# Study on the Change in Skin Resistance of a Person exposed to Stress with and without the Use of the QLink pendant

## 1. Introduction

The study, the results of which are presented herein, was carried out by Dr. Reye at Denver, Colorado. The purpose of the study was to determine to what extent the use of the QLink pendant has an impact on changes in skin resistance, which can be observed during stress. The experiment was carried out as a pilot study in order to obtain first evidence on the effectiveness of the QLink pendant.

## 2. Material and Methods

A total of 24 adults (10 males and 14 females) were tested, two of which had to be excluded from the evaluation because of incomplete data. Three test groups were formed:
Group A: 13 persons, 3 test conditions: baseline measurement, exposure to an electric facial muscle stimulator as stress condition with and without the use of the QLink pendant.
Group B: 5 persons, 3 test conditions: baseline measurement, exposure to an electric hair-dryer as stress condition with and without the use of the QLink pendant.
Group C: 4 persons, 2 test conditions: baseline measurement and the QLink pendant without stress condition
Both devices the facial muscles stimulator and the hair-dryer were switched on and placed in the lap of the test person. The QLink pendant had not been worn for more than two minutes before the person was exposed to the stress. The skin resistance was measured by means of a Computronix Acupro II, model Z-41. Each series of measurements included 40 defined points on the skin (20 points on the right side of the body and 20 points on the left side of the body). These defined points are acupuncture points and correspond to the testing points along the acupuncture meridians. The device measures skin resistance by introduction of a voltage of 1.25 volt and measuring the current. The device scales the skin resistance in terms of conductivity. The scale goes from 0 to 100. Values below 50 are considered a sign of "congestion", whereas values above 55 are considered a sign of an "inflamed" condition.. Values between 50 to 55 are considered balanced. This scale is essentially a logarithmic one rescaled to give values between 0 and 100. The measurement range is 0.5 µmho/cm² to 200 µmho/cm².
Prior to the analysis of the experiment the distribution function with regard to skin resistance was inspected. As values may vary between 0 and 100, strictly speaking it is impossible that the rescaled values show a normal distribution (this distribution varies indefinitely to both ends of the scale). Nevertheless it was possible to approximate the empirical distributions with regard to each measuring point fairly well by means of the normal distribution. There was no significant deviation in any of the cases (Kolmogorov-Smirnov test). Thus, the test results are well represented by the mean values and standard deviations. For each of the three test groups and the respective test conditions the profiles of mean values with standard errors (SEM Standard Error of Mean) were determined with regard to all 40 test points.
For statistical evaluation of the differences between the various test conditions the measured results achieved for the 40 points were categorised as follows: values below 40

(~5.5µmho/cm²), values ranging from 40 to below 50 (~10µmho/cm²), values ranging from 50 to below 55 (~14µmho/cm²), values ranging from 55 to below 65 (~26µmho/cm² and values of 65 and above. For each person and test condition the number of test points (of 40) within these 5 categories was determined. Due to the fixed number of test points, four of these frequencies are sufficient for characterisation. With regard to groups A and A plus B these results were analysed by means of a multivariate analysis of variance followed by Tukey's HSD tests with respect to the differences between the individual test conditions. Because of the small number of cases in groups B and C the results of these two groups were analysed separately for the four categories by means of univariate analyses of variance.

## 3. Results

Figures 1 to 3 show the profiles of means for groups A to C and the three test conditions. Figure 4 shows the profiles of means for groups A and B taken together.
Most test points showed a change in the galvanic skin response (conductivity of the skin) as compared to the baseline measurement when exposed to the electric device.
This was true for both groups exposed (A: with facial muscle stimulator; B: with hair-dryer). If the QLink pendant is worn at the same time, this leads to a reduction of conductivity in the direction to the balanced range.

