# Psychometric characteristic of the Italian version of the Temperament and Character Inventory—Revised, personality, psychopathology, and attachment styles

Giovanni Martinotti[a], Laura Mandelli[b,*], Marco Di Nicola[a], Alessandro Serretti[b], Andrea Fossati[d], Serena Borroni[d], C. Robert Cloninger[c], Luigi Janiri[a]

[a]Department of Psychiatry, Catholic University Medical School, 00168 Rome, Italy
[b]Institute of Psychiatry, University of Bologna, 40123 Bologna, Italy
[c]Center for Psychobiology of Personality, Department of Psychiatry, Washington University in St, Louis, School of Medicine, St. Louis, MO, USA
[d]Faculty of Psychology, Vita-Salute San Raffaele University, Milan, Italy

## Abstract

In this article, we described the psychometric characteristics of the revised version of the Cloninger's personality Temperament and Character Inventory (TCI-R), Italian translation. Two independent samples, which were composed of 355 and 385 nonclinical mother-language Italian subjects, respectively, completed the TCI-R. A further sample of psychiatric outpatients was compared with community samples. We analyzed the internal consistency of each dimension, the test-retest reliability and the factorial structure of the questionnaire. Furthermore, we explored the potential association between personality, psychopathologic indicators (evaluated by the Symptom Checklist-90), behavior dyscontrol measures, and adaptive and maladaptive interpersonal styles. As a whole, the internal consistency of the TCI-R scales was adequate, although some differences in Cronbach α values were observed between the 2 samples in some TCI-R subfacets. The factorial structure was consistent with the original hypothesis of Cloninger and test-retest showed a good stability of the scores over the time. Normal data for the Italian population were also calculated. Furthermore, the character dimensions of self-directedness and cooperativeness were related with some psychopathologic domains in our sample and negatively with impulsiveness, anger, and hostility. Novelty seeking was associated with impulsiveness, whereas harm avoidance was associated with anger and hostility. On the contrary, persistence and reward dependence were inversely correlated with such traits. Harm avoidance, reward dependence, self-directedness, and cooperativeness were strongly related with measures of attachment. Finally, significant differences were observed in both temperament and character traits between community subjects and psychiatric outpatients.

In the present study, the validity of the Italian translation of the TCI-R is therefore supported. Personality features are also confirmed as risk factors for specific psychopathologic domains, impulsivity, anger, and hostility. Furthermore, we found attachment styles of nonclinical subjects correlated with personality features.

© 2008 Elsevier Inc. All rights reserved.

## 1. Introduction

The Temperament and Character Inventory (TCI) [1] is a 226-item self-questionnaire developed to assess the 7 dimensions of personality defined by the biosocial model of personality. Cloninger and colleagues [2,3] developed this model of personality based on temperament (harm avoidance [HA], novelty seeking [NS], reward dependence [RA],

persistence) and character dimensions (self-directedness [SD], cooperativeness [C], self-transcendence [ST]). Temperamental traits refer to automatic emotional responses to experiences that are moderately heritable and stable throughout life. In contrast, character facets refer to self-concepts and individual differences in goals and values and they are moderately influenced by insight and learning and mature in progressive steps; however, some recent studies showed some heritability also for character dimensions [4]. Temperament consists of 4 traits, so-called harm avoidance, novelty seeking, reward dependence, and persistence. *Harm avoidance* denotes the individual's inclination to behavioral

inhibition in front of potentially dangerous stimuli and to anticipate negative effects; *novelty seeking* relates to exploratory behaviors and activation in response to novel stimuli; *reward dependence* concerns relational and affective skills but also others dependencies; and finally, *persistence* characterizes industrious, hard working, and stable despite frustration and fatigue individuals. Character consists of 3 dimensions: SD, C, and ST. *Self-directedness* expresses the individual's competence toward autonomy, reliability, and maturity; *cooperativeness* is related to social skills, such as support, collaboration, and partnership; and finally, *self-transcendence* denotes the aptitude toward mysticism, religion, and idealism.

The TCI has been used extensively in research studies worldwide during the past 15 years; it provides quantitative measures of personality that are clinically useful in psychiatry and psychology [5] and it is a reliable instrument to assess personality disorders: lower SD and cooperativeness (C) scores have been found consistently in individuals with personality disorders [6,7]. The Italian version of the TCI was validated by Fossati et al [8], in both clinical and nonclinical samples.

Recently, Cloninger developed a revised version of the TCI (TCI-R) [9] introducing 2 major modifications. First, the original TCI was a true-false questionnaire, whereas in the TCI-R, participants must respond on a 5-point Likert scale ranging from 1 (definitively false) to 5 (definitively true) to enhance the precision of measurement for subscales. Second, in the original TCI, Persistence was measured by only one short scale, whereas in the TCI-R, this dimension has 35 items and 4 subscales to improve its description and measurement. In addition, the TCI-R adds a new subscale for RA.

Until recently, few data have been available about the TCI-R. The TCI-R has been reported structurally equivalent to the TCI and the TCI-R; a good internal consistency and factorial structure for the TCI-R have been replicated in Belgian [10], Sweden [11], German [11], Spanish [12], French [13], and Czech [14] populations. Recently, Fossati et al [15] showed that the Italian translation of the TCI-R was provided with adequate reliability and validity data in a sample of 504 consecutively admitted Italian psychiatric outpatients. Internal consistency reliabilities ranged from 0.79 (RA) to 0.91 (persistence) for the main TCI-R dimensions. In this study, 1-month test-retest reliabilities ranged from 0.52 (NS) to 0.80 (ST), suggesting a moderate-to-good stability of TCI-R scores also in treated psychiatric outpatientts. Both multiple-group component and Procrustes factor analyses suggested a close correspondence between the theoretical and the empirical 7-factor structure of the TCI-R facets also in a large sample of Italian outpatients. Logistic regression analyses showed that the Italian translation of the TCI-R was efficient both in discriminating subjects with any *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*) personality diagnosis from subject with no personality disorder diagnosis and in differentiating the individual *DSM-IV* personality disorder diagnoses [15].

