

The role of anxious and hyperthymic temperaments in mental disorders: a national epidemiologic study

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Temperament has been demonstrated clinically to be linked to mental disorders. We aimed to determine the possible role of temperament in mental disorders in a national epidemiologic study. A nationally representative sample of adults (n=1320) was administered the Lebanese-Arabic version of the Temperament Evaluation of the Memphis, Pisa, Paris and San Diego Autoquestionnaire (TEMPS-A), and the Arabic CIDI 3.0, as part of the LEBANON study. The association among temperaments and DSM-IV mood, anxiety, and impulse control disorders was assessed. The anxious temperament was shown to be a robust predictor of most disorders, especially within the anxiety and depressive clusters. The hyperthymic temperament had a uniquely protective effect on most mental disorders, with the exception of separation anxiety, bipolar, substance abuse and impulse control disorders. These effects were moderated by age and education. Temperaments, previously largely neglected in epidemiologic studies, could play a major role in the origin of mental disorders.

Key words: Temperament, Lebanon, mood, anxiety, impulse control

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Temperament is best described as the trait emotional reactivity of an individual (1,2), appears to be stable across life (3,4), and has strong genetic underpinnings (5-7). There is increasing evidence that temperaments and related personality constructs play a role in predisposing individuals to mental disorders (3,8,9). The degree to which the two belong to the same “continuum” is still under debate (10,11).

Akiskal et al (12) developed the Temperament Evaluation of the Memphis, Pisa, Paris and San Diego Autoquestionnaire (TEMPS-A) to measure five affective temperament traits: depressive, cyclothymic, hyperthymic, irritable, and anxious (13). In addition to its English version (12), this instrument has been adapted and validated in other languages (14), and was shown to be quite suitable for administration in large epidemiological studies (4).

Although temperament has been found clinically to be linked to mental disorders (14), this effect has seldom been assessed in a non-clinical population (8,15) and, to the best of our knowledge, has not been investigated at a national level.

The Lebanese Evaluation of the Burden of Ailments and Needs Of the Nation (LEBANON) (16-18) was carried out as part of the World Health Organization (WHO)'s World Mental Health (WMH) surveys, now spanning over 29 countries. The LEBANON study showed that 25.8% of the Lebanese adult population had at least one DSM-IV defined lifetime disorder and 17% had at least one 12-month disorder. The lifetime prevalence of mood and anxiety disorders was 12.6% and 16.7%, respectively, while their 12-month prevalence was 6.6% and 11.2% (17,18). Lebanese adults scored highest on the hyperthymic, followed by the depressive, cyclothymic, anxious, and lastly the irritable temperament (16), echoing the general trends in other populations (14,19-21).

The aim of this study was to explore the following issues:

- do temperaments vary between individuals who have 12-month DSM-IV axis I mental disorders and those who do not?
- what is the interplay between temperament and socio-demographic variables in predicting mental disorders?

METHODS

The LEBANON study is comprised of two components: the LEBANON WMH component, carried out in association with the Harvard University and the WHO using the Composite International Diagnostic Interview (CIDI) 3.0 (17,18,22), and the LEBANON-TEMP component using the Lebanese-Arabic TEMPS-A (4,16).

A nationally representative stratified multi-stage clustered area probability sample of non-institutionalized adults (aged ≥18 years) was selected for this study. A total of 2,857 respondents were administered the CIDI 3.0 and a sub-sample of 1,320 respondents (47% of the total sample) were requested to fill the TEMPS-A.

Consent procedures were approved by the Institutional Review Board Committee of the St. George University Medical Centre/Faculty of Medicine, Balamand University, Lebanon, which is registered with the US Office of Human Research Protections in the Department of Health and Human Services.

The Lebanese-Arabic TEMPS-A is a questionnaire consisting of 110 items for women and 109 for men, covering the five affective temperamental scales: depressive (21 items), cyclothymic (21 items), hyperthymic (21 items), irritable (20/21 items) and anxious (26 items). Details on the psychometric

properties of this scale and its suitability for use in epidemiologic studies can be found elsewhere (16,17). A factor analysis of the Lebanese-Arabic TEMPS-A yielded five factors: anxious-depressive, hyperthymic, irritable, anxious-somatic, and depressive-cyclothymic (16).

