

In recent years, considerable research on personality has supported a five-factor personality model. Common labels for the five factors are Extraversion, Agreeableness, Conscientiousness, Neuroticism versus emotional stability, and Intellect/Imagination (or Openness in the Five Factor Model, McCrae, 1993/1994). The term Big Five is generally reserved for measures derived from analysis of the trait-descriptive lexicon, whereas McCrae and Costa's approach is based on more extensive questionnaire items and referred to as the Five Factor Model (FFM). The Big Five and FFM structures are substantially correlated (see McCrae & John, 1992), and we generally refer to the model as the Big Five/FFM.

Previous theory and research have linked measures of temperament to the Big Five/FFM. McCrae, Costa, Ostendorf, Angleitner, and Hrebickova (2000), for example, argued for subsuming the Big Five/FFM models under temperament. They note that evidence from behavioral genetics, animal personality, and the considerable stability of the Big Five/FFM across development and cultures supports the proposition that the five factor structure of personality is based on more fundamental temperamental processes. They note that temperament researchers tend to emphasize basic processes such as attention and affect, whereas Big Five and Five Factor Model researchers are more likely to go beyond basic processes to emphasize prognostic outcomes, e.g., using conscientiousness to predict job performance. Personality researchers also often stress the effects individual differences have on others, especially in the agreeableness construct (Hogan & Hogan, 1995), although the

difficultness construct in temperament is also concerned with these effects (Thomas & Chess, 1977).

Using adult subjects, Angleitner and Ostendorf (1994) have related the Big Five/FFM to four measures of temperament, the Strelau Temperament Inventory (Strelau, Angleitner, Bantelmann, & Ruch, 1990), the EASI-III Temperament Survey (Buss & Plomin, 1975), the Sensation-Seeking Scale (Zuckerman, Eysenck, & Eysenck, 1978), and the Dimensions of Temperament Survey (Windle & Lerner, 1986). Five- and six-factor solutions similar to the Big Five/FFM were extracted, and temperament scores loaded with Big Five/FFM factors. The six-factor solution included an additional rhythmicity factor.

Angleitner and Ostendorf also carried out a factor analysis of the temperament measures alone. Factor scores from this solution were then correlated with factor scores from the six-factor solution that included the Big Five/FFM measures. Correlations were high, but consistent with convergence of only four factors in the temperament analyses to the personality model. Angleitner and Ostendorf's (1994) research aggregated multiple measures of temperament, rather than relating specific temperament constructs to adult models. One of the goals of the current research is to investigate relations between specifically defined temperament constructs and the Big Five/FFM.

Like Derryberry and Rothbart (1988) in the original adult Physiological Reactions Questionnaire or PRQ, scales and their operational definitions were generated from temperament constructs. The broad domains to be investigated were selected from previous work. Evidence from research on temperament (Putnam, Ellis, & Rothbart, 2001; Strelau & Zawadzki, 1997), neuroscience (Carver & White, 1994; Davidson, 1993; Depue & Collins, 1999; Derryberry & Tucker, 1992; Gray, 1990), and affective individual differences (Watson & Clark, 1992; Watson & Walker, 1996; Watson, Wiese, Vaidya, & Tellegen, 1999), for example, suggests the existence of at least two high level temperamental motivational–emotional domains. One of these is associated with potentially aversive stimuli and negative affect, the other with potentially appetitive stimuli and positive affect. Our labels for these domains are negative affect and extraversion/surgency, respectively.

We also wished to explore the differentiation of aggressive and non-aggressive negative affect by adding scales with aggression-related content. Derryberry and Rothbart (1997) differentiated fear and frustration, and Zuckerman (1997; Zuckerman, Kuhlman, Joireman, Teta, and Kraft, 1993) identified superfactors discriminating fear-anxiety and anger-aggression constructs in research with adults. Some models of personality, however, do not make this distinction (e.g., Harkness, Tellegen, & Waller, 1995; Tellegen, 1985; Watson et al., 1999). Costa and McCrae's (1994) scales of neuroticism (e.g., anxiety, depression, and anger-hostility) are consistent with Tellegen's (1985) model. Under their Five Factor Model, however, aggression is related to both Neuroticism and to the negative pole of Agreeableness (e.g., Costa & McCrae, 1994). Aggression items are also included at the negative pole of Cloninger's cooperation scale (see Cloninger, Przybeck, Svrakic, & Wetzel, 1994).

The original PRQ study had also included only one scale with surgency/extraversion-related content (high intensity pleasure). The PRQ high intensity pleasure scale was to a large extent a sensation-seeking construct, including items related to likely enjoyment of skydiving or racecar driving. For the ATQ version, we replaced most of these items for this scale in an effort to remove the influence of fear on responses. One might enjoy the idea of skydiving, for example, while also being fearful of jumping from an airplane, so this item was removed. A new sociability scale was defined as enjoyment in interacting with and

being in the presence of others, as distinguished from fear and shyness in interactions with others (see Buss, 1991, for a discussion distinguishing sociability from shyness). In addition to high intensity pleasure and sociability, a scale assessing positive affect (its intensity, duration, frequency, rate of onset, and rising intensity of pleasure) was also included.

Rothbart and Derryberry (1981) and Rothbart, Derryberry, and Posner (1994) have proposed attentional processes as fundamental components of temperament. Effortful control, a broad temperament construct based on the executive attention system (Rothbart & Rueda, 2005), includes attentional and inhibitory control (ability to inhibit inappropriate behavior). Activation control (capacity to perform an action when there is a strong tendency to avoid it) was also added to the ATQ. A second broad attentional construct is orienting sensitivity. It includes constructs of perceptual sensitivity (awareness of slight, low intensity stimulation arising from the external or internal environment), associative sensitivity (frequency and remoteness of automatic cognitive activity), and affective perceptual sensitivity (awareness of affect associated with low intensity stimuli). To investigate the separability of reactive and effortful attentional processes, the breadth of reactive sensitivity was emphasized in the ATQ scales.

Scales were also added within the domain of affiliativeness. Rothbart and others (Derryberry & Rothbart, 1997; Ellis & Rothbart, 2007; Gartstein & Rothbart, 2003; Oldehinkel, Hartman, de Winter, Veenstra, & Ormel, 2004; Rothbart, 1994; Rothbart, Ahadi, & Evans, 2000; Rothbart & Bates, 1998) have proposed affiliativeness as a dimension of temperament. Affiliativeness involves concern for others, whereas sociability refers to a preference for conversing, interacting, and approaching others.

Affiliative scales assessing emotional empathy (affective responses congruent with the feelings of others), empathic guilt (distress in response to negatively affecting other people), and social closeness (feelings of warmth, closeness, interest and involvement with others) were assessed. The goal was for each scale to be conceptually differentiated from the others while also being part of a general positive concern for others. The ATQ was originally developed using operational definitions for these temperament constructs, including only items fitting those definitions. A pilot study for scale development involved 207 undergraduate subjects, and 16 internally reliable scales were developed (Evans, 2004). Data from an additional 114 undergraduates evaluated the internal consistency and correlations among affiliativeness and aggression-related scales, yielding 2 additional scales.

## 2. Study One

Goals of the research were thus to explore the hierarchical relations among lower level theoretically generated constructs of temperament, and to relate temperament constructs to the lexical Big Five model of personality. Factor analysis was used to investigate hierarchical relations among temperament variables. Factor scores derived from this model were then related to scores from Saucier's (1994) Mini-Marker measure of the Big Five.

