

Factorial Structure, Validity and Reliability of the Turkish Temperament and Character Inventory

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SUMMARY

Objective: To assess the factorial structure, reliability and validity of the Turkish version of the Temperament and Character Inventory (TCI), a 240-item, self-report, paper-and-pencil test, and true-false format inventory based on Cloninger's psychobiological model of personality. It measures the four higher-order temperament dimensions and three character dimensions

Method: Using samples consisting of 470 healthy volunteers and 544 psychiatric patients, psychometric features were explored.

Results: The internal consistency of the scales was good (Cronbach alpha coefficients between 0.68 and 0.84), but weak for Reward dependence (0.55) and Persistence (0.56). The factor structures of the temperament and character dimensions, explored separately, were in agreement with the hypothesized constructs, except for the scales NS1 (Novelty Seeking 1 = exploratory excitability) and SD4 (Self-directedness 4 - self-acceptance). The present study also confirmed that the TCI scales were weakly related among themselves. On the whole, psychiatric patients had higher harm avoidance and lower self-directedness, persistence, cooperativeness, and self-transcendence scores than the normal subjects. Gender differences were also found for different dimensions.

Conclusion: The findings of this study suggest that the TCI can be applied in the investigation of psychiatric and normal populations.

Key Words: Temperament, Character, Personality, TCI

INTRODUCTION

Cloninger constituted a general psychobiological theory in order to define the structure and development of personality (Cloninger 1987, Cloninger, Svrakic and Przybeck 1993). This model included four temperament dimensions (novelty seeking, harm avoidance, reward dependence and persistence) which were thought to be genetically separate, moderately stable during life, unchangeable against socio-cultural influences and had pre-conceptual subjectivity in perceptive memory and three character dimensions (self-directedness, cooperativeness and self-transcendence) which were presumed to mature in adulthood and have influence on individual and social activities by learning introspection about selfness concept.

The dimensions of temperament were defined according to individual differences in associative learning in response to novelty, danger, punishment or reward. One of the factors of temperament, novelty seeking, might be evaluated as an inherited subjectivity or tendency which initiated or activated some behaviors like frequent investigation activity in response to novelty, impulsive decision, aggressiveness in the probability of a reward, easily and sudden irritability and active avoidance from obstacles. Second factor of temperament, harm avoidance, might be considered as an inherited subjectivity or tendency which stopped or gave intervals to some behaviors like passive avoidance as pessimist thoughts about probable future problems, fear from uncertainty, feel ashamed of strangers and easily getting tired. Third factor of temperament, reward dependence,

might be thought as an inherited subjectivity or tendency to carry on behaviors which were expressed as excessive susceptibility, social devotion and dependency to obtain consent from others. Fourth factor of temperament, persistence, which was considered as a component of reward dependency before, might be regarded as an inherited subjectivity or tendency to continue same behaviors against obstacles, tiredness or intermittent reinforcement. The dimensions of temperament were correlated with a specific central monoaminergic system activity; novelty seeking was correlated with low dopaminergic activity; harm avoidance was correlated with high serotonergic activity; and, reward dependency was correlated with low noradrenergic activity (Cloninger 1986, 1987).

Character matches with individual differences in voluntary targets and values depend upon introspection derived concepts about us, other people and other objects. Three dimensions of selfish thoughts differentiate according to how someone defines himself at what measure of autonomy (self-directedness), as an integrated part of the society (cooperativeness) and the universe (self-transcendence) (Cloninger, Svrakic and Przybeck 1993).

Temperament compensates with procedures of sensation, connection and motivation which underlie integration of skills and habits related with feelings. In contrast, character compensates with procedures of symbolization and abstraction which depend upon conceptual learning. Specifically, temperament and character may be conceptually considered as two types of memory and learning; propositional and procedural. Temperament (sensational core of personality) contains procedural memory which is regulated by cortico-striato-limbic system. Character (conceptual core of personality) is related with propositional memory which includes high cognitive functions like symbolization and abstraction. These two basic memory and learning systems may be differentiated functionally. For example, in Parkinson's disease which is characterized with striatal lesions, procedural learning is impaired, but propositional learning is not affected. In contrast, in amnesia syndrome which is characterized with lesions in medial temporal lobe, propositional learning is impaired, but procedural learning is intact (Cloninger and Svrakic).

Cloninger and colleagues developed a scale on the basis of psychobiological personality theory of

Cloninger which measured seven dimensions of personality and was called as Temperament and Character Inventory (TCI) (Cloninger et al. 1993; 1994). TCI evaluate four dimensions of temperament and three dimensions of character. Its worldwide use in psychiatry and psychology increased considerably during last 10 years. TCI is a self-report scale which may be administered to individuals over 17 years of age in 30-45 minutes. It includes 240 items which will be determined as true or false.

This study was carried on in order to examine the use of the scale in Turkey. Psychometric characteristics (internal consistency, factorial validity and factor structure) were evaluated in a sampling which included psychiatric patients and healthy volunteers.

METHOD

Participants

Sampling included 544 psychiatric patients who applied to outpatient and inpatient clinics of Dokuz Eylül University Medical Faculty Department of Psychiatry and 470 healthy volunteers who never had any psychiatric/psychological treatment before. Demographic characteristics of the groups are presented in Table 1.

