

Application of the Seven-Factor-Model of Personality to an Italian Preschool Sample

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Objective Advances in dimensional assessment of children in healthy and clinical populations has renewed interest in the study of temperament. Cloninger's Temperament and Character Inventory (TCI) has shown high reliability and internal consistency. Adult and adolescent versions have been translated into a number of languages and validated in cross-cultural studies worldwide. To date only one preschool-TCI-based study has been conducted in early infancy with teachers as observers. The present study is aimed to test an Italian Preschool version of the Temperament and Character Inventory (PsTCI). This is the first replication and the first validation study of TCI on preschoolers with parents as observers.

Methods 395 preschool children, recruited from pediatric communities and day-care centres throughout Italy, participated in the study. Parents of each child enrolled in the study and completed a PsTCI about the child. Standard psychometric tests of reliability and validation were performed.

Results Exploratory factor analyses demonstrated the presence of distinct domains for temperament and character. TCI dimensions had good internal consistency with Cronbach's alpha ranging values ($|0.60|$ – $|0.81|$). Gender differences were found for Harm Avoidance ($\beta = -0.186$; $p \leq 0.001$) and Self-Directedness ($\beta = -0.216$; $p \leq 0.01$), and accounted for 5–35% of the observed variance.

Conclusion The present work suggests the psychological complexity of Cloninger's model and confirms its application in pre-school children from diverse environmental and cultural backgrounds. The results confirm that Cloninger's instrument for temperament and character evaluations can also be used with different observers and highlight the importance of considering cultural and demographic differences in the assessment of temperament and character in preschoolers.

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Key Words Temperament and Character Inventory, Preschoolers, Italian PsTCI.

INTRODUCTION

In recent years, significant advances in understanding the neurobiological and psychosocial causes of human behavior have enabled the creation of clinically useful models of per-

sonality development, such as the models of Cloninger, Zuckerman, and Eysenck.¹⁻³ The most clinically useful and realistic studies on personality have been made using Cloninger's Temperament and Character Inventory (TCI). It allows assessment of the complex biopsychosocial processes that occur within an individual as a non-linear dynamical process.⁴⁻⁷ Cloninger's seven-dimensional psychobiological model has been developed and continually revised and updated and over the last 20 years.^{8,9} TCI measures both the emotional core of personality (i.e., temperament dimensions) and the higher cognitive processes that regulate conflicts among various emotional drives (i.e., character dimensions).¹⁰ Many clinicians and researchers have used the TCI as a tool in studies of personality in both normal and pathology-affected adult

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population samples.^{10,13}

Much research has been conducted into child temperament in early infancy and in preschool age children, using different theoretical models.^{17,18} Despite the heterogeneity of the different dimensional and theoretical approaches at present, there is consensus on a number of aspects: 1) temperament is characterized by moderate heritability, 2) temperament traits differentiating individuals are present at an early age, and 3) temperament traits are moderately stable throughout the lifespan of the person.¹⁹ Experiential evidence from clinical studies has established how early temperamental differences relate to early childhood behavioural problems, social relationship and cognition.²⁰ These follow-up studies have shown that early behavioural and temperamental differences already evident in children at 3-years of age were consistent from toddlerhood to middle childhood.²¹ Researchers in infant and childhood temperament have shown that a toddler's 'difficult temperament', characterized by aggressive behaviour and other forms of disruptive conduct, are predictive of externalizing disorders at preschool age.²² In addition, temperament traits (emotionality and shyness) were associated with childhood anxiety disorders in population studies.²³

Recently the scientific basis of Cloninger's personality construct is of interest to child psychiatrists because many researchers and clinicians regard the personality assessment of psychiatric patients in childhood as a critical and fundamental step.^{6,24,25}

To these ends, two versions of the TCI have been set up for developmental age: the Junior Temperament Character Inventory (JTICI) and the Preschool Temperament Character Inventory (PsTCI), the former for children between the ages of six and seventeen and the later for preschool children between two and five years of age. The JTICI has been translated into a number of languages and validated in cross-cultural studies worldwide.²⁹⁻³¹ In recent years research has been carried out using JTICI to identify specific temperamental and character profiles in children and adolescents with psychiatric disorders.^{29,32-34} For example, using the JTICI, children with Attention Deficit Hyperactivity Disorder (ADHD) and sub-threshold ADHD have a profile of high novelty seeking, low persistence, and low self-directedness (SD), when compared with those of a control group. In addition, application of JTICI^{29,35} has shown that children and adolescents with social phobias have a profile of high harm avoidance and low SD.