In Study One, scales within six general domains were included: non-aggressive negative affect (fear, sadness, and discomfort), aggressive negative affect (frustration, social anger, and aggression control), affiliativeness (emotional empathy, social closeness, and empathic guilt), extraversion/surgency (sociability, positive affect, and high intensity pleasure), orienting sensitivity (affective perceptual sensitivity, general perceptual sensitivity, and associative sensitivity), and effortful control (effortful attention, activation control, and

Table 1  
Study One: general constructs and associated scales

Broad domains	Associated scales
Affiliativeness	Emotional empathy, empathic guilt, social closeness
Aggressive negative affect	Aggression control, frustration, social anger
Effortful control	Activation control, effortful attention, inhibitory control
Extraversion/surgency	High intensity pleasure, positive affect, sociability
Non-aggressive negative affect	Discomfort, fear, sadness
Orienting sensitivity	Affective perceptual sensitivity, associative sensitivity, general perceptual sensitivity

inhibitory control). Table 1 displays the scales associated with each of the six broad domains, and Appendix A lists scale definitions with sample items for the scales.

### 2.1. Method

A total of 258 undergraduate psychology students (150 women and 108 men) filled out the 18 scales of the Adult Temperament Questionnaire (ATQ) using a randomly generated order of seven-response option Likert scales, followed by completion of the Big Five Mini-Markers scale. English was the first language for 95% of the subjects and 91.5% identified the United States as their country of origin. The ATQ included 253 items. Subjects received participation credit for their undergraduate psychology courses.

Saucier's (1994) Mini-Markers (40 trait-descriptors) were used to measure the lexical Big Five. Eight trait-descriptors were used to represent each of the five domains. The Mini-Markers derived from and were highly correlated with Goldberg's (1992) set of 100 markers measuring the domains of the Big Five. Saucier and Goldberg (2003) have since developed alternative marker sets that they believe have improved upon both Goldberg's 100 marker set and Saucier's Mini-Marker measures of the Big Five. However, at the time data was collected, these alternative measures were not available. Mini-Marker items are included in Appendix B. Using a Likert-scale ranging from one to nine, subjects rated themselves on trait-descriptive adjectives. The 40 items were presented in alphabetical order.

### 2.2. Results and discussion

Table 2 reports the means, standard deviations, and reliabilities for the ATQ temperament scales in this study. Three items from the 253 original items in ATQ were removed to improve reliability. After removal of these items, reliabilities as assessed by coefficient  $\alpha$  for 13 of 18 of the temperament scales reached a level of .80 or higher, and only one scale was lower than .70 (inhibitory control at .66).

An exploratory factor analysis (EFA) was then performed on all of the temperament scales. The first seven eigenvalues were 3.05, 2.50, 1.55, 1.19, 1.10, .78, and .66. The most abrupt drop in eigenvalues was between the second and third factors, suggesting the extraction of two factors. Expressing each eigenvalue as a numerator with the subsequent eigenvalue as denominator, the most abrupt drop in the ratio of eigenvalues occurred between the second and third factors, and the next most abrupt drop was between the fifth and sixth eigenvalues. According to the scree criterion, extracting two factors would be

Table 2

Means, standard deviations, and  $\alpha$  reliability coefficients of Adult Temperament Questionnaire (Version 2) and Big Five scales for Study One

Scales	Mean	SD	$\alpha$
<i>ATQ scales</i>			
Frustration	4.23	.82	.80
Social Anger	3.83	.88	.81
Aggression control	4.92	.91	.84
Sadness	4.39	.86	.80
Discomfort	3.94	.76	.72
Fear	4.27	.87	.76
Effortful attention	3.70	.95	.88
Inhibitory control	3.95	.74	.66
Activation control	4.17	.97	.84
General perceptual sensitivity	4.96	.70	.81
Affective perceptual sensitivity	5.02	.88	.90
Associative sensitivity	5.16	.79	.85
Sociability	5.41	.89	.89
High pleasure	5.10	.73	.77
Positive affect	5.12	.88	.84
Emotional empathy	5.08	.71	.75
Empathetic guilt	5.61	.86	.84
Social closeness	5.80	.60	.81
<i>Big Five scales</i>			
Neuroticism	4.94	1.21	.82
Intellect/openness	6.70	1.36	.85
Extraversion	5.68	1.53	.88
Agreeableness	7.23	1.06	.85
Conscientiousness	6.08	1.40	.85

optimal, but five factors would be the second best number of factors to extract. Eigenvalue-of-one and conceptually driven criteria also suggested the extraction of five factors.

The EFA of the five-factor solution was consistent with a hierarchical structure ordering the scales within the original broad domains, except that the aggressive and non-aggressive negative affect scales loaded on the same general Negative Affect factor. The pattern matrix for the five-factor solution is reported in Table 3. Factor I (Negative Affect) included loadings from scales assessing facets of both aggressive negative affect (frustration, aggression control, social anger) and non-aggressive negative affect (fear, discomfort, and sadness). Effortful attention and inhibitory control also loaded modestly and negatively on the first factor. Factor II included loadings from scales of Orienting Sensitivity (affective perceptual sensitivity, general perceptual sensitivity, and associative sensitivity), with small positive secondary loadings from sadness and high intensity pleasure.

Factor III included highest loadings from scales derived from the Extraversion/Surgency domain (sociability, high intensity pleasure, and positive affect) along with moderate loadings from social closeness (positive loading) and inhibitory control (negative loading), and modest secondary loadings from discomfort (negative loading) and emotional empathy. Factor IV included loadings from the Affiliativeness domain (emotional empathy, empathic guilt, and social closeness), with a moderate secondary loading from aggression control and smaller loadings from social anger (negative loading), fear, and positive affect. Factor V, the Effortful Control factor, included highest loadings from activation control

Table 3  
Pattern matrix for EFA of adult temperament scales for Study One

Adult temperament scales	Factor loadings				
	NA	OS	E	Aff	EC
Frustration	<b>.79</b>	-.22	.11	-.01	.11
Aggression control	-.73	-.04	-.17	<b>.47</b>	-.17
Social Anger	<b>.68</b>	.22	-.13	-.32	.01
Fear	<b>.64</b>	-.04	-.20	.31	-.14
Discomfort	<b>.58</b>	-.03	-.39	.15	.16
Sadness	<b>.53</b>	.28	-.22	.19	-.10
Affective perceptual sensitivity	-.06	<b>.87</b>	-.03	.09	-.04
General perceptual sensitivity	-.05	<b>.74</b>	.06	.05	.11
Associative sensitivity	.09	<b>.72</b>	.13	-.01	-.04
Sociability	-.05	-.06	<b>.76</b>	.17	-.05
High pleasure	-.10	.26	<b>.60</b>	-.07	-.19
Positive affect	-.20	-.04	<b>.57</b>	.29	.16
Emotional empathy	.15	.04	.33	<b>.65</b>	.11
Empathetic guilt	-.01	.06	.03	<b>.65</b>	-.05
Social closeness	.07	.21	<b>.48</b>	<b>.47</b>	.08
Activation control	.17	-.05	.03	.12	<b>.87</b>
Effortful attention	-.39	.15	-.04	-.21	<b>.52</b>
Inhibitory control	-.34	.11	-.41	.10	<b>.40</b>

Note: Abbreviations: NA, negative affect; OS, orienting sensitivity; E, extraversion; Aff, affiliation; EC, effortful control. Loadings of .40 or greater are printed in bold.

and effortful attention, along with a moderate loading from inhibitory control. Although inhibitory control is a sub-construct of Effortful Control, it loaded relatively equally on factors of Effortful Control, Extraversion/Surgency, and Negative Affect. An expected correlation between the Negative Affect and effortful control factors was found ( $r = -.50$ ). A positive correlation of .26 was found between Orienting Sensitivity and extraversion. Both Orienting Sensitivity and Extraversion/Surgency were modestly correlated with the Affiliativeness factor ( $r = .28$  and  $r = .20$ , respectively), and other correlations were close to zero.