The Arabic CIDI 3.0 was used as the diagnostic instrument for DSM-IV disorders. The CIDI included two parts: part I assessed "core" disorders (depression, mania, panic, phobias, generalized anxiety disorder, intermittent explosive disorder, suicide and alcohol abuse) and was administered to all respondents; part II assessed risk factors, consequences and other correlates (employment history, educational attainment, social and marital life, exposure to trauma, etc.) as well as additional disorders (drug abuse, post-traumatic stress disorder, obsessive-compulsive disorder, psychosis, attention-deficit/hyperactivity disorder, conduct disorder, and separation anxiety disorder). The assessment of conduct disorder and attention-deficit/hyperactivity disorder was limited to respondents aged 18-44 years to reduce recall bias. Part II section was administered to all part I respondents who met lifetime criteria for any "core" disorder, plus a probability sub-sample (20%) of the rest of the respondents (who screened negative) (16,17).

The mean age of the TEMPS-A sample was 43±16 years (45% men, 55% women); 68% of the sample were married, 24% were single and the remaining 8% were either separated, divorced or widowed. The mean scores on the TEMPS-A subscales were as follows: hyperthymic 12.5±4.5, depressive 7.6±2.9, cyclothymic 5.9±4.3, anxious 6.6±5.2, and irritable 2.8±3.1 (16).

All results were weighted for the appropriate differential probability of selection and were post-stratified to govern-

ment population data on socio-demographic and geographic variables (17,18). Differences between weighted means were measured by Student t-test. Differences in frequencies were tested using Rao Scott chi-square test. Correlates of disorders were identified using logistic regression. These analyses were conducted using SAS version 9.1 procedures that account for complex sample design, and significance was determined using a 95% confidence interval. Analyses for significance were not calculated for unweighted numbers ≤30.

Cutoffs for the temperament variables were determined through the classification and regression tree analysis (CART), using the RPART routine in R version 2.3.1 without weighting. This program develops CART models using a two stage procedure with the resulting model displayed as binary trees. First the saturated model was fit for all three outcomes (any anxiety, any mood and any disorder). Then the tree with the smallest cross validation error was selected. Based on cross validation, the optimal trees were identified using the number of nodes corresponding to the smallest cross validation error (xerror < 1 for optimal trees, or xerror smaller than 1 SE for best trees). The splitting of nodes was stopped at n <30.

RESULTS

Compared to respondents having no disorders, respondents with any 12-month mood or anxiety disorder had significantly higher scores on each of the depressive, cyclothymic, irritable and anxious subscales, but *lower* scores on the hyperthymic temperament subscale (Table 1). Impulse control, agoraphobia and adult separation anxiety disorders had

Table 1 Affective temperament scores and 12-month DSM-IV disorders

	Temperament score (mean±SE)				
	Depressive	Cyclothymic	Hyperthymic	Irritable	Anxious
Any mood disorder (n=82)	9.9±0.5**	9.6±0.6**	10.2±0.6**	5.6±0.5**	12.3±1.0**
Major depressive disorder (n=64)	9.9±0.5**	9.1±0.7**	9.5±0.7**	5.2±0.7*	12.5±1.1**
Dysthymia (n=8) ^a	11.9±1.4	11.6±2.5	12.9±2.1	5.8±2.4	15.0±2.8
Bipolar disorders (n=18) ^a	9.7±0.7	11.8±0.8	12.8±0.9	7.5±0.8	11.8±1.4
Any anxiety disorder (n=101) ^b	8.9±0.4*	8.3±0.8*	11.1±0.6*	4.9±0.6*	10.3±0.8**
Panic disorder (n=6) ^a	13.5±1.8	10.9±2.4	8.9±1.6	7.0±2.2	16.5±2.3
Generalized anxiety disorder (n=19) ^a	9.5±0.6	8.0±1.0	12.8±1.2	5.5±0.8	12.4±1.2
Specific phobia (n=85)	8.6±0.5*	8.7±0.6**	11.8±0.4*	4.5±0.4**	9.8±0.7**
Social phobia (n=16) ^a	9.8±0.7	10.1±1.6	10.6±1.0	4.8±1.2	10.8±1.9
Agoraphobia without panic (n=3) ^a	11.4±1.3	14.4±1.5	14.4±0.5	8.2±1.0	17.3±2.4
Post-traumatic stress disorder (n=15) ^{a,b}	10.0±0.9	10.0±1.6	9.4±1.0	5.1±1.7	15.0±1.6
Obsessive-compulsive disorder (n=3) ^{a,b}	14.0±0.9	14.7±2.9	11.0±2.6	12.4±3.3	17.2±2.5
Separation anxiety disorder (n=7) ^{a,c}	11.2±1.0	12.0±0.9	14.1±1.6	10.1±0.8	14.2±1.7
Any impulse control disorder (n=18) ^{a,c}	9.7±0.7	12.5±0.6	13.3±0.5	8.7±0.6	13.6±1.3
ADHD (n=6) ^{a,c}	11.7±0.5	12.5±0.8	12.6±1.0	10.4±0.6	15.2±0.8
Intermittent explosive disorder (n=15) ^a	8.6±0.7	11.6±1.1	13.6±0.5	7.5±0.5	13.0±1.4
Any substance use disorder (n=5) ^{a,b}	10.0±0.5	5.7±1.7	16.0±1.0	4.2±1.4	5.8±1.9
Any disorder (n=163) ^b	9.0±0.3**	8.1±0.6*	11.7±0.6	4.8±0.4**	9.9±0.8**
No disorder (n=384)	7.5±0.2	5.7±0.4	12.7±0.3	2.6±0.3	5.7±0.3