To date only one PsTCI-based study has been conducted on the seven-factor model application in early infancy.³⁶ In this study, the seven-factor model was validated in 241 preschoolers enrolled from four high-quality day-care centres where primary day-caregivers completed the PsTCI. Exploratory and confirmatory factor analyses, showed high levels of

internal consistency and inter-rater-reliability as well as a high degree of stability of interindividual differences in temperament and character over a 3-year period from toddlerhood to early school age in 29 preschoolers.

Comparison between PsTCI dimensions and temperament dimensions as measured using established Colorado Child temperament inventory were performed, highlighted interesting relation between two instruments.³⁶

The objectives of our study were to:

Replicate observations about temperament and character in a sample of Italian preschoolers, but in this case, with the parents as observers instead of teachers. As most research on temperament in early infancy and in preschool children was conducted with parents as observers this will allow us to compare our results with those of other studies on temperament.

This paper represents the first study to examine, the psychometric properties of PsTCI version in a different country from that original one and to obtain specific normative data for the Italian preschool population.

TCI model in preschoolers

TCI deconstructs personality into seven dimensions: four of temperament and three of character. Temperament dimensions refer to individual differences in the strength of drives underlying basic emotions, which are moderately stable throughout a person's life. Each temperament-related dimension is influenced by neuromodulatory factors and represents a specific response to stimuli. Temperament was described in terms of four heritable dimensions: Harm Avoidance (HA), Novelty Seeking (NS), Reward Dependence (RD) and Persistence (P). HA represents the tendency to respond intensely to adversity stimuli with inhibitory behaviours to avoid punishment, novelties and frustrating non-rewards. NS represents the tendency to respond with exhilaration and excitement to novel stimuli or cues for potential rewards, which leads to frequent exploratory activities in pursuing potential rewards as well as active avoidance of monotony. RD represents the tendency to intensely respond to signals of reward - in particular verbal signals of social approval. Persistence (P) represents a tendency to maintain or resist the extinction of behaviours that have previously been associated with rewards or relief from punishment. Differences in average values correspond to specific emotional and behavioural dispositions (i.e., anxiety, anger, impulsivity, social detachment). Extensive data indicate that individual differences in personality are causal antecedents contributing to the full range of psychopathology.^{6,13}

The character dimensions were developed to measure additional aspects of personality that allow people to be valued for their skill in regulating emotion and impulsivity regardless of temperament. They provide information about a person's

goals, values, and object relationships, distinguishing a person's self-directedness (SD), cooperativeness (CO), and awareness of their participation in things greater than their individual self (Self-transcendence, ST). Temperamental and character dimensions constitute different personality configurations. Personality traits vary quantitatively and occur in all possible combinations and define the wide variety of personality in the general as well as in the clinical population.^{39,40}

METHODS

Sample and procedure

The PsTCI was completed by the parents of 400 3–6-year-old children (3 year-old children $n=58$; 4 year-old children, $n=147$; 5 year-old children, $n=117$; 6 year-old children, $n=73$). One child was excluded from the analysis due to excessive missing data ($\geq 10\%$). The sample was made up of 196 boys and 199 girls (four cases from central Italy we have no information about gender). The mean age of the sample was 53.64 months ($SD=11.38$). The detailed demographic characteristics of the sample are shown in Table 1. Children were recruited from kindergartens or community paediatric medical practices located in different geographical areas of Italy (North, Centre, and South). Overall there were 305 from central Italy (Latium), 53 from southern regions (Apulia and Campania) and 37 from northern Italy (Lombardy). A retest was performed after two weeks on a random sub-sample of 45 children. The validation study of the Italian version of Preschooler Temperament and Character Inventory (PsTCI) considered different methodological procedural steps in order to maximize reliability. We followed the Guidelines for the Process of Cross-Cultural Adaptation of Self Report Measures for the Translation of instrument.^{41,42} The first step was the translation into Italian of the original (US English) PsTCI version of the questionnaire carried out by independently by two experts in American English language and a 'reconciled version' of the questionnaire was produced. The 'reconciled version' was then back translated by two native-language translators who were unfamiliar with the original version of the questionnaire. Minor changes were required in the Italian version to make it more understandable to parents, care-givers and teachers who would be required to complete the question-

naire. These changes were made with the supervision and approval of Professor Cloninger. Finally, the project was sent to a number of paediatricians, parents and teachers from the above-mentioned Italian regions for them to be involved in the study planning as well to gain an understanding of the recruitment procedures. During *ad hoc* meetings, participants in the project received outlines of the questionnaire, the rating scale as well as detailed instructions on how to complete it. At the same time permission was obtained from parents for their children to participate in the study.