General scales were also constructed by averaging scales within each domain, except that the non-aggressive and aggressive negative affect constructs were collapsed into a single general scale to conform with the five factor structure. These five scale scores were highly correlated with the exploratory factor scores, with correlations all .90 or higher. These correlations suggest a strong match between well-defined constructs of temperament, and the emerging factor structure.

### 2.2.1. Correlations between temperament and the Big Five

Table 4 shows the correlations between EFA temperament factor scores and the Mini-Marker measure of the Big Five. The five correlations with the Big Five scales range from .64 to .74. Only one additional correlation exceeded .35, the negative correlation between Effortful Control and Neuroticism ( $r = -.41$ ). The negative affect factor score was highly correlated with Big Five Neuroticism ( $r = .74$ ), orienting sensitivity with Big Five Intellect/Openness ( $r = .65$ ), temperamental Extraversion/Surgency with Big Five Extraversion ( $r = .67$ ), and Affiliativeness with Big Five Agreeableness ( $r = .69$ ). The Effortful Control factor score was highly correlated with Big Five conscientiousness ( $r = .64$ ), while also having a substantial negative correlation ( $r = -.41$ ) with Big Five Neuroticism. The temperament

Table 4  
Correlations of ATQ factor scores with Big Five scales (Study One)

Temperament factor scores	Big Five scales				
	N	I/O	E	A	C
Negative affect	<b>.74</b>	–.04	–.14	–.30	–.24
Orienting sensitivity	.22	<b>.65</b>	.13	.22	.02
Extraversion	.04	.21	<b>.67</b>	.31	–.06
Affiliativeness	–.09	.18	.26	<b>.69</b>	.25
Effortful control	<b>–.41</b>	.13	.14	.12	<b>.64</b>

Note: Abbreviations: I/O, intellect/openness; C, conscientiousness; E, extraversion; A, agreeableness; and N, neuroticism. Correlations greater than .35 are printed in bold.

scale scores within domains independent of factor analysis (except for aggressive and non-aggressive negative affect collapsed into one scale) showed the same pattern and strength of correlation with the Mini-Marker scales of the Big Five (correlations along the main diagonal ranged from .60 to .70).

### 2.3. Discussion

In Study One a five factor temperament model was extracted that showed considerable convergence with the Big Five Mini-Marker scales. However, several of the scales loaded on more than one factor. This issue is further explored in Study Two, investigating the possibility of a six-factor model with multiple loading scales deleted.

Because oblique rotations were used, it was also possible to explore relations between higher order factors. In particular, we discuss the negative relation between Effortful Control and Negative Affect, and the positive relation between Extraversion/Surgency and Orienting Sensitivity. An extensive literature is consistent with the negative correlation found between Negative Affect and Effortful Control (e.g., Derryberry & Rothbart, 1988; Ellis & Rothbart, 2007; Eysenck & Eysenck, 1985). Studies using the emotional Stroop task have repeatedly suggested that negative semantic information interferes with executive attentional processing (Dawkins & Furnham, 1989; MacLeod & Hagan, 1992; Mogg, Bradley, & Williams, 1995; Myers & McKenna, 1996; Pratto & John, 1991). In addition, the Diagnostic and Statistical Manual of Mental Disorders: Fourth Edition (American Psychiatric Association, 1994) lists attentional difficulties as indicators of anxiety and depressive disorders.

Other research is consistent with the positive correlation between Extraversion/Surgency and Orienting Sensitivity. Positive affect has been associated with generating more unusual and diverse word associations (Isen, Johnson, Mertz, & Robinson, 1985), and in general, a more creative and broad ranging cognitive style is produced when positive affect is induced (Ashby, Isen, & Turken, 1999). Recent factor analyses of scales comprising the Infant Behavior Questionnaire-Revised (IBQ-R) have also resulted in a first factor with loadings from both perceptual sensitivity and extraversion scales (Gartstein & Rothbart, 2003).

### 3. Study Two

Study Two further explored a hierarchical model within a larger and more diverse sample. Analyses for Study One had showed EFA support for a five-factor model, with

aggressive and non-aggressive negative affect sub-constructs collapsing into a single negative affect factor. Although a conceptually clear five-factor model emerged, some of the scales loaded on more than one factor. These multiple loading scales were deleted from the instrument for Study Two, so that each scale would more exclusively represent a single temperament domain. Data in Study One was also limited to college students of approximately the same age, cohort, and level of education. Study Two data were collected from a larger community sample that was substantially older and more diverse.

The primary goal for Study Two was to further examine the five- and six-construct models of temperament both internally through factor analysis and externally in relation to personality trait measures in a large community sample. A special version of the ATQ was constructed for participants in the Eugene-Springfield Community Sample (Goldberg, 2003). The goals for constructing this measure included: 1 using almost all the same general constructs as Study One for purposes of replication; 2 constructing a short form; and 3 developing a measure that could be used to further explore relations between temperament and personality models. A 100-item measure was developed that could be administered in a short period of time as a part of the biannual collection of data in the Eugene-Springfield Community Sample (see Goldberg, 2003).

The structure of items was also changed to fit the format used by Goldberg (2003) with the community sample. Pronouns and other unnecessary words were omitted from items. For example, the fear item, “I become easily frightened.” was changed to “Become easily frightened.” The meanings of the items were not changed, and it is not likely that the changes in item structure influenced responding significantly. The rating scale was also changed from a 9-point to a 5-point Likert-scale. Table 5 displays the six general domains and their corresponding scales.

By deleting scales in Study Two, we hoped to develop more coherence within each domain as well as differentiation from other constructs. No new scales were included, but four scales were omitted. Inhibitory control had loaded on three factors, and social closeness equally on two factors, and both were removed from analysis. Discomfort included two moderate secondary loadings and was also removed. Aggression control was excluded because its items fit conceptually under the domains of both effortful control and negative affect. Items were selected from the existing scales, and our approach to reducing the number of scale items for the community sample was to balance both reliability and item diversity to create a 100-item scale.

The Big Five/FFM, Multi-Language Seven, and Cloninger’s TCI scales were also assessed for the Community Sample. Costa and McCrae’s NEO-PI-R (1994; McCrae and Costa, 1996; McCrae et al., 1996) is a 240 item questionnaire measure of the Big Five/FFM domains, with each domain including six facet scales.

Table 5  
Study Two: general constructs and associated scales from the 100-item ATQ

Broad domains	Associated scales
Affiliativeness	Emotional empathy and empathic guilt
Aggressive negative affect	Frustration and social anger
Orienting sensitivity	Affective perceptual sensitivity, associative sensitivity, and general perceptual sensitivity
Effortful control	Activation control and effortful attention
Extraversion/surgency	High intensity pleasure, positive affect, and sociability
Non-aggressive negative affect	Fear and sadness

Although the Big Five is presently the most researched model of personality, Saucier (2001, 2003) and others (Block, 1995, 2001) have questioned the universality of the model. Saucier (2003) explored the convergence of endogenously derived Filipino (Church, Katigbak, & Reyes, 1998; Church, Reyes, Katigbak, & Grimm, 1997) and Hebrew (Almagor, Tellegen, & Waller, 1995) factor structures, noting substantial convergence. He then found that English translations of both the Hebrew and Filipino scales representing these factor structures were highly convergent. Saucier refers to this model as the Multi-Language Seven (ML7).