Mean age of healthy volunteers was 34.1 years (standard deviation was 11.5 with an interval of 18-72 years). Voluntary participation was a must. Main criterion of the choice was accessibility; no payment was present and factors like willingness of the participant which could impair objectivity were excluded. There were 332 females and 138 males in control group. Most of the participants were between 17-27 years of age; the number of participants between 48-57 years of age (7%) and who were older than 58 years (4.3%) were relatively low. Nearly half of the controls (50.2%) were married. Singles formed second largest group according to marital status (39.6%). Most of the controls inhabited in urban areas (55% in metropolitans and 35% in cities) and were graduated from high school (48.7%). Thirty-five percent of the controls were university graduates.

Patient group included 544 individuals who applied to for the first time or received therapy from outpatient and inpatient clinics of Dokuz Eylül University Medical Faculty Department of Psychiatry. There were 365 females and 179 males whose

TABLE 1. Demographic characteristics of the sample.

	Sampling					
	Patients Psychiatric (n=544)		Normal (n=470)		Total (n=1014)	
	n	%	n	%	n	%
Gender						
Female	365	67	332	70.6	697	68.7
Male	179	33	138	29.4	317	31.3
Age						
17-27	159	29.2	157	33.4	316	31.2
28-37	127	23.3	142	30.2	269	26.5
38-47	118	21.7	116	24.7	234	23.1
48-57	84	15.4	35	7.4	119	11.7
58+	56	10.3	20	4.3	76	7.5
Residence						
Village	1	0.2	12	2.6	13	1.3
Town	19	3.5	37	7.9	56	5.5
City	109	20	162	34.5	271	26.7
Metropol	415	76.3	259	55.1	674	66.5
Marital status						
Single	189	34.7	186	39.6	134	37
Engaged	4	0.7	9	1.9	13	1.3
Married	294	54	236	50.2	530	52.3
Divorced	33	6.1	20	4.3	53	5.2
Widow	24	4.4	19	4	43	4.2
Educational level						
Primary school	97	17.8	37	7.9	134	13.2
Secondary school	63	11.6	31	6.6	94	9.3
High school	259	47.6	229	48.7	488	48.1
University	119	21.9	165	35.1	284	28
Master Graduate	6	1.1	8	1.7	14	1.4

mean age was 37.6 years (standard deviation 13.9, interval 18-80). Most of the patients (93%) were treated on outpatient basis. Only 39 patients were hospitalized. Thirty-five percent of patients applied to Department of Psychiatry for the first time during their lives and the remaining 65% were on psychiatric therapy for a while. Patients who had diagnosis of organic brain syndrome, who had mental retardation, who were confused and agitated and not capable of filling the form reliably and who were clearly psychotic were not included. The patients were diagnosed as Axis I disorders by examining or treating psychiatrists. The distributions of diagnoses according to DSM-IV criteria were as follows: mood disorder (44.7%); anxiety disorder (28.1%); psychotic disorder (9.4%); adjustment disorder (7.2%); other Axis I disorders (10.6%). Most of the patients were females like controls (67% and 70.6%). Most of the patients were between 17-27 years of age like controls;

half of them (54%) were married. Singles formed second largest group according to marital status (35%). There were individuals from each educational level in patient group, but most of them were graduated from high school (47%).

Instrument

Temperament and Character Inventory (TCI): This self-report scale includes 240 items to be filled as true or false. It is made up of 25 (lower-order) subscales and 7 (higher-order) scales; 12 subscales are about temperament; exploratory excitability (NS1, 11 items), impulsiveness (NS2, 10 items), extravagance (NS3, 9 items), disorderliness (NS4, 10 items), anticipatory worry and pessimism (HA1, 11 items), fear of uncertainty (HA2, 7 items), shyness with strangers (HA3, 8 items), fatigability and asthenia (HA4, 9 items), sentimentality (RD1, 10 items), attachment (RD3, 8 items), dependence (RD4, 6 items), persistence (PER, 8 items); and 13

TABLE 2. Means, standard deviations and Cronbach alphas of the dimensions of the TCI.