ADHD – attention-deficit/hyperactivity disorder

^anumber of cases too small (n≤30) to test for significance; ^bestimated in the part II sample (n=547); ^cestimated among respondents aged 18-44 years in the part II sample
Significantly different from the category "no disorder": *p<0.05; **p<0.001

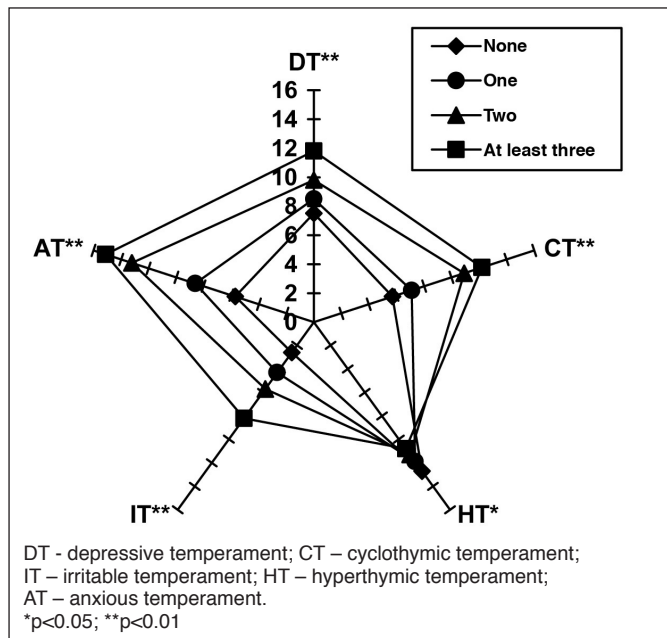


Figure 1 Temperament scores and number of mental disorders

higher scores on all the temperaments, including the hyperthymic; however, due to small numbers, significance analyses could not be computed (Table 1). Similar results were found for lifetime analyses (data available upon request).

The mean scores on the depressive, cyclothymic, anxious

and irritable temperament subscales increased significantly as the number of disorders increased ($p<0.001$). Conversely, the mean hyperthymic score decreased significantly as the number of disorders increased ($p<0.05$) (Figure 1). As with the original TEMPS-A scales, the scores of the other four statistically derived factors (anxious-depressive, irritable, anxious-somatic, and depressive-cyclothymic) were higher among individuals with any anxiety or any mood disorder, and again conversely the scores on the hyperthymic factor were lower (data available upon request).

Temperament scores were entered in three logistic models as continuous variables controlling for socio-demographic variables (age, gender, marital status, and education) to predict any disorder, any mood and any anxiety disorder. Having any disorder (mood, anxiety, impulse control and substance abuse) was associated with being single (OR=2.4, CI=1.1-5.5), younger (18-49 yrs) (OR=18.9-23.2), and having a higher anxious temperament score (OR=1.2, CI=1.1-1.3). Having any mood disorder was associated with being single (OR=3.1, CI=1.4-6.9), younger (<65 years) (OR=7.6-16.7), and having higher scores on the irritable (OR=1.2, CI=1.1-1.3) and anxious temperament (OR=1.2, CI=1.1-1.2) subscales, but lower hyperthymic temperament score (OR=0.8, CI=0.8-0.9). Any anxiety disorder was more likely found among female gender (OR=3.4, CI=1.5-7.4), and associated with higher anxious temperament scores (OR=1.1, CI=1.0-1.2), but lower hyperthymic temperament scores (OR=0.9, CI=0.8-0.9) (Table 2).