The ML7 thus assesses lexically based personality scales that extend beyond the Big Five. Neuroticism is divided into aggressive (even-tempered in reverse; “angry” and “irritable” reverse items versus “calm” and “patient”) and non-aggressive (self-assured in reverse; e.g., “fearful” and “scared” reverse items versus “tough”) related factors. The self-assured factor also includes descriptors relevant to extraverted approach-related behavior (e.g., “confident” and “courageous”). The ML7 includes a negative valence factor, with items related to socially undesirable levels of intelligence (“stupid”), morality (“corrupt”), stability (“dangerous”), and sanity (“crazy”). This factor was not expected to be related to any temperament construct. Saucier’s ML7 measure was completed by the community sample used for Study Two, and we were therefore able to explore the ATQ in relation to the ML7.

In addition, we wished to explore possible links between our measure and a measure assessing Cloninger’s model in the Temperament and Character Inventory (TCI; Cloninger et al., 1994). Cloninger’s (1998; Cloninger and Svrakic, 1997) model of temperament is one of the most extensively studied models of adult temperament. Four of the TCI dimensions are conceptualized as temperament, and believed to be associated with facets of behavioral conditioning. Harm avoidance refers to anxiety proneness versus risk taking, novelty seeking to approach and exploration, reward dependence to attachment and dependence, and persistence to diligence and achievement striving. The other three scales are defined as character. Self-directedness refers to being responsible and resourceful versus helpless, cooperative refers to empathic and loving versus hostile, and self-transcendence refers to intuitive and spiritual versus concrete and materialistic (Cloninger et al., 1994). Cloninger (1998; Cloninger et al., 1994) states that these latter dimensions are less heritable, and refer to character rather than temperament. Cloninger (1998) also defines character as involving cognitive elements related to the self (self-directedness), the larger social group (cooperation), and the universe (self-transcendence).

In Cloninger’s model, persistence is believed to involve resistance to extinction. It is plausible, however, that persistence would be a correlate of the ATQ measure of effortful control. Cloninger’s scales show little one-to-one convergence with factors from other models, such as the Big Five (e.g., in the Eugene-Springfield Community data, see Goldberg, 2003).

Cloninger’s (1998; Cloninger et al.’s 1994) seven-dimension model of temperament and character was measured by a 295-item adaptation by Goldberg (2003) of the TCI (Cloninger et al., 1994). The purpose of Goldberg’s adaptation was to simplify longer and/or confusing items, without changing meanings. As noted, similar changes were performed on the ATQ items without altering the apparent meanings of items. Subsequent reference to this adapted measure will simply be to the TCI.

### 3.1. Method

#### 3.1.1. Participants and measures

A total of 700 participants from a Eugene-Springfield, Oregon community sample completed the 100-item version of the ATQ. The majority of these subjects had also completed a large number of questionnaires during the past decade, including the questionnaires described above. The Eugene-Springfield Community Sample is managed by Goldberg (2003), and originally included 1062 participants. Participants were recruited by mail solicitation in 1993 from lists of local homeowners, and data were collected through the mail. Age and gender data was known for 693 of the 700 people. Participants included 296 men, 397 women, and seven of unknown gender, and ranged in age from 26 to 91 years with a median age of 57 years and a mean of 58.7 years. Only 30 participants were younger than 40 years of age.

#### 3.1.2. Short form of the ATQ

The 100-item ATQ questionnaire was adapted from the version of the ATQ used in Study One, as described previously. Scales included 6–8 items each. To be consistent with other questionnaires completed by the community sample, this version of the ATQ used a 5-point Likert-scale instead of the previously used 7-point scale. This version of the ATQ was completed in 2002, and included two additional scales that were not of interest in this study.

#### 3.1.3. Measures of the Big Five, FFM, and TCI

The other measures reported in relation to the ATQ were completed by participants in the community sample within seven years prior to administration of the ATQ. These measures included the trait-marker measure of the ML7 derived from measures administered at different points between 1992 and 1998, McCrae and Costa's (1996) NEO-PI-R measure of the FFM domains administered in 1994, and Goldberg's (2003) adaptation of Cloninger et al.'s (1994) TCI administered in 1997. Of the 700 subjects who completed the ATQ, between 530 and 563 (depending on the scale) completed the markers for the ML7, 635 completed the NEO-PI-R, and 629 completed the TCI.

### 3.2. Results and discussion

Table 6 reports the means, standard deviations,  $\alpha$  reliability coefficients, and number of items for each of the ATQ scales in the community sample. After making revisions in the scales included in the study, we once again examined a six-factor structure in an EFA of the data. In contrast to Study One, this structure was conceptually clear, and very similar to the five-factor structure, except that the latter structure differentiated aggressive and non-aggressive negative affect factors. The six-factor EFA solution for these data included only one loading that deviated substantially from the initial six domains (see Table 7). Confirmatory Factory Analysis (CFA) fit was good for this solution (the analysis is available from the first author). The positive affect scale loaded slightly higher on the negative affect factor (negative loading) while also loading modestly on the extraversion/positive emotionality factor.

#### 3.2.1. Correlations among factors

The aggressive and non-aggressive negative affect factors were positively correlated ( $r = .54$ ), and these factors were negatively correlated with effortful control ( $r = -.31$  and

Table 6

Study Two: means, standard deviations, and  $\alpha$  reliability coefficients for general scales and scales from 100-item ATQ

	Mean	SD	$\alpha$	# of items
<i>Effortful control</i>	3.77	.54	.60	2
Activation control	3.83	.66	.76	7
Effortful attention	3.70	.60	.74	8
<i>Orienting sensitivity</i>	3.58	.58	.69	3
Affective perceptual sensitivity	3.40	.84	.79	6
General perceptual sensitivity	3.98	.62	.68	6
Associative sensitivity	3.36	.73	.66	6
<i>Extraversion/surgency</i>	3.48	.55	.59	3
High intensity pleasure	3.10	.76	.62	6
Positive affect	3.75	.66	.71	6
Sociability	3.60	.79	.79	6
<i>Non-aggressive negative affect</i>	2.76	.67	.74	2
Fear	2.69	.77	.77	8
Sadness	2.82	.73	.72	7
<i>Aggressive negative affect</i>	2.63	.59	.73	2
Frustration	2.74	.65	.72	8
Social anger	2.52	.69	.78	8
<i>Affiliativeness</i>	4.18	.50	.65	2
Emotional empathy	4.09	.58	.68	6
Empathic guilt	4.27	.58	.64	6

Note: The number of items for general scales refers to the number of scales in the general scales. General scales printed in italics.

