

Relevance of Autonomic Arousal in the Stress Response in Psychopathology

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Abstract: The principal goal of this study is to describe the relevance of typical autonomic patterns of response in accordance to a number of psychopathological syndromes for an accurate multi-dimensional assessment.

A sample of 89 subjects was subdivided in five pathological groups in accordance with the clinical diagnosis following the diagnostic criteria of DSM V [1]: Generalized Anxiety Disorder (GAD), Panic Attack Disorders (PAD), Major Depressive Episodes (MDE), Obsessive Compulsive Disorders (OCD), Anorexia Nervosa (AN) and a Healthy control group. Obtained data were compared in regard to each physiological parameters by using the mean value of the last minute of the registration at rest, and two activation indexes: "stress response" and "recovery after stress".

Furthermore, for each of the physiological parameters (EMG, SCL/SCR, PT and HR), and diagnostic group, mean values in the three different phases (last minute of rest, first minute of stress, last minute of recovery) were compared to evaluate the four physiological parameters trends.

In GAD and PAD patients, the obtained Conductance Response mean values are much higher than MDE and OCD.

Furthermore, the HR response is also higher in GAD than in the other three groups. So, OCD and MDE patients seem to be characterized by a flat profile in all the parameters.

We confirmed that a condition of autonomic hyper activation is typically connected to a high level of tension and anxiety; vice versa, a low level of autonomic activation and the impossibility to react to the stimuli is typically connected to MDE, OCD and AN. Obtained data suggest that there might be a new tool for differential diagnosis in psychopathology, represented by specific and typical pattern in autonomic response.

Keywords: Psychophysiology, autonomic arousal, Behavioral Activation System (BAS), Behavioral Inhibition System (BIS), differential diagnosis, psychopathology.

INTRODUCTION

The multidimensional approach to clinical diagnosis in psychopathology is usually made by the detection of data coming from different areas in the individuals – i.e., behavioral, cognitive, emotional and psycho-physiological – to better pick out and describe pathological phenomena. Indexes like those proposed by DSM V [1], are very useful guides but cannot represent the only support in clinical diagnosis. The psycho-physiological evaluation consists of detection, storage and evaluation of some of the physiological indexes connected with the Autonomic Nervous System (ANS) arousal and the complex system involved in stress response. The following are some of the most useful indexes for the evaluation of ANS: peripheral temperature (PT), skin conductance response (SCR), Heart Rate (HR), Inter Beat Interval (IBI), muscle tension as indicated by the Surface Electromyogram (EMG). There is a great deal of scientific evidence coming from experimental and clinical studies regarding the relevance of these types

of indexes in pathological conditions. In the last few decade, the works of Grey [2] and Fowels [3,4] have documented that HR and SCR are the most important physiological correlates of the *Behavioral Activation System* (BAS). The BAS is made up of dopaminergic pathways, which include the ventral tegmental area and the accumbens nucleus in the brain. The BAS is activated by discriminative stimuli principally associated with positive and negative reinforcements both connected with positive and agreeable situations and events able to regulate appetitive behavior and *fight or flight reactions*.

Otherwise, the *Behavioral Inhibition System* (BIS), characterized by a decrease in HR and SCR, is constituted by a reticular neuronal structure including Amygdale and the hippocampal septum system. It receives serotonergic afferences from the locus ceruleus with projection to the frontal lobe of the brain. It is usually activated by negative events like punishments or by the sudden suspension of positive reinforcement. It mediates conflicts connected to the management of problematic situations by blocking active response behaviors or the development of defense and passive avoidance behaviors. One of the techniques used for the clinical evaluation of the

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autonomic arousal is the Psycho Physiological Profile (PPP) first described by Fuller [5]. PPP requires the simultaneous registration of some physiological parameters strictly connected with the autonomic stress response, e.g. EMG, HR, SCR, PT, etc. The registration is usually made in three different and subsequent phases: at rest (to obtain a baseline), administration of stressful stimuli (to provoke an activation or an ANS arousal), recovery, trying to return to the pre stress values [6-9]. There are a large number of mental stress test (MST) utilized as the Mental Arithmetic Task (MAT) or problem solving tasks as the CPM 47 in computerized version [9-11].