Starting from these considerations, the aim of the present study was to confirm and extend the psychometric properties of Italian translation of the TCI-R also in 2 nonclinical Italian samples. Furthermore, we aim to investigate the potential association between personality and indicators of psychopathology, of behavior dyscontrol, adaptive, and maladaptive interpersonal styles. Finally, we will perform a comparison between scores obtained in the community sample with those obtained in a sample of patients affected by psychiatric disorders already investigated in a previous study [15].

## 2. Materials and methods

### 2.1. Subjects

The investigation was performed on 2 independent community samples of adult (older than 18 years) volunteers. The first sample was composed of 355 Italian mother-language subjects from the community (mostly members of the hospital staff), recruited at the "Agostino Gemelli" Hospital, Catholic University of Rome (Italy), who volunteered to take part in the study after signing a written informed consent form. The sample was composed by 150 males (42.3%) and 205 females (57.7%); subjects had a mean age of $36.2 \pm 14.2$ years (range, 18-86 years), and they were mainly employed (60.7%,; 29.2% of them were students, 8.9% homemaker or retired, and 1.2% unemployed.

The second sample was composed of 385 Italian mother-language participants living in Milan urban or suburban areas who volunteered to take part in the study after signing a written informed consent form; they were mostly members of the San Raffaele of Hospital of Milan staff. One hundred sixty-three (42.3%) participants were male and 222 (57.7%) female; participants' mean age was $32.59 \pm 9.26$ years. Three hundred seven participants (79.7%) were active community workers, whereas 78 participants (20.3%) were undergraduate college students. Among active community workers, the most frequent professions were white-collar ($n = 119$. 38.8%), housewife ($n = 20$, 6.5%), teacher ($n = 17$. 5.6%), and blue-collar ($n = 15$. 4.9%). In both samples, subjects were not screened for psychiatric disorders or other medical conditions. To be included in the study, subjects should possess an education level equal to or grater than elementary school. All subjects were white.

The 2 samples did not differ in sex distribution ($\chi^2_1 = 0.003$, $P = .096$), although the second sample was slightly but significantly younger ($t_{738} = 4.11$, $P < .0001$). Some differences were observed also in other demographic characteristics; in particular, the first sample included a significantly higher proportion of students than the second sample ($\chi^2_1 = 13.1$, $P < .0001$), although the effect size of this difference was at best slight ($\phi = 0.13$).

Table 1
Mean scores and Cronbach α coefficients for TCI-R dimensions and subfacets in sample 1 and sample 2

| | No. of item | Sample 1 | | Sample 2 | |
|---|---|---|---|---|---|
| | | Mean ± St dev | α | Mean ± St dev | α |
| NS | 35 | 100.5 ± 21.3 | **.84** | 98.5 ± 12.9 | **.78** |
| Exploratory excitability (NS1) | 10 | 30.3 ± 7.1 | .28 | 28.7 ± 5.0 | .55 |
| Impulsiveness (NS2) | 9 | 23.5 ± 6.5 | .42 | 24.4 ± 5.3 | .71 |
| Extravagance (NS3) | 9 | 27.6 ± 7.5 | .07 | 26.25 ± 5.2 | .72 |
| Disorderliness (NS4) | 7 | 19.1 ± 4.8 | .24 | 19.3 ± 3.75 | .45 |
| HA | 33 | 92.2 ± 22.1 | **.88** | 96.4 ± 14.4 | **0.85** |
| Anticipatory worry (HA1) | 11 | 30.3 ± 8.1 | .43 | 31.8 ± 5.8 | 0.74 |
| Fear of uncertainty (HA2) | 7 | 21.5 ± 5.2 | .47 | 22.5 ± 3.9 | 0.50 |
| Shyness (HA3) | 7 | 19.1 ± 6.2 | <.01 | 20.4 ± 4.85 | 0.78 |
| Fatigability (HA4) | 8 | 21.4 ± 6.4 | .23 | 21.7 ± 5.1 | 0.72 |
| RA | 30 | 100.0 ± 19.7 | **.82** | 101.4 ± 13.0 | **.83** |
| Sentimentality (RD1) | 8 | 26.8 ± 5.9 | .37 | 27.0 ± 4.2 | .59 |
| Openness to warm communication (RD2) | 10 | 34.8 ± 8.0 | .26 | 34.8 ± 5.7 | .75 |
| Attachment (RD3) | 6 | 19.3 ± 5.7 | .17 | 19.5 ± 4.8 | .78 |
| Dependence (RD4) | 6 | 19.2 ± 4.5 | .42 | 20.1 ± 3.4 | .36 |
| Persistence (P) | 35 | 111.3 ± 23.3 | **.89** | 116.3 ± 14.4 | **.87** |
| Eagerness of effort (P1) | 9 | 30.3 ± 6.7 | .76 | 30.6 ± 3.8 | .65 |
| Work hardened (P2) | 8 | 27.3 ± 6.2 | .58 | 27.65 ± 4.5 | .62 |
| Ambitious (P3) | 10 | 28.5 ± 6.9 | .79 | 31.8 ± 5.9 | .80 |
| Perfectionist (P4) | 8 | 25.6 ± 7.4 | .36 | 26.3 ± 4.8 | .64 |
| SD | 40 | 136.8 ± 27.7 | **.82** | 139.1 ± 16.5 | **.85** |
| Responsibility (SD1) | 8 | 29.2 ± 7.7 | .51 | 29.6 ± 4.8 | .72 |
| Purposeful (SD2) | 6 | 21.6 ± 5.6 | <.01 | 21.8 ± 3.8 | .63 |
| Resourcefulness (SD3) | 5 | 18.5 ± 6.1 | .47 | 18.2 ± 3.0 | .59 |
| Self-acceptance (SD4) | 10 | 28.9 ± 8.3 | .50 | 30.2 ± 7.0 | .77 |
| Enlightened second nature (SD5) | 11 | 39.2 ± 8.7 | .48 | 39.3 ± 5.6 | .66 |
| C | 36 | 132.1 ± 24.0 | **.86** | 134.9 ± 13.9 | **.85** |
| Social acceptance (C1) | 8 | 28.9 ± 6.3 | .02 | 29.5 ± 4.5 | .76 |
| Empathy (C2) | 5 | 18.0 ± 4.1 | .13 | 17.9 ± 2.7 | .45 |
| Helpfulness (C3) | 8 | 29.1 ± 6.8 | .18 | 17.9 ± 3.7 | .57 |
| Compassion (C4) | 7 | 26.3 ± 5.6 | <.01 | 26.8 ± 4.1 | .62 |
| Pure-hearted conscience (C5) | 8 | 30.1 ± 6.4 | <.01 | 31.2 ± 4.3 | .60 |
| ST | 26 | 65.6 ± 18.5 | **.82** | 69.9 ± 14.5 | **.84** |
| Self forgetful (ST1) | 10 | 26.1 ± 8.2 | .78 | 27.7 ± 6.9 | .74 |
| Transpersonal identification (ST2) | 8 | 19.4 ± 7.7 | .80 | 20.4 ± 5.6 | .71 |
| Spiritual acceptance (ST3) | 8 | 20.4 ± 6.0 | .41 | 21.9 ± 5.5 | .64 |