CART was used to evaluate the cutoffs at which specific

Table 2 Correlates of 12-month DSM-IV disorders, OR (95% CI)

	Any disorder	Any mood	Any anxiety
<i>Sex</i>			
Female	2.1 (0.9-5.2)	1.0 (0.5-2.2)	3.4 (1.5-7.4)
Male	1.0	1.0	1.0
	$\chi_1^2=2.7$	$\chi_1^2=0.0$	$\chi_1^2=9.1^*$
<i>Age (years)</i>			
18-34	23.2 (1.7-317.8)	7.6 (1.3-44.7)	4.1 (0.7-22.4)
35-49	18.9 (1.5-239.7)	20.8 (3.6-120.6)	3.2 (0.4-26.2)
50-64	6.3 (0.9-42.3)	16.7 (2.5-112.6)	1.8 (0.4-8.2)
≥65	1.0	1.0	1.0
	$\chi_3^2=6.1$	$\chi_3^2=15.3^*$	$\chi_3^2=3.6$
<i>Marital status</i>			
Never married	2.4 (1.1-5.5)	3.1 (1.4-6.9)	1.4 (0.4-4.7)
Married/cohabiting	1.0	1.0	1.0
	$\chi_1^2=4.5^*$	$\chi_1^2=8.3^*$	$\chi=0.3$
<i>Education</i>			
Primary, no education	2.9 (0.4-23.1)	1.4 (0.3-5.9)	0.5 (0.1-2.5)
Complementary, some secondary	1.5 (0.5-4.9)	1.9 (0.6-5.5)	1.2 (0.3-4.4)
Secondary or some university	2.0 (0.6-6.5)	1.8 (0.7-4.6)	2.3 (0.6-8.3)
University degree	1.0	1.0	1.0
	$\chi_3^2=2.2$	$\chi_3^2=1.8$	$\chi_3^2=8.1^*$
<i>Temperament</i>			
Depressive	1.0 (0.9-1.2)	1.1 (0.9-1.2)	1.1 (0.9-1.2)
Cyclothymic	0.9 (0.8-1.1)	1.0 (0.9-1.1)	0.9 (0.8-1.1)
Hyperthymic	0.9 (0.8-1.0)	0.8 (0.8-0.9)	0.9 (0.8-0.9)
Irritable	1.1 (1.0-1.2)	1.2 (1.1-1.3)	1.1 (0.9-1.2)
Anxious	1.2 (1.1-1.3)	1.2 (1.1-1.2)	1.1 (1.0-1.2)

The correlates of mood disorder were estimated in the part I sample (n=1320), those of anxiety and any disorders in the part II sample (n=547). Any disorder included mood, anxiety, impulse control, and substance use disorders. Each temperament was entered as a continuous variable