The aim of this evaluation, is to verify how long the psycho-physiological balance, connected to the homeostasis processes, is or is not able to adapt by means the following general criteria:

- High value of some parameters even at rest, as a sign of improper autonomic activation
- Slow, inconstant, or absent adaptation (e.g. slow increase of PT and decrease of SCL) of one or more parameters during the rest phase
- Abnormal peak of great amplitude in one or more parameters during the stress phase
- Slow, inconstant or absent modification of one or more values during the stress presentation (steady values)
- Slow inconstant or absent tendency to return to the values obtained at rest during the recovery phase.

In the clinical area, a great deal of different studies have shown the possibility to describe specific physiological pattern related to different psychopathological syndromes. Among others, Stegagno & Palomba [12] and other recent researches based on evaluation of stress profile [13-15] have found typical patterns in clinical syndromes like depression and anxiety, confirming Lader's previous data [16,17]. These clinical pictures could be summarized as follows: syndromes characterized by anxiety are often connected with high level HR, SCL, EMG, low values in PT. Otherwise, clinical pictures characterized by depression often show low or irregular HR and EMG, and low level of SCR both at rest and during stress session.

The principal aim of the present study is to verify, by means of four of the most frequently used physiological

parameters: EMG, SCR, HR, PT, the typical autonomic patterns of response in five psychopathological groups of subjects and in a control group of healthy people.

METHODS

Study Design

This is an observational transversal study, made with the ethical approval of the Clinical Psychology Center and with the informed consent of each participant.

Subject

A group of 89 people, 44 male and 45 female, aged from 21 to 51 years (mean age 38.4 ± 9.7), was consecutively recruited in a Clinical Psychology Center and the sample size was calculated basing on previous studies [18,19]. Patients had the following diagnoses according to the DSM V criteria [1]: General Anxiety Disorder (GAD), Major Depression Episode (MDE), Panic Attack Disorder (PAD), Obsessive Compulsive Disorder (OCD), Anorexia Nervosa restricted (AN), with a different and not homogenous educational status. Sample characteristics are summarized in Table 1.

Table 1: Sample Characteristics. Number and Gender

Diagnosis (DSM 5)	#	M	F
GAD	35	14	21
MDE	13	7	6
PAD	19	12	7
OCD	13	8	5
AN	9	-	9

Furthermore, a group of 34 graduate and doctoral students of psychology 20 female, 14 male, age from 21 to 34 years (mean age $23.27 \pm 3,22$), was recruited as a control group (healthy). Pathological and healthy sample were not balanced, since the control group was made of volunteers.

Both for the pathological groups and for the healthy group, each individual was asked to sign the informed consent

Inclusion Exclusion Criteria

For all the group of psychology students the fourth sheet of the Cognitive Behavioral Assessment [20] was administered to permit the dropping out of all subjects that were undergoing psychological or pharmacological

treatment or had done this in the past 5 years. Patients of all the selected psychopathological groups were required not to have taken any psycho drugs in the previous three months. Furthermore, subjects that were affected by Central Nervous System (CNS) physical illnesses or with concomitant organic syndromes or comorbidity with other DSM V disorders, were excluded.

Physiological Measures

All subjects underwent, among other tests for the group of patients, a continuous physiological registration of 4 parameters, as follows:

- **Adaptation phase:** all participants were welcomed into a room in which temperature and humidity were controlled (between 18-22 C° and below 50% humidity). A pair of researchers (clinical psychologists) gave all the explanations regarding the apparatus, the electrodes and the other devices, the pc programs etc., and regarding the absolutely non painful registration procedure.