Table 7

Pattern matrix for six-factor EFA of adult temperament scales for Study Two

Adult temperament scales	Factor loadings					
	OS	Agg-NA	Nonag-NA	Aff	EC	E
Affective perceptual sensitivity	<b>.76</b>	-.02	-.02	.13	-.08	-.10
General perceptual sensitivity	<b>.68</b>	.02	-.06	.07	.10	.02
Associative sensitivity	<b>.52</b>	-.02	.12	-.12	.05	-.14
Social anger	.20	<b>.79</b>	.04	-.14	.01	-.12
Frustration	-.17	<b>.68</b>	.04	-.01	.05	.08
Sadness	.13	-.04	<b>.83</b>	.11	-.06	.01
Fear	-.12	.23	<b>.60</b>	.17	.08	.08
Emotional empathy	.16	.05	<b>.06</b>	<b>.74</b>	.02	-.02
Empathic guilt	-.07	-.17	.17	<b>.62</b>	.05	-.02
Effortful attention	.15	-.15	.02	-.13	<b>.69</b>	-.03
Activation control	-.13	.14	-.07	.19	<b>.67</b>	.03
High intensity pleasure	.20	.07	.12	-.16	.01	<b>.65</b>
Sociability	-.07	-.03	-.04	.04	.01	<b>.58</b>
Positive affect	.20	.02	<b>-.41</b>	.23	-.06	<b>.33</b>

Note: Loadings of .30 or greater in bold print. Abbreviations: OS, orienting sensitivity; Agg-NA, aggressive negative affect; Nonag-NA, non-aggressive negative affect; Aff, affiliation; EC, effortful; and E, extraversion, control.

$r = -.39$ , respectively). These two correlations are consistent with the negative correlation between Negative Affect and Effortful Control found in Study One. Extraversion/Surgency and Orienting Sensitivity were again positively correlated as well ( $r = .42$ ). Other correlations were not substantial.

### 3.2.2. FFM and the ATQ

Correlations between the factor scores from the temperament model and the Big Five/FFM scales are reported in Table 8. Five of the factor scores from the six temperament factors converged with the FFM scales, with correlations ranging from .52 to .69. Non-aggressive negative affect correlated highest with Neuroticism ( $r = .69$ ), while Aggressive Negative Affect was correlated with both Neuroticism ( $r = .57$ ) and Agreeableness ( $r = -.43$ ). This has been found with the NEO-PI-R, where the Angry-Hostility Neuroticism facet scale loads positively on Neuroticism and negatively on Agreeableness at roughly the same level (e.g., Costa & McCrae, 1994). This finding suggests stronger links to Neuroticism from non-aggressive than Aggressive Negative Affect.

### 3.2.3. Multi-Language Seven (ML7) and the ATQ

Table 9 shows the correlations between the six-factor model scores from the ATQ and the Multi-Language Seven (ML7). There was a strong trend toward one-to-one convergence between temperament factor scores and each of the ML7 traits except for negative valence. Highest correlations between six of the ML7 dimensions and the six temperament factor scores ranged from absolute values of .45 to .61. However, there was less one-to-one correspondence between non-aggressive negative affect and the ML7. Non-aggressive negative affect was negatively correlated ( $r = -.49$ ) with ML7 self-assured, which includes non-aggressive negative affect descriptors at its negative pole, and negatively correlated ( $-.47$ ) with even-tempered (conceptually the opposite pole of aggression). Effortful control was correlated with conscientiousness ( $r = .47$ ) as expected, but was also moderately correlated

Table 8  
Correlations between ATQ factor scores and NEO-PI-R FFM Measure

ATQ factor scores	FFM scales				
	C	I/O	N	E	A
Effortful control	<b>.59</b>	-.02	-. <b>45</b>	.18	.09
Orienting sensitivity	-.04	<b>.61</b>	.04	.29	.03
Non-aggressive negative affect	-.24	-.03	<b>.69</b>	-.25	-.12
Aggressive negative affect	-.15	-.09	<b>.57</b>	.04	-. <b>43</b>
Extraversion/surgency	.03	<b>.41</b>	-.15	<b>.64</b>	.20
Affiliativeness	.10	.18	-.01	.16	<b>.52</b>

Note. Correlations .30 or greater listed in bold print. Abbreviations: C, conscientiousness; I/O, intellect/openness; E, extraversion; N, neuroticism; and A, agreeableness.

Table 9  
Correlations between ATQ factor scores and Saucier's multi-language seven

Temperament scales	ML7 scales						
	ET	SA	G	CFO	C	I	NV
Aggressive Neg. affect	-. <b>61</b>	-.28	-.01	-.18	.00	-.10	.17
Non-aggressive Neg. affect	-. <b>47</b>	-. <b>49</b>	-.11	.11	-.11	-.13	.13
Positive emotionality	.01	.28	<b>.53</b>	.18	.01	.21	-.05
Affiliativeness	.12	-.07	.09	<b>.52</b>	.09	.01	-.23
Effortful control	.28	<b>.36</b>	.04	.00	<b>.47</b>	.08	-.22
Orienting sensitivity	-.06	.22	.23	.07	-.04	<b>.45</b>	.03

Note. Correlations above .30 are listed in bold print. ET, even-tempered; SA, self-assurance; G, gregariousness; CFO, concern for others; C, conscientiousness; I, intellect; NV, negative valence; and Neg., negative.

Table 10  
Correlations between ATQ factor scores and TCI scale scores

ATQ scales	TCI scales						
	HA	NS	P	RD	SD	ST	C
Effortful control	–.37	–.11	.43	–.03	.41	–.08	.17
Orienting sensitivity	–.21	.30	.14	.25	.13	.31	.21
Extraversion/surgency	–.38	.28	.21	.57	.28	.32	.38
Non-aggressive negative affect	.60	–.04	–.15	.00	–.51	.04	–.24
Aggressive negative affect	.39	.07	–.07	–.11	–.47	–.08	–.49
Affiliativeness	.09	–.12	.09	.47	.21	.29	.52

Note. Correlations of .25 or greater listed in bold print. Abbreviations: HA, harm avoidance; NS, novelty seeking; P, persistence; RD, reward dependence; SD, self-directedness; ST, self-transcendence; and C, cooperation.

with self-assured ( $r = .36$ ). Negative valence was, as expected, not related to the temperament factors. Negative valence seems to involve judgments related to social undesirability (e.g., trait items such as “stupid,” “dangerous,” “evil,” “insane,” etc.), which although they may be part of personality, are not basic temperament processes.

#### 3.2.4. Cloninger's temperament and character inventory (TCI) and the ATQ

Correlations between the six-factor model factor scores from the ATQ and Cloninger's factor level scales are reported in Table 10. Convergence here is not substantial. ATQ extraversion/surgency is also correlated with six of the seven Cloninger TCI factors at .28 or higher, including reward dependence ( $r = .57$ ), harm avoidance ( $r = -.38$ ) and cooperation ( $r = .38$ ). TCI reward dependence is also related to ATQ affiliativeness ( $r = .47$ ). Persistence is moderately correlated with effortful control ( $r = .43$ ), as is self-directedness ( $r = .41$ ) and harm avoidance ( $r = -.37$ ). Aggressive negative affect is less related to harm avoidance ( $r = .30$ ) than is non-aggressive negative affect ( $r = .53$ ). Aggressive negative affect also has a larger negative correlation with cooperation ( $r = -.49$ ) than with non-aggressive negative affect ( $r = -.15$ ).

## 4. General discussion

Our primary motivation for these studies was to develop a hierarchical model of temperament based on development of operationally defined temperament constructs within broad temperament domains. In Study Two, this goal was substantially achieved, with internally consistent scales related to each other within the six original broad domains. In Study One, a five-factor rather than the expected six-construct model emerged. The five-factor model reflected constructs from the initial six domains, except that aggressive and non-aggressive negative affect scales loaded on the same factor. Scale scores representing the five-construct model showed high levels of one-to-one correspondence with the Big Five scales, with correlations ranging from .64 to .74. Correlations were found between factor scores, with negative correlations between effortful control and negative affect, and positive correlations between extraversion/surgency and orienting sensitivity, as discussed above.