Scale			Age										α
			17-27		28-37		38-47		48-57		58+		
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
NS	Patient	Fem.	20.63	4.77	17.55	4.73	17.25	4.86	16.64	3.48	15.72	4.72	0.68
		n	105		88		79		61		32		
		Male	18.65	6.30	18.34	5.19	19.46	6.83	17.96	4.27	16.54	4.97	
		n	54		39		39		23		24		
	Normal	Fem.	20.29	5.02	18.79	4.17	18.23	4.93	17.92	4.82	14.63	3.44	
		n	112		104		80		25		11		
HA	Patient	Male	18.38	4.42	17.95	4.24	17.36	4.47	13.90	4.77	13.89	3.76	
		n	45		38		36		10		9		
		Fem.	23.50	5.74	22.85	7.13	22.04	6.90	21.16	5.47	21.13	4.44	
		Male	21.44	6.96	23.31	5.34	18.44	6.41	18.61	7.00	19.46	5.55	
	Normal	Fem.	15.70	5.62	16.28	6.07	17.01	5.74	17.28	7.93	20.00	5.00	
		Male	15.27	5.61	15.66	6.06	17.22	6.24	19.00	6.77	16.78	5.14	
RD	Patient	Fem.	14.32	3.55	14.34	2.93	14.10	3.00	14.62	3.18	13.44	2.47	0.55
		Male	12.85	2.90	12.05	2.86	13.82	2.34	13.52	2.94	13.50	2.83	
	Normal	Fem.	14.62	3.40	14.03	3.45	14.65	3.11	14.12	3.50	13.45	2.02	
		Male	12.62	3.26	13.34	3.64	12.92	3.31	11.90	3.11	13.56	3.05	
PER	Patient	Fem.	4.42	1.76	4.86	1.86	5.05	1.62	5.26	1.95	4.78	1.84	0.56
		Male	4.41	2.07	4.08	1.91	5.23	1.66	4.26	2.14	4.67	1.63	
	Normal	Fem.	4.88	2.13	5.23	1.71	5.31	1.82	5.28	1.62	4.73	1.49	
		Male	4.96	2.17	6.11	1.71	4.83	1.90	4.50	1.96	5.11	1.90	
SD	Patient	Fem.	22.83	6.78	24.66	7.89	24.75	6.57	26.23	6.01	27.66	5.24	0.82
		Male	24.30	7.09	25.05	8.35	26.90	7.37	28.17	7.39	27.13	7.47	
	Normal	Fem.	27.90	6.29	28.56	6.68	27.78	5.63	28.56	6.97	28.82	3.34	
		Male	27.33	6.77	28.55	5.56	27.61	6.01	27.20	6.84	33.44	7.57	
CO	Patient	Fem.	25.42	7.18	27.57	5.45	27.41	5.70	27.89	5.26	27.03	4.90	0.80
		Male	25.96	6.83	24.49	7.98	26.79	5.26	26.70	7.57	27.13	5.67	
	Normal	Fem.	27.88	6.20	28.30	5.57	28.98	5.33	28.76	6.11	29.55	2.88	
		Male	26.29	6.59	27.71	5.75	26.42	6.05	24.80	4.37	29.00	6.16	
ST	Patient	Fem.	16.37	5.38	16.65	6.04	17.81	6.01	19.44	6.15	16.63	5.78	0.80
		Male	16.83	6.35	16.18	5.67	17.23	6.19	17.83	5.57	17.96	6.17	
	Normal	Fem.	18.12	5.57	17.95	5.72	18.58	5.96	17.48	5.54	18.82	5.91	
		Male	17.98	6.02	18.45	5.01	18.03	4.66	18.30	5.40	15.11	5.23	

M: Mean

TABLE 3. Correlations Between TCI Scales and Age.

	NS	HA	RD	PER	SD	CO	ST
HA	-0.23						
RD	0.13	-0.09					
PER	-0.17	-0.23	0.12				
SD	-0.14	-0.49	0.11	0.18			
CO	-0.08	-0.26	0.41	0.15	0.45		
ST	0.08	-0.11	0.14	0.22	-0.21	0.07	
AGE	-0.24	0.03	-0.01	0.05	0.11	0.06	0.04

subscales are about character; responsibility (SD1, 8 items); purposefulness (SD2, 8 items), resourcefulness (SD3, 5 items), self-acceptance (SD4, 11 items), congruent second nature (SD5, 12 items), social acceptance (CO1, 8 items), empathy (CO2, 7 items), helpfulness (CO3, 8 items), compassion (CO4, 10 items), pure-hearted conscience (CO5, 9 items), self-forgetfulness (ST1, 11 items), transpersonal identification (ST2, 9 items), spiritual acceptance (ST3, 13 items). Sum of subscales form scales (for example, NS=NS1+NS2+NS3+NS4). TCI has been translated into many languages and evaluated psychometrically in various cultures; by Brandstrom and colleagues in Sweden (1998), by Pelissolo and Lepine in France (2000), by Duijsens and colleagues in the Netherlands (2000), by Gutierrez and colleagues in Spain (2001), by Tanaka and colleagues in Japan (1998), by Hansenne and colleagues in Belgium (2001), by Richter and colleagues in Germany (1999), by Waller and colleagues in England (1991), by Kozeny and Höschl in Czech Republic (1999), by Sung and colleagues in Korea (2002). It has been used in various psychiatric investigations is still in use worldwide. It was translated into Turkish by Köse and then reversely translated by Sayar and the latter was approved by Cloninger (Köse and Sayar, 2001). First findings about validity and reliability of the scale were reported by Köse and colleagues (2004).

Procedure

Temperament and Character Inventory (TCI) were administered individually to the subjects. At the beginning of administration, necessary information was presented. Cover page of the scale included a general introduction, the addresses of the investigators and information which underlies that participation was entirely voluntary. Questions

about demographics were included at cover page as well. Prior to statistical analyses, all of the variables were examined through various SPSS programs for accuracy of data entry, missing values, and fit between their distributions and assumptions of multivariate analysis. There was no outlier between cases according to Mahalanobis distance criterion ($p < 0.001$). Normality and linearity was checked and found to be satisfactory.