A third sample was compared with the community sample. The sample has been already analyzed by Fossati et al [15]. Subjects were all outpatients, affected by anxiety disorders (16.7%), substance abuse/dependence disorders (20.8%), eating disorders (11.1%), mood disorders (28, 5.6%), and other *DSM-IV* Axis I diagnosis (sleep disorders, sexual disorders, somatoform disorders, etc) (3.6%). A large part of the sample received a diagnosis of personality disorder (65.9%). For further details, the reader can refer to the article of Fossati et al [15].

### 2.2. Measures

All subjects filled in the TCI-R; no serious acceptability or comprehension difficulties appeared in the completion. The Italian version of the TCI-R was translated by M Battaglia, a professional English translator who evaluated its adequacy to its respective English version through a back-version. TCI-R was analyzed in accordance with the

calculation method indicated by Cloninger [9]. To estimate test-retest reliability of the TCI-R and its stability over time, 48 subjects in the first sample were asked to fill in the questionnaire twice, after a minimum of 6 months till a

Table 2
Cronbach α coefficients for TCI-R dimensions in males, females and stratified for three cohort of age

| | Cronbach α (males) | Cronbach α (females) | Cronbach α (age ≤24 y) | Cronbach α (age 25-49 y) | Cronbach α (age ≥50 y) |
|---|---|---|---|---|---|
| NS | 0.81 | 0.86 | 0.91 | 0.75 | 0.83 |
| HA | 0.87 | 0.88 | 0.92 | 0.84 | 0.84 |
| RD | 0.79 | 0.83 | 0.93 | 0.71 | 0.72 |
| P | 0.88 | 0.90 | 0.91 | 0.87 | 0.90 |
| SD | 0.84 | 0.83 | 0.91 | 0.82 | 0.77 |
| C | 0.86 | 0.90 | 0.95 | 0.81 | 0.87 |
| ST | 0.80 | 0.86 | 0.91 | 0.78 | 0.78 |

P indicates persistence.

Table 3
Test-retest reliability: ICC (n = 48)

|  | Time 1 | Time 2 | ICC |
|---|---|---|---|
| NS | 99.5 ± 16.2 | 100.5 ± 15.1 | 0.81 |
| HA | 93.0 ± 14.3 | 91.8 ± 14.4 | 0.88 |
| RD | 74.2 ± 16.7 | 72.0 ± 15.1 | 0.87 |
| P | 114.1 ± 17.4 | 114.5 ± 17.5 | 0.83 |
| SD | 143.1 ± 19.3 | 146.5 ± 20.6 | 0.80 |
| C | 139.5 ± 12.8 | 140.0 ± 13.7 | 0.68 |
| ST | 69.3 ± 16.1 | 68.7 ± 17.2 | 0.76 |

maximum of 8 months from the first administration. In the first sample, 235 subjects were also evaluated for psychopathologic and general symptoms by the Symptom Checklist (SCL-90) [16]. Ninety-three subjects were also investigated for psychiatric family history by the Family Abbreviated Interview (FAI) [17]. Of 93, 62 subjects (66.7%) were positive for familiar psychiatric disorders; the most frequent familiar disorders were depression (41.9%) and eating disorders (18.3%). Subjects with positive and negative family history for psychiatric disorders were not different for sex, gender, and social status. In the second sample, to extend the construct validity data of the TCI-R, all subjects were administered the Italian versions of the Barratt Impulsiveness Scale-11 (BIS-11 [18]), Aggression Questionnaire (AQ [19]), and Attachment Style Questionnaire (ASQ [20]). The Italian versions of the BIS-11, AQ and ASQ were provided with adequate reliability and validity data [8,21,22].

Data were analyzed by simple pairwise case deletion. In fact, in both samples, no other variable was missing in more than 5% of cases, except for the educational level in sample 1. Nevertheless, by the missing value analysis, education was missing completely at random and it did not affect any other variable in the sample.

### 2.3. Statistical analysis

The internal consistency of the scores and subscores of TCI-R was calculated through the Cronbach α coefficient. To explore the effect of sex and age on internal consistency, we calculated the coefficient separately in men and women and in 3 different cohorts of age (divided according to lower and upper quartiles of the distribution of age). Exploratory principal-components analyses with Varimax transformation were performed to analyze the factorial structure of the questionnaire; and to explore test-retest reliability, intraclass correlation coefficients (ICCs) were calculated for each TCI dimension. Raw TCI-R scores were then converted to $T$ scores (distribution's mean, 50; St dev, 10) to provide normal data. Association of TCI-R scores with age, sex, SCL-90, BIS-11, AQ, and ASQ scores and family history for psychiatric disorders (FAI) were explored by the correlation analysis and the Student $t$ test. The comparison between TCI-R scores in community and PD subjects was performed by the

analysis of covariance controlling for sex and age and post hoc by the contrast analysis.

