Examination of acute effects of QRS magnetic field mats on the recovery of patients on a health cure after physical stress.
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Introduction:

The measurements described below were achieved in a double blind trial and were based on two premises:
1. A single exposure on a matlike magnetic field applicator cannot improve the general well being of the healthy average person in a relaxed state.
2. Therefore volunteers chosen from the guests of a health spa were physically stressed before exposure to the magnetic mat, in order to determine possible differences concerning the speed and type of recovery while lying down, which takes place under placebo as well as active conditions.

All trial participants were evaluated, firstly 3 minutes after doing a short stint of sport (stress situation) and secondly after recovery while lying down on an active or inactive mat (recovery situation).

Materials and methods:

1. Test method:
CSA test (clinical stress assessment)

The measuring technique used is the so-called CSA test (clinical stress assessment). Due to specific metabolic changes in the energy balance, which all can be defined as catecholamine effects (that is changes in the acid-base-balance, electrolyte balance, as well as in the carbohydrate metabolism), the objective of the test is to infer the immediate, as well as the preceding stress condition after short stress. The CSA test is based on the fact that the distribution and effectiveness of the catecholamines is not subject to a negative feedback system, but shows an additive reaction.[1,2]

The reaction to a "stress situation" (physical stress) therefore does not only show the immediate, but also the intensity of a possible preceding stress, as such stresses add up.[3,4] This means that people who are already stressed will react differently to further strain than unstressed people, because the preceding stress condition influences the renewed stress situation.[5] For the recovery situations of course the opposite applies.

The provocation of an organism is a measure of its sensitivity. If even slight stress causes a high sensitivity one can expect more stress to cause overtaxing. For quantification of sensitivity the stress hormone level in the blood is less important than the reaction of various organ systems to the provocation. For example the measurement of blood gas concentration before and after a standard provocation includes the reaction of heart and lungs, as well as the muscles in its evaluation.[6]

The test used here evaluates the catecholaminee effects on the metabolism, because it is known that catecholamines have a great influence on the carbohydrate, as well as the electrolyte metabolism, the breathing frequency, the pulse frequency etc., the measurement of the hormones themselves is however very time consuming and expensive. These effects form a certain catecholamine-induced pattern, which shows the stress or the maximum resilience, as well as preceding stress of individuals or the group. Through determination of the catecholamine effects it is also in a certain way possible to distinguish between psychological and physical stress.

The influence of catecholamines on the metabolism therefore allows some conclusions on the activity, the condition and the maximum resilience. This method is a test of reserve, which means that the body's reserve due to imposed stress (stress situation), is to be broken down, in order to evaluate the physical condition of the individual trial participants. With the help of this test day to day or unusual psychological and/or physical stress can be discerned, but of course also, as is the case here, AFTER stress took place to measure quantitatively the RECOVERY.[7,8,9,10]

Literature:
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9 Temmel W., Heidinger D., Kogler A., Porta S. Serum-magnesium-status and blood gas changes as a differential diagnosis between psychological and physical stress. Presented at the 21. Magnesium symposium of the society for magnesium research. Klinikum Fulda, 17.-18.9.1999

2. Measuring instruments

For determination of blood gas- and blood electrolyte values the equipment of the NOVA Company were used. (NOVAPHOX and NOVA electrolyte analyzer 8).

3. Course of the trial

200 ul capillary blood from the fingerpad was taken from 37 voluntary, older trial participants (43-65 years old) after slight physical stress (20 slow kneebends individually carried out), the following parameters were determined: blood gases (pH, HCO_3, pO_2, O_2-sat., BE, PCO2), blood electrolytes (sodium, calcium, magnesium, potassium), as well as blood glucose and lactate.

Immediately afterwards the trial participants were treated with the QRS system. This consists of a control device activated by a chip card, which produces in accordance with an e-function increasing rectangular impulses with pauses in between in the patented full body coil mat (ca. 180x80x2cm). The trial participants were randomly assigned, depending on appliance availability, to the placebo system QRS 101 (11 male, 8 female trial participants) or the active system QRS 301 (7 male, 11 female trial participants). Theduration of the trial was scheduled for 30 minutes, where in the case of the active system the program Basis/Vital/Relaxation on level 2 (medium flow via applicator 3,4 uT) was applied only for the first 16 minutes, while during the following 14 minutes the trial participants recovered lying down without the magnetic field. The mats were lying on aligned folding beds at a distance of about 80 cm.
At the end of the treatment phase capillary blood was taken again from the trial participants, where the same parameters were determined as before. The obtained values were entered into an access-databank and via an MS Excel mask the average values, the SEM values of the group, as well as significance tests and the correlation among them were automatically calculated.

4. Evaluation

After testing all data of both groups for normal distribution with the Kolmogorov-Smirnov-tests and ensuing Lilliefors correction, the exceeding probability of the differences of the normally distributed

parameters with t-tests for independent or dependent sample surveys were calculated, in the cases of abnormally distributed parameters the Mann-Whitney-U-test or the Wilcoxon-test for pair differences were used. Linear correlations between measurement parameters were used wherever it was necessary for better understanding.