Internal consistency of scales and subscales of TCI was assessed with Cronbach's alpha method. In order to determine the relationships between TCI scales, correlations between them were calculated. In order to evaluate the relationships between TCI personality dimensions and age, Pearson correlation coefficients were calculated. In order to determine factorial structure of the scale, a principal components factor analysis with "Kaiser normalization and oblimin" rotation. was carried out on the temperament and character dimensions separately. The two groups consisted of normals and psychiatric patients were combined to form one sample due to the sample size requirement of factor analysis ($N=1014$). In order to test the differences between patients and controls, multivariate analysis of variance (MANOVA) was performed. Discriminant analysis was realized by using 25 subscales of TCI as predictors of belonging to patient or control group. All the statistical analyses were carried out the appropriate subprograms of the SPSS.

RESULTS

The mean scores and standard deviations for the sample by group, gender, and age group for the higher-order dimensions of the TCI were calculated (see Table 2).

TABLE 4. Factor structure of temperament subscales (Pattern Matrix).

Temperament	Factor 1	Factor 2	Factor 3
NS1	-.57	.19	.41
NS2	.11	.68	-.13
NS3	-.10	.67	.21
NS4	-.12	.68	-.01
HA1	.77	.04	.22
HA2	.74	-.14	.13
HA3	.75	.01	-.17
HA4	.75	.23	.09
RD1	.12	-.08	.63
RD3	-.28	.17	.66
RD4	.16	-.09	.47
PER	-.32	-.55	.18

Internal Consistency

Internal consistency of the TCI scale and subscales were calculated via Cronbach's alpha method. Cronbach's alpha values of TCI scales were presented in Table 2. These values were between 0.55-0.84 in temperament scales and 0.80-0.84 in character scales. Lowest Cronbach's alpha values were present at Reward Dependency (0.55) and Persistency (0.56) subscales. Cronbach's alpha values were above 0.80 level in all three character scales.

Cronbach's alpha values of TCI subscales were generally consistent except cooperativeness scale (NS1: .49, NS2: .50, NS3: .67, NS4: .31, HA1: .64, HA2: .61, HA3: .71, HA4: .69, RD1: .49, RD3: .58, RD4: .31, SD1: .64, SD2: .60, SD3: .51, SD4: .69, SD5: .57, CO1: .58, CO2: .36, CO3: .35, CO4: .79, CO5: .39, ST1: .63, ST2: .64, ST3: .70). Cronbach's alpha value of cooperativeness scale was 0.80, but its subscales showed a great variation. Cronbach's alpha value of helpfulness (CO3) subscale was the lowest (0.35). Cronbach's alpha values of empathy (CO2) and pure-hearted conscience (CO5) were also considerably low (0.36 and 0.39 respectively). Cronbach's alpha values of subscales of Harm Avoidance item were relatively stable and varied between 0.64 and 0.71. Subscales of Self-directedness item varied between 0.57 and 0.69 except resourcefulness (SD3) subscale which was at 0.51 level. Subscales of Novelty Seeking

item varied in a wide range like subscales of Cooperativeness. As a result, 11 of 24 subscales were below 0.60 level.

Correlations Between TCI Subscales

In order to evaluate the relationship between TCI scales, the correlations between them were calculated (see Table 3). When the correlations between temperament and character scales were taken into consideration, Self-directedness was negatively correlated with Harm Avoidance ($r=-0.49$). Cooperativeness was positively correlated with Reward Dependency ($r=0.41$) and Self-directedness (0.45) both. These relations should be interpreted as lower self-directedness meant higher harm avoidance and higher cooperativeness meant higher reward dependency and self-directedness. Correlations between other scales were weak (between 0.02 and 0.26).

Correlations Between TCI Subscales and Age

As seen in Table 3, age was negatively correlated with Novelty Seeking (NS, $r=-0.24$, $p<0.001$) and positively correlated with Self-directedness (SD, $r=0.11$, $p<0.05$). With the increase in age, novelty seeking decreased, but self-directed increased.

Factorial Structure

Data were analyzed with a principal compo-

TABLE 5. Factor structure of character subscales (Pattern Matrix).

Character	Factor 1	Factor 2	Factor 3
SD1	.06	-.31	.67
SD2	.03	.02	.76
SD3	-.11	.04	.83
SD4	.47	-.44	-.04
SD5	.11	.02	.71
CO1	.68	.02	.09
CO2	.44	.19	.25
CO3	.60	.07	.10
CO4	.82	.05	-.15
CO5	.60	-.05	.03
ST1	-.06	.76	-.10
ST2	.26	.78	.02
ST3	.00	.70	-.02

nents with oblimin rotation. The groups of psychiatric patients and healthy volunteers were combined in order to achieve an adequate sample size (n=1014) for factor analysis. The pattern which was a consequence of seven-factorial analysis of all 25 subscales of TCI was not simple. It was difficult to conclude that seven-factorial solution repeated proposed factorial structure of TCI. Only Novelty Seeking, Harm Avoidance and Self-transcendence gave a load to a factor. Persistence scale was not found to be a separate dimension of character model at least in our sample. Temperament and character dimensions overlapped on same factors. Self-directedness and Cooperativeness could not be defined completely.

