

Research project to the subject: strain and stress in school - examined on handicapped and non-handicapped school-age children

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On the professorial chair for Pedagogics on the impairment of learning faculties at the University of Potsdam is the subject of strain and stress experiences a central concern of research, based on the increasing significance of chronic illnesses, psychical disorders, psychosomatic detractions as well as fear of school and failure to learn in childhood and later years as juveniles.

(PETERMANN/NOECKER/BODE 1987; REMSCHMIDT/WALTER 1989; ENGEL/HURRELMANN 1989; HOLLER-NOWITZKI 1994; HURRELMANN 1998; K?STERS 1998; MELZER/ SANDFUCHS 2001).

According to the newest health studies and despite immense economic progress and pioneering new medical knowledges already 10 to 12 percent of the pupils in primary schools suffer on strangeness and disarrangements in areas of "performance, perception, sentiment, contact and other developments" (PALENTIEN 1997, 9). The ratings for juveniles are even higher - a range between 15 and 20 percent (ebd., 9). The shown graphs about the development and health of children and juveniles are based on studies in Germany, and especially in the region of Brandenburg. As a matter of fact actual tests to a high degree were noticed among these pupils entering school.

In a social report of 1999 on the health of children for the past years in the region of Brandenburg, a rapid increase was noticed on children concerned with health detractions (MASGF 1999). Examinations, performed by the Health Services for Children and Juveniles in the region of Brandenburg in 1998 (KJGD) on children starting school, revealed that 30,5 percent according to medical evidences had relevant findings which makes an early encouragement urgently necessary (ebd., 13).

Although no statements are available on the mentioned tests as to how children and juveniles react to strained situations, we believe, that there is a direct connection between psychosomatic strangeness and disorders and the biological capability for the relaxation of tension. Our research project is therefore subject to this matter.

This contribution shall draw our attention on the problems of health and performances and it shall be taken into consideration to encourage existing conditions essential for the life and learning in school, so that possible changes can be made into the direction of a "healthier school".

Knowing, that very often late recognition on introspection and unaccustomed observations and psychological test methods of strain in the vegetative-emotional systems must be considered for early detections, we included in our studies beside such procedures physiological parameters. Such a diagnostic offers a variety of advantages. Vague and diffus experienced feelings and evaluations as well as knowingly and unknowingly passed reactions can be comprehended, which hardly could be measured with other instruments of studies. Through these measurements on psychophysiological reactions, which are beyond conscious control, tendencies of distortion found in all forms of verbal tests can be excluded (vgl. G.R.P 2001).

For this reason we used since 1998 for the methodical preparation of our strain and stress research project with children and juveniles not only observations and psychological test procedures but made physiological measurements in cooperation with the Institute for Research of Stress in Berlin. In factual terms we take blood pressure and skin resistance tests of pupils based on a chronobiological regulatory diagnostic developed by Hecht and Balzer as a result of a longtime medical research at the Berlin Charit?.

(HECHT et al. 2001, 552; HECHT et al. 2000, 145 ff; BALZER/HECHT 1989 a; BALZER/HECHT 1989 b; SALZBERG-LUDWIG/SIEPMANN 2001; SIEPMANN/SALZBERG-LUDWIG 2001). These measurements were evaluated and given to our disposal.

Theoretical Arrangement

Actions on the studies and developments of human beings are more effective, if they are pointed directly on the bio-psycho-social uniformity of the actual individual. These ideas of a patterned unity of human beings are not new. But not enough attention is given on humane scientific disciplines in regards to diagnosis, intervention and prognosis.

Proceeding from the overall view of perceptions on psychoneuroimmunology and chronobiology are specially suitable for our research request. (SCHEDLOWSKI/TEWS 1996), der Physiologie (BOUCSEIN 1988; VOSSEL 1990; VOSSEL/ ZIMMER 1998) und der Chronobiologie (HECHT et al. 2001; HELLBR?GGE 1977; HILDEBRANDT 1994). The human being is seen by these areas of science in permanent timely-rhythmical arguments with internal and external development factors (B?ELER 1994, 145).

