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# Personality Traits as Risk Factors of Depression and Anxiety Among Japanese Students

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The aim of this study is to examine the effects of personality (temperament and character) on specific depression and specific anxiety. A total of 541 Japanese undergraduates were investigated by using the Temperament and Character Inventory (TCI) and the Hospital Anxiety and Depression (HAD) scale. Hierarchical multiple regression analyses demonstrated that specific depression was predicted by lower Reward-Dependence, Persistence, Self-Directedness, Cooperativeness, and Self-Transcendence; specific anxiety was predicted by higher Novelty-Seeking, Harm-Avoidance, Persistence, and Self-Transcendence, and lower Self-Directedness. Immaturity of Self-Directedness is a risk factor for negative affectivity. Immaturity of all character dimensions is a risk factor for specific depression. The relationship between Harm-Avoidance and depression in previous studies may be linked partly to somatic symptoms that were deliberately eliminated in the HAD scale. © 2005 Wiley Periodicals, Inc. *J Clin Psychol* 62: 97–109, 2006.

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The relationship between personality traits and depressed or anxious moods has been studied in several models (Beck, Epstein, & Harrison, 1983; Clark, Watson, & Mineka, 1994; Cloninger, 1986; Eysenck, 1957, 1967; Gray, 1981; Larsen & Ketelaar, 1991; Tellegen, 1985). Among many personality traits, neuroticism was strongly related to Major Depression in terms of lifetime prevalence and severity (Duggan, Lee, & Murray, 1990; Scott, Eccleston, & Boys, 1992). However, individuals who had higher neuroticism and lower extroversion exhibited higher anxiety (Gershuny & Sher, 1992). The severity of Generalized Anxiety Disorder was positively associated with the traits of anxiety and neuroticism and was negatively associated with extroversion (Gomez & Francis, 2003).

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These reports suggest that different personality traits interact with each other and that the effects are independently related to depression and anxiety.

Frequent comorbidity of depression and anxiety has been consistently reported (Barbee, 1998); such comorbidity suggests that depression and anxiety share a construct. The tripartite model (Clark & Watson, 1991) involves the specific constructs of depression, anxiety, and an underlying construct of both; specific depression indicates low levels of positive affect (anhedonic depression); specific anxiety relates to elevated levels of physiological hyperarousal (automatic anxiety), and negative affectivity, shared by depression and anxiety, includes fear, anger, guilt, shame, and misery (generalized distress). Twin studies (Jardine, Martin, & Henderson, 1984; Kendler, 1996; Roy-Byrne et al., 2002) have indicated that depression and anxiety share a genetically determined neurobiological component. Axelson and Birmaher (2001) have suggested that negative affective temperament contributes to depression and anxiety disorders.

The biosocial model of temperament and character (Cloninger, Svrakic, & Przybeck, 1993) describes relationships between the biogenetic structure of personality and psychiatric disorders. This model postulates that personality is comprehensively developed with respect to genetic traits, learning, and insight into the self-concept. The personality model consists of four temperament and three character dimensions, all of which are viewed as being the results of continuous interactions during the life span.

Temperament is largely genetically determined, is independently manifested in early life, and configures automatic behavior responses. The subdimensions of temperament are Novelty-Seeking, Harm-Avoidance, Reward-Dependence, and Persistence. *Novelty-Seeking* refers to a heritable bias in the activation and initiation of behavior. Individuals high in Novelty-Seeking show exhilaration in response to novel stimuli, intuitive decision making, and active avoidance of rules or orders. *Harm-Avoidance* indicates a heritable bias for inhibition and cessation of behaviors. Individuals high in Harm-Avoidance show worry, pessimism, easy fatigue, tenseness in unfamiliar situations, and shyness with strangers. *Reward-Dependence* refers to a heritable bias for maintenance of ongoing behavior. Individuals high in Reward-Dependence are sentimental, affectionate, and dependent upon the approval of others. *Persistence*, which was originally viewed as a component of the Reward-Dependence construct, indicates perseverance of behavior despite frustration and fatigue. Individuals high in Persistence are industrious, determined, and tenacious. This model, presented by Cloninger and associates (1993), was originally based on a literature review primarily of animal learning experiments. Twin studies (e.g., Heath, Cloninger, & Martin, 1994) have shown substantial genetic contribution to the development of temperaments as conceptualized in the Temperament and Character Inventory (TCI; Cloninger et al., 1993). Several biological studies using human subjects have supported significant associations between temperament traits measured by the TCI and monoamines proposed by Cloninger and associates as substances underpinning them (Benjamin et al., 1996; Curtin et al., 1997; Demitrack et al., 1992; Ebstein et al., 1996; Garvey, Noyes, Cook, & Blum, 1996; Stein, Hollander, & Liebowitz, 1993).