As factorial structure which was found as a result of seven-factorial solution was not consistent with personality model of Cloninger, analyses repeated for Principal Components according to oblimin rotation for temperament and character subscales separately. Determined factors were presented in Table 4 and 5. Generally subscales which were related with a specific dimension gave their highest factor loads to a single dimension in both dimensions.

Three factorial solution of temperament scale revealed that Harm Avoidance and Reward Dependency were considerably powerful. In Novelty

Seeking factor, subscales of impulsiveness (NS2), extravagance (NS3) and disorderliness (NS4) gave constant loads, but exploratory excitability (NS1) subscale had a very weak contribution. Exploratory excitability (NS1) rather influenced Factor 1 (Harm Avoidance) negatively and Factor 3 (Reward Dependency) positively. Persistence gave highest factor load negatively on Factor 2 (Novelty Seeking). Three factors contributed 24%, 15% and 11% (cumulatively 50%) of total variance. Factorial structures of temperament subscales of TCI were presented in Table 4.

According to three factorial analyses of characters, Cooperativeness and Self-transcendence were considerably powerful. Under Self-directedness factor, while taking responsibility (SD1), purposefulness (SD2), resourcefulness (SD3) and congruent second nature (SD5) subscales were giving significant load, self-acceptance (SD4) did not have that attribute. Self-acceptance (SD4) more distinctly gave positive load to Factor 1 (Cooperativeness) and negative load to Factor 2 (Self-transcendence). Three factors explained 27%, 16% and 10% (cumulatively 53%) of total variance. Factor structure of character subscales might be seen in Table 5.

Group and Gender Comparisons

In order to examine probable group and gen-

TABLE 6. Significant MANOVA Results.

Source	Factor	F	df	p
Novelty Seeking	Group* gender	7.91	1.1010	<0.01
Harm Avoidance	Group	148.43	1.1010	<0.001
	Gender	6.01	1.1010	<0.05
	Group* gender	3.88	1.1010	<0.05
Reward Dependency	Gender	37.50	1.1010	<0.001
Persistence	Group	14.39	1.1010	<0.001
Self Determination	Group	38.43	1.1010	<0.001
Cooperativeness	Group	6.98	1.1010	<0.01
	Gender	8.86	1.1010	<0.005
Self Transcendence	Group	5.02	1.1010	<0.05

der differences, 2 (psychiatric patients vs. healthy volunteers) * 2 (females vs. males) multivariate analysis of variance (MANOVA) was employed. Seven subscales of TCI; Novelty Seeking (NS), Harm Avoidance (HA), Reward Dependency (RD), Persistence (PER), Self-directedness (SD), Cooperativeness (CO), Self-transcendence (ST); were dependent variables. In terms of the Novelty Seeking scale, the analysis showed that there was only a significant group by gender interaction (see Table 6 for the F values, degrees of freedom and the probabilities). Male normals reported significantly lower levels of novelty seeking (mean=17.37) than did female normals (mean=18.96). No significant group of gender main effect was obtained.

In dependent variable of the Harm Avoidance scale (HA), the analysis revealed significant main effects for group and gender and a significant group by gender interaction (see Table 6). Psychiatric patients had significantly higher scores on harm avoidance than did normals. Females reported significantly higher levels of harm avoidance than did males. Also, female psychiatric patients had significantly higher scores.

In dependent variable of Reward Dependence (RD), there was a significant main effect of "gender" in two-way analysis of variance (see Table 6), but there was not any main effect of "group" or interaction effect. Reward dependency of females (mean=14.31) was higher than males (mean=12.99). Being normal or psychiatric did not have any effect on this variable.

The analysis on the Persistence scale (PER) re-

sulted in a significant group main effect (see Table 6). Psychiatric patients had significantly lower scores on persistence than did normals. No gender main effect or interaction effect was observed.

In dependent variable of Self-directedness (SD), analysis revealed a significant group main effect (see Table 6). Psychiatric patients reported significantly lower levels of self-directedness than did normals. No gender main effect or interaction was observed.

In terms of the Cooperativeness scale (CO), the analysis resulted in a significant group main effect and a significant gender main effect without any interactions (see Table 6). Psychiatric patients had significantly lower scores on cooperativeness than did normals. Females reported significantly higher levels of cooperativeness than did males.

For final component, self-transcendence, only a group main effect was found (see Table 6). Psychiatric patients had significantly lower scores on self-transcendence than did normals.

Discriminant Analysis

Discriminant analysis was performed by using 25 subscales of TCI in order to determine whether they were predictors of being belong to groups of patients or healthy volunteers.

A single discriminant function was calculated; $\Lambda=0.74$, $\chi^2(25, N=1014)=2973$, $p<0.001$. This significant Wilks' Lambda result pointed out that predictors could significantly differentiate the groups.

TABLE 7. Results of Discriminant Function Analyses of TCI Subscales.