In Study Two, a large sample of community participants over a much broader age range completed a 100-item version of the ATQ, allowing further examination of the five- and six factor models in a larger and more diversified sample. A six-factor solution was found for

which the CFA fit was good. This model allowed differentiation within the Big Five/FFM in a way that was not possible with the five-factor model. Five of the factors showed convergence between temperament and personality models, with non-aggressive negative affect linked to neuroticism, and the aggressive negative affect factor correlating substantially with both Five Factor agreeableness (negatively) and neuroticism.

The exploration of our temperament model in relation to the ML7 in Study Two was also informative. The ML7 is very similar to the Big Five, with the exception that the model includes separate factors related to non-aggressive and aggressive facets of neuroticism (self-assured and even-tempered, respectively), and agreeableness-affiliativeness (concern for others). These scales were generally consistent with our six-factor temperament model, although aggressive affect was related to both neuroticism and agreeableness (negatively) in a way that is similar to relations with the Five Factor model. An additional inconsistency was the negative correlation of non-aggressive negative affect with the ML7 even-tempered as well as self-assured. Self-assured was also predicted by temperamental effortful control, indicating that self-assured is related to multiple temperament factors.

The meaning of correlations between temperament and the Big Five/FFM scales may in part reflect similarity of item content. However, our method of generating content involved developing items that fit within operational definitions of broad temperament processes. Temperament items were then generated directly from these operational scale definitions, so that temperament items often differed considerably from the personality items. In particular, the orienting sensitivity and openness items were very different. It was surprising to note that orienting sensitivity, including awareness of low intensity stimuli, was related to much more complex personality constructs like self-reported insight, reflection and imagination as measured in the Big Five/FFM. In the past, the origins of openness have been much less clear than for the other factors. Replication of this finding in the future and its inclusion in developmental studies will be of great interest.

Digman and Shmelyov (1996) have suggested that temperament could be subsumed under the Big Five model. An alternative approach, however, is the possibility that the Big Five/FFM structure is shaped by individual differences in early temperament, although our analyses do not in any way address issues of developmental causality. McCrae et al. (2000) have proposed that basic temperament processes form the substrate of global personality traits. We suggest that factors of both temperament and personality have latent substrates that can be defined by basic psychological processes, such as those used to generate the temperament scales. Factor analysis identifies latent variables, assuming that some process accounts for content that is aggregated to form one factor, which in turn is relatively independent of content loading on other factors. Distress proneness or susceptibility to aversive stimuli may thus be a latent substrate of neuroticism, and a reward or incentive system a latent subordinate of extraversion (see Tellegen, 1985; Watson et al., 1999). Our data also suggest that effortful control could be an attentional substrate for conscientiousness, and orienting sensitivity a substrate for intellect/openness. Our data are correlational and based on the assumption that our temperament scales assess temperamental processes. However, extensive work in developmental psychology has linked effortful control to children's model task performance on tasks that assess the efficiency of the executive attention system (Rothbart & Rueda, 2005). We believe these findings combined with the results of adult temperament studies are promising, and that they may fuel more rigorous research designs aimed at exploring this issue longitudinally and experimentally.

Block (1995) has questioned the Big Five for its lack of dynamism, arguing that motivational aspects of personality organize thinking and behavior with respect to goals. Although this research does not empirically examine the intra-individual structure of personality, temperament identifies basic attentional and affective-motivational processes that are engaged in dynamic interaction. For example, effortful control includes the capacity to inhibit prepotent positive (extraversion/surgency) and negative (negative affect) responses in favor of subdominant response tendencies; orienting sensitivity involves noticing peripheral stimuli with emotional relevance (see Derryberry & Rothbart, 1997). Hence, effortful and reactive facets of attentional processing can be mapped in relation to the suppression and activation of positive and negative emotionality.

Our model includes substantial correlations with the TCI, but little evidence of one-to-one convergence. For example, temperamental extraversion/surgency is correlated with all seven of the TCI scores, with the strongest correlation for reward dependence. Reward dependence is also substantially related to affiliativeness in the ATQ. In addition, the temperament scores are related to TCI character scales as well as temperament scales. Although details are beyond the scope of this discussion, the Big Five/FFM shows a pattern of correlations with the TCI scale scores that is very similar to that of the temperament factors (see Goldberg, 2003). We suggest that psychological processes represented in constructs of temperament might account for latent substrates of the Big Five/FFM, with association with the TCI less clear. Future studies will be needed to more systematically and rigorously explore this issue.

The ATQ's distinction between motivational–emotional and attentional constructs is an advantage of the temperament model. Attentional constructs are further differentiated, with the capacity to control attention while experiencing emotion as a facet of effortful control, distinguished from the awareness of emotion as a aspect of orienting sensitivity. This additional level of complexity allows for more fine-grained conceptualizations of how emotion and cognition might be separable process while also being interactive. The conceptual and empirical differentiation of motivational–emotional constructs into negative/aversive and positive/appetitive constructs is an additional advantage (see Derryberry & Rothbart, 1997). The current ATQ model also allows us to relate effortful attention to the study of individual differences in the laboratory (Derryberry et al., 2002; Rothbart & Rueda, 2005).

Recent findings suggest that the ATQ is useful with respect to fine-grained differentiation of cognitive and emotional constructs. For example, Evans and Rothbart (2007) have shown that Aron and Aron's (1997) self-report measure of sensitivity can be differentiated into two orthogonal components. Orienting sensitivity and negative affect (uncorrelated measures) highly correlated with these factors, suggesting that the sensitivity construct is actually a blend of two orthogonal components.

In this paper, we have provided evidence that scales assessing lower-level constructs demonstrate a structure reflecting higher-level domains. These general constructs also show empirical convergence with global traits (i.e., the Big Five/FFM and the ML7) developed from a very different approach, and provide a more differentiated view of constructs like neuroticism and agreeableness within the Big Five. These constructs also describe more complex relations with the character and temperament scales of the TCI. It is hoped that this work will contribute to future research relating temperament to questionnaire reports of personality, genetic analyses, and laboratory measures at the psychobiological and psychological levels.

## Appendix A. Broad constructs and definitions of scales with sample items

---

### Affiliativeness

**Emotional empathy:** Affective response congruent with what others are perceived to feel.

*I am rarely bothered by the apparent suffering of strangers (coded in reverse)*

**Empathic guilt:** Distress in response to negatively affecting other people. *Whenever I believe that I have hurt someone's feelings, I feel guilty*

**Social closeness:** Feelings of warmth, closeness, interest, and involvement with others.

*There are some people that I feel very close to*

### Effortful control

**Activation Control:** Capacity to perform an action when there is a strong tendency to avoid it. *I hardly ever finish things on time (coded in reverse)*

**Effortful attention:** Capacity to focus attention as well as to shift attention when desired, including attentional shifting from punishment and attentional shifting from reward

**Inhibitory control:** Capacity to inhibit inappropriate behavior. *It is easy for me to hold back my laughter in a situation where it is not appropriate*

### Extraversion/surgency

**High intensity pleasure:** Pleasure related to situations involving high stimulus intensity, rate, complexity, novelty, and incongruity. *I would not enjoy the sensation of listening to loud music with a laser light show (coded in reverse)*

**Positive affect:** Latency, threshold, intensity, duration, and frequency of experiencing pleasure. *It doesn't take much to evoke a happy response in me*

**Sociability:** Enjoyment derived from social interaction and being in the presence of others.

*I usually enjoy being with people*

### Negative affect

**Aggression control:** Capacity to inhibit the behavioral expression of anger. *I do not have a problem in controlling hostile impulses*

**Discomfort:** Unpleasant affect resulting from the sensory qualities of stimulation. *I find loud noises to be very irritating*