Parents of all children enrolled in the study completed a PsTCI. For kindergartens only the project also allowed for the compilation of a further Italian Temperament Questionnaire⁴³ by parents (for concurrent validity evaluation purposes) and of the PsTCI by teachers (to check inter-rater reliability values). To test the stability level of the seven factors, research project also scheduled a follow-up assessment 2 years later.

Measure

The PsTCI is a questionnaire composed of 74 questions to measure seven dimensions of temperament and character.³⁶ The questions were adaptable to preschool age children; in particular, ST was focused on capacity for pretense (make-believe) in play activities. Questions regarding each dimension were designed to be appropriate for preschool children and unambiguous for their parents to answer. Each dimension of the PsTCI structure is measured by a separate set of questions that also varied in number. For each item, the parents rated the children's temperament and character traits on a 5 point Likert scale: 1=definitely false; 2=mostly or probably false; 3=neither true nor false or about equally true and false; 4=mostly or probably true; 5=definitely true.

To assess concurrent validity we used Temperament Italian Questionnaires (QUIT) version for children aged 3 to 6 years. This questionnaire is validated on Italian sample (Axia G., Questionari Italiani per il Temperamento, 2002). The version for children aged 3 to 6 years is structured in 60 items on likert scal (1 "almost never" to 6 "almost always") describing child behaviour in three different contexts (child with the others; child on his play time; child facing of novelty or while s/he is performing an activity or a task). The scale of questionnaire are the following: Motor Control Activity (vigour of

Table 1. Demographic characteristics of the sample (N=395)

Gender	Region			Total
	North	Center	South	
Boys	20 (54.1%)	147 (48.2%)	29 (54.7%)	196 (49.6%)
Girls	17 (45.9%)	158 (51.8%)	24 (45.3%)	199 (50.4%)
Total	37 (100%)	305 (100%)	53 (100%)	395 (100%)

movement and modulation of motor control activity); Attention (orientation, regulation and attention persistency); Inhibition to novelty (emotional reactivity introducing an adjustment to social context); Social Orientation (emotional answers in front of unknown people and attention/interest towards social stimuli); Positive Emotionality and Negative Emotionality (predominance of negative and positive emotions).

Statistical analyses

Means, standard deviations and Cronbach's alpha coefficients were calculated for each of the PsTCI scales. Test-retest reliabilities were assessed using by Pearson's correlation coefficients. Concurrent validity Gender differences were examined with t-test. Effect sizes (Cohen's d) were estimated from t-tests. Pearson's correlation coefficient was used to assess the linear association between 7 dimensions of the PsTCI.

Firstly, maximum likelihood confirmatory factor analyses (CFA) were conducted over the covariance matrices of the PsTCI temperament and character scales to test the hypothesized factor structures. The analyses were performed through the AMOS 7 statistical package.⁴⁴ The following goodness-of-fit indices were used to assess the degree of fit between the proposed model and the sample data: 1) the χ^2 statistic; 2) the comparative fit index (CFI); 3) the root mean square error of approximation (RMSEA); 4) the standardized root-mean-square residual (SRMR). CFI value greater than 0.90 suggest an acceptable fit.^{45,46} For the RMSEA, a cut-off value ranging from 0.05 or lower indicates good model fit and values up to 0.08 represent moderate model fit. An SRMR of between 0 and 0.05 indicates a good fit, and between 0.05 and 0.10, an acceptable fit.^{47,48} Secondly, the factor structure was analyzed through a Principal Component Analysis (PCA) with Promax rotation. Temperament and character subscales were factor analyzed separately because the relationships among the temperament and character dimensions are strongly non-linear that cannot be adequately specified by the linear assumptions of factor analysis^{7,8} (Cloninger, 2000, 2008).