Predictor Variant	Correlation Coefficients with Discriminant Functions	Standardized Coefficients for Discriminant Functions	
	Function 1	Function 2	Univariate F (1.1012)
NS1	-.26	.10	23.95**
NS2	.17	.16	9.79*
NS3	.01	.02	0.05
NS4	-.05	-.00	0.72
HA1	.64	.34	143.04**
HA2	.42	.12	61.84**
HA3	.36	-.08	46.58**
HA4	.74	.57	192.86**
RD1	.05	.01	0.81
RD3	-.15	-.09	8.29*
RD4	.10	.07	3.30
PER	-.19	.07	12.21**
SD1	-.35	-.05	43.17**
SD2	-.33	.02	37.06**
SD3	-.44	-.08	69.38**
SD4	.09	.27	3.09
SD5	-.43	-.24	65.99**
CO1	-.21	-.07	15.94**
CO2	-.32	-.21	36.08**
CO3	-.06	.16	1.21
CO4	-.09	-.09	3.02
CO5	.06	.14	1.19
ST1	-.11	-.22	4.29
ST2	-.00	.35	0.00
ST3	-.17	-.25	9.86*
Canonical R	.51		
Eigenvalue	.35		

**p<0.001, *p<0.01.

Correlation coefficients and standard coefficients for discriminant function were presented in Table 7. Depending upon these coefficients, fatigability (HA4) showed the most powerful relation with discriminant function. Other predictors which showed powerful relations were anticipatory worry (HA1), congruent second nature (SD5) and em-

pathy (CO2). Psychiatry patients got tired easier (mean=5.32) than healthy volunteers (mean=3.41). The level of anxiety and pessimism was more intense in psychiatry patients (mean=7.29) than healthy volunteers (mean=5.57). It might be expressed that the number of inconsistent habits and the level of self-mistrust were higher in psychia-

try patients (mean=7.86) than healthy volunteers (mean=8.95). Empathy ability of psychiatry patients (mean=3.69) was more limited than healthy volunteers (mean=-4.24).

Of the sample which included totally 1014 people, 735 (72.5%) people could be classified exactly; 397/544 people from patients group and 338/470 people from normal group were classified in the right category. Sensitivity of the classification was determined as 72%, whereas its specificity was found as 73%, positive predictive value as 70% and negative predictive value as 75%.

DISCUSSION

Basic objective of this study was to evaluate the utility of Temperament and Character Inventory in Turkey. Psychometric properties of Turkish Version of Temperament and Character Inventory were similar with original form which was developed in United States of America or other versions which were employed in various countries.

The scales in Turkish version of TCI had considerable internal consistency except for Reward Dependence and Persistence which received low points. Cronbach's alpha values as an indicator of reliability of internal consistency varied between 0.55-0.84 in temperament scales and 0.80-0.84 in character scales. Lowest Cronbach's alpha levels were present in Reward Dependence (0.55) and Persistence (0.56). Persistence has been evaluated as a subscale of reward dependence before, but as it was found to be unrelated with other subscales of reward dependence, the scale was reviewed and persistence was added as a fourth temperament factor. But it was shown not to have adequate psychometric properties as an independent variant and its internal consistency was found to be low in the study of Köse and colleagues (2004) from our country and in many other studies from various countries (Swedish version, Brandstrom et al. 1998; German version, Richter et al. 1999; Dutch version, Duisjens et al. 2000; French version, Pelissolo and Lepine, 2000; Spanish version, Gutierrez et al. 2001; Korean version, Sung et al. 2002). Difficulties about Reward Dependence and Persistence might be due to relatively low number of items (persistence scale had only 8 items) and problems related with translation from original form. Cronbach's alpha values of subscales of TCI were generally consistent with each scale other than Cooperativeness (CO) scale. While Cronbach's al-

pha value of Cooperativeness scale was 0.80, its subscales showed a great variance (between 0.35-0.79). The items of "I'd rather like if other people talked less" of empathy (CO2, $\alpha=0.36$) subscale and "Members of a staff occasionally obtained their rights fairly" of helpfulness (CO3, $\alpha=0.35$) subscale showed weak internal consistency with their subscales. Cronbach's alpha values of subscales of Harm Avoidance were relatively stable (between 0.64-0.71). Subscales of Self-directedness (SD) were between 0.57-0.69 except SD3 which was 0.51. Cronbach's alpha values of subscales of Self-transcendence were between 0.63-0.70. There was a wide multiplicity in subscales of Novelty Seeking like subscales of Cooperativeness (between 0.31-0.67). Cronbach's alpha value of disorderliness (NS4) subscale which was 0.31 increased to 0.34 if the item of "I like to be tidy and put regulations for others" was excluded. As a result, 11 of 24 subscales were below the level of 0.60. These subscales which had weak and low internal consistencies would not form an important problem if they were not used as a unique entity. It was thought to be possible that all significant data obtained from clinical and epidemiological studies would depend upon scales.