The participants were asked to sit in a very comfortable reclining armchair and while setting up the electrodes the operator encouraged the subjects to freely ask any other questions they had regarding the procedure and the test. The aim was to help people to relax as much as possible before the start of the registration, trying to avoid anticipatory anxiety.

- **Registration at rest (6min):** subjects were asked to close their eyes and to be as silent and relaxed as they could, lifting up the index finger of the non-dominant hand to indicate any problems, e.g. if they were having problems swallowing, coughing, breathing, etc.
- **Stress session (4 min):** subjects were administered the Mental Arithmetic Task (MAT) as a Mental Stress Test (MST). In this task the subject is required to subtract the number 13 from 1007 continuing until the stop signal from the psychologist.
- **Recovery session (6 min):** at the end of the MAT, the subject was requested to stop the exercise and try to relax and remain at rest, as much as possible.

The following parameters were registered:

- **Frontal electromyogram (EMG):** the electrical potential was detected by means two active

electrodes placed 1 cm over the two eyebrows on the same line as the pupils and one reference electrode placed at the centre of the forehead (2 cm of distance between poles).

- **Heart Rate (HR):** detection of the electrical potential of cardiac muscle by the classic bipolar shunt for the electrocardiogram (EKG), and calculating the transit time of the “r” wave” (ventricular contraction) to evaluate the Inter Beat Interval (IBI).
- **Peripheral temperature (PT):** by an electronic thermometer with a device placed on the “tenar” eminence of the non-dominant hand.
- **Skin Conductance Level - Response (SCL - SCR):** giving a very low intensity direct electric current by means two electrodes placed on the first and second finger of the dominant hand.

EMG and HR parameters were detected by means of surface disposable electrodes with a 0.5 mm of active surface. An appropriate conductor gel was utilized to facilitate the detection. For the SCR two gold plated electrodes were used. For the PT a very sensitive thermometer (capable of evaluating fluctuation in temperature of less than 0.01 C°) was utilized. The machine used for registration was the “Modulab 800” by SATEM, Rome, Italy. The Modulab was connected by an infrared cable with a PC (Windows XP System) and all the data was detected and processed by the PANDA Works program (by SATEM, Rome, Italy).

Statistical Analysis

All statistical analysis was processed by the SPSS.14 Software.

Arithmetic mean and SD were calculated for all the physiological parameters at the time of:

- last minute of rest as a baseline,
- first minute of the stress phase, to evaluate the possible best activation during the MST presentation, and to exclude possible habituation phenomenon due to acclimatization to the situation.
- last minute of the recovery, as a evaluation of the best possible recovery after the stress presentation [21].

The Shapiro-Wilks statistical test was utilized to evaluate the possible normal distribution of the values. Seeing as these were not distributed normally and because there were several differences in the number of every sample (from 9 to 35; see Table 1) it was decided to use a non parametric statistical analysis.

A comparison between groups was made on the basis of the mean value calculated three times in every phase of the registration. Each mean value was considered a unique index. The Mann-Witney statistical test was utilized to verify the significance of the possible differences among groups.

In order to better describe the performance of the registered values during the three phases and on the basis of the suggestion made by Arena & Blanchard [21] the following indexes were also calculated:

- stress response; as a index of the autonomic activation response amplitude, calculated subtracting from the mean value of the first minute of the stress phase, the mean value of the last minute of the rest (baseline) session.
- Recovery after stress; to evaluate the recovery amplitude after the best activation, subtracting from the mean value of the whole stress session the mean value of the last minute of the recovery phase.

RESULTS

Table 2 shows the arithmetic mean (AM) and Standard Deviation (SD) of all the physiological

parameters registered in the three phases: “rest” or baseline (B), “stress”(S) and “recovery”(R).