*Significant at the .05 level, two-sided test



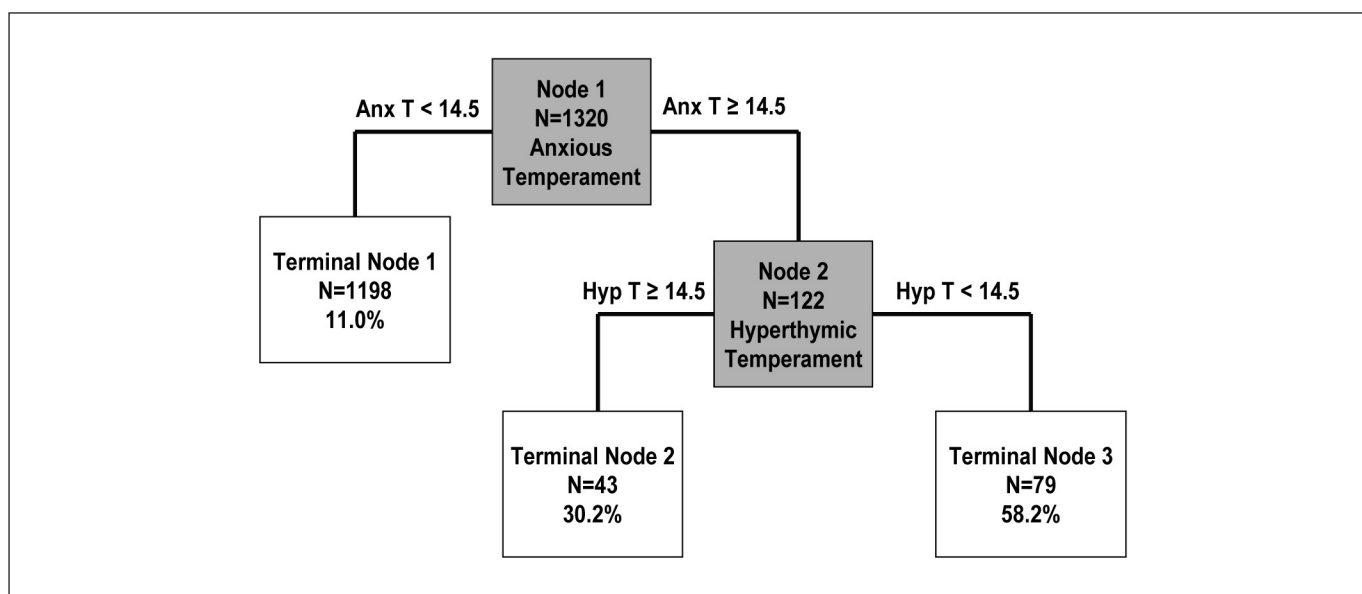


Figure 2 The classification and regression optimal tree for having any mental disorder

temperaments increase the probability of having a mental disorder controlling for socio-demographic variables (age, gender, marital status, and education). Optimal models were reached for any mental disorder, for any mood and for any anxiety disorder.

A cutoff of 14.5 (+1.5 SD of the population mean) on the anxious temperament subscale was the main node that divided the risk of having any 12-month mental disorder into two groups. Individuals with an anxious temperament score <14.5 had an 11% risk of developing a mental disorder versus 47.5% for those with an anxious score ≥ 14.5 . Those who, in addition to the higher scores on the anxious temperament (≥ 14.5), had hyperthymic scores lower than 14.5 (+0.4 SD of the population mean) had a risk increased to 58.2%, but, if their hyperthymic score was higher or equal to 14.5, their risk of having any mental disorder diminished to 30.2% (Figure 2).

For the diagnosis of any 12-month mood disorder, a cutoff of 14.5 (+1.5 SD of the population mean) on the anxious temperament subscale was the main node that divided the risk of having any mood disorder into two groups. Individuals with an anxious score <14.5 had only a 3.8% risk of developing a mood disorder versus 28.7% for those who had an anxious score ≥ 14.5 . However, if the latter had, in addition, a hyperthymic score <6.5 (-1.3 SD of population mean) the risk increased up to 66.7%, while, if their hyperthymic score was ≥ 6.5 , the risk was 23.4%. For those who had a hyperthymic score ≥ 6.5 , the probability increased up to 64.3% if they had higher education and an irritable temperament score ≥ 8.08 (+1.7 SD of population mean), but decreased to 18.8% if they had an irritable score <8.08 (Figure 3). Anxious temperament remained a main predictor of having a mood disorder even after controlling for having a comorbid anxiety disorder (data not shown).

The optimal model for any 12-month anxiety disorder

showed that a cutoff of 14.5 on the anxious temperament subscale divided individuals into a lower risk group (7.5%) and a higher risk group (32.8%) for having any anxiety disorder. However, if the latter had a hyperthymic score ≥ 14.5 , the risk became 18.6%, while it increased to 40.5% if the hyperthymic score was <14.5. For those who had a low hyperthymic score (<14.5), the risk would be 30.3% if they were 18-34 years or older than 65. However, if they were 35-64 years, the risk was determined by whether their score on the hyperthymic subscale was <11.5 (58.0%) or ≥ 11.5 (36.4%) (Figure 4).

The CART analyses for any disorder, for any mood or any anxiety disorders were repeated with factors, and factor one (anxious-depressive) showed to be the main node outlining the risk of having 12-month disorders, with factor two (hyperthymic) having a protective role. Additionally, CART analyses were repeated for each gender alone and yielded the same results regarding anxious temperament and mood disorders (data available upon request).

DISCUSSION

Our findings from a non-clinical, nationally representative sample suggest that, on a bivariate level, affective temperaments as defined by the TEMPS-A (or the factors of the latter) are associated with 12-month prevalence of several DSM-IV mental disorders as diagnosed by the CIDI 3.0. This association is significantly *positive* for the cyclothymic, depressive, anxious and irritable temperaments, which have been shown to be correlated (16), and *negative* for the hyperthymic temperament, except for impulse control disorders, substance abuse disorders and adult separation anxiety, while small numbers precluded solid conclusions at this time. We partially addressed the shortcoming of small numbers by looking