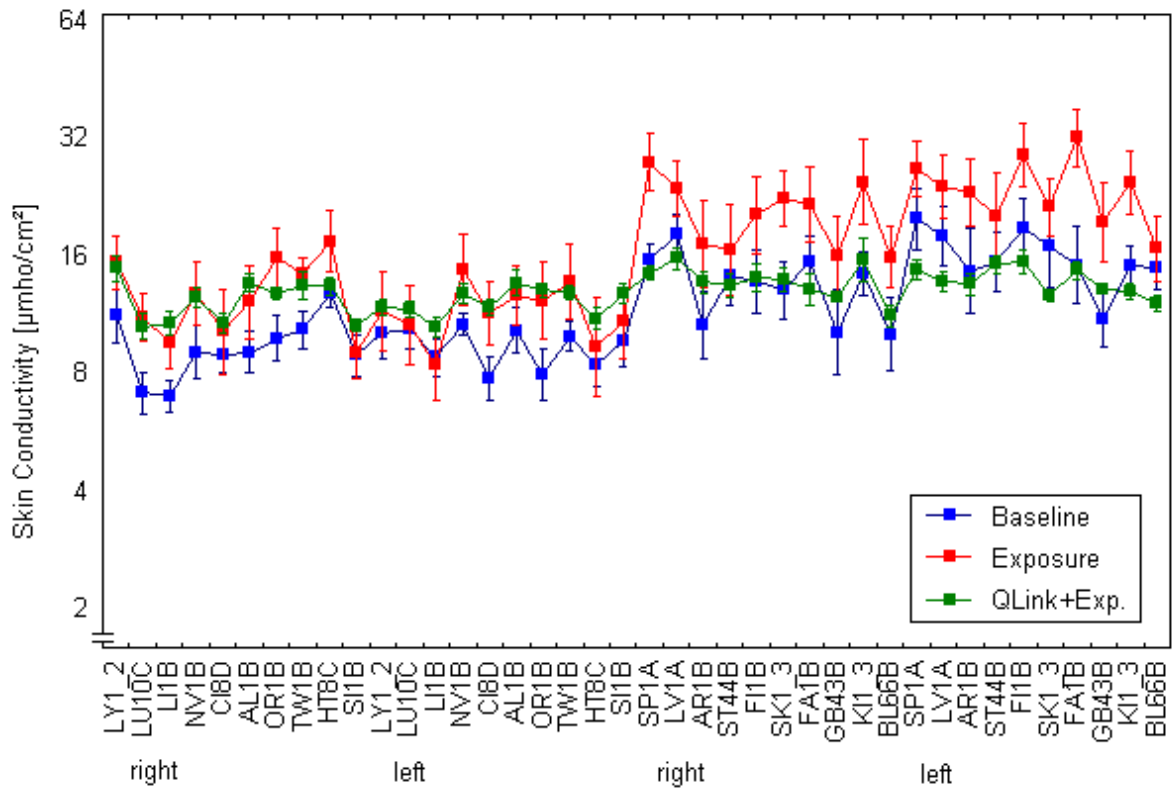


**Fig. 1: Means (+/- SEM) of group A (exposed to a facial muscle stimulator) for all test points** **Abb. 1** Geometrische Mittelwerte (±SEM) der Hautleitfähigkeit der Gruppe A (Exposition: Gesichtsmuskelstimulator) für alle Messpunkte und Versuchsbedingungen.