Finally, these factor structures were compared with the original version of the PsTCI, that was validated with 305 children. Orthogonal Procrustes rotations^{49,50} and congruence coefficients between the factorial matrices are provided to demonstrate the equivalence between the American and Italian version of the PsTCI. A congruence coefficient of 0.90 or higher has been traditionally considered evidence of factor replication.⁵¹

Basic statistical analyses were carried out with version 19.0 of the SPSS statistical software, significance was assumed with $p < 0.05$.

RESULTS

Exploratory factor analysis for temperament

Exploratory factor analyses (principal components analysis with varimax rotation) were conducted separately for temperament and character as recommended by Cloninger.⁸ By examining both Kaiser criterion and Scree test method the four-factor solution was chosen, because it is the one with the cleanest factorial structure and represents the most parsimonious model.^{52,53} Other factorial solutions were omitted, such as those with nine (50% observed variance), eight (47% observed variance), seven (44% observed variance), six (41% observed variance), and five (37% observed variance) factors respectively, as in these cases the factors presented less than three items and did not produce interpretable results.

However, the exploratory factor analysis was reiterated for four factors (33.6% observed variance) and it showed a content of empirically-derived factors reflecting four domains of temperament, in accordance with Cloninger's theoretical framework assumptions.⁵⁴⁻⁵⁶

The first extracted factor explained 13.6% of the total variance and comprised items reflecting the degree at which individual subjects easily fatigue, as well as the excessive worry and shyness. Factor 1 was defined by all of the HA items and two RD items (21. Child is something of a loner; 68. Child finds people more stimulating than anything else.) and one NS item (41. When upset by an unexpected situation, child quickly calms down).

The Factor 2 (8.1%) was mainly defined by eight of the nine NS items, and two PS items (27. Child goes from toy to toy quickly; 7. Child plays with a single toy for long periods of time).

The third extracted factor explained 6.5% of the total variance and comprised items representing the hard-working and perseverance degree that individual subjects can achieve. This factor was defined by nine of the eleven PS items, and one RD item (70. Child stops fussing whenever he/she is talked to or picked up by someone).

The fourth extracted factor explained 5.3% of the total variance and included items reflecting the extent at which individuals are characterized by enhanced learning abilities while in presence of reward signals, which was defined seven of the ten RD items.

Exploratory factor analysis for character

An analysis of principal components was also conducted to define the appropriate pool of items to be designated as character assessment factors. After extraction, the item-loading tables were compared and it the number of factors to retain for rotation was decided. For the number selection of factors

Table 2. Orthogonal procrustes rotated structure with congruence coefficients for PsTCl temperament items

Temperament items	Factor 1 (HA)	Factor 2 (PS)	Factor 3 (NS)	Factor 4 (RD)	Item congruence
Harm avoidance					
Q2	0.55	-0.09	0.25	-0.12	1.00**
Q3	-0.14	0.11	0.06	0.10	0.42
Q14	-0.58	0.01	0.01	-0.34	0.98**
Q19	-0.59	0.18	-0.13	0.01	0.97**
Q30	0.69	0.21	-0.05	0.04	0.91*
Q31	0.53	0.12	0.13	-0.09	0.86
Q33	-0.47	0.14	0.23	0.03	1.00**
Q46	0.52	-0.12	0.34	-0.21	0.96**
Q58	0.64	0.16	0.05	0.10	0.95**
Q60	0.58	-0.05	0.29	0.12	0.86
Novelty seeking					
Q11	0.05	-0.00	0.63	0.29	0.98**
Q12	-0.13	0.06	0.53	-0.15	0.92*
Q20	-0.12	-0.05	0.59	0.27	0.69
Q22	-0.07	-0.11	0.61	0.23	0.98**
Q24	0.17	0.01	0.61	0.16	0.98**
Q26	-0.15	0.11	-0.39	-0.09	0.97**
Q39	-0.08	-0.39	0.53	-0.07	0.88*
Q41	-0.38	0.18	-0.13	-0.05	0.87*
Q57	-0.17	0.25	-0.29	0.10	0.82
Reward dependence					
Q4	0.10	-0.11	0.14	0.51	0.99**
Q9	-0.38	0.07	-0.02	-0.50	0.99**
Q21	0.46	0.08	0.19	0.34	0.89*
Q35	-0.31	-0.02	0.15	-0.26	0.96**
Q55	0.03	0.15	0.20	-0.54	0.84
Q67	0.19	-0.05	0.16	0.50	0.97**
Q68	-0.43	0.03	0.18	-0.09	0.80
Q70	-0.05	0.11	-0.07	-0.09	0.67
Q72	0.07	-0.07	0.16	0.52	0.98**
Q74	0.03	-0.01	0.02	0.62	0.97**
Persistence					
Q5	0.30	-0.52	0.27	0.01	0.92*
Q6	-0.17	0.53	-0.08	-0.00	0.99**
Q7	0.17	0.18	-0.17	-0.08	0.88*
Q16	0.04	0.56	-0.03	-0.19	0.95**
Q17	0.35	-0.46	0.24	-0.03	0.99**
Q18	-0.22	0.61	-0.11	-0.10	0.87*
Q27	-0.15	-0.15	0.30	0.07	0.84
Q47	0.10	0.38	0.30	-0.24	0.76
Q52	0.09	0.63	0.23	0.05	0.94**
Q64	-0.02	0.69	0.15	-0.05	0.95**