A Bonferroni correction was systematically applied when analyzing SCL-90, BIS-11, AQ, and ASQ scores. Overall, α levels ranged from 0.001 to 0.0009. With these parameters, we obtained a sufficient power of 0.80 to detect small effect sizes ($r = 0.235$) for correlations between TCI-R and SCL scores; between TCI-R, BIS-11, and AQ scores ($r = 0.21$); and between TCI-R and ASQ scores ($r = 0.20$).

## 3. Results

Mean scores of main dimensions and facets of the TCI-R for samples 1 and 2 are shown in Table 1.

Because this new version of the TCI gives the choice to answer "neither true nor false," or about equally "true or false" (response 3), it is of interest to know if some items frequently received this response. The item with the highest rates of this response in our samples was the 161 (47.1%, "I think I will have very good luck in the future" from HA1), according to reference [13]. Other items that frequently scored 3 were the 81 (38.1% from HA4), 117 (40,6%, from P3), 55 (42.5%, from P4), and 76 (39.8%, from P4).

### 3.1. Internal consistency

The internal consistency of the main dimensions and subfacets has been explored by the mean of the Cronbach α coefficient on both samples and presented in Table 1. All TCI-R main dimensions showed adequate internal consistency coefficients (≥70). At the facet level, almost all TCI-R facets showed adequate internal consistencies in sample 2, whereas low reliability values were observed in sample 1.

Table 4
Principal-component analysis of temperament subscales (Varimax transformation including factors with eigenvalue of 1 or more)

|  | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---|---|---|---|---|
|  | P | HA | NS | RD |
| NS1 | 0.38 | −0.05 | **0.64** | 0.40 |
| NS2 | 0.09 | 0.12 | **0.84** | 0.08 |
| NS3 | 0.11 | 0.12 | **0.72** | 0.38 |
| NS4 | 0.18 | 0.17 | **0.78** | 0.16 |
| HA1 | 0.12 | **0.87** | 0.12 | −0.02 |
| HA2 | 0.19 | **0.84** | 0.06 | 0.18 |
| HA3 | 0.03 | **0.85** | −0.01 | −0.08 |
| HA4 | −0.10 | **0.79** | 0.19 | 0.10 |
| RD1 | 0.36 | 0.49 | 0.24 | 0.49 |
| RD2 | 0.41 | 0.02 | 0.30 | **0.77** |
| RD3 | 0.15 | 0.02 | 0.19 | **0.88** |
| RD4 | 0.24 | 0.49 | 0.06 | **0.53** |
| PS1 | **0.82** | 0.13 | 0.17 | 0.23 |
| PS2 | **0.85** | 0.08 | 0.15 | 0.21 |
| PS3 | **0.81** | 0.00 | 0.26 | 0.21 |
| PS4 | **0.83** | 0.11 | −0.03 | 0.07 |
| Explained variance (%) | 21.07 | 21.23 | 16.36 | 15.12 |

Loadings with absolute values of 0.50 or more are shown in boldface type.

Table 5
Principal-component analysis of character subscales (Varimax transformation including factors with eigenvalue of 1 or more)

| | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| | C | ST | SD |
| SD1 | 0.39 | −0.05 | **0.67** |
| SD2 | 0.32 | 0.13 | **0.71** |
| SD3 | 0.10 | 0.18 | **0.75** |
| SD4 | 0.39 | −0.02 | **0.59** |
| SD5 | 0.48 | 0.17 | **0.67** |
| C1 | **0.82** | 0.12 | 0.23 |
| C2 | **0.72** | 0.23 | 0.23 |
| C3 | **0.78** | 0.12 | 0.19 |
| C4 | **0.83** | 0.14 | 0.26 |
| C5 | **0.71** | 0.28 | 0.31 |
| ST1 | 0.20 | **0.85** | −0.03 |
| ST2 | 0.01 | **0.87** | 0.16 |
| ST3 | 0.29 | **0.79** | 0.11 |
| Explained variance (%) | 28.99 | 18.17 | 20.32 |

Loadings with absolute values of 0.50 or more are shown in boldface type.

Table 7
Correlation between TCI-R and SCL-90 scores (n = 233)

| | NS | HA | RD | P | SD | C | ST |
|---|---|---|---|---|---|---|---|
| Somatization | −0.14 | −0.12 | −0.17 | −0.05 | −0.11 | −0.16 | −0.03 |
| Obsessive-compulsive symptoms | −0.05 | −0.08 | −0.18 | −0.17 | **−0.26** | **−0.25** | −0.03 |
| Interpersonal sensitiveness | 0.05 | −0.08 | 0.09 | −0.09 | 0.12 | 0.13 | 0.05 |
| Depression | 0.03 | 0.07 | −0.07 | 0.005 | −0.02 | 0.004 | 0.06 |
| Anxiety | −0.08 | −0.15 | −0.04 | −0.09 | −0.17 | **−0.20** | −0.07 |
| Hostility & anger | 0.13 | −0.14 | −0.18 | −0.12 | **−0.21** | −0.17 | −0.002 |
| Phobic anxiety | 0.11 | −0.15 | **−0.21** | −0.14 | **−0.25** | **−0.27** | −0.08 |
| Paranoid ideation | 0.12 | −0.11 | −0.16 | 0.03 | −0.13 | −0.14 | −0.08 |
| Psychotic symptoms | −0.14 | −0.12 | **−0.20** | −0.17 | **−0.27** | **−0.26** | −0.14 |
| Other symptoms | 0.14 | −0.11 | −0.10 | −0.03 | −0.07 | −0.11 | −0.02 |

Significant correlations are shown in boldface type.