Since the psychoneuroimmunology especially searches for the interrelation between nerves, hormone and immune systems, so is the chronobiology engaged in and above all with the timely-rhythmic or also with the timely-periodic course of different human bodyfunctions (e.g.; respiration, heart- and pulsation). According to physiological and psychological reaction patterns, which, or as the case may be, can be seen and measured, makes it evident whether or not the human being is in a stable well balanced condition. Disorders of balance are also present when the rhythm between tension and relaxation is interrupted and strained situations are out of control. Such a condition can lead in a long run to a disturbance of the regulatory process within the human system and therefore ends into illness.

The ability for relaxation is an important factor. In the process of our physiological research this factor was used. Results from measurements on blood pressure and skin resistance were the criterion to diagnose the ability for relaxation.

In the science of medicine blood pressure measurements as a diagnostic method is being used for a long time to a high degree. Especially in force are systolic values of blood pressure as a sensitive indicator for the view of the emotional state of health and respectively the ability for relaxation. However, these measurements are not quite correct from the diagnostic point of view. The so called effect of the "White Coat" (Excitement, fear, stress, expectation) falsify the value of blood pressure (HECHT et al. 2001, 259 ff.; SCHEDLOWSKI/TEWS 1996).

For this reason, we made measurements in time intervals. The reflection of electrodermal activities by measuring the skin resistance shows psychic

incidents in activation and deactivation of the vegetative-emotional system. The physiological basis of electrodermal processes is being activated in our empiric work and registered in our emotional sweat-glands. Important is, the emotional sweat-gland activity like all processes for the treatment of information, are controlled dominantly by the neocortex (Centre of mental activity) and the limbic system (Control centre of emotions). Therefore is the registration of the electrodermal activity as a physiological correlate a suitable method for the inclusion of mental-emotional processes (e.g.; BOUCSEIN 1988, 1; 36). This way we have found a direct access to the excitation level and respectively to the stress and strain situation of our study group.

Through these measurements with psycho-physiological parameters the current system of condition on strain and stress can be restored "unfiltered". There is no influence on conscious, respectively pre-conscious levels of evaluations and reflexions. Also, a parasympathetic opposition of regulation would be out of question in case a measurement of the electrodermal activity takes place (BOUCSEIN 1988, 17 ff.; ST?CK 1998, 25ff.).

For the evaluation of our data we took a measure- and analysis method developed by HECHT and BALZER for the interpretation of stress, relaxation and conditions of illnesses. Development of the method of measurement by HECHT and BALZER was in conjunction with their work on the regulation of biological systems based on chronobiological experiences.

Target Objective

This contribution deals with examination results which in particular give information as to whether and how younger school children are able to relax. The evaluation of the variables were based on the measuring of blood pressure in timely intervals under rest conditions (Blood pressure relaxation test) and under a situation of stress influence (Three-Phase-Relaxationtest - DET) A comparison was made.

Formulation of Questions

1. *Question Are children intentionally able to relax during a blood pressure relaxation test?*
2. *Question Are children able to relax in the three-phase-relaxation test under the influence of a stress factor?*
3. *Question Is there a difference in the ability of relaxation under children with and without learning disorders?*

Design of Examination

Study Group

The presentation of these examinations included 19 pupils (female and male) of a primary school, which at the time of measurement were from eight to ten years of age. Eleven boys and eight girls were examined in this study group. Since the beginning of their school-days the children learned in a class of integration with a very high degree of a heterogeneous field of performance. Three children were diagnosed with learning disorders. In the first three years teaching was conducted differentiated by a Two-Teacher-Team to satisfy the level of learning and development of the individual children.

Plan of experiment

The study group was tested under two timely measurement points (3. and 6. scholastic year) and the blood pressure relaxation- and the three-phase-relaxation test was carried out (according to HECHT/BALZER).

The blood pressure relaxation test will be taken five minutes before the three-phase-relaxation test begins. The measurement is taken on the non-dominant hand according to the experiences on the distinct modes of operation of dominant hemispheres (SPRINGER/DEUTSCH 1998). Within ten minutes measurements are taken per minute. During that unit of time the particular test person must relax. The test conductor requests and stimulates through his presence and communicative messages an atmosphere of silence and relaxation. The measurement factors shown in a curve shows whether the test person relaxed (fig. 1).

In figure 1 measurement results show that the selected test person # 15 had in the beginning a blood pressure of 130 mm Hg : 74mm Hg auf 104 mm Hg : 53 mm Hg decreasing, as a result of psycho-physiological relaxation.