In the comparison between groups, a significant statistical difference was found in the EMG even at rest and during the stress session in the comparison between the student group and the others. Patients with PAD, GAD, OCD MDE and AN seem to be characterized by a higher level in muscle tension than healthy subjects (Table 3; Figure 1). In SCR- SCL parameter some statistical significant differences were found in all the phases: rest, stress and recovery (Table 3; Figure 1).

In addition, GAD and PAD are characterized by higher values in SCR during all three phases in comparison to MDE, OCD, AN and Healthy. MDE and AN showed a typical pattern of a very low values and are characterized by lower values in the same parameter during all three phases in comparison to GAD, PAD and Healthy.

Regarding the HR parameter, the comparison between groups showed a typical pattern of high values in all the phases in GAD patients, which was very different from the other psychopathological groups and to the healthy (Table 3 and Figure 2).

Regarding the calculated indexes (Tables 4 and 5 and Figure 1), AN showed a low level of muscle activation in comparison to the others and the MST response is significantly lower than PAD, OCD, MDE. Furthermore, GAD, OCD and PAD seem to be very similar to others and all were very different from MDE and AN, in particular for the SCR parameter (Figure 1),

Table 2: Descriptive Statistics of all Physiological Indexes. Mean and Standard Deviation

	PAD		GAD		OCD		Healthy		MDE		AN	
	AM	SD	AM	SD	AM	SD	AM	SD	AM	SD	AM	SD
EMG (B)	3,8	1,6	4,1	2,0	3,4	1,3	2,8	1,0	3,8	1,7	4,9	1,6
EMG (S)	6,3	2,3	6,6	3,6	6,5	3,3	4,1	1,0	6,6	3,3	5,7	1,7
EMG (R)	3,9	2,0	3,9	1,7	3,7	1,3	3,1	1,2	4,9	2,8	5,2	1,8
SCL (B)	8,7	5,3	8,4	4,9	2,8	1,7	5,7	4,8	2,3	2,4	2,9	2,0
SCL(S)	14,6	10,5	13,4	7,0	4,3	2,7	7,9	5,3	3,6	4,1	3,9	2,7
SCL(R)	12,1	7,9	9,9	5,2	3,8	2,1	6,7	4,7	3,7	3,5	3,2	2,0
PT (B)	31,9	2,9	31,0	2,9	32,5	2,0	30,2	2,8	32,5	2,1	32,1	2,9
PT(S)	32,0	3,1	31,1	2,6	32,7	2,1	30,0	2,8	32,5	2,1	32,1	2,9
PT(R)	31,8	3,2	31,0	2,4	32,4	2,3	29,8	2,9	32,4	2,3	32,1	2,8
HR (B)	69,5	8,2	80,7	9,3	67,7	14,2	73,8	13,9	70,6	13,0	72,2	13,9
HR (S)	79,9	11,2	88,2	13,2	76,9	9,6	87,5	18,1	77,6	12,3	75,5	15,3
HR (R)	70,2	9,2	80,0	10,7	69,8	7,9	71,0	11,9	72,5	14,2	72,8	13,8

Table 3: Comparison between Pathological Groups and Healthy Control in each Parameter “U” of Mann-Withney statistical test, and “p” values in the comparison between psychopathological groups and healthy subjects on the mean values of the psychophysiological parameters registered in the three phases “rest” or Baseline (B), “Stress” (S) and Recovery (R).