This finding was somewhat unexpected considering that the variances observed in sample 1 were substantially larger that the variances observed in sample 2. Analyzing separately men and women, and different cohorts of age, all main dimensions maintained adequate internal consistencies in the different groups (Table 2).

### 3.2. Test-retest reliability

Results of test-retest reliability analysis are shown in Table 3. All scales obtained good ICCs (≥70), indicating the stability of the measures over time. Unfortunately, only a subgroup of sample 1 subjects agreed to participate in the longitudinal part of the study. The analysis was thus performed on 48 subjects of sample 1, assessed twice (16 males and 32 females; mean age, 40.3 ± 15.7 years). This subsample was not different regarding sex ($P = .31$), but they were a little older ($t_{405} = 2.33$, $P = .065$) than the general sample.

### 3.3. Factor structure

Two principal-component analyses were performed for temperament and character subscores, separately, with Varimax transformation, taking into account factors with eigenvalues of 1 or more. With regard to temperament subscales, 4 factors were identified, accounting for 73.8% of the variance (Table 4). Factors were consistent with those defined by Cloninger: factor 1 included all subscales of P (P factor), factor 2 included all subscales of HA (HA factor), factor 3 included all subscales of NS (NS factor), and factor 4 included all the subscales of RA (RD factor), except for RD1 (sentimentality), which loaded equally on RD and HA. Again, consistently with Cloninger, 3 factors were identified for character subscales, accounting for 67.5% of the variance (Table 5). Factor 1 included all the scales of C (C factor); factor 2 included all the subscales of ST (ST factor) and factor 3 included all the subscales of SD (SD factor).

### 3.4. Normal data

In Table 6, normal scores of the TCI-R for the Italian, nonclinical population are provided in summary. Raw scores were converted to $T$ scores (distribution's mean, 50; St dev, 10); thus, subjects scoring between 40 and 60 $T$ scores for a specific trait are considered in the medium range; those scoring between 30 and 39 are considered low and those scoring between 61 and 70 are considered high; finally, those scoring less than 30 or higher than 70 are

Table 6
Normal scores calculated in all individuals (n = 740)

| | TCI-R raw scores | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | NS | HA | RD | P | SD | C | ST | $T$ score |
| Significantly low scores | <64 | <56 | <66 | <75 | <92 | <93 | <34 | <30 |
| Low scores | 64-81 | 57-74 | 67-83 | 75-93 | 92-114 | 94-113 | 34-50 | 30-39 |
| Medium scores | 82-117 | 75-113 | 84-118 | 115-161 | 115-161 | 114-153 | 51-83 | 40-60 |
| High scores | 118-135 | 114-132 | 119-134 | 135-153 | 162-184 | 154-173 | 84-101 | 61-70 |
| Significantly high scores | 136-175 | 133-165 | 135-150 | 154-175 | 185-200 | 174-180 | 102-130 | <70 |

Raw TCI-R scores are converted to $T$ scores (mean, 50; St dev, 10).

Table 8
Association between TCI-R scales and BIS-11 and AQ scales (n = 385)

| TCI-R scales | BIS-11 scales | | | | AQ scales | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AI | MI | NP | Total | PA | VA | AN | HO | Total |
| NS | **0.29** | **0.55** | **0.34** | **0.49** | 0.09 | 0.15 | 0.12 | −0.04 | 0.09 |
| HA | 0.06 | 0.03 | 0.13 | 0.10 | −0.05 | −0.04 | **0.27** | **0.43** | **0.25** |
| RD | −0.03 | 0.03 | −0.08 | −0.04 | **−0.20** | −0.05 | −0.09 | **−0.28** | **−0.23** |
| PE | −0.13 | −0.16 | **−0.44** | **−0.34** | 0.00 | 0.08 | −0.02 | −0.09 | −0.02 |
| SD | **−0.33** | **−0.36** | **−0.34** | **−0.43** | **−0.22** | −0.16 | **−0.38** | **−0.52** | **−0.46** |
| CO | −0.15 | **−0.21** | **−0.21** | **−0.24** | **−0.35** | **−0.31** | **−0.34** | **−0.43** | **−0.50** |
| ST | 0.09 | 0.09 | −0.10 | 0.02 | −0.10 | −0.08 | 0.01 | 0.00 | −0.05 |

Significant correlations are shown in boldface type. NS indicates novelty seeking; HA, harm avoidance; RD, reward dependence; PE, persistence; SD, self-directedness; ST, self-transcendence; CO, cooperativeness; AI, attention impulsiveness; MI, motor impulsiveness; NP, nonplanning impulsiveness; PA, physical aggression; VA, verbal aggression; AN, anger; HO, hostility.

considered, respectively, significantly lower or significantly higher in such trait (<5% of individuals obtained such scores). Full table with all subfacets and *T* score for each raw score is available on request.

### 3.5. Correlation with SCL-90 scores

Symptom Checklist-90 dimensions were not correlated with age, whereas sex was associated with "somatization," with higher scores in females (*t* = 3.18, *P* = .002). The associations between TCI-R scales and SCL-90 domains are listed in Table 7. Correlation coefficient greater than 0.19 in absolute value are significant at Bonferroni-corrected nominal *P* level (ie, *P* < .005). RA was negatively correlated with phobic anxiety and psychotic symptoms; SD and C were negatively correlated with obsessive compulsive symptoms, depression (only C), hostility and anger (only S), phobic anxiety, and psychotic symptoms. No other significant association could be observed.

Positive family history for any psychiatric disease, as measured by the FAI, was not associated with any specific personality dimension or specific psychopathologic feature (data not shown, available on request).