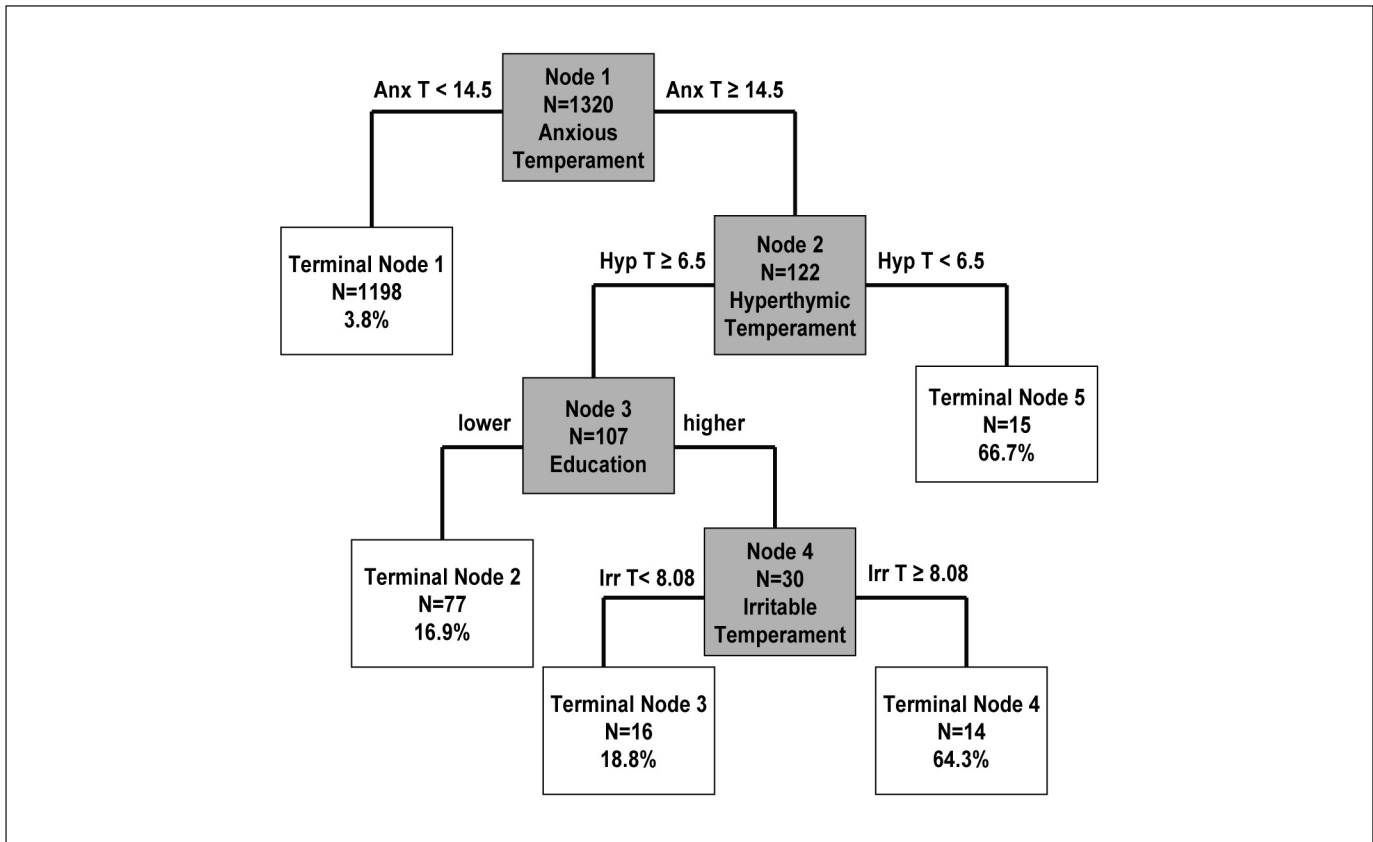


Figure 3 The classification and regression optimal tree for having any mood disorder