Character involves individual differences in higher cognitive processes. Character regulates the cognitive processes of sensory perception and emotion provoked by temperament, leading to the development of a mature concept of the self in the personal, social, and spiritual arenas. These traits are determined more by environment than heredity. The subdimensions of character are Self-Directedness, Cooperativeness, and Self-Transcendence. *Self-Directedness* refers to identification with the autonomous self and the confidence to deal with any situation in accordance with one's goals and values. Individuals high in Self-Directedness have high self-esteem, responsibility, and ability to pursue a purpose. *Cooperativeness* indicates the extent to which individuals view other

people as a part of the self. Individuals high in Cooperativeness are socially tolerant, empathetic, helpful, and compassionate. *Self-Transcendence* refers to identification with a unity of all things in the world. Individuals high in Self-Transcendence are described as fulfilled, serene, intuitive, creative, and spiritual.

Many studies have been conducted to confirm the validity and reliability of Cloninger's theory by using the Tridimensional Personality Questionnaire (TPQ; Cloninger, 1987) and, more recently, the Temperament and Character Inventory (TCI; Cloninger et al., 1993). One consistent finding is that higher Harm-Avoidance and lower Self-Directedness are correlated with depression and anxiety (Ball, Smolin, & Shekhar, 2002; Brown, Svrakic, Przybeck, & Cloninger, 1992; Cowley, Roy-Byrne, Greenblatt, & Hommer, 1993; Strakowski, Dunayevich, Keck, & McElroy, 1995; Svrakic, Przybeck, & Cloninger, 1992). However, the personality traits in these studies may simultaneously predict negative affectivity underlying specific depression and specific anxiety. Of interest are the differential links of personality traits to depression and anxiety. Tanaka, Sakamoto, Kijima, and Kitamura (1998) indicated that specific depression and specific anxiety (after controlling for the negative affectivity of the other type) were independently predicted by temperament and character dimensions.

This study examined the relationships between temperament and character dimensions and specific depression and specific anxiety, after eliminating the effects of negative affectivity of the other types.

We chose a nonclinical sample of Japanese students in a cross-sectional design for the following reasons: First, depression, anxiety, suicide, self-harm, eating disorders, and personality disorders frequently occur among university students (Association for University and College Counselling [AUCC], 2001; Mkize, Nonkelela, & Mkize, 1998; Royal College of Psychiatrists, 2003). For example, Webb, Ashton, Kelly, and Kamali (1996) reported that the scores of the Hospital Anxiety and Depression scale (HAD; Zigmond & Snaith, 1983) identified 12% to 15% of students who had moderate depression and 17% to 25% who had moderate or severe anxiety. Fukuda, Asakura, Komuro, Wakisaka, and Nishimura (2002) reported that 23% of university entrants exhibited depression on the Center for Epidemiological Studies Depression scale (CES-D; Radloff, 1977). Many students in transition from adolescence to adulthood experience major stressors, including identity formation, exploration of sexuality and intimacy, independence of parents, and career choice, which result in poor mental health status (Royal College of Psychiatrists, 2003). Furthermore, Sashidharan, Surtees, Kreitman, Ingham, and Miller (1990) reported that there were no substantial differences in the clinical features of depression patients and community inhabitants who had depression. Second, our primary focus are the interpersonal differences in the relationship between personality and specific depression and specific anxiety. Unlike intraindividual changes (e.g., developmental changes or therapeutic effects), which must be measured longitudinally, interpersonal differences can be sufficiently examined by cross-sectional studies. Cross-sectional studies are useful to describe the prevalence of specific health disorders or other defined health attributes and to estimate relationships among specified variables, using multivariate analysis (Hulley et al., 2001). Moreover, research that employs this design is more economical in time and cost than research that uses other designs.

## Method

### *Participants and Procedures*

We administered a set of questionnaires to undergraduate students who were taking a psychology class. A total of 573 students responded. Of these students, 12 refused to

participate in the study. Twenty foreign students were excluded because of their poor linguistic command of Japanese. Thus, data from 541 Japanese students were analyzed; the data pool included 212 men (39%) and 329 women (61%). The mean ( $M$ ) age was 19.6 years (standard deviation [ $SD$ ] = 2.5). The excluded students, 15 men and 17 women, did not differ in gender from the included students. The mean age of the foreign students ( $M$  = 22.6 years,  $SD$  = 2.2) was significantly higher than the mean age of the included students ( $t[558] = 5.3, p < .001$ ).