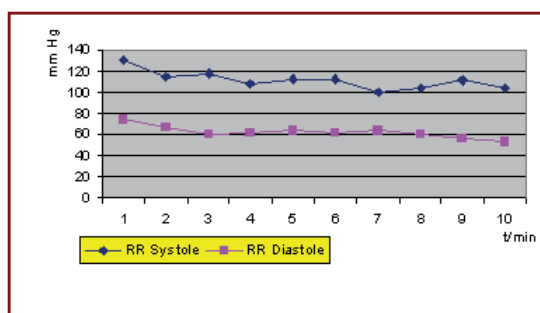


Fig. 1: Measurement results during a blood pressure relaxation test (Vp 15; MP 2)

The inclusion of the skin resistance on the wrist of the non-dominant hand occurs in the three-phase relaxation test over a time interval of 20 minutes (see Fig. 2).

- Phase 1: Relaxation phase - 10 minutes
- Phase 2: Strain with a stress factor (noise) - one minute
- Phase 3: Relaxation phase - 9 minutes

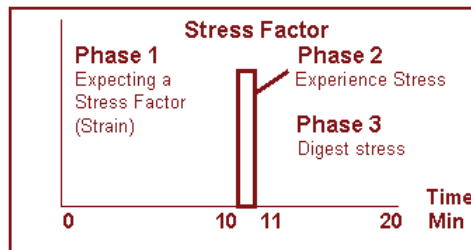


Fig. 2: Three-Phase-Relaxation Test (TRT)

Before the test situation starts the testee will be informed in details how the three-phase-relaxation test functions. The stress factor is a loud noise and will be received over earphones. The volume of sound of the stress factor will be individually set for each testee. The pupils decide which volume of sound is still bearable. Afterwards the testee will be alone in the room.

This test shall demonstrate a daily situation. The testee knows, that he will experience a stress factor within 10 minutes. It must be evaluated how the person is affected by the stress factor before, during and after the test. The appropriate regulation processes will be written down and technically evaluated after the measurement by a mathematical analyses. Particularly interesting is the fact whether the test person can relax in the last phase of the test, consequently after the stress factor was in effect.

Modality of Evaluation

For instance a comparison to the relaxation capability was made during the blood pressure relaxation test. The criterion for the measurement of the relaxation ability deflect medical experiences. The ability for relaxation is given, when the blood pressure between the 1st. and 10th. measurement (subject to the timely rise of Adrenalin) decreases (SCHEDLOWSKI 1996, 584). Subject to the baseline the systolic blood pressure must, about 5 mm Hg (Baseline smaller 100 mm Hg), about 13 mm Hg (Baseline between 100 and 139 mm Hg) respectively by at least 13 mm Hg (Baseline larger 139 mm Hg), decline.

Our results and measurements were carried out under the influence of the developed (HECHT und BALZER (HECHT 2001, 231) modalities of performance and evaluation for the three-phases relaxation test. In this association depending on the stability of the 2nd. and 3rd. phase of test, four types of stress can be classified. The stability results out of numerous changes of periods in the 2nd. and 3rd. phase of test. The more changes, the more instable the regulation. Afterwards the Controller (BH), the Manager (BW) the Compensator (KP) and Non-Manager (NBW) will be differentiated (comp.Fig. 3)