One of the basic objectives of the study was to see whether various personality dimensions which were found in different cultures were valid or not in our society. The results revealed that these personality dimensions were applicable to our population. Personality factors which were determined in elsewhere were determined in our country as well. But in "oblimin" rotation in which 25 subscales of TCI were analyzed together, factor analysis of Principal Components did not repeat proposed TCI factorial structure. The pattern which was a consequence of seven-factorial solution was not simple. Only Novelty Seeking, Harm Avoidance and Self-transcendence gave load to a factor. Persistence scale was not exactly a separate dimension of personality model in at least our study. Temperament and character dimensions overlapped on same factors. Self-directedness and Cooperativeness were not completely defined. The results of studies which used seven-factorial psychobiological theory of Cloninger were controversial. The studies of Cloninger which was performed in USA (1993) and Duisjens and colleagues which was performed in the Netherlands (2000) revealed seven-factorial solution successfully to combine temperament and character dimensions. Studies which were

performed with Swedish version (Brandstrom et al. 1998), German version (Richter et al. 1999), French version (Pelissolo and Lepine, 2000), Spanish version (Gutierrez et al. 2001), Korean version (Sung et al. 2002), Japanese version (Kijima et al. 1996) and another study which was performed in USA with a larger and older population than Cloninger's (Herbst et al. 2000) could not reveal seven factors in a single analysis and reported results of factor analysis of temperament and character separately instead. As factorial structure which was a consequence of seven-factorial analysis was not consistent with Cloninger's personality model in our study, factor analyses were repeated for subscales of temperament and character separately. Generally, subscales which were related with specific dimensions gave their highest factorial loads to a single dimension.

According to three-factorial analysis of temperament, Harm Avoidance and Reward Dependency seemed considerably powerful. In Novelty Seeking factor, subscales of impulsiveness (NS2), extravagance (NS3) and disorderliness (NS4) gave constant loads, but exploratory excitability (NS1) subscale had a very weak contribution. Exploratory excitability (NS1) rather influenced Factor 1 (Harm Avoidance) negatively and Factor 3 (Reward Dependency) positively. Persistence gave highest factor load negatively on Factor 2 (Novelty Seeking). Three factors contributed 24%, 15% and 11% (cumulatively 50%) of total variance. But this level of variance was lower than previous studies. The level of variance which was explained with temperament factors was reported as 58.9% by Brandstrom and colleagues (1998), as 62% by Richter and colleagues (1999), as 60.3% by Gutierrez and colleagues (2001) and as 61.2% by Sung and colleagues (2002).

In temperament dimensions, subscale of exploratory excitability (NS1) gave negative load to Harm Avoidance rather than Novelty Seeking. Similar results were obtained from studies of Köse and colleagues (2004), Richter and colleagues (1999), Pelissolo and Lepine (2000) and Hansenne and colleagues (2001). These results revealed that investigative tendency was influenced considerably with blocking properties and subscale of exploratory excitability (NS1) was heterogeneous. Another unexpected finding of this study was that Persistence scale did not have a separate and isolated dimension gave its highest load negatively to

Novelty Seeking. Many other studies reported that persistence did not show adequate psychometric properties.

According to three factorial analyses of characters, Cooperativeness and Self-transcendence were considerably powerful. Under Self-directedness factor, while taking responsibility (SD1), purposefulness (SD2), resourcefulness (SD3) and congruent second nature (SD5) subscales were giving significant load, self-acceptance (SD4) did not have that attribute. Self-acceptance (SD4) unexpectedly gave positive load to Factor 1 (Cooperativeness) and negative load to Factor 2 (Self-transcendence). Three factors explained 27%, 16% and 10% (cumulatively 53%) of total variance. Similar results were reported by Köse and colleagues (2004) in Turkish and Svrakic and colleagues (1993) in American population. Cloninger interpreted this finding as accepting ability of self limits was related with accepting ability of others' limits and tolerating them.

When correlation patterns of temperament and character scales were evaluated, Self-directedness showed significant relationship with Harm Avoidance in negative direction ($r=-0.49$). Cooperativeness was positively correlated with Reward Dependence ($r=0.41$) and Self-directedness (0.45) both. Lower self-directedness meant higher harm avoidance. This relationship should be interpreted as people with anxiety had difficulty in determining aims and individual values and accepting themselves as who they were. Higher cooperativeness was with higher reward dependency and self-directedness. These correlations sourced from their relationships with interpersonal communications. Similar correlation patterns were present in American (Cloninger et al. 1993), Swedish (Brandstrom et al. 1998), German (Richter et al. 1999), French (Pelissolo and Lepine, 2000), Spanish (Gutierrez et al. 2001), Korean (Sung et al. 2002), Czech (Kozeny and Höschl, 1999), Dutch (Duisjens et al. 2000) and Japanese (Kijima et al. 1996) samples. Correlation coefficient between Self-directedness and Harm Avoidance varied between -0.39 and -0.47 and was -0.49 in current study; between Cooperativeness and Reward Dependency varied between 0.36 and 0.57 and was 0.41 in current study; between Cooperativeness and Self-directedness varied between 0.38 and 0.57 and was 0.45 in current study.