Table 2. Continued

Temperament items	Factor 1 (HA)	Factor 2 (PS)	Factor 3 (NS)	Factor 4 (RD)	Item congruence
Q65	-0.04	-0.47	0.28	0.06	0.95**
Factor congruence	0.95**	0.91**	0.88*	0.86*	0.90**

Loadings with absolute values of 0.40 or more are shown in bold. Theoretically expected loadings have a grey background. *congruence higher than that of 95% of rotations from random data, **congruence higher than that of 99% of rotations from random data. NS: Novelty Seeking, HA: Harm Avoidance, RD: Reward Dependence, PS: Persistence, PsTCI: Preschool version of Temperament and Character Inventory

to retain, both Kaiser criterion and Scree test method were applied.⁵² By examining the eigen values' graph, it was observed that, in this case, the number of data points *above* the break was seven. The three-factor solution was chosen because it is the one with the cleanest factorial structures and represents the most parsimonious model.⁵³

Other factorial solutions were omitted such as those with seven (43% observed variance), six (40% observed variance) and five (36% observed variance) factors respectively, as in these cases the factors presented less than three items and did not produce interpretable results. The exploratory factor analysis was reiterated for three factors (31.5% observed variance) and showed a content of empirically-derived factors reflecting three domains of character in accordance with Cloninger's theoretical framework assumptions.

The first extracted factor explained 17.9% of the total variance and comprised fourteen of the sixteen CO items reflecting individual relational abilities towards the others and how they evolve in time as a function of social learning and maturation of the interpersonal behaviour and was cooperativeness.

The second extracted factor explained 7.7% of the total variance and entails items representing concepts about self of individual subjects were evaluated and thus it was referred to as SD, which was defined by eight of the ten SD items.

The third extracted factor explained 5.7% of the total variance and included items reflecting the extent at which the individuals are characterized by transpersonal relational abilities which was defined by all of the ST items and two SD (43. Child really likes to be a helper; 28. When a child has unmet needs he/she actively seeks help from a caregiver, rather than just getting upset) and two CO items (69. Child seems to be considerate of others; 38. Child likes to share with other children).

Confirmatory factor analyses for temperament and character

The confirmatory factor analyses (CFA) were conducted separately from the pool of items designated to assess temperament as well as those designated to assess character. As several researchers^{44,48,57} suggest the adequacy level of the model has been estimated on the basis of various indices of

fit: chi square, root mean square error of approximation (RMSEA, a value less than 0.06 is considered a good fit), the standardized root mean square residual (SRMR, a value less than 0.08 is considered a good fit), and comparative fit index (CFI, a value on average .9 is considered a good fit).

Confirmatory factor analysis results for temperament indicated a poor fit in relation to the hypothesized four-factor model of temperament: $\chi^2=2002.53$, $Df=734$, $p<0.0001$; RMSEA=0.066, SRMR=0.082, CFI=0.611.

Confirmatory factor analysis of character items indicated that the hypothesized three-factor model of PsTCI provided a poor fit for the data ($\chi^2=1226.28$, $Df=524$, $p<0.0001$; RMSEA=0.058, SRMR=0.073, CFI=0.730).

Congruence and procrustes-rotated structure

To examine the cross-cultural replicability of the PsTCI factor structure, orthogonal Procrustes rotation were used. Table 2 and 3 present the Procrustes-rotated factor structure in the Italian sample.