### Measures

**Temperament and Character.** The Temperament and Character Inventory (Cloninger et al., 1993) Japanese 125-item short version (Kijima et al., 1996) was administered. The TCI measures four temperament dimensions (Novelty-Seeking, Harm-Avoidance, Reward-Dependence, and Persistence) and three character dimensions (Self-Directedness, Cooperativeness, and Self-Transcendence). The original true–false response scale was modified into a 4-point scale, which has better internal consistency among Japanese populations (Kijima et al., 1996); the 4-point scale ranges from 1 (strongly disagree) to 4 (strongly agree). The validity of the temperament subscales of the TCI was confirmed by Cloninger (1987), who developed and used a clinical instrument, the Tridimensional Interview of Personality Style (TIPS). The clinical diagnosis of personality disorders based on the results of the TIPS corresponded well to the patterns of the self-rating measure of temperament—the Tridimensional Personality Questionnaire (TPQ). Reliability and factor validity of the Japanese version of the TCI were reported by Tomita and coworkers (2000) and Kijima and colleagues (1996). The internal consistencies for the TCI subscale in this study are shown in Table 1 with the ranges, means, and standard deviations. The TCI subscales indicated higher internal consistency (.75–.84) except for Novelty-Seeking and Persistence. Principal component analyses with promax rotation yielded four and three factors for temperament and character, respectively (Table 1).

**Depression and Anxiety.** The Hospital Anxiety and Depression (HAD) scale (Zigmond & Snaith, 1983) Japanese version (Kitamura, 1993) measures cognitive symptoms

Table 1  
Means, Standard Deviations, and Internal Consistency for the HAD and TCI Scores

	Number of items	Range	$M$	$SD$	Cronbach's alpha
1 HAD-D	7	0–16	5.2	3.2	.64
2 HAD-A	7	0–19	7.3	3.7	.77
3 NS	20	32–75	51.3	6.4	.69
4 HA	20	29–80	54.2	8.2	.84
5 RD	15	21–59	43.5	6.0	.75
6 P	5	5–20	13.6	2.6	.67
7 SD	25	34–92	59.9	9.0	.83
8 C	25	37–95	70.9	8.4	.83
9 ST	15	17–60	35.0	6.8	.82

Note. HAD = Hospital Anxiety and Depression Scale; TCI = Temperament and Character Inventory; HAD-D = Depression; HAD-A = Anxiety; NS = Novelty-Seeking; HA = Harm-Avoidance; RD = Reward-Dependence; P = Persistence; SD = Self-Directedness; C = Cooperativeness; ST = Self-Transcendence.

of depression and anxiety. The HAD consists of 14 items; the depression (HAD-D) and anxiety (HAD-A) subscales each include 7 items. No items referring to somatic symptoms are incorporated. The scale is rated from 0 (low depression/anxiety) to 3 (high depression/anxiety) and the total score of the HAD-D/HAD-A can range from 0 to 21; a higher score indicates more severe depression/anxiety. The internal consistencies for the HAD subscale scores are shown in Table 1 with the ranges, means, and standard deviations. The alpha coefficients in the HAD were .77 and .64 for the HAD-A and HAD-D, respectively. Principal component analysis with promax rotation yielded two factors representing anxiety and depression. All anxiety items loaded the appropriate factor (less than .40). Five of the depression items loaded the appropriate factor. Items 8 and 10 loaded neither factor (less than .40).

### Data Analysis

To eliminate the effects of coexisting negative affectivity of the other type, we performed a series of hierarchical multiple regression analyses. In analyzing the relationship between the TCI scores and the HAD-D scores, we entered the HAD-A scores into the regression model as a covariate. Correspondingly, in analyzing the TCI and HAD-A scores, we entered the HAD-D scores as a covariate. The residual in the HAD-D score after controlling for the HAD-A score consists of specific depression. The residual in the HAD-A score after controlling for the HAD-D score consists of specific anxiety. A set of temperament scales was then entered into the model before a set of character scales was entered. The influence of temperament, which has a heritable basis, was postulated to outstrip the influence of character. Thus, we first entered demographic variables (sex and age); second, entered the HAD-A/HAD-D scores as a covariate; third, entered temperament scores (Novelty-Seeking, Harm-Avoidance, Reward-Dependence, and Persistence); and fourth, entered character scores (Self-Directedness, Cooperativeness, and Self-Transcendence).