### 3.6. Correlations with impulsivity, aggressiveness, and adult attachment styles

The associations between TCI-R scales, and impulsivity and aggressiveness domains are listed in Table 8. Correlation coefficient greater than 0.17 in absolute value are significant

at Bonferroni-corrected nominal *P* level (ie, *P* < .00089). The TCI-R NS scale showed significant associations with the BIS-11 total score, particularly with the motor impulsiveness subscale. Interestingly, the NS scale was not associated with AQ dimensions (aggression). Persistence was negatively correlated with impulsivity measures—particularly, with nonplanning impulsiveness. As expected, RD was not associated with any impulsivity dimension, but showed significant, negative correlations with the AQ scales. Self-directedness and cooperativeness character dimensions were both significantly and negatively associated with BIS-11 (impulsivity) and AQ dimensions (aggression). The significant correlations that were observed between "hostility"—and to a lesser extent "anger"—dimension and TCI-R HA scale represented the only unexpected finding. No substantial differences in the correlations between the TCI-R scales, and the BIS-11 and AQ dimensions, respectively, were observed when the effect of sex and age was partialled out; indeed, the root mean square difference between raw and partial correlation was 0.04 (min = 0.00, max = 0.08).

The correlations between attachment styles and TCI-R scales are listed in Table 9. Correlation coefficients greater than 0.16 in absolute value are significant at Bonferroni-corrected nominal *P* level (ie, *P* < .0014). Self-directedness and cooperativeness correlated significantly with the ASQ secure attachment scale (ie, confidence scale). Reward dependence was significantly correlated with secure attachment and negatively correlated with avoidant insecure attachment scales (ie, discomfort with closeness and

Table 9
Association between TCI-R scales and ASQ scales (n = 385)

| TCI-R scales | Confidence | Discomfort with closeness | Relationships as secondary | Need for approval | Preoccupation with relationships |
|---|---|---|---|---|---|
| NS | 0.13 | **−0.16** | −0.05 | −0.14 | −0.03 |
| HA | **−0.39** | **0.34** | 0.04 | **0.47** | **0.27** |
| RD | **0.45** | **−0.54** | **−0.46** | −0.11 | **0.16** |
| PE | **0.18** | −0.01 | 0.05 | −0.12 | −0.02 |
| SD | **0.33** | **−0.30** | **−0.27** | **−0.44** | **−0.34** |
| CO | **0.29** | **−0.37** | **−0.47** | **−0.16** | −0.10 |
| ST | 0.14 | −0.07 | −0.14 | 0.09 | 0.20 |

Significant correlations are shown in boldface type.

Table 10
TCI-R scores in the community sample and in a psychiatric sample; contrast analysis

| TCI-R scales | Community sample | Psychiatric sample | $F_1$ | $P$ |
|---|---|---|---|---|
| | Mean ± St dev | Mean ± St dev | | |
| NS | 98.5 ± 12.9 | 102.82 ± 15.8 | 18.9 | <.0001 |
| HA | 96.4 ± 14.4 | 110.84 ± 19.4 | 138.7 | <.0001 |
| RD | 101.4 ± 13.0 | 100.15 ± 13.7 | 1.3 | .26 |
| PE | 116.3 ± 14.4 | 108.19 ± 19.3 | 42.2 | <.0001 |
| SD | 139.1 ± 16.5 | 119.99 ± 21.0 | 205.7 | <.0001 |
| CO | 134.9 ± 13.9 | 127.92 ± 15.9 | 45.5 | <.0001 |
| ST | 69.9 ± 14.5 | 67.2 ± 15.2 | 7.95 | .005 |

relationships as secondary). Finally, HA was negatively correlated with confidence and positively correlated with ASQ indices of both avoidance (discomfort with closeness) and anxiety (need for approval) insecure attachment styles.

Interestingly, when the potentially confounding effect of sex and age was held constant, the partial correlations did not differ at any appreciable level from the raw correlations, as it was indicated by a root mean square difference value of 0.02 (min = 0.00, max = 0.07).

### 3.7. Comparison of normal TCI-R scores with those derived from a clinical sample

Comparing scores obtained on the community sample with those derived from a sample of psychiatric outpatients, independently from age and sex, all scales were significantly different, except for RD. Contrast analysis confirmed the observed differences, except for ST, that was no more significant with at $P < .001$ (Table 10). Regarding subscales, significant differences were observed for extravagance (NS3) and disorderliness (NS4), higher in patients, for all HA subscales, again higher in patients, marginally for sentimentality (RD1) and openness to warm communication (RD2), which were respectively higher and lower in patients, for all P, SD and C subscales, and for transpersonal identification (ST2) and spiritual acceptance (ST3) subscales, which were all lower in the clinical sample compared with the community one.

## 4. Discussion

A first aim of the present work was to perform a validation analysis of the Italian TCI-R, evaluating the internal consistency of each dimension, the factorial structure, and the test-retest reliability of the questionnaire. We obtained sufficient consistency for almost all major dimensions, although some non negligible differences were observed between the 2 samples. In particular, sharp differences were observed for the internal consistency statistics of a number of TCI-R subfacets. However, differences in the composition of the 2 samples (age, working status, etc), as well as statistical oscillations, may explain a small part of such inconsistencies. Overall, the factorial structure of TCI-R was consistent with

the original distinctions of Cloninger, and test-retest reliability gave a positive result, indicating stability of the measures over time. These data confirm the validity of this instrument in the Italian version, according to other language translations [10-13,15]. Given these good results, we thus calculated normal scores for the Italian population. The conversion of raw scores in *T* scores allows the TCI-R evaluators to categorize subjects in a simple way and to discriminate subjects scoring significantly higher/lower than the general population. On the other hand, it is well known that sex and age can markedly affect scores obtained at personality tests. Indeed, women medially score high on HA and RA, whereas age is inversely correlated with NS and positively correlated with HA [23], SD, and C [3]. Furthermore, when evaluating psychiatric patients, the evaluator have to consider that personality scores may be affected by the current mental state of the individual as well as the illness history [1].