**Fear:** Unpleasant affect related to anticipation of pain or distress. *Loud noises sometimes scare me*

**Frustration:** Unpleasant affect related to the interruption of tasks and behavior. *I seldom become irritated when someone is late (coded in reverse)*

**Sadness:** Unpleasant affect and lowered mood and energy related to object or person loss, disappointment, and exposure to suffering. *I rarely feel sad after saying good-bye to friends or relatives (coded in reverse)*

**Social anger:** Hostility felt toward other people. *I rarely feel angry at people (coded in reverse)*

### Orienting sensitivity

**Affective perceptual sensitivity:** Spontaneous emotional cognitive content associated with low intensity stimuli. *I am often consciously aware of how the weather seems to affect my mood*

**Appendix A (continued)**

**Associative sensitivity:** Spontaneous cognitive content that is not related to standard associations with the environment. *When I am resting with my eyes closed, I sometimes see visual images*

**General perceptual sensitivity:** Awareness of slight, low intensity stimulation arising from the external or internal environment. *I often notice visual details in the environment*

**Appendix B. Mini-markers for the Big Five**

Note: Big Five scales listed in bold; associated trait-adjectives listed under the name of each scale. Items with “R” in parenthesis indicate conceptual reverse of the associated scale’s label.

<b>Extraversion</b>	<b>Agreeableness</b>	<b>Conscientiousness</b>	<b>Neuroticism</b>	<b>Intellect</b>
Bashful (R)	Cold (R)	Careless (R)	Envious	Complex
Bold	Cooperative	Disorganized (R)	Fretful	Creative
Energetic	Harsh (R)	Efficient	Jealous	Deep
Extraversion	Kind	Inefficient (R)	Moody	Imaginative
Quiet (R)	Rude (R)	Organized	Relaxed (R)	Intellectual
Shy (R)	Sympathetic	Practical	Temperamental	Philosophical
Talkative	Unsympathetic (R)	Sloppy (R)	Touchy	Uncreative (R)
Withdrawn (R)	Warm	Systematic	Unenvious (R)	Unintellectual (R)

**References**

- Almagor, M., Tellegen, A., & Waller, N. (1995). The Big Seven: a cross-cultural replication and further exploration of the basic dimensions of natural language of trait descriptions. *Journal of Personality and Social Psychology, 69*, 300–307.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Angleitner, A., & Ostendorf, F. (1994). Temperament and the Big Five factors of personality. In C. F. Halverson Jr., G. A. Kohnstamm, & R. P. Martin (Eds.), *The developing structure of temperament and personality from infancy to adulthood* (pp. 69–90). Hillsdale, NJ: Erlbaum.
- Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology, 73*, 345–368.
- Ashby, F. G., Isen, A. M., & Turken, A. U. (1999). A neuropsychological theory of positive affect and its influence on cognition. *Journal of Personality and Social Psychology, 106*, 529–550.
- Block, J. (1995). A contrarian view of the five-factor approach to personality description. *Psychological Bulletin, 117*, 187–215.
- Block, J. (2001). Millennial contrarianism: the five-factor approach to personality description 5 years later. *Journal of Research in Personality, 35*, 98–107.
- Buss, A. H. (1991). The EAS theory of temperament. In J. Strelau & A. Angleitner (Eds.), *Explorations in temperament* (pp. 45–60). New York: Plenum Press.
- Buss, A. H., & Plomin, R. (1975). *A temperament theory of personality development*. New York: Wiley-Interscience.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology, 67*, 319–333.
- Church, A. T., Katigbak, M. S., & Reyes, J. A. S. (1998). Further exploration of Filipino personality structure using the lexical approach: Do the Big Five or Big Seven dimensions emerge? *European Journal of Personality, 12*, 249–269.

- Church, A. T., Reyes, J. A. S., Katigbak, M. S., & Grimm, S. D. (1997). Filipino Personality structure and the Big Five model: a lexical approach. *Journal of Personality*, *65*, 477–528.
- Cloninger, R. C. (1998). The genetics and psychobiology of the seven-factor model of personality. In K. R. Silk (Ed.), *Biology of personality disorders* (pp. 63–92). Washington, DC: American Psychiatric Press.
- Cloninger, C. R., Przybeck, T. R., Svrakic, D. M., & Wetzel, R. D. (1994). *The temperament and character inventory (TCI): A guide to its development and use*. St. Louis, MO: Center for Psychobiology of Personality, Washington University.
- Cloninger, C. R., & Svrakic, D. M. (1997). Integrative psychobiological approach to psychiatric assessment and treatment. *Psychiatry*, *60*, 120–141.
- Costa, P. T., Jr., & McCrae, R. R. (1994). Stability and change in personality from adolescence through adulthood. In C. F. Halverson, G. A. Kohnstamm Jr., & R. P. Martin (Eds.), *The developing structure of temperament and personality from infancy to adulthood* (pp. 139–150). Hillsdale, NJ: Erlbaum.
- Davidson, R. J. (1993). The neuropsychology of emotion and affective style. In M. Lewis & J. M. Haviland-Jones (Eds.), *Handbook of emotions* (2nd ed.) (pp. 143–154). New York: Guilford.
- Dawkins, K., & Furnham, A. (1989). The colour naming of emotional words. *British Journal of Psychology*, *80*, 383–389.
- Depue, R. A., & Collins, P. F. (1999). Neurobiology of the structure of personality: dopamine, facilitation of incentive motivation and extraversion. *Behavioral and Brain Sciences*, *22*, 491–569.
- Derryberry, D., & Reed, M. A. (2002). *Anxiety-related attentional biases and their regulation by attentional control*. Unpublished manuscript, Oregon State University at Corvallis.
- Derryberry, D., & Rothbart, M. K. (1988). Arousal, affect, and attention as components of temperament. *Journal of Personality and Social Psychology*, *55*, 958–966.
- Derryberry, D., & Rothbart, M. K. (1997). Reactive and effortful processes in the organization of temperament. *Development and Psychopathology*, *9*, 633–652.
- Derryberry, D., & Tucker, D. M. (1992). Neural mechanisms of emotion. *Journal of Consulting and Clinical Psychology*, *60*, 329–338.
- Digman, J. M., & Shmelyov, A. G. (1996). The structure of temperament and personality in Russian children. *Journal of Personality and Social Psychology*, *71*, 341–351.
- Ellis, L. K., & Rothbart, M. K. (2007). *Revision of the early adolescent temperament questionnaire*. Manuscript in preparation.
- Evans, D. E. (2004). *Individual differences in temperament and attention*. Unpublished doctoral dissertation, University of Oregon.
- Evans, D. E., & Rothbart, M. K. (2007). *Sensory sensitivity and sensory discomfort as orthogonal components of temperament*. Submitted for publication.
- Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences: A natural science approach*. New York: Plenum Press.
- Gartstein, M. A., & Rothbart, M. K. (2003). Studying infant temperament via the Revised Infant Behavior Questionnaire. *Infant Behavior and Development*, *26*, 64–86.
- Goldberg, L. R. (1992). The development of markers for the Big Five-factor structure. *Psychological Assessment*, *4*, 26–42.
- Goldberg, L. R. (2003). The Eugene-Springfield Community Sample: information now available. *Oregon Research Institute Technical Report*, *43*.
- Goldsmith, H. H., Buss, A., Plomin, R., Rothbart, M. K., Thomas, A., Chess, S., et al. (1987). What is temperament? Four approaches. *Child Development*, *58*, 505–529.
- Gray, J. A. (1990). Brain systems that mediate both emotion and cognition. *Cognition and Emotion*, *4*, 269–288.
- Harkness, A. R., Tellegen, A., & Waller, N. (1995). Differential convergence of self-report and informant data for multidimensional personality questionnaire: implications for the construct of negative emotionality. *Journal of Personality Assessment*, *64*, 185–204.
- Hogan, R., & Hogan, J. (1995). *Hogan Personality Inventory manual* (2nd ed.). Tulsa, OK: Hogan Assessment Systems.
- Izen, A. M., Johnson, M. S., Mertz, E., & Robinson, G. F. (1985). The influence of positive affect on the unusualness of word associations. *Journal of Personality and Social Psychology*, *48*, 1413–1426.
- MacLeod, C., & Hagan, R. (1992). Individual differences in the selective processing of threatening information, and emotional responses to a stressful life event. *Behavior Research and Therapy*, *30*, 151–161.
- McCrae, R. R. (1993/1994). Openness to experience as a basic dimension of personality. *Imagination, Cognition and Personality*, *13*, 39–55.