Most of the temperament items has its highest loading on the intended factor, except item 41 (NS), 21 (RD), 35 (RD), 68 (RD), 70 (RD), and 27 (PS). Out of the 40 items, 22 items showed a significant congruence coefficient at $p<0.01$, and another 8 items at $p<0.05$. The remaining 10 items (2 NS items, 3 HA items, 3 RD items, 2 PS items) differed from the American normative sample matrix.

Only 4 items from the total 34 character items have highest loading on an unexpected factors: item 28 (SD), item 43 (SD), item 38 (CO), and 69 (SD). Out of all character items, 23 items showed a significant congruence coefficient at $p<0.01$, and another 7 items at $p<0.05$. Four items (1 SD item, 3 CO items) differed from the American normative sample matrix.

Concurrent validity, reliability and gender differences

We estimated the coefficients of internal consistencies (Cronbach's alpha), the coefficients of stability (test-retest Pearson correlation), and sex differences for each dimension of both temperament and character domains. Cronbach's alpha relating to the PsTCI questionnaire is shown in Table 4, the alphas were between 0.60 and 0.81. The dimension of cooperativeness showed the highest internal consistency (0.81)

whereas the dimension of reward dependence represented the case with the lowest internal consistency (0.60). As second reliability method, the test-retest reliability procedure to as-

sess the consistency of a measurement between two different times (range 15 days) on a sub-sample of 45 children recruited from four randomly-selected classrooms. The high corre-

Table 3. Orthogonal Procrustes rotated structure with congruence coefficients for PsTCl character items

Character items	Factor 1 (CO)	Factor 2 (SD)	Factor 3 (ST)	Item congruence
Self-directedness				
Q13	-0.14	-0.51	0.19	0.95**
Q23	0.11	0.53	-0.12	1.00**
Q28	-0.11	-0.14	0.36	0.66
Q29	0.12	0.70	0.03	1.00**
Q36	0.00	-0.72	0.07	0.98**
Q37	0.00	-0.44	0.39	0.98**
Q40	0.33	0.36	0.15	0.95**
Q42	0.23	0.62	0.02	1.00**
Q43	-0.22	-0.21	0.37	0.94*
Q51	0.23	0.30	-0.05	0.88*
Cooperativeness				
Q1	0.60	0.03	0.00	1.00**
Q8	-0.45	0.00	0.24	0.92*
Q10	0.29	-0.21	0.02	0.82
Q25	0.55	0.09	-0.18	0.99**
Q32	0.40	0.24	-0.17	0.79
Q34	-0.34	-0.25	0.03	0.99**
Q38	-0.24	-0.30	0.29	0.92*
Q44	0.35	0.27	-0.04	0.95**
Q49	0.72	0.09	0.00	0.97**
Q54	-0.45	-0.12	0.13	0.93*
Q56	0.55	0.32	-0.15	0.94*
Q59	0.50	0.20	-0.03	1.00**
Q61	0.69	-0.00	0.05	0.97**
Q62	0.66	0.20	0.07	0.99**
Q63	0.58	0.08	0.14	0.97**
Q69	-0.18	-0.31	0.33	0.65
Self-transcendence				
Q15	-0.06	-0.05	0.39	0.86*
Q45	-0.08	-0.20	0.27	0.98**
Q48	0.04	0.12	0.58	0.98**
Q66	0.06	0.04	0.55	0.98**
Q71	-0.12	-0.29	0.48	0.97**
Q73	-0.17	-0.12	0.61	1.00**
Q50	-0.13	0.03	0.60	0.96**
Q53	-0.19	0.01	0.61	0.97**
Factor Congruence	0.94**	0.93**	0.93**	0.93**

Loadings with absolute values of 0.40 or more are shown in bold. Theoretically expected loadings have a grey background. *congruence higher than that of 95% of rotations from random data, **congruence higher than that of 99% of rotations from random data. SD: Self-Directedness, CO: Cooperativeness, ST: Self-Transcendence, PsTCl: Preschool version of Temperament and Character Inventory

lation between these measures showed a high test-retest stability of the scales: Pearson's correlation coefficients are varied from 0.73 to 0.98 ($p < 0.001$).

