Development of an Autonomic Nervous System Questionnaire: Diagnostic Aid in Measurement of Anxiety, Depression, and Aggression

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Problem

The autonomic nervous system (A.N.S.) is that part of the anatomy that keeps in equilibrium the neurophysiology of the organs. The neurological impulses required for these actions are mediated by transmitters of the adrenergic (A) and cholinergic (Ch) systems. Most of the work performed to study the functions of the A.N.S. has been carried out by Wenger (1941, 1942, 1943, 1947, 1948). He established an Autonomic Balance Score (A) by measuring physiological parameters through various tests listed in Table 1.

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TABLE 1

Tests used to determine Autonomic Balance

(Wenger's Test)

1. Salivary Output
2. Dermographia Persistence
3. Palmar Conductance
4. Volar Conductance
5. Pulse Pressure
6. Heart Period
7. Respiration Period

Scores above the mean on these tests indicate parasympathetic predominance, while scores below the mean indicate sympathetic predominance. Many others have used the A score to determine if there is a predominance of one of the systems under differing conditions. Wenger (1948), for instance, contended that if the A.N.S. is related to emotional activity and pilots show apprehension, emotional instability, and confusion in the air, then the measurement of the autonomic factor would assist in dis-

covering individuals who are prone to engage in this kind of emotional behavior. In other words, some people who are placed in such stressful situations may then react with a predominance in one of the systems. Low scores have been found in chronic anxiety states (Holt, 1956; Parker, 1954), and treatment has been attempted by blocking partial sympathetic functioning. Smith and Wenger (1965) demonstrated that there was a significant decrease in phasic (nonchronic) anxiety and a corresponding drop in sympathetic nervous system functioning in doctoral students after completing oral examinations for Ph.D. degrees.

Some researchers have found that certain personality traits are associated with the autonomic nervous system (Fox et al., 1961; Acker, 1963a, 1963b; Mardkoff, 1966). Some have suggested a relationship between mental illness and the A.N.S. functioning (Wenger et al., 1956).

The balance of these systems can be modified, causing a predominant response of either system as a result of some form of stress. One way to regulate a disequilibrium of the system is by means of administering substances that are adrenergic or cholinergic, or substances that are anti-adrenergic or anticholinergic. In psychiatric pharmacotherapy, most antipsychotic drugs have cholinergic properties (phenothiazines, butyrophenones), while antidepressants have adrenergic qualities. In many instances, psychiatric patients fail to respond to treatment; usually this is attributed to severity and/or chronicity of the illness, or improper dosage. However, the possibility of an impaired adrenergic-cholinergic mechanism, somewhat competing or neutralizing the same properties held by the psychopharmacological agent, should be entertained. Therefore, to medicate a psychiatric patient would require a pharmacological balance of the drugs administered in regard to the adrenergic and cholinergic predominance. As a reminder, most biochemical theories of mental illness such as affective disorders and psychoses imply a disturbance of the adrenergic and cholinergic pathway (Wenger et al., 1956; Handlon, 1962). As mental illnesses are generally accompanied by severe stress, an alteration of the A.N.S. balance can be expected. When this disturbance is the outstanding pathology we speak of a neurovegetative dystonia. This syndrome is characterized by physical symptoms ascribed to the pathology of the A.N.S.

In order to determine the reaction of the A.N.S. under different situations, the Autonomic Balance Score has generally beep used. These physiological parameters can be semiologically represented by the symptoms subjectively or objectively reported by the patient. The purpose of this study was twofold: (1) to establish a questionnaire which could easily detect if there is a predominance of one system under different emotional states such as anxiety, depression, and anger without resorting to laboratory equipment as required by Wenger's test; (2) once the questionnaire was established it could be used to study some of the factors that cause pharmacotherapeuti-cal failures as mentioned above.

Method

Subjects: Sixty-nine patients at the North Nassau Mental Health Center were administered the A.N.S. questionnaire, and of these, 50 were readministered the questionnaire. The control group consisted of 69 **Ss** without history of psychiatric treatment, and the sample was obtained from staff members of the Clinic and Hofstra University students. Patients were not categorized into nosological groups.

Materials and Apparatus: The questionnaire can be seen in Table 2a (cholinergic system) and 2b (adrenergic system) responses.