According to psychobiological theory, temperament dimensions may be observed in early childhood as they are hereditary. But character dimensions mature in adulthood. A cross-sectional study which analyzed the relationship between age and character dimensions of TCI (Cloninger et al. 1993) partially supported this proposal. Moderate positive correlation between age, self-directedness and cooperativeness supported the point of view that character matured with age. Data about the relationship between age and temperament scales of TCI showed that Novelty Seeking points were higher in younger individuals (Otter et al. 1995, Weyers et al. 1995). These findings revealed that all temperament dimensions did not occur in early childhood and stay stable lifelong. In our study age was negatively correlated with Novelty Seeking ($r=-0.24$) and positively correlated with Self-directedness ($r=0.11$). Reverse relationship between age and Novelty Seeking has been proposed by Cloninger first (1986). The decrease in interest to new stimulants accompanies the increase in maturation and participation to daily social activities. Novelty Seeking points decrease nearly one by one in each decade (Cloninger et al. 1991). Negative relationship between age and Novelty Seeking was demonstrated in many studies (Pelissolo and Lepine 2000, Brandstrom et al. 2001, Duisjens et al. 2000, Hansenne et al. 2001, Mendlowicz et al. 2001, Köse et al. 2004). The increase in age was with the increase in self-directedness. According to Cloninger, lifelong maturation had an influence on the significance of the relationship between age and self-directedness. The findings of this study generally confirmed the relative stability personality dimensions. McRae and Costa (1988, cited in Somer, 1998) reported that there were studies which showed that mean level of personality properties continued their consistency as long as 40 years in adulthood. The investigators carried on a longitudinal study for 6 years about consistency of personality properties and found considerably high test-retest correlations. The authors pointed out that aging itself had minimal influence on personality despite various negative events like diseases, divorcements and unemployment periods. Moreover, they proposed that while there was not any great difference in normal population, impressive changes were present in individuals with psychiatric or neuropsychologic disorders.

Analyses of variance which were performed in order to compare psychiatry patients with normal

individuals revealed significant differences in Persistence, self-directedness, Cooperativeness and self-transcendence variables. Judiciousness, shyness, skepticism and pessimism were significantly more and tenaciousness, persistence, responsibility, purposefulness, skillfulness, social acceptance, empathy, mercifulness and spiritual acceptance were significantly less frequent in psychiatry patients when compared with normal individuals. These findings were consistent with previous studies which were performed in various populations. One of temperament dimensions, Harm Avoidance (HA), and one of character dimensions, Self-directedness (SD), were found to be constantly related in depression, depressive affect or psychiatry patients (Richter et al. 2000, Svrakic et al. 1992) and healthy individuals (Peirson and Heuchert, 2001, Naito et al. 2000). Getting high scores from "Harm Avoidance" and low scores from "Self-directedness" was accepted as general characteristics of various psychiatric disorders (Bullik et al. 1995). Patients with affective disorders showed significantly high "Harm Avoidance" and low "Self-directedness" and "Cooperativeness" (Joyce et al. 1994, Hansenne et al. 1999). High "Harm Avoidance" and low "Self-directedness" and "Cooperativeness" were found in anxiety disorders (Ball et al. 2002), social phobia (Pelissolo et al. 2002), panic disorder (Starcevic et al. 1996), obsessive-compulsive disorder (Kusunoki et al. 2002), schizophrenia (and low "Novelty Seeking", Guillem et al. 2002), alcohol dependency (and high "Novelty Seeking", Basiaux et al. 2000) and eating disorders (and high "Novelty Seeking" in bulimia nervosa and low "Novelty Seeking" in anorexia nervosa, Fassino, Svrakic et al. 2002, Fassino, Abbate-Dega et al. 2002) as characteristics. These findings contributed structural validity of TCI and showed its utility in evaluation of psychiatric and normal samples.

Discriminant analyses which were performed by using 25 subscales of TCI in order to determine whether or not they were predictors of being belong to groups of patients or healthy volunteers revealed that predictors could differentiate both groups significantly. Fatigability (HA4) showed the most powerful relationship with discriminant function. Other predictors which showed powerful relations were anticipatory worry (HA1), congruent second nature (SD5) and empathy (CO2). Psychiatry patients got tired easier had higher levels of anxiety and pessimism than healthy volunteers. It might be expressed that the number of inconsistent

habits and the level of self-mistrust were higher in psychiatry patients. These findings provided additional support to structural validity of TCI.

The results revealed that gender had influence on Reward Dependence, Cooperativeness and Harm Avoidance dimensions of Temperament and Character Inventory. Females evaluated themselves as more bighearted, sympathetic, discerning, empathic, merciful, tolerant, supportive, mistrust and pessimist versus males. High HA, RD and CO were found in many other studies which were performed with TCI (Hansenne et al. 2001, Pelissolo and Lepine 2000, Brandstrom et al. 1998, Duisjens et al. 2000, Mendlowicz et al. 2000). Hansenne and colleagues (2001) found low SD points in females like us, but Pelissolo and Lepine (2000) reported high SD points in females. There may be possible causes of these gender specific differences. These differences may reflect hereditary effects for HA and RD. Buss reported that (1999, cited in Mendlowicz et al. 2000), individual differences in

hereditary properties were related with activities like surviving or sexuality which were closely correlated with reproductive success. After reviewing scientific information about gender specific differences, Buss proposed that females had evolution in interest and sentimental mind reading mechanisms that provided them to be more effective parents. When it was taken into consideration that individuals with higher reward dependency were more sentient, socially sensitive, compassionate and altruistic, reward dependency might be the reason why females had higher parental effectiveness.

As a result and with considering the findings of Köse and colleagues (2004), investigators concluded that psychometric properties (factor structure, internal consistency and validity) of Turkish version of TCI were satisfactory and it was convenient to use it in our country. TCI seemed like a beneficial instrument to evaluate personality in clinical applications and research studies both.

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