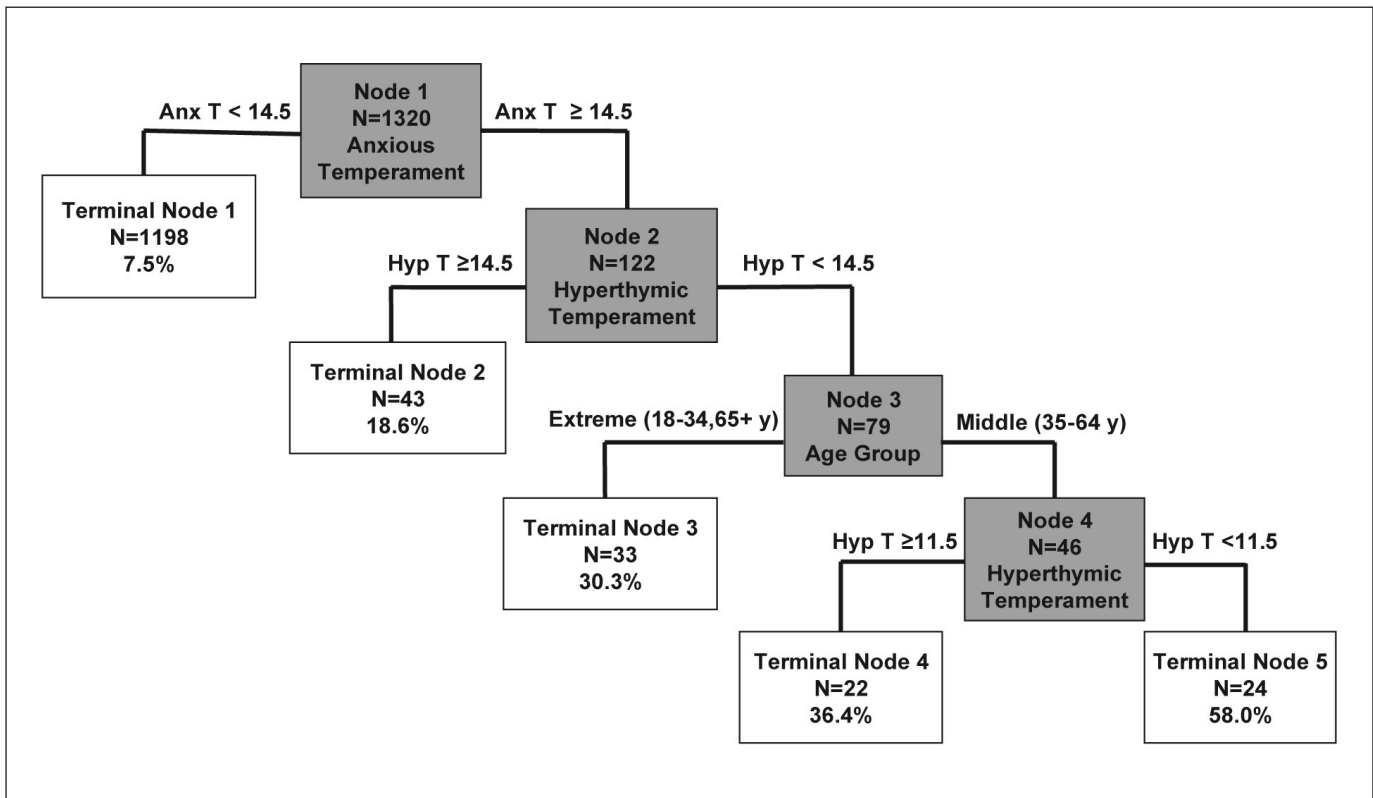


Figure 4 The classification and regression optimal tree for having any anxiety disorder





at lifetime prevalence, and found that hyperthymic temperament was *not* protective for bipolar disorders, separation anxiety disorder and impulse control disorders. In addition, the number of mental disorders *decreased* significantly in subjects with higher scores on the hyperthymic scale and increased with higher scores on the other temperaments.

It could be argued that subjects who scored higher on the hyperthymic temperament were motivated by the social desirability of the items under this cluster and by the same token denied having any of the disorders. Against this possibility is the lack of “protection” of the hyperthymic temperament in substance abuse and impulse control disorders, which are not the most desirable features to admit having in a field study or to a lay interviewer. Another argument would be that the answers to the TEMPS-A simply reflect answers to mental disorders and so they measure the same variables. Against this is our finding (4) that the vast majority of the respondents have stated that their answers to the TEMPS-A reflected correctly how they felt since they were 18 years old, suggesting that their answers were more related to traits than states. Nevertheless, since most of the mental disorders are recurrent and in some cases chronic, only a prospective study of temperaments could accurately settle this issue.

We have shown in previous publications that the 12-month prevalence of mental disorders in the LEBANON study (17) is related to a variety of socio-demographic variables (gender, age, and marital status). When controlling for these variables and adding temperament as a correlate of mental disorders, our results show that, on a multivariate level, and in addition to other socio-demographic variables, mood, anxiety and any disorder were associated with higher scores on the anxious temperament and lower scores on the hyperthymic temperament.