Previous validations of Cloninger's temperament inventory in Italian samples, on the Tridimensional Personality Questionnaire [23] and on the previous TCI version [1], revealed higher NS and HA, and lower RA in the Italian population [8,24] compared with the US sample [23]. In addition, lower persistence, lower SD, lower C, and lower ST have been reported in Italian subjects [1,8]. Nevertheless, the subjects of the Italian samples were significantly younger, and there were overall more females than in the US samples. On the other hand, ethnic and cultural features could affect temperamental and character dimensions. For example, compared to the French nonclinical sample [13], which was not different for age, our Italian sample was characterized by higher HA scores and higher RA scores. Nevertheless, the sex distribution in the French study was not specified for the nonclinical population; thus, we do not know whether sex could be responsible for such differences. Looking at other samples, such as the Belgian [25] and the Finnish [26], which included both medially older subjects than our sample, there were no observable differences in temperamental dimensions, except for persistence, which was higher in the Belgian sample. Significant differences could be instead observed in all character dimensions, explained by the medium older age in Belgian and Finnish samples. Recently, Miettunen et al [27] compared temperament dimensions across 20 countries, adjusting for age and sex. The Italian sample of Manfredonia et al [24], included in that study, was high in NS, but not different from other western countries such as Germany, Austria, and Sweden; it was medium in HA and persistence and the highest in RA, although not differently from the US sample. Thus, some variation exists between countries; nevertheless, Italian population temperamental scores are quite similar to that of many other western countries.

A second aim of the present study was to investigate the correlation between TCI-R dimensions and psychopathologic symptoms in a nonclinical sample, to see whether some traits may predispose to psychopathology. We could observe correlations between low scores in RA, SD, and C, and some psychopathologic domains, such as obsessive-compulsive,

anxiety, phobic symptoms, hostility, anger, and psychosis. This is a further confirmation of the utility of these dimensions in predicting the development of psychopathologic symptoms [26]. Nevertheless, we did not observe any correlation between HA and depressive or anxious symptoms; this is quite surprising, as this temperamental feature is usually strongly correlated with depression and anxiety. Nevertheless, 2 factors could have masked the association: first, we used a general scale for psychopathologic symptoms, the SCL-90, and not a specific scale for depressive or anxiety symptoms like in other studies (eg, reference [26]); second, the medium age of subjects correspond approximately to the age of onset of major depression and anxiety disorders, thus, symptoms may have not been yet developed by a great number of subjects in our sample.

We also investigated the relationship between family history for psychiatric disorders, but only 93 subjects were evaluated. Taken together, subjects having a positive family history were not significantly different from those who had not; nevertheless, familiarity for specific disorders may be associated as well with specific personality dimensions. Unfortunately, in our sample, homogeneous subsamples consisted of only few subjects; thus, we did not have the statistical power to perform such analysis.

The correlations that were computed in the second sample between reliable and valid measures of aggressiveness and impulsivity, and the TCI-R scale gave further evidence of the construct validity of the TCI-R. With the partial exception of the unexpected associations between HA, and hostility and anger AQ scales, all other associations were in the direction that was predicted by Cloninger's theoretical model of personality and its disorders. Indeed, C and SD were negatively correlated with impulsivity and aggressiveness, which in turn are personality features that are provided with a relevant maladaptive potential and that play a role in several cluster B personality disorders. Consistent with TCI-R theoretical framework, NS and persistence showed opposite correlations with impulsivity features; moreover, the validity of NS was stressed both by its association with BIS-11 total score and motor impulsiveness subscale, and by its lack of significant relationships with the AQ scales.

The TCI-R showed significant associations with different styles of adult attachment. Consistent with the theoretical expectations of the relationships between character dimensions, personality functioning, and secure/insecure attachment styles in adulthood, SD and C scales correlated positively with ASQ secure attachment index and negatively with all insecure attachment scales. The positive association between RA and secure attachment, and its negative association with avoidance scales—ie, discomfort with closeness and relationships as secondary—was strongly consistent with Cloninger's nomological network; similar construct validity considerations hold also for the correlations that were observed between HA and the ASQ scales.

Finally, the comparison between the community sample and a previously analyzed sample of patients affected by psychiatric disorders is in line with previous observations in other clinical sample. Indeed, according to the original theory of Cloninger, the biggest difference observed between community individuals and those diagnosed for psychiatric disorder concerned the SD dimension, which was greatly lower than community individuals. A second strong association was found with HA, which is extremely higher in subjects with a psychiatric diagnosis. Recently high levels of HA and low levels of SD have been found to be nonspecific indicator of psychopathology [28] and of poor quality of life [29]. HA correlates with symptoms of depression, anxiety, self-reported lifetime mental disorder, health care use for psychiatric reason, and family history of mental disorder. At the opposite, SD correlates negatively with lifetime mental disorder and health care use [26]. Self-directedness also moderately predict the presence of a personality disorder [30], with high NS associated with cluster B types and high HA associated with cluster C disorders [31]. Low persistence and C, both indicator of stability and character strength, also characterized the psychiatric sample. The analysis of specific characterizations within the clinical sample have been already analyzed; the interested reader can obtain further details from the article of Fossati et al [15].

To summarize, the present work supports the validity of the Italian TCI-R, although with some concerns regarding some subfacets. The validation was performed on nonclinical samples and this should have allowed to avoid biases linked to severe psychopathology, as well as those linked to the use of screened healthy control samples, which may lack representativeness. Furthermore, the sample was sufficiently heterogeneous for age, sex, and social status. Our second aim was to analyze the correlation between TCI-R dimensions, psychopathology, potentially maladaptive personality traits, and attachment styles. Taken into account the mentioned limitations of samples size, our data support temperament and character features as risk factors for some psychopathologic domains and personality malfunctioning. Accordingly, we found significant differences between community subjects and psychiatric patients for almost all personality dimensions.

## References

[1] Cloninger CR, Przybeck TR, Svrakic DM, Wetzel RD. The temperament and character inventory (TCI): a guide to its development and use. St. Louis (Mo): Center for Psychobiology of Personality Washington University; 1994.
[2] Cloninger CR. A systematic method for clinical description and classification of personality variants. A proposal. Arch Gen Psychiatry 1987;44:573-88.