	EMG (B)	EMG (S)	EMG (R)	SCL (B)	SCL (S)	SCL (R)	PT (B)	PT (S)	PT (R)	HR (B)	HR (S)	HR (R)
<i>PAD/GAD</i>	324,50 (0,89)	320,50 (0,83)	324,00 (0,88)	319,00 (0,81)	322,00 (0,85)	300,00 (0,56)	259,00 (0,18)	254,00 (0,16)	267,00 (0,24)	126,00 (0,00)	196,00 (0,01)	155,00 0,00
<i>PAD/OCD</i>	99,00 (0,36)	119,00 (0,88)	117,00 (0,82)	21,00 (0,00)	31,00 (0,00)	29,00 (0,00)	114,00 (0,73)	110,00 (0,62)	114,00 (0,73)	109,00 (0,60)	105,00 (0,50)	106,00 0,52
<i>PAD/HEALTHY</i>	168,00 (0,02)	96,00 (0,00)	201,00 (0,09)	166,00 (0,02)	167,00 (0,02)	159,00 (0,01)	184,00 (0,04)	173,00 (0,02)	185,00 (0,04)	254,00 (0,53)	219,00 (0,18)	272,00 0,79
<i>PAD/MDE</i>	110,00 (0,62)	118,00 (0,85)	93,00 (0,25)	18,00 (0,00)	26,00 (0,00)	32,00 (0,00)	114,00 (0,73)	118,00 (0,85)	116,00 (0,79)	114,00 (0,73)	105,00 (0,50)	118,00 0,85
<i>PAD/AN</i>	61,50 (0,24)	69,00 (0,44)	60,00 (0,22)	16,00 (0,00)	18,00 (0,00)	15,00 (0,00)	84,00 (0,96)	82,00 (0,89)	82,50 (0,89)	84,00 (0,96)	63,00 (0,29)	81,00 0,85
<i>GAD/OCD</i>	180,00 (0,27)	225,00 (0,95)	217,00 (0,81)	51,00 (0,00)	52,00 (0,00)	55,50 (0,00)	152,00 (0,08)	145,00 (0,06)	155,00 (0,09)	79,00 (0,00)	94,50 (0,00)	83,00 0,00
<i>GAD/HEALTHY</i>	302,00 (0,00)	255,00 (0,00)	361,00 (0,03)	335,00 (0,01)	278,00 (0,00)	327,00 (0,01)	425,00 (0,19)	404,00 (0,11)	386,00 (0,07)	326,00 (0,01)	498,00 (0,72)	272,00 0,00
<i>GAD/MDE</i>	208,00 (0,65)	221,00 (0,88)	179,00 (0,26)	40,00 (0,00)	47,00 (0,00)	58,00 (0,00)	152,00 (0,08)	154,00 (0,09)	151,00 (0,08)	85,00 (0,00)	110,00 (0,01)	115,00 0,01
<i>GAD/AN</i>	113,00 (0,20)	149,00 (0,82)	90,50 (0,05)	41,00 (0,00)	35,00 (0,00)	32,00 (0,00)	135,00 (0,53)	127,50 (0,39)	118,00 (0,26)	82,00 (0,03)	80,50 (0,02)	82,00 0,03
<i>OCD/HEALTHY</i>	136,00 (0,12)	61,00 (0,00)	135,00 (0,12)	113,00 (0,03)	111,00 (0,03)	116,00 (0,04)	103,00 (0,01)	87,00 (0,00)	97,00 (0,01)	163,00 (0,41)	124,00 (0,06)	190,00 0,91
<i>OCD/MDE</i>	73,00 (0,58)	84,00 (1,00)	64,00 (0,31)	53,00 (0,11)	54,00 (0,13)	64,00 (0,31)	81,00 (0,88)	80,00 (0,84)	83,00 (0,96)	78,00 (0,76)	77,00 (0,72)	77,00 0,72
<i>OCD/AN</i>	26,50 (0,03)	54,00 (0,79)	27,00 (0,04)	57,00 (0,95)	52,00 (0,70)	50,00 (0,60)	57,00 (0,95)	52,00 (0,70)	56,00 (0,90)	54,00 (0,79)	46,00 (0,43)	56,00 0,90
<i>HEALTHY/MDE</i>	120,00 (0,05)	100,00 (0,01)	119,00 (0,05)	86,00 (0,00)	84,00 (0,00)	94,00 (0,01)	100,00 (0,01)	99,00 (0,01)	96,00 (0,01)	163,00 (0,41)	128,00 (0,08)	189,00 0,89
<i>HEALTHY/AN</i>	28,00 (0,00)	47,00 (0,00)	37,00 (0,00)	79,00 (0,06)	64,00 (0,02)	65,00 (0,02)	87,00 (0,11)	83,00 (0,09)	76,00 (0,05)	120,00 (0,64)	78,00 (0,06)	129,00 0,86
<i>MD/AN</i>	38,00 (0,19)	51,00 (0,65)	51,00 (0,65)	39,00 (0,21)	44,00 (0,36)	56,00 (0,90)	55,00 (0,85)	53,00 (0,74)	55,00 (0,85)	56,00 (0,90)	47,00 (0,47)	57,00 0,95