### Results

Table 2 indicates the correlation coefficients among the TCI, HAD-D, and HAD-A scores. The correlations among the TCI scores obtained in this study were comparable to results obtained from an American general population (Cloninger et al., 1993) except for the correlation between Novelty-Seeking and Harm-Avoidance (in this study,  $r = -.39$ ; in Cloninger et al.,  $r = -.08$ ). The HAD-D score was positively correlated with the Harm-Avoidance score and negatively correlated with the Reward-Dependence, Persistence, Self-Directedness, Cooperativeness, and Self-Transcendence scores. The HAD-A score was positively correlated with the Harm-Avoidance, Persistence, and Self-Transcendence scores and was negatively correlated with the Self-Directedness and Cooperativeness scores. As expected, the HAD-D and HAD-A scores were moderately correlated ( $r = .49$ ,  $p < .01$ ).

As shown in Table 3, after controlling for the demographic variables and the HAD-A scores, the HAD-D scores were significantly predicted by temperament ( $F[4,533] = 11.53$ ,  $p < .001$ ) and character ( $F[3,530] = 12.20$ ,  $p < .001$ ).  $R^2$  changes at step 3 and step 4 were .06 and .04, respectively, indicating that temperament and character explain 10% of the variance in the HAD-D score. The temperament dimension, Reward-Dependence ( $t[533] = -1.97$ ,  $p < .05$ ), and Persistence ( $t[533] = -2.08$ ,  $p < .05$ ) scores and all of the character dimension scores were negatively correlated with the HAD-D scores (Self-Directedness,  $t[530] = -3.96$ ,  $p < .001$ ; Cooperativeness,  $t[530] =$

Table 2  
Correlations of the HAD and TCI Scores

	1	2	3	4	5	6	7	8
1 HAD-D	—	—	—	—	—	—	—	—
2 HAD-A	.49**	—	—	—	—	—	—	—
3 NS	-.03	.04	—	—	—	—	—	—
4 HA	.26**	.44**	-.39**	—	—	—	—	—
5 RD	-.21**	.00	.02	.03	—	—	—	—
6 P	-.14**	.09*	-.04	-.15**	.22**	—	—	—
7 SD	-.39**	-.46**	.00	-.46**	.03	.15**	—	—
8 C	-.31**	-.14**	-.10*	-.06	.54**	.21**	.27**	—
9 ST	-.13**	.12**	.18**	-.15**	.22**	.35**	.03	.24**

Note. HAD = Hospital Anxiety and Depression Scale; TCI = Temperament and Character Inventory; HAD-D = Depression; HAD-A = Anxiety; NS = Novelty-Seeking; HA = Harm-Avoidance; RD = Reward-Dependence; P = Persistence; SD = Self-Directedness; C = Cooperativeness; ST = Self-Transcendence.

\* $p < .05$ ; \*\* $p < .01$ .

$-2.49, p < .05$ ; Self-Transcendence,  $t[530] = -2.42, p < .05$ ). The Harm-Avoidance and Novelty-Seeking scores showed no significant correlation.

After controlling for the demographic variables and the HAD-D scores, the HAD-A scores were significantly predicted by temperament ( $F[4, 533] = 42.53, p < .001$ ) and character ( $F[3, 530] = 13.19, p < .001$ ).  $R^2$  changes at step 3 and step 4 were .18 and .04, respectively, indicating that temperament and character explain 22% of the variance of the HAD-A score. All temperament scores except for Reward-Dependence were positively correlated with the HAD-A scores (Novelty-Seeking,  $t[533] = 4.85, p < .001$ ; Harm-Avoidance,  $t[533] = 9.25, p < .001$ ; Persistence,  $t[533] = 5.27, p < .001$ ). The character score of Self-Directedness was negatively correlated with the HAD-A scores ( $t[530] = -4.59, p < .001$ ), and the Self-Transcendence score was positively correlated with the HAD-A scores ( $t[530] = 3.76, p < .001$ ).