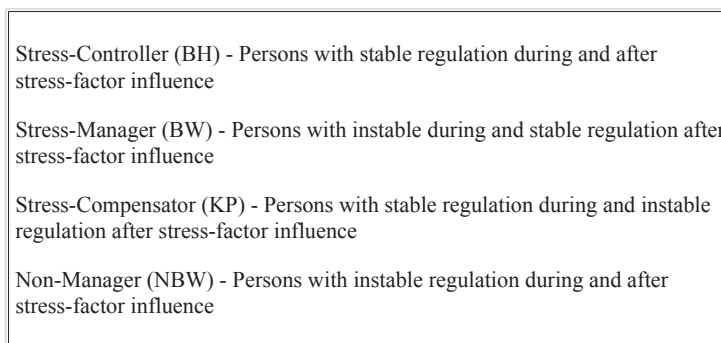


Fig. 3: Standard Types after Three-Phases-Relaxation Test

After the display on energy of regulations, which points out the particular dominance shorter (s) and longer (l) periods in separate phases of tests a further differentiation will be shown on the types of standards as described in the "Berlin Stress-Scale" (BSS) (see Chart 1). Short and long periods will be seen in connection with different energy consumptions. The dominance of short periods is connected with high consumption of energy and refers to activation, excitation and tension. When longer periods are measured during and after the stress-factor, is the proband in a deactivated, relaxed condition and will therefore be able to handle quite well the alleged test situation. If periods are listed - 2nd. phase short and 3rd. phase long - is the testee during the stress-factor not able to relax but after the influence of the stress-factor. This is the basis for a check against one another of the "Berlin Stress-Scale". From step 1 to step 16 the ability in relation to and overcoming stress decreases.

Quality Steps of Self - Regulation	Step	Type	Dominant Periods of 2nd. and 3rd. Testphase
Very good	1	BH	long, long
	2	BH	short, long
Good	3	BW	long, long
	4	BH	long, short
Still good	5	BW	short, long
	6	KP	long, long
Moderate	7	BH	short, short
	8	BW	long, short
	9	KP	short, long
	10	NBW	long, long
Unsatisfactory	11	BW	short, short
	12	KP	long, short
	13	NBW	short, long
Insufficient	14	KP	short, short
	15	NBW	long, short
	16	NBW	short, short

Chart 1: "Berlin Stress-Scale" (BSS) by HECHT (2001, 231)

In figure 4 the steps of the Berlin Stress-Scale will be grouped and evaluated by quality, which makes the interpretation of the results more understandable.

BSS - Step 1 to 5 Excellent to good	Very good to good self regulation (stable, with little consumption of energy) - means: - high psycho-physical condition - positive evaluation of stress - small individual strain
BSS - Step 6 to 10 Still good to moderate	Self regulation limited - necessity to mobilize reserves of energy to overcome the test situation - means: - positive evaluation of strain - moderate to strong individual strain

BSS - Step 11 to 16 Unsatisfactory to insufficient	Self regulation partially interrupted or suspended - means: - negative evaluation of strain - high degree of individual strain - overstrained up to collapse of regulation
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Fig 4: Interpretative Estimation on Classification of Berlin Stress-Scale (by Hecht 2001, 232)

Results

Blood pressure relaxation test (BET)

In our trial group there were 68,4% of the children who could relax in the 1st. and 2nd. test phase. 10,6% of the children during the first test were not able to relax, but were able to do it in the second test. By 15,8% of the children worsened the ability to relax from the first to the second test. In both tests there were 5,3% without relaxation. Two of three children with learning disorders were not able to relax during both tests. The ability for relaxation worsened by one child (see chart 2).

Proband	BET 1998	BET 2001
1	+	+
2	-	+
3	+	-
4	-	-
5	+	+
6	-	+
7 (learning disorders)	+	+
8	+	+
9	+	-
10	-	+
11 (learning disorders)	+	+
12	-	-
13	+	+
14	+	+
15	+	+
16	-	-
17	+	+

18 (learning disorders)	+	-
19	+	+

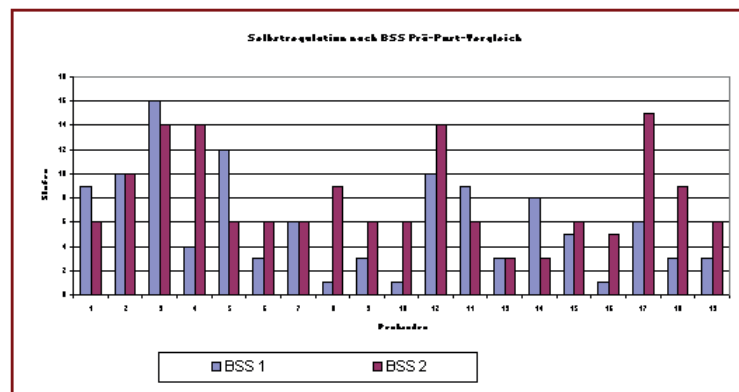
Chart 2: Relaxation ability during a BET - see 1st. and 2nd. Test
(+ = YES; - = NO)

Three Phases Relaxation Test

The assessment of the Berlin Stress-Scale shows that the self regulation of our probands during the three-phases relaxation tests worsened from the 1st. to the 2nd. measurement. At the 1st. time of measurement there were nine without learning- and one child with learning disorders, who had very good to good results in their self regulation, but in the 2nd. test there were only three of the children without learning- and no child with learning disorders.