The correlation matrices for the 4 temperament and 3 character dimensions and age are shown in Table 5. The highest correlations were for CO with NS (-0.72), and moderate correlations were obtained for SD with CO (0.49), and HA (-0.46). All other correlation coefficients showed weaker (≤ 0.40) relationships. Age correlated negatively with NS (-0.26) and positively with PS (-0.16), CO (0.25) and ST (0.13).

In conclusion, concurrent validity was evaluated by comparing PsTCI domains with relevant domains in the QUIT questionnaire using Pearson's Correlation Coefficient (r). We found interested statistical significant correlation between all measures PsTCI temperament and character dimensions (except P) and QUIT. By correlation analysis we observed that the Temperamental configuration are mostly associated with predominance of negative and positive emotions especially in front of unknown people and attention/interest towards social stimuli [Harm Avoidance (HA) correlates significantly with Inhibition to novelty ($r = 0.445$; $p < 0.001$); Negative Emotionality ($r = 0.338$; $p < 0.05$); Positive Emotionality ($r = -0.170$; $p < 0.001$); Novelty Seeking (NS) correlates significantly with Negative Emotionality ($r = 0.236$; $p < 0.001$); Reward Depen-

dence (RD) correlates significantly with Social Orientation ($r = 0.176$; $p < 0.001$); Inhibition to novelty ($r = -0.155$; $p < 0.05$); Negative Emotionality ($r = -0.198$; $p < 0.001$); Positive Emotionality ($r = -0.146$; $p < 0.05$); Persistence (P) correlates significantly with Attention ($r = -0.359$; $p < 0.005$)].

While, the Character dimensions are mostly associated with a component of attention as orientation, regulation and attention persistency (Self-directedness (SD), correlates significantly with Inhibition to novelty ($r = -0.215$; $p < 0.001$); Negative Emotionality ($r = -0.259$; $p < 0.001$); Attention ($r = -0.146$; $p < 0.05$); Cooperativeness (CO), correlates significantly with Social Orientation ($r = 0.176$; $p < 0.005$); Negative Emotionality ($r = -0.134$; $p < 0.001$); Attention ($r = -0.162$; $p < 0.05$). Self-transcendence (ST) correlates significantly with Negative Emotionality ($r = 0.161$; $p < 0.05$); Attention ($r = -0.184$; $p < 0.05$).

DISCUSSION

The present study is aimed to test an Italian Preschool version of the Temperament and Character Inventory (PsTCI). The Italian study is the first replication and the first validation of TCI on preschoolers with parents as observers. The methodology of validation is articulated in different aspects of validation (structural validation exploratory and confirmatory)

Table 4. Internal consistency reliabilities (α), test-retest correlations (Pearson r), means, standard deviations (SD), and gender differences on the PsTCI dimensions

PsTCI dimensions	Number of item	Cronbach's α	Test-retest r	Girls		Boys		t	p value	Cohen's d
				Mean	SD	Mean	SD			
Novelty seeking (NS)	9	0.71	0.77	2.50	0.65	2.62	0.66	1.90	0.058	0.183
Harm avoidance (HA)	10	0.76	0.95	2.47	0.66	2.60	0.67	1.91	0.056	0.195
Reward dependence (RD)	10	0.60	0.98	4.16	0.47	3.98	0.45	3.65	<0.001	0.391
Persistence (PS)	11	0.70	0.96	3.41	0.57	3.30	0.58	1.90	0.058	0.191
Self-directedness (SD)	10	0.71	0.97	4.10	0.52	3.94	0.54	2.88	0.004	0.301
Cooperativeness (CO)	16	0.81	0.96	3.87	0.52	3.62	0.57	4.41	<0.001	0.458
Self-Transcendence (ST)	8	0.67	0.73	3.92	0.58	3.72	0.65	3.18	0.002	0.324

PsTCI: Preschool version of Temperament and Character Inventory

Table 5. Correlations between temperament and character scales and age (N=399)

	NS	HA	RD	PS	SD	CO	ST
Novelty seeking (NS)	-						
Harm avoidance (HA)	0.19**						
Reward dependence (RD)	-0.22**	-0.36**					
Persistence (PS)	-0.28**	-0.14**	0.21**				
Self-directedness (SD)	-0.39**	-0.46**	0.42**	0.39**			
Cooperativeness (CO)	-0.72**	-0.21**	0.39**	0.36**	0.49**		
Self-transcendence (ST)	-0.13**	-0.10*	0.28**	0.40**	0.31**	0.25**	
Age	-0.26**	0.00	0.06	0.21**	0.05	0.25**	0.13**

* $p \leq 0.05$, ** $p \leq 0.01$

and reliability (internal consistency, test-retest stability and concurrent reliability).