with the most significant difference among AN and GAD groups.

DISCUSSION

Obtained results partially confirmed some of the data already present in the literature but with more

specific indications for every psychopathological syndrome [18,19]. Each parameter examined, paves the way for interesting clinical observation.

EMG values, significantly higher in the pathological groups than in healthy controls, give an important indication of a condition of general muscular

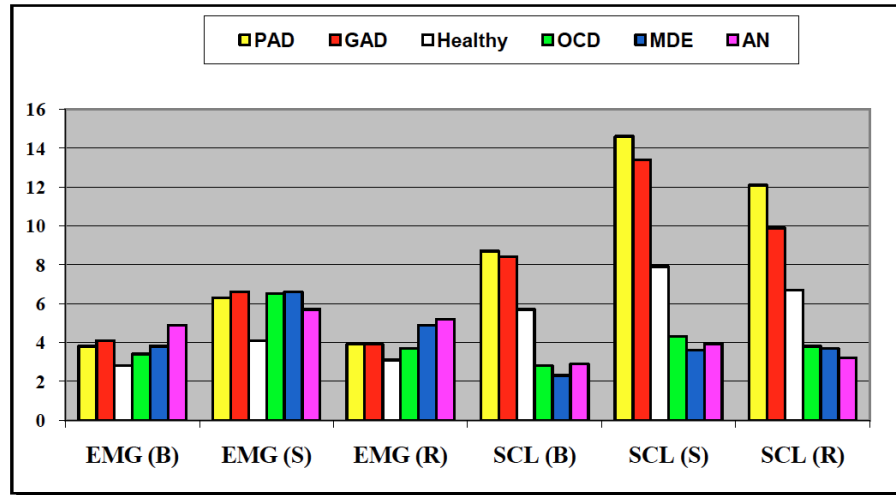


Figure 1: EMG and SCR mean values at rest (baseline, B), and in the stress (S) and recovery (R) phases.

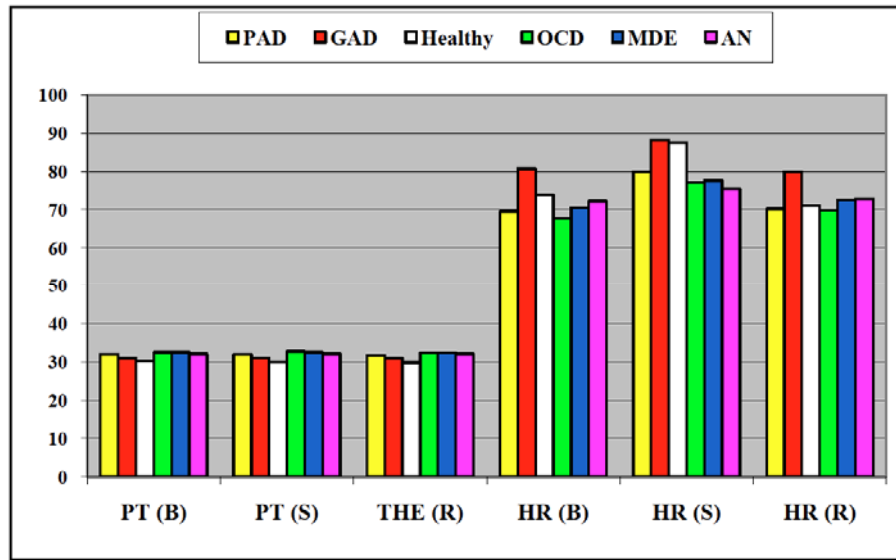


Figure 2: Mean values at rest (baseline, B), stress (S) and recovery (R) phases.