[3] Cloninger CR, Svrakic DM, Przybeck TR. A psychobiological model of temperament and character. Arch Gen Psychiatry 1993;50: 975-90.

[4] Ando J, Ono Y, Yoshimura K, Onoda N, Shinohara M, Kanba S, et al. The genetic structure of Cloninger's seven-factor model of temperament and character in a Japanese sample. J Pers 2002;70:583-609.

[5] Cloninger CR, Svrakic DM. Integrative psychobiological approach to psychiatric assessment and treatment. Psychiatry 1997;60:120-41.

[6] Svrakic DM, Whitehead C, Przybeck TR, Cloninger CR. Differential diagnosis of personality disorders by the seven-factor model of temperament and character. Arch Gen Psychiatry 1993;50:991-9.

[7] Bayon C, Hill K, Svrakic DM, Przybeck TR, Cloninger CR. Dimensional assessment of personality in an out-patient sample: relations of the systems of Millon and Cloninger. J Psychiatr Res 1996; 30:341-52.

[8] Fossati A, Donati D, Donini M, Novella L, Bagnato M, Maffei C. Temperament, character, and attachment patterns in borderline personality disorder. J Personal Disord 2001;15:390-402.

[9] Cloninger CR. The Temperament and Character Inventory—Revised. St Louis (Mo): Center for Psychobiology of Personality, Washington University; 1999.

[10] Hansenne M, Reggers J, Pinto E, Kjiri K, Ajamier A, Ansseau M. Temperament and character inventory (TCI) and depression. J Psychiatr Res 1999;33:31-6.

[11] Brandstrom S, Richter J, Nylander PO. Further development of the Temperament and Character Inventory. Psychol Rep 2003;93: 995-1002.

[12] Gutierrez-Zotes JA, Bayon C, Montserrat C, Valero J, Labad A, Cloninger CR, et al. Temperament and Character Inventory Revised (TCI-R). Standardization and normative data in a general population sample. Actas Esp Psiquiatr 2004;32:8-15.

[13] Pelissolo A, Mallet L, Baleyte JM, Michel G, Cloninger CR, Allilaire JF, et al. The Temperament and Character Inventory—Revised (TCI-R): psychometric characteristics of the French version. Acta Psychiatr Scand 2005;112:126-33.

[14] Preiss M, Kucharova J, Novak T, Stepankova H. The Temperament and Character Inventory—Revised (TCI-R): a psychometric characteristics of the Czech version. Psychiatr Danub 2007;19:27-34.

[15] Fossati A, Cloninger CR, Villa D, Borroni S, Grazioli F, Giarolli L, et al. Reliability and validity of the Italian version of the Temperament and Character Inventory—Revised in an outpatient sample. Compr Psychiatry 2007;48:380-7.

[16] Derogatis LR, Lipman RS, Covi L. (1973) SCL-90: an outpatient psychiatric rating scale—preliminary report. Psychopharmacol Bull 2007;9:13-28.

[17] Martinotti G, Di Nicola M, Pedullà C, Janiri L. Family Abbreviated Interview (FAI): an instrument for the assessment of the psychiatric family history. Idee in psichiatria [in press].

[18] Patton JH, Stanford MS, Barratt ES. Factor structure of the Barratt Impulsiveness Scale. J Clin Psychol 1995;51:768-74.

[19] Buss A, Perry M. The Aggression Questionnaire. J Pers Soc Psychol 1992;62:452-9.

[20] Feeney JA, Noller P, Hanrahan M. Assessing adult attachment. In: Sperling MB, Berman WH, editors. Attachment in adults: clinical developmental perspective. New York: Guilford Press; 1994. p. 128-52.

[21] Fossati A, Maffei C, Acquarini E, Di Ceglie A. Multigroup confirmatory component and factor analyses of the Italian version of the Aggression Questionnaire. Eur J Psychol Assess 2003;19:54-65.

[22] Fossati A, Feeney JA, Donati D, Donini M, Novella L, Bagnato M, Acquarini E, Maffei C. On the dimensionality of the Attachment Style Questionnaire in Italian clinical and nonclinical participants. J Soc Personal 2003;20:55-79.

[23] Cloninger CR, Przybeck TR, Svrakic DM. The Tridimensional Personality Questionnaire: U.S. normative data. Psychol Rep 1991; 69:1047-57.

[24] Manfredonia MG, Gasperini M, Sciuto G, Bellodi L, Smeraldi E. The distribution of dimensional personality traits in an Italian general population. New Trends Exp Clin Psychiatry 1991;7:113-29.

[25] Hansenne M, Delhez M, Cloninger CR. Psychometric properties of the Temperament and Character Inventory—Revised (TCI-R) in a Belgian sample. J Pers Assess 2005;85:40-9.

[26] Jylha P, Isometsa E. Temperament, character and symptoms of anxiety and depression in the general population. Eur Psychiatry 2006;21:389-95.

[27] Miettunen J, Kantojärvi L, Veijola J, Järvelin M, Joukamaa M. International comparison of Cloninger's temperament dimensions. Pers Individ Diff 2006;41:1515-26.

[28] Poustka L, Parzer P, Brunner R, Resch F. Basic symptoms, temperament and character in adolescent psychiatric disorders. Psychopathology 2007;40:321-8.

[29] Masthoff ED, Trompenaars FJ, Van Heck GL, Hodiamont PP, De Vries J. The relationship between dimensional personality models and quality of life in psychiatric outpatients. Psychiatry Res 2007;149: 81-8.

[30] Morse JQ, Pilkonis PA. Screening for personality disorders. J Personal Disord 2007;21:179-98.

[31] Ha JH, Kim EJ, Abbey SE, Kim TS. Relationship between personality disorder symptoms and temperament in the young male general population of South Korea. Psychiatry Clin Neurosci 2007; 61:59-66.