- McCrae, R. R., & Costa, P. T., Jr. (1996). Toward a new generation of personality theories: theoretical contexts for the Five Factor Model. In J. S. Wiggins (Ed.), *The Five Factor Model of personality: Theoretical perspectives* (pp. 51–87). New York: Guilford Press.
- McCrae, R. R., Costa, P. T., Jr., Ostendorf, F., Angleitner, A., Hrebickova, M., et al. (2000). Nature over nurture: temperament, personality, and life span development. *Journal of Personality and Social Psychology*, *78*, 173–186.
- McCrae, R. R., & John, O. P. (1992). An introduction to the Five Factor Model and its applications. *Journal of Personality*, *60*, 175–215.
- McCrae, R. R., Zonderman, A. B., Costa, P. T., Jr., Bond, M. H., & Paunonen, S. V. (1996). Evaluating replicability of factors in the Revised NEO Personality Inventory: Confirmatory factor analysis versus procrustes rotation. *Journal of Personality and Social Psychology*, *70*, 552–566.
- Mogg, K., Bradley, B. P., & Williams, R. (1995). Attentional bias in anxiety and depression: The role of awareness. *British Journal of Clinical Psychology*, *34*, 17–36.
- Myers, L. B., & McKenna, F. P. (1996). The colour naming of socially threatening words. *Personality and Individual Differences*, *20*, 801–803.
- Oldehinkel, A. J., Hartman, C. A., de Winter, A. F., Veenstra, R., & Ormel, J. (2004). Temperamental profiles associated with internalizing and externalizing problems in preadolescence. *Development and Psychopathology*, *16*, 421–440.
- Panksepp, J. (1998). *Affective neuroscience: The foundations of human and animal emotions*. New York: Oxford University Press.
- Pratto, F., & John, O. P. (1991). Automatic vigilance: The attention grabbing power of negative social information. *Journal of Personality and Social Psychology*, *61*, 380–391.
- Putnam, S. P., Ellis, L. K., & Rothbart, M. K. (2001). The structure of temperament from infancy through adolescence. In A. Elias & A. Angleitner (Eds.), *Advances in research on temperament* (pp. 165–182). Germany: Pabst Scientific.
- Rothbart, M. K. (1994). Broad dimensions of temperament and personality. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion* (pp. 337–341). New York: Oxford University Press.
- Rothbart, M. K., Ahadi, S. A., & Evans, D. E. (2000). Temperament and personality: origins and outcomes. *Journal of Personality and Social Psychology*, *78*, 122–135.
- Rothbart, M. K., & Bates, J. (1998). Temperament. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Social, emotional and personality development*, (5th ed.) (pp. 105–176). New York: Wiley.
- Rothbart, M. K., & Bates, J. E. (2006). Temperament. In *Handbook of child psychology* W. Damon, R. Lerner, & N. Eisenberg (Eds.), *Social, emotional, and personality development* (Vol. 3). 6th ed., pp. 99–166). New York: Wiley.
- Rothbart, M. K., & Derryberry, D. (1981). Development of individual differences in temperament. In M. E. Lamb & A. L. Brown (Eds.), *Advances in developmental psychology* (Vol. 1, pp. 37–86). Hillsdale, NJ: Erlbaum.
- Rothbart, M. K., Derryberry, D., & Posner, M. (1994). A psychobiological approach to the development of temperament. In J. Bates & T. D. Wachs (Eds.), *Temperament: Individual differences at the interface of biology and behavior* (pp. 83–116). Washington, DC: American Psychological Association.
- Rothbart, M. K., & Rueda, M. R. (2005). The development of effortful control. In U. Mayr, E. Awh, & S. W. Keele (Eds.), *Developing individuality in the human brain: A tribute to Michael I. Posner* (pp. 167–188). Washington, DC: American Psychological Association.
- Saucier, G. (1994). Mini-markers: A brief version of Goldberg's unipolar Big-Five markers. *Journal of Personality Assessment*, *63*, 506–516.
- Saucier, G. (2001). *What is more replicable than the Big Five? Broader factors from the natural language of personality*. Unpublished manuscript, University of Oregon at Eugene.
- Saucier, G. (2003). An alternative multiple-language structure of personality attributes. *European Journal of Personality*, *17*, 179–205.
- Strelau, J., Angleitner, A., Bantelmann, J., & Ruch, W. (1990). The Strelau Temperament Inventory-Revised (STIR). Theoretical considerations and scale development. *European Journal of Personality*, *4*, 209–235.
- Strelau, J., & Zawadzki, B. (1997). Temperament and personality: Eysenck's three superfactors as related to temperamental dimensions. In H. Nyborg (Ed.), *The scientific study of human nature: Tribute to Hans J. Eysenck at eighty* (pp. 68–91). Oxford, UK: Pergamon.

- Tellegen, A. (1985). Structure of mood and personality and their relevance to assessing anxiety, with an emphasis on self-report. In A. J. Tuma & J. D. Maser (Eds.), *Anxiety and the anxiety disorders* (pp. 681–706). Hillsdale, NJ: Erlbaum.
- Thomas, A., & Chess, S. (1977). *Temperament and development*. New York: Brunner/Mazel.
- Watson, D., & Clark, L. A. (1992). Affects separable and inseparable: on the hierarchical arrangements of the negative affects. *Journal of Personality and Social Psychology*, 62, 489–505.
- Watson, D., & Walker, L. M. (1996). The long-term stability and predictive validity of trait measures of affect. *Journal of Personality and Social Psychology*, 70, 567–577.
- Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1999). The two general activation systems of affect: structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology*, 76, 820–838.
- Windle, M., & Lerner, R. M. (1986). Reassessing the dimensions of temperamental individuality across the life span: The Revised Dimensions of Temperament Survey (DOTS-R). *Journal of Adolescent Research*, 1, 213–229.
- Zuckerman, M. (1997). The psychobiological basis of personality. In H. Nyborg (Ed.), *The scientific study of human nature: Tribute to Hans J. Eysenck at eighty* (pp. 3–16). Oxford, UK: Pergamon/Elsevier.
- Zuckerman, M., Eysenck, S. B., & Eysenck, H. J. (1978). Sensation seeking in England and America: cross-cultural, age, and sex comparisons. *Journal of Clinical and Consulting Psychology*, 46, 139–148.
- Zuckerman, M., Kuhlman, D. M., Joireman, J., Teta, P., & Kraft, M. (1993). A comparison of three structural models of personality: The Big Three, the Big Five, and the Alternative Five. *Journal of Personality and Social Psychology*, 65, 757–768.