Results and discussion

Fig. 1:
Graphic illustration of the trial's average values (+/- SEM) of all ascertained parameters.

Fig. 2:
Graphic illustration of the trial's median values of all ascertained parameters.

In both illustrations the first two columns (blue) show the placebo group (light blue after initial stress, dark blue after recovery on the mat), the two red columns (light red after initial stress, dark red after recovery on the mat) show the reaction of the active group.
In cases where there was abnormal distribution the median values were used for graphic illustration and significance calculations. In cases of normal distribution they coincide to a large degree with the average values.

QRS magnetic field mats
Examinations, distributions and significances

					Plac E : Active E	Active B:: Active E	Plac B : Plac E	Plac B : Active B
	Placebo B	Placebo E	Active B	Active E	"End"	Active course	Placebo course	"Beginning"
pH								
PCO2								
BE Base Excess								
HCO3								
PO2								
02 saturation								
sodium								
calcium								
magnesium								
lactate								
blood glucose								
potassium								
					active higher to B	increase compared to B decrease compared to B	increase compared to B decrease compared	

Table1:
Summarized illustration of distributions and significances

Legend:

B….beginning (before recovery)
E…..end (after recovery)
Course… quantity of the difference between beginning and end (triangle symbol)
n…. normally distributed
nn….. abnormally distributed
ns: p>10%
t: p<10%
+: p<5%
++: p<1%
+++: p<0,1%

Placebo reactions:

Starting point for both groups (after stress): increased lactate, decreased pCO2, normal pH, decreased HC)#, slightly increased oxygen saturation, calcium, magnesium normal, sodium slightly increased and base excess in both cases slightly decreased.
The normal pH and the decreased HC)# especially indicate an overcompensation after stress under the described conditions. Such a reaction mostly happens in cases of psychological or moderate physical stress. Therefore the trial participants were not excessively challenged.
There were no significant differences between the results of the first measurements of placebo and active, which makes the comparability much easier (see table 1).
The changes of values in the course of the recovery after stress in the placebo group are given for better understanding of the results.
The increased lactate values after stress were reduced, which does not show significantly in the buffer systems (BE, pCO2, HCO3).
The blood pH level however increases highly significantly, but the oxygen partial pressure (pO2) and the oxygen saturation (O2-sat) decrease highly significantly or are trending downwards.
Ionized magnesium and calcium are decreasing in the serum. Here it has to be taken into consideration that these are average values. As some groups are abnormally distributed, the median reaction was considered as well. In comparison to the average values there is a slight decrease of pCO2. In comparison to the median values a striking difference is an increase of BE in the median values.

Active reactions:
The decrease of lactate (triangle symbol) as a consequence of recovery is significant in the active group, as well as in the placebo group (p=0,13% or 0,0004%).
Following this, the absolute values of BE at the end of the trial are not significantly different, but the *triangle symbol* BE values of the active group^{++}, as well as of the placebo group^{+} are (see significance table).
The increase of the blood pH is highly significant in both cases too.
However in neither case were there significant changes in the partial pressure of carbon dioxide (pCO2), but the probability for error in the bicarbonate buffer increase in the active cases is only 5%, the placebo cases are a long way from that.
The increase of the blood pH and the minor reaction of pCO2 can indicate a drop of free fatty acids in the recovery phase, which is then more pronounced in the active group (HCO3 increase) than in the placebo group.

The drop of the oxygen partial pressure due to recovery is in both cases highly significant; the also occurring drop of the oxygen saturation however was statistically covered only in the active group.
The reaction of the oxygen in the blood to recovery is also more pronounced than the one of CO2. The determined persisting catecholamine effect of Ca reaction probably limits a further increase of pCO2.

In both cases a significant decrease of Na impresses where electrolytes are concerned, this effect is statistically more pronounced in the active group. The highly significant decrease of Ca in the placebo group is most likely due to a continuous, catecholamine-conditioned Ca-infusion into the tissue. It is noticeable that this reaction does not occur in the active group Also the – certainly still due to stress – decrease of magnesium is not significant in the active group, but highly significant in the placebo group. The fact that the lactate values after recovery in both groups correlate significantly and linearly with HCO3 and pCO2 also indicates a still existing sympathetic nerve influence.
Due to the short stress no significant amount of magnesium can, after the ATP – ADP – reaction in the muscles, flow back into the blood, the magnesium clearance due to stress has priority in the end result.

In summary it shows that in both cases (placebo and active) a distinct recovery can be measured, but in both cases a measurable sympathetic nerve influence due to and lingering from the preceding stress can be determined.
However – in comparison to the placebo group – the almost significant increase of HCO3, the non-existent Ca and Mg decrease in the active group, as well as the significant normalization of oxygen saturation indicates a distinctly faster recovery of the group that was treated with the QRS system.

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