## Discussion

This study has demonstrated that lower Self-Directedness independently predicts both specific depression and specific anxiety. This finding supports the idea that immaturity of self-concept is a vulnerability factor for negative affectivity in general. The Self-Directedness construct includes cognitive functions such as self-esteem, internal locus of control, problem-solving, coping behaviors, and perceived support resources. Kitamura, Kijima, Watanabe, Takezaki, and Tanaka (1999) reported that higher Self-Directedness is related to the number of supportive people in the social network. The character dimensions are developed by psychotherapy (Cloninger et al., 1993). Insightful knowledge about the self may encourage accurate cognitive appraisal using effective coping resources in difficult situations. This developmental process may contribute to protection from the onset of mood and anxiety disorders.

In addition to the nonspecific link of Self-Directedness to negative affectivity, this study has demonstrated specific links to the two types of negative affectivity—depression and anxiety. In this study, specific depression was predicted by lower scores in all of the character dimensions. This finding supports the character cube model in which the melancholic character, as indicated by lower Self-Directedness, Cooperativeness, and Self-

Table 3  
Hierarchical Multiple Regression Analyses of HAD with TCI

	HAD-D				HAD-A			
	R <sup>2</sup> change	F change	(df)	pr	R <sup>2</sup> change	F change	(df)	pr
Step 1. Demographics	0.012	3.29*	(2, 538)	—	0.001	0.26	(2, 538)	—
Sex	—	—	—	-.099*	—	—	—	.051
Age	—	—	—	.036	—	—	—	.010
Step 2. Covariate	0.239	171.70***	(1, 537)	—	0.242	171.70***	(1, 537)	—
	—	—	—	.396***	—	—	—	.396***
Step 3. Temperament	0.060	11.53***	(4, 533)	—	0.183	42.53***	(4, 533)	—
NS	—	—	—	-.068	—	—	—	.206***
HA	—	—	—	-.043	—	—	—	.373***
RD	—	—	—	-.085*	—	—	—	-.003
P	—	—	—	-.090*	—	—	—	.223***
Step 4. Character	0.044	12.20***	(3, 530)	—	0.040	13.19***	(3, 530)	—
SD	—	—	—	-.169***	—	—	—	-.195***
C	—	—	—	-.107*	—	—	—	-.005
ST	—	—	—	-.105*	—	—	—	.161***

Note. For sex, men coded as 1, women coded as 2. HAD = Hospital Anxiety and Depression Scale; TCI = Temperament and Character Inventory; HAD-D = Depression; HAD-A = Anxiety; NS = Novelty-Seeking; HA = Harm-Avoidance; RD = Reward-Dependence; P = Persistence; SD = Self-Directedness; C = Cooperativeness; ST = Self-Transcendence.  
\**p* < .05; \*\**p* < .01; \*\*\**p* < .001.

Transcendence scores, is the prototype of unipolar depression and leads to increased risk of suicide attempts (Cloninger, Bayon, & Svrakic, 1998) and recurrent depressive disorder (Richter, Eisemann, & Richter, 2000). Melancholic character can be described as intolerant, selfish, emotionally reactive, and fluctuating between miserly and miserliness (Cloninger et al., 1998). These individuals may view life as a consecutive struggle with adversity or persecution by vindictive people and experience anhedonic mood as a result. This cognitive process may contribute to provoking the onset of depression.

In the regression analysis, specific depression was also predicted by low Reward-Dependence and low Persistence. When repeating the regression analysis for specific depression with the character domains entered before the temperament domains, it was found that low Reward-Dependence and low Persistence were still able to predict specific depression. This is a unique finding and is difficult to interpret. These temperament items measure personality traits such as sentimentalism, warmth, attachment, and dependence. These are traits often referred to as "adaptive" in the Japanese culture (Doi, 1971; Hamaguchi, 1988; Kitayama & Markus, 1999; Travis, 1998). Therefore, individuals low in these traits may be more specifically vulnerable to the development of depression. Although twin studies strongly suggest heritability of these temperaments, the possibility remains that the environment plays a role in the formation of these traits.