The sample, composed of 399 children from different Italian regions, was not completely representative but, was however large enough to elaborate large and different enough to provide approximate norms for a general population. The results confirm that Cloninger's instrument for temperament and character evaluations can be adapted to preschoolers with different environmental and cultural background, and can also be used with different observers. Structural analysis (exploratory and confirmatory factor analyses) also demonstrated that the PsTCI is an effective tool to identify distinct domains of temperament and character in accordance to Cloninger's model.²⁹ The stability value estimated for each domain is reasonably acceptable (Pearson's correlation coefficients are varied from 0.73 to 0.98, $p < 0.001$) and the correlation between the subscales was strong. Internal consistency of the seven dimensions were high (Cronbach's alphas are varied from 0.60 to 0.81), only with the exception of one scale (RD, Cronbach's alpha: 0.60), in accordance with the results of the PsTCI application to American sample. Confirmatory factor analyses showed a poor degree of fit between the loading of empirically-derived factors and the designation of theoretically-derived items (with regard to temperament: $\chi^2=2002.53$, $Df=734$, $p < 0.0001$; $RMSEA=0.066$, $SRMR=0.082$, $CFI=0.611$ and regard to character: $\chi^2=1226.28$, $Df=524$, $p < 0.0001$; $RMSEA=0.058$, $SRMR=0.073$, $CFI=0.730$). However, the exploratory factor analysis and orthogonal Procrustes rotation supported the expected structures, and the Italian version of PsTCI replicates the American normative factor structure.

The congruence coefficients for the 7 dimensions ranged from 0.86 to 0.95, and most of the items clearly define the intended factor of predetermined empirical structure and this can be interpreted as replication of the original result.

"We used Temperament Italian Questionnaires (QUIT) to test concurrent validity. This instrument explore six dimension of temperament: three areas are connected to the child adjustment to the environment (the Motor activity, the Attention and the Inhibition to novelty areas) and the other three areas are related to the child adaptation to the social world (Social orientation, Positive emotionality and Negative Emotionality areas). The concurrent validity analysis highlighted a strong relation between all PsTCI dimensions and Temperament measures of QUIT. In particular all PsTCI temperament and character dimensions (except Persistence) showed a significant relation with negative emotionality of the QUIT. More, character PsTCI dimensions were strongly related also with attention QUIT. A significant relation was found between two temperament PsTCI dimensions (HA and RD) and novelty inhibition and between RD and orientamento

sociale, activity of QUIT. Sintetically, all PsTCI dimension are significantly correlated with well established Temperament dimensions of QUIT; particularly negative emotionality, attention and novelty inhibition".

Regional influences, due to the different geographical regions the children came from, were not study subjects as the sampling distribution was not uniform. The scientific literature is inconsistent as to how gender affects temperament and adjustment, but our study also included statistical analyses on gender differences as there is some experimental evidence on this subject. Meta-analyses on gender differences related to some aspects of temperament reported by Else-Quest et al.⁵⁸ showed that the level of control is higher in girls whereas levels of surgency are higher in boys. Furthermore, Werner⁵⁹ found that temperament can predict the resilience capability in girls only, whereas Eisenberg et al.⁶⁰ found that the low negative emotionality was protective in the development of poor social skills in boys only. In our sample of the study the gender variable presents significant differences as to four dimensions (RD, SD, CO, and ST) but not in three temperament dimensions: Novelty seeking, Harm avoidance and Persistence.

The clinical aspect is the limitation and the implication of this study: the authors suggest the expressiveness of different temperament traits and character in different psychopathological manifestations. Starting from this intuition, the authors believe that the traits in the population tested with the pTCI pathological profiles delineate different temperament and character. The implications regarding the clinical use of the pTCI: the clinician could use the pTCI to probe the vulnerability to disease or the severity of the disease. The authors hypothesized methods analysis and evaluation articulated in order to demonstrate the structure of temperament and character traits in pathological profiles. The importance of this implication is very clear in a preschool sample typical or atypical.

CONCLUSION

The present work suggests the psychological complexity of Cloninger's model, confirms its application in early age and highlights the importance of considering cultural and demographic differences in the assessment of temperament and character in preschoolers.

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