On the steps 6 to 10 in the area of still good to moderate were under the 1st. point of measurement five and under 2nd. point of measurement eleven non handicapped and two handicapped pupils. In the area of unsatisfactory to insufficient regulations were under the 1st. and 2nd. point of measurement respectively two non handicapped and one handicapped child (see graph 1).

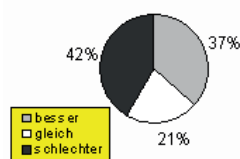
These results enforces our opinion that the children processes for regulation are not stable yet and therefore can be influenced. These are essential potentials for the strategy engagement to overcome stress.



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Graph 1: Self regulation of Three-Phases-Relaxation test - Assessed by BSS

This pie chart illustrates, how many children of the whole testing group improved or changed for the worse under the evaluation of the Three-Phases Relaxation test (Graph 2).



Graph 2: Self regulation by BSS in Pre-Post-Comparison

Summary of Discussion

Based on the results and our formulation of questions in this survey the following can be said:

During the blood pressure relaxation test (Formulation of Question 1) - in a communicative situation - were pupils extremely well in the position to relax. 68,4% of them are able in both points of measurement had a good relaxation for the 10 minutes under a conscious influence.

By summarizing the results of question 2 - digesting a stress-factor during a test phase it shows, that in the 1st. test three and in the 2nd. test four children had an unsatisfactory respectively an insufficient self regulation. That means the self regulation is partially interrupted.

This signifies a negative evaluation of strain and the necessity to mobilize reserves of energy to overcome the test situation. 70% of the children can handle the stress from good to moderate not only in the pre- but also in the post test situation with positive reactions to strain. Their psycho-physical requirements are sufficient with still good to moderate use of the test situation. They evaluate the situation as positive and mobilize their reserves of energy to handle the situation. Their vegetative-emotional system is under moderate to strong individual strain (see fig. 4). This is a normal reaction of the organism during test- and stress situations. Harmful to health would be, if the person is often under strain and no strategies are given for this situation.

In addition it was observed, that the abilities to overcome a stress situation from the 1st. to the 2nd. point of measurement worsened by 40% of the probands. Instead 37% of the children improved (see graph 2).

In one respect it shows, that children are not stable yet in the processes of regulation but on the other hand can learn the strategies to overcome stress.

Comparing the results of both measurement procedures then it can be observed, they are basically in agreement. That means that children during blood pressure relaxation tests concentrating for relaxation have good to moderate abilities for self regulation under stress conditions (DET).

In answering the 3rd. question a comparison is made between three pupils with learning disorders and 16 intellectually normal developed children. According to the evaluation results of the children with learning disorders no significant differences to their classmates were noted in their ability to handle situations of strain.

In conclusion to our survey we like to emphasize, that the ability for relaxation is a biological pattern of reaction and belongs without doubt to the most favourable self regulations of mankind.

Well functioned processes of regulation are also the foundation for health and efficiency. The results of our research project can in no way be taken as a generalization but we conclude responsible with the thesis: Children and juveniles of the passing 20th. century and the begin of the 21st. century are standing increasingly under the danger to lose their natural ability for relaxation, peace of mind and relaxed moods. It is the responsibility of the school to realize these circumstances, in order to initiate as soon as possible recorded and altered processes for life and knowledge.

Consequences, which can be derived from:

- Observation criteria and measurement procedures for pedagogues must be developed to realize early symptoms of inadequate strain.
- To avoid overstrain and non-performance it would be necessary to find strong attention for the individual pupils in their initial position.
- It should be observed that the form of teaching during the lessons and breaktimes of all age-groups have a rhythmic change of activation and silence, respectively strain and relaxation.
- Individual-differentiated one-sided work at school under the aspect of performance can not be substantiated. The pupils need to be challenged and should be encouraged according to their possibilities and in association with strain.
- All participants responsible for the processes of development and education of our children and juveniles should be instructed in detail to this problem.

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