The first 12 symptoms are those which are affected by the cholinergic system. Symptoms 12-24 are controlled by the adrenergic system. To validate the clinical symptoms with physiological correlates of the adrenergic and cho-

TABLE 2A

Autonomic Nervous System Questionnaire

NAME: (Please) _____

SEX: ( ) Male ( ) Female ( ) Age

INSTRUCTIONS: Please mark the severity of the symptoms as follows: When you feel Anxious (X); Depressed (✓); Angry or Aggressive (0).

	Very Frequently	Often	Some-times	Rare or Never
1. Heart Burn				
2. Diarrhea				
3. Urge to frequent urination				
4. One or more muscles feel weak				
5. Sleeping more than usual				
6. Flushing of the face				
7. Waterish mouth				
8. Excessive appetite				
9. Feel sexually aroused				
10. Have difficulty breathing				
11. Stomach growls				
12. Dry palms				

linergic functionings, the works of Wenger (1947), Wenger et al. (1956), Koelle (1965), and Leukel (1972) were consulted. Some of these works described how the clinical symptoms were originally correlated with the systems. Frequency of the symptoms were given the following values: very often —15; often —10; sometimes—5; and rare or never—0. For the cholinergic system a total score was found for the mood anxiety, then for depression, and then anger. The same was done for the adrenergic system. Thus, each control S and each patient had six total scores in all.

Procedure: Both control **Ss** and patients were asked to indicate the frequency of symptoms felt when they were anxious. Then they were asked to go through the questionnaire again, this time indicating the symptoms felt when they were depressed and subsequently angry. No definition of anxiety, depression, or anger was given.

It was difficult to readminister the questionnaire to all 69 of the original patients. Therefore, 50 who were contacted helped to establish the reliability of the questionnaire. Test-retest time was between one to four months.

Results

To establish test-retest reliability, Pearson Product Moment Correlations were done between adrenergic responses (Variables 1 and 2) under anxiety; cholinergic responses (Variables 3 and 4) under anxiety; between adrenergic responses (Variables 5 and 6) and also between cholinergic responses (Variables 7 and 8) under depression; and adrenergic (Variables 9 and 10) and cholinergic responses (Variables 11 and 12) under anger or aggression. A correlational matrix is presented in Table 3.

TABLE 2B

Autonomic Nervous System Questionnaire

NAME: (Please) _____

SEX: ( ) Male ( ) Female ( ) Age

INSTRUCTIONS: Please mark the severity of the symptoms as follows: When you feel Anxious (X); Depressed (✓); Angry or Aggressive (0).

	Very Frequently	Often	Some-times	Rare or Never
13. Constipation				
14. One or more muscles feel tense				
15. Sleeping less than usual				
16. Pallor of the face				
17. Cold feet				
18. Wet hands				
19. Wet armpits				
20. Heart palpitations				
21. Dry mouth				
22. Goose pimples				
23. Butterflies in stomach				
24. Poor appetite				

TABLE 3

Pearson-Product Moment Correlations for Test-Retest Reliability

	1	2	3	4	5	6	7	8	9	10	11	12
1.	1.00	.74	.56	.41	.72	.45	.31	.35	.75	.64	.38	.38
2.		1.00	.55	.61	.55	.69	.24	.48	.68	.79	.33	.43
3.			1.00	.70	.37	.49	.66	.64	.51	.55	.82	.62
4.				1.00	.40	.55	.49	.88	.36	.52	.56	.77
5.					1.00	.60	.38	.43	.52	.45	.26	.39
6.						1.00	.35	.55	.41	.65	.32	.49
7.							1.00	.70	.40	.31	.72	.57
8.								1.00	.37	.46	.57	.80
9.									1.00	.80	.47	.47
10.										1.00	.51	.60
11.											1.00	.66
12.												1.00

Those scores which are underlined in Table 3 demonstrate the consistency of the patient's response to the questionnaire the second time. Since the correlations are very high, this indicates that the patients reported to a high degree the same symptoms after one to four months. As observed, all correlations were .60 or above. Test-retest correlations for the above variables were .74, .70, .60, .70, .80, .66 respectively. All were significant at the .01 level for 48 degrees of freedom.

To determine whether there was a significant difference between the adrenergic and cholinergic responses for anxiety, depression, and anger for the control group, a correlated t-test was computed, $t(68) = 5.58$, $p < .001$, $t(68) = .35$, $p > .05$; $t(68) = 5.29$, $p < .001$ was found respectively.