Table 4: Descriptive Statistics of Calculated Indexes “Response” and “Stress”. Mean and Standard Deviation

	PAD		GAD		OCD		HEALTHY		MDE		AN	
	AM	SD	AM	SD	AM	SD	AM	SD	AM	SD	AM	SD
response(EMG)	96,77	136,45	84,62	108,37	115,41	119,70	56,36	54,16	82,44	69,09	20,76	22,62
response (SCL)	67,61	90,64	81,56	112,36	79,09	132,88	54,78	53,74	50,44	74,71	40,03	69,93
response(PT)	-,31	1,70	-,34	2,58	-,71	2,07	,57	1,09	,06	,35	,10	,79
Response (HR)	15,22	11,03	9,31	9,25	16,91	21,89	18,74	14,29	10,71	10,81	4,40	4,71
stress (EMG)	,36	17,53	6,27	47,29	30,98	100,84	9,30	23,97	27,41	46,78	8,16	16,41
stress (SCL)	37,04	46,02	36,37	72,20	49,07	62,33	35,09	48,67	69,51	71,48	17,20	37,20
stress (PT)	,57	3,00	-,38	8,13	,34	1,98	1,28	1,96	,30	1,59	,07	1,65
stress (HR)	1,01	4,91	-,92	5,88	6,47	22,83	-3,38	5,98	2,90	8,26	,95	3,43

Table 5: Comparison between Pathological Groups and Healthy in Stress Indexes. “U” of Mann – Withney statistical test, and “p” values in the comparison between psychopathological groups and healthy subjects on the mean values of calculated indexes “response” and “stress”

		Response (EMG)	Response (SCL)	Response (PT)	Response (HR)	Stress (EMG)	Stress (SCL)	Stress (PT)	Stress (HR)
GAD/PAD	U	300,00	315,00	311,00	215,00	322,00	298,00	332,00	242,00
	p	0,56	0,75	0,70	0,03	0,85	0,53	0,99	0,10
PAD/OCD	U	112,00	114,00	120,00	102,00	112,00	113,00	117,00	114,00
	p	0,68	0,73	0,91	0,43	0,68	0,71	0,82	0,73
PAD/HEALTHY	U	266,00	284,00	173,00	262,00	234,00	277,00	257,00	167,00
	p	0,70	0,98	0,02	0,64	0,30	0,87	0,57	0,02
PAD/MDE	U	104,00	93,00	100,00	83,00	75,00	96,00	107,00	116,00
	P	0,47	0,25	0,38	0,13	0,07	0,31	0,55	0,79
PAD/AN	U	47,00	53,00	76,00	32,00	74,00	58,00	67,00	80,00
	p	0,06	0,12	0,66	0,01	0,60	0,19	0,38	0,81
GAD/OCD	U	188,00	204,00	227,00	174,00	224,50	190,00	214,00	164,00
	P	0,36	0,59	0,99	0,22	0,95	0,38	0,75	0,14
GAD/HEALTHY	U	511,00	498,00	285,00	302,00	428,00	495,00	459,00	443,00
	P	0,85	0,72	0,00	0,00	0,20	0,69	0,39	0,28
GAD/MDE	U	201,00	163,00	199,00	218,00	160,00	159,00	204,00	152,00
	P	0,54	0,14	0,51	0,83	0,12	0,11	0,59	0,08
GAD/AN	U	107,00	95,00	138,00	108,00	118,00	133,00	130,50	99,00
	P	0,15	0,07	0,59	0,16	0,26	0,49	0,44	0,09
OCD/HEALTHY	U	159,00	179,00	120,00	155,00	150,00	179,00	158,00	114,00
	P	0,35	0,69	0,05	0,30	0,24	0,69	0,34	0,03
OCD/MDE	U	81,00	78,00	84,00	69,00	62,00	71,00	79,00	84,00
	P	0,88	0,76	1,00	0,45	0,26	0,51	0,80	1,00
OCD/AN	U	31,00	42,00	56,00	28,00	40,00	41,00	47,00	54,00
	P	0,07	0,29	0,90	0,04	0,24	0,26	0,47	0,79
HEALTHY/MDE	U	144,00	143,00	107,00	126,00	150,00	141,00	139,00	107,00
	P	0,18	0,18	0,02	0,07	0,24	0,16	0,14	0,02
HEALTHY/AN	U	76,00	88,00	86,00	35,00	134,00	92,00	75,00	68,00
	P	0,05	0,12	0,11	0,00	0,99	0,16	0,05	0,03
MDE/AN	U	15,00	52,00	58,00	33,00	49,00	27,00	49,00	57,00
	P	0,00	0,70	1,00	0,10	0,56	0,04	0,56	0,95