After controlling for the HAD-A score, the Harm-Avoidance score did not predict the HAD-D score despite a significant zero-order correlation between the two. A possible explanation is that the increased Harm-Avoidance score is created by the depressive affect rather than the converse. Previous studies have reported that higher Harm-Avoidance scores were related to the severity of depression (Hansenne et al., 1999) and decreased after successful pharmacotherapy (Corruble, Duret, Pelissolo, Falissard, & Guelfi, 2002; Mulder & Joyce, 1994). The use of trait and state may be too simplistic. Abrams and associates (2004) reported that the Harm-Avoidance score was decreased after treatment for depression but remained at a higher level than that observed in normal control subjects. They have suggested that Harm-Avoidance has both trait and state aspects. The state-dependent aspects of Harm-Avoidance may be partly associated with somatic symptoms of depression. For example, unlike in this study, Tanaka and coworkers (1998) reported that specific depression (after controlling for the effects of anxiety) measured by the Self-Rating Depression Scale (SDS; Zung, 1965) showed significant correlation with the Harm-Avoidance score. This difference may be caused by the different measures of depression used in the two studies. The HAD scale used in this study deliberately eliminates somatic symptoms because it was constructed as a measure of depression and anxiety mainly in liaison psychiatry. However, the SDS used by Tanaka and colleagues includes somatic symptoms such as insomnia, weight loss, loss of appetite, constipation, and hyposexuality. These vegetative symptoms are frequently found in medical disease (Zigmond & Snaith, 1983), suggesting that somatic symptoms result in the increased correlation between depression and Harm-Avoidance.

Specific anxiety was predicted by the TCI scores. The variance of these scores was explained more by the temperament dimension than by the character dimension. The finding that anxiety was predicted by high Novelty-Seeking and Harm-Avoidance scores may be explained in terms of neuroticism that is akin to the Harm-Avoidance dimension (Waller, Lilienfeld, Tellegen, & Lykken, 1991). Persons who demonstrate high neuroticism are likely to show higher anxiety (Bienvenu & Stein, 2003). Higher Harm-Avoidance accompanied by higher Novelty-Seeking also represents neurotic or borderline temperament with approach-avoidance conflict (Cloninger et al., 1998). These findings again support the concept that anxiety is partly associated with initiation and inhibition of human behavior associated with impulsiveness. The association between specific anxiety

and Self-Transcendence is a unique finding. Self-Transcendence is the least studied character domain. If, as suggested by Cloninger and associates (1993), Self-Transcendence is the last character aspect that matures during the course of development, it may be that people who have imagination and awareness of unity with the universe can tolerate and consciously feel anxiety reflecting penitential guilt feelings—a sign of ego maturation. Although Cloninger's model makes no reference to the Persistence dimension, further investigations are needed to identify the role of intensified efforts in response to anticipated reward in anxiety disorders.

The limitations of this study must be emphasized. First, we used a nonclinical student sample. Although studies in nonclinical samples have some implications in the clinical setting (Vredenberg, Flett, & Krames, 1993), further studies must be conducted in a clinical population. Second, personality, depression, and anxiety were measured at a single time. Longitudinal studies are required to understand the state/trait dependency of personality and the course of recovery from depression and anxiety disorders. Third, the measures used in this study did not necessarily all have excellent reliability. The HAD-D scale in this study exhibited lower reliability than is usually reported. In a preliminary factor analysis of the HAD items using this data set, items 8 and 10 loaded neither the anxiety nor the depression factor. Cronbach's alpha should be at least .60 for a self-report instrument to be considered reliable (Nunnally & Bernstein, 1994). Previous studies reported alpha coefficients of .68–.93 and .67–.90 for HAD-A and HAD-D, respectively (Bjelland, Dahl, Haug, & Neckelmann, 2002; Friedman, Samuelian, Lancrenon, Even, & Chiarelli, 2001; Johnston, Pollard, & Hennessey, 2000; Leung, Ho, Kan, Hung, & Chen, 1993; Mykletun, Stordal, & Dahl, 2001; White, Leach, Sims, Atkinson, & Cottrell, 1999). Several studies reporting two-factor solutions indicated lower factor loadings in item 8 (“I feel as if I am slowed down”) and item 10 (“I have lost interest in my appearance”) in relation to the other HAD-D scale items (Bedford, Pauw, & Grant, 1997; Moorey et al., 1991; Quintana et al., 2003; Savard, Laberge, Gauthier, Ivers, & Bergeron, 1998). Accordingly, these items in this study may not be representative of the central construct of anhedonic depression, and lower reliability of the HAD-D scale may result. Nevertheless, we used conventional scoring in this study in order to maintain compatibility with previous reports. Among the TCI subscales, lower reliability of the Novelty-Seeking scale might be caused by a small distribution of the variance. Lower reliability of the Persistence scale might reflect the fact that there are few items on this scale. Finally, we also have to be cautious when interpreting these results because of the small portions of the variance of depression or anxiety explained by the TCI scores, which may have been caused by the fairly large number of participants involved in the statistics. Depression and anxiety may be determined mainly by other variables not examined in this study.

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