The same was done for the patient population. For anxiety, $t(68) = 4.14$, $p < 001$ was found between the adrenergic and cholinergic responses. For depression, $t(68) = .72$, $p < .05$, and for anger $t(68) = 3.33$, $p < .001$ was found. Means and standard deviations and cutoff points for the adrenergic and cholinergic systems under the three emotional states for the patient population are presented in Table 4.

TABLE 4

Means, Standard Deviations, and Cutoff Points For The Two Systems under Three Emotional States

	Adrenergic			Cholinergic		
	Means	Cutoff Pts.	S.D.'s	Means	Cutoff Pts.	S.D.'s
Anxiety	57.75	58	42.09	42.10	42	31.52
Depression	31.30	31	31.33	28.99	29	25.17
Anger	40.72	41	38.14	28.19	28	26.88

Thus, Table 4 indicates that for the patient population clinical symptoms manifested under anxiety and aggression were significantly more affected by the adrenergic system. For depression, no significant difference between the adrenergic and cholinergic systems was found. In other words, neither system seemed to be more affected than the other, and frequency of clinical symptoms exhibited were similar for both systems.

Cutoff points were determined by rounding off the means to the nearest whole number. Thus, as seen in Table 4, a patient who obtains a score of 58 or above when anxious under the adrenergic system would be considered adrenergic provided the score on the cholinergic symptoms is less than 42. If both had been above the means, then it would be more difficult to state if the patient was adrenergic or cholinergic. To be more stringent in placing patients under one or the other system, a higher cutoff point could be used. This cutoff point would be the addition of the standard deviations to the means shown in Table 4. For instance, for anxiety one could use 58 as the cutoff point, or more stringently 58 + 42.09 which equals 100.

To determine which were the most common or more frequently exhibited symptoms under anxiety, depression, and aggression for the patient population, the frequency of response for each symptom was calculated. The very frequent and often frequencies were used in this calculation since it was the higher incidence of the symptom which was of interest. Any symptom which scored above 20 was considered a symptom commonly or more frequently reported. Tables 5, 6, and 7 show the most common symptoms found under each emotional state.

No significant difference was found between the norms and the patient population under the two autonomic nervous systems and the three emotional states.

TABLE 5

Common Symptoms Exhibited During Anxiety in Descending Rank Order

1. Butterflies in stomach
2. Heart palpitations
* 3. One or more muscles feel tense
* 4. Dry mouth
5. Sleeping less than usual
6. Wet armpits
7. Wet hands

*Same frequency

TABLE 6

Common Symptoms Exhibited During Depression in Descending Rank Order

1. Sleeping more than usual
2. Excessive appetite
3. Poor appetite

TABLE 7

Common Symptoms Exhibited During Aggression (Anger) in Descending Rank Order

* 1. One or more muscles feel tense
* 2. Sleeping less than usual
3. Butterflies in stomach

*Same frequency.

Discussion

One interesting finding is the lack of predominance between adrenergic and cholinergic groups in the emotional state of depression for both normals and patients. Most theories of depression speak of a disturbance of the adrenergic pathway (Ax, 1962; Handlon, 1962). It was also shown that anxiety and aggression (anger) indicated a prevalence of the adrenergic system, which corroborates the finding of numerous studies based on the works of Cannon.

Equal frequency of response under the three types of emotions was found in the normal and patient population indicating that the A.N.S. in mental patients is not impaired in the direction of the response. However, since the mental patient's capacity to tolerate stress is usually decreased, he or she might respond with equal frequency but under less amount of stress, and thus, in many instances, an acute episode of mental illness may occur. Presently, further research is being carried out in this area.

This questionnaire is an established test, since it has been found to be highly reliable and valid. Therefore, it can be used in clinical practice. Immediate application of the test may consist of the following:

a. to determine if a predominance of the adrenergic or cholinergic system exists for a particular patient when anger, depression, and anxiety are reported.
b. to establish the deviation of a patient from his own norm by using the cutoff point system and, thus, indicating indirectly the in tensity of the response or the organ threshold to certain stimuli.
c. which are the organ or organs more affected by a determined emotion.

In addition, it may facilitate the study of the efficacy of psychopharmacologi-cal drugs where the role of the A.N.S. may modify the therapeutic response.

Since the preliminary work is completed and cutoff points have been established, the questionnaire form is being revised.

On the new form, a summary of the patients' obtained scores and a summary of the stringent and very stringent cutoff points will be shown on a chart. This will enable the clinician to determine immediately whether a predominance of one system exists. The scoring may be done by a clerical worker and recorded on the summary chart. This is in preparation.

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