We went a step further and tried determining the cutoffs at which temperaments predicted mental disorders using CART analyses. Results from these exploratory analyses confirmed the results of the logistic regressions, where interplay between higher scores on the anxious temperament scale and lower hyperthymic scores increased the probability of having any mood or anxiety disorder. A cutoff of 14.5 (+1.5 SD of the population mean) on the anxious temperament was a determinant factor in increasing the risk of having any mood or anxiety disorder. Hyperthymic temperament was protective again at a cutoff of 14.5 (+0.4 SD of population mean) against any anxiety disorder, and at a lower cutoff of 6.5 (−1.3 SD of population mean) for mood disorders. This lower cutoff for mood disorders suggests that a pinch of hyperthymic temperament has an important role in decreasing the risk for depression and dysthymia (but not for bipolar disorders, as per our lifetime analyses). While one would be tempted to think that the role of the anxious temperament in mood disorders might be due to the well-known comorbidity of mood and anxiety disorders, we repeated the CART analyses for mood disorders excluding any cases that had comorbidity with anxiety disorders. Again, the anxious temperament was the main risk factor for mood disorders at the

same cutoff as when comorbidity was included.

Our data support what has been found in other studies that examined the relationship between temperament variables such as “extraversion” (hyperthymic) and “neuroticism” (anxious) in predicting mood and anxiety disorders (23,24), especially in light of recent reports clearly linking the TEMPS-A defined hyperthymic temperament to extraversion and the others to neuroticism (21). Given that several of these temperament measures have strong genetic determinants (5,6), our study favors the view that such genetic determinants interact with selected environmental and demographic factors in favoring the origin of mental disorders (25). War may be one of these factors (18).

Other relevant findings in our study point to the interaction between demographic and temperament factors, such as the probable interaction between education and irritable temperament: higher scores on the irritable subscale, but only among highly educated individuals, increased the risk for mood disorders. Lastly, we found that temperament overrides gender in mood disorders, which is in line with earlier suggestions by Perugi et al (26) in a clinical setting.

The results of the study should be interpreted in light of several limitations. First, although an earlier version of the CIDI (1.1) was validated in Lebanon, yet the CIDI 3.0 was not. Second, 43.1% of respondents were not able to fill in the TEMPS-A questionnaire themselves due to illiteracy, old age, or possibly because of fatigue, since the TEMPS-A was given after the CIDI 3.0. Nonetheless, with respect to the latter point, we have shown previously that there was no difference between the two modes of delivery (self-filled vs. interviewed) (4). Third, the total response rate of 70%, though quite acceptable in large epidemiologic studies, may have introduced a systematic under-representation of mental illness. Fourth, the data was collected retrospectively for temperament and mental disorders. Finally, many Lebanese have witnessed episodes of military strife, and these findings might not be applicable to other settings that have not witnessed such upheavals.

Although it is difficult to assess how much of recurrence in episodes of mental illness is due to war stress, our previous work indicated that exposure to this stress was related to first onset of mood, anxiety and impulse control disorders, with highest risks for anxiety and impulse control disorders (18). The affective temperaments appear to be possible mediating factors. Given the genetic underpinnings of the anxious temperament in relation to the serotonin transporter “s” polymorphism, additional studies are needed to investigate how these genetic factors are related to temperament and disorders together, as well as the role of temperament in gene x environment interactions.

Temperaments are probably important determinants of mental disorders and have intricate relations to other demographic variables, such as age and education and, to a lesser extent, gender. Anxious temperament at a cutoff +1.5 SD of the population mean seems to be a solid predictor of 12-month mental disorders in Lebanon. Hyperthymic tempera-



ment seems to have a uniquely protective effect on most mental disorders, but not on bipolar, separation anxiety, and impulse control disorders. There is a need for similar studies in different settings to assess the role of the various temperaments in their interaction with the specific environments.

Although the TEMPS-A and several constructs related to its subscales have been used to prospectively predict the emergence of bipolar subtypes (15), and switching from unipolar to bipolar II (27), other prospective studies with this instrument would be desirable to confirm the role of affective temperaments in predicting the occurrence of the more common mental disorders presented herein. Such studies would present complex methodological challenges, because of the early age of onset of many of these disorders (28), but nonetheless would be of great heuristic, clinical and public health significance in such domains as affective disorders (14), suicide (29), and substance abuse (30), as well as the complex riddles of comorbidity (31).

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