tension. Among the pathological groups, AN shows the lowest EMG activation, probably because of a decrease in the general functioning due to the typical underweight [22].

As hypothesized by Fowles [3,4] and Gray [2], the most important physiological indexes linked to a high level of tension and anxiety were the SCL and the HR.

In particular, SCL seems to be the best indicator of an acute state of anxiety, since in GAD and PAD it is higher than the rest of the pathologic groups and

healthy control. This can be probably explained in GAD by the chronic arousal and control on external stimuli, causing anticipatory anxiety and performance anxiety [23]. In PAD, higher SCR could be explained by the continuous checking of the internal states, and can be seen as the physiological index of the “anxiety sensitivity”, the typical feature of GAD and PAD [24-26]. SCR also offers an interesting pattern of hypo activation compared to healthy population in AN and MDE. This in AN is probably due, to the underweight [22, 27], while, in MDE, it could be interpreted as the

physiologic mirroring of the “Leaned Helplessness” [28] and of unsuccessful attempts to suppress emotional reactions [29-31], leading to a progressive poorer life style, with feedback on the autonomic system as a maladaptive loop.

Furthermore, the HR at rest appear to be higher in GAD patients than PAD patients as a differential index between syndrome manifestations. It is important to emphasize that at present this role is played only by the respiratory indexes. Coherent to literature were the data from the SCL parameters of PAD and OCD patients [13,25,32-36].

The electrodermal trend of GAD, PAD and MDE, seems to confirm the BIS and BAS theory of Gray [2] and Fowles [3,4]: the high values in baseline, the elevated peak values during stress presentation, and the incomplete recovery of the galvanic response, could be connected to the BIS due to internal or external danger or threat signals.

CONCLUSIONS

This study, confirms the latest trend in psychophysiological research: typical patterns of activation linked to specific psychopathologies. This offers important tools to the clinicians in three different times:

- At the diagnostic phase: to get a proper differential diagnosis when handling pathologies that have cognitive and behavioral pale differences, and also to get a diagnosis that is completely based on the individual
- At the treatment phase: integrating techniques able to intervene also on the physiological pattern (i.e. biofeedback) in order to operate in a more holistic approach, considering mind and body as one, and planning tailored interventions for each pathology and each patient
- At the time of treatment evaluation: to have an objective measure of changing, wich can be registered many times also as follow up.

This study, should be replicate, with a higher number of participants, in order to get conclusive evidences that could be permanently integrated in the diagnostic criteria. We also ought to include more DSM- 5 Axis I and Axis II pathologies in further studies, in order to get a wider insight on psychopathological psychophysiology.

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Received on 23-09-2015

Accepted on 17-11-2015

Published on 25-03-2016

<http://dx.doi.org/10.6000/1927-5129.2016.12.26>

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