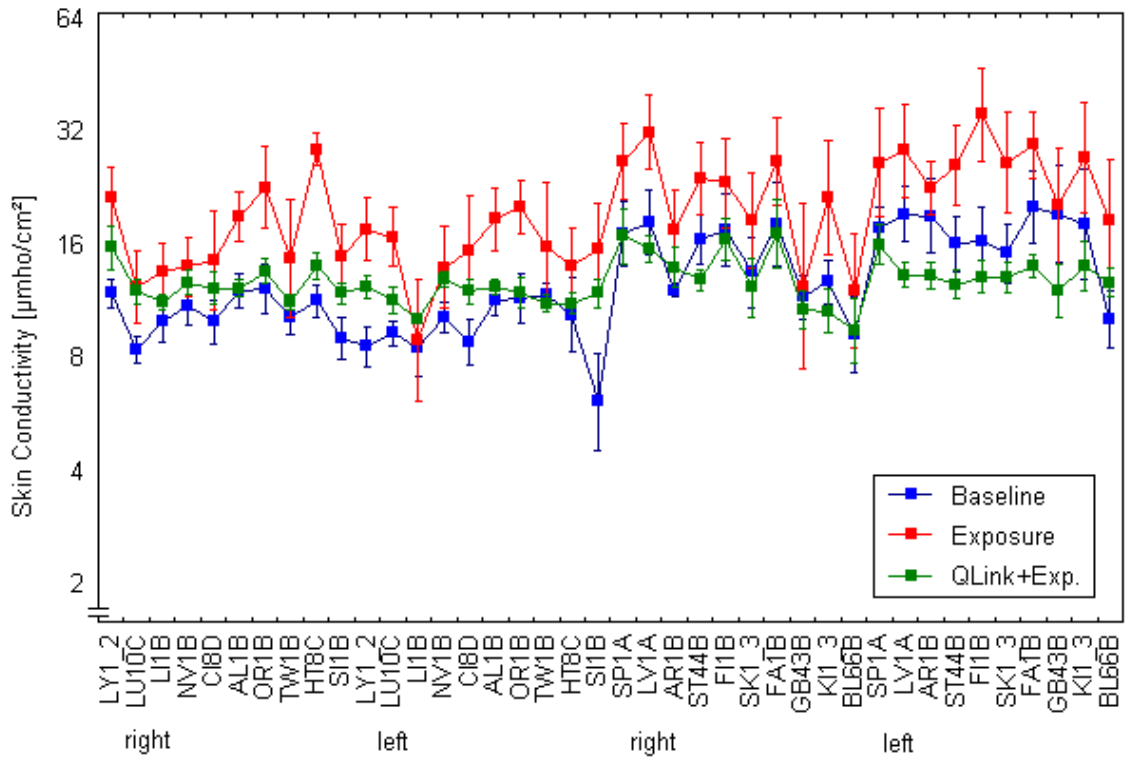


**Fig. 2:** Means (+/- SEM) of group B (exposed to hair-dryer) for all test points and test conditions.

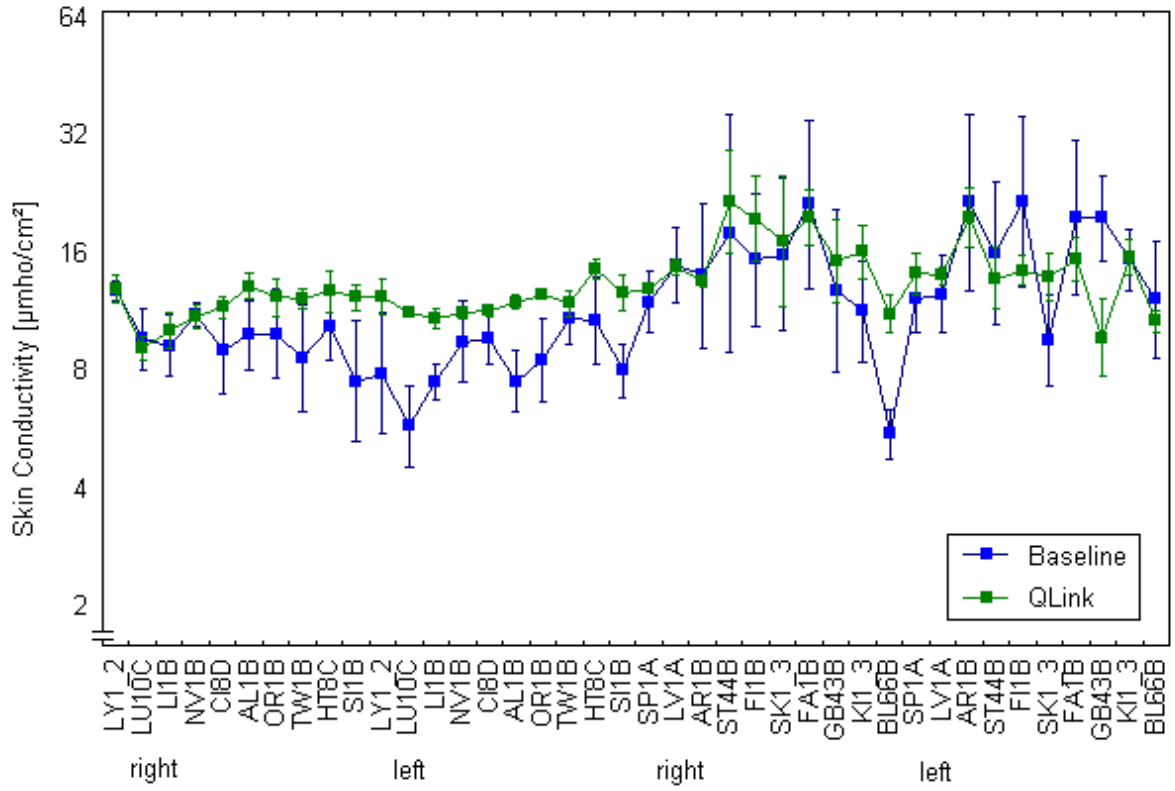


**Fig. 3:** Means (+/- SEM) of group C (no exposure) for all test points and test conditions.

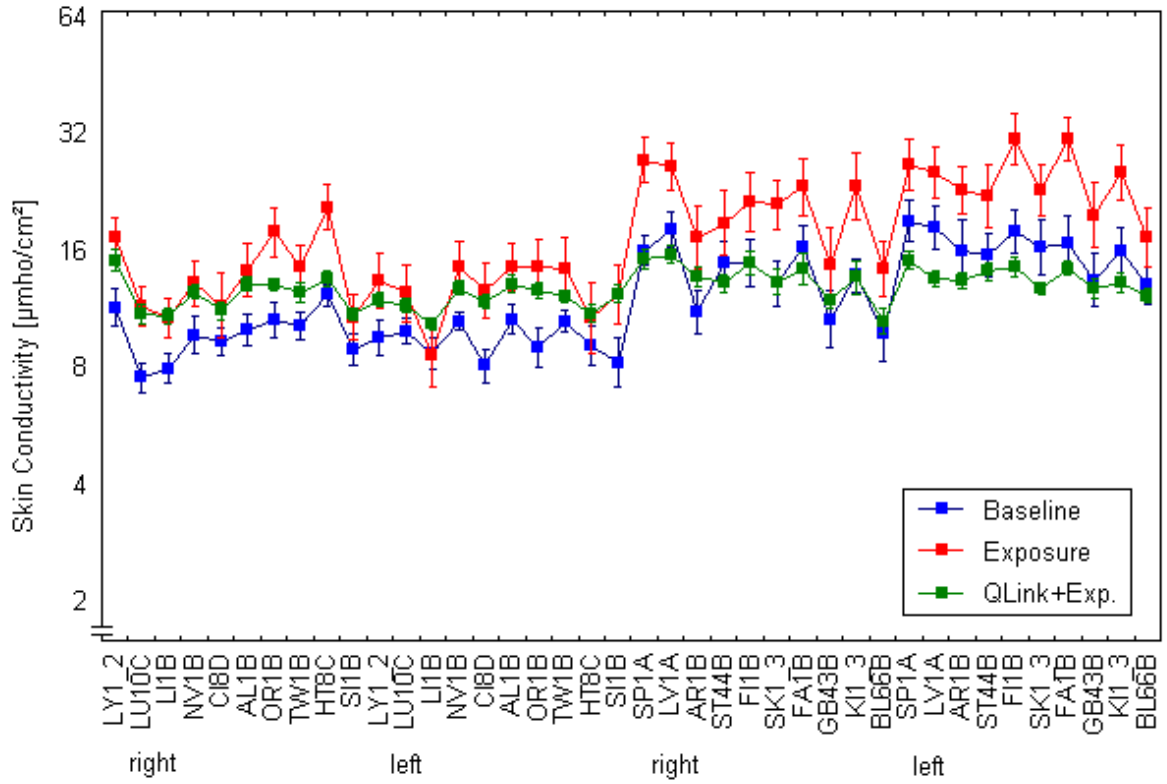


**Fig. 4:** Means (+/- SEM) of groups A plus B (all exposures) for all test points and test conditions.

Also group C, which was only tested for the effects of the QLink pendant alone compared to the values of the baseline measurement, showed a balancing effect of the QLink pendant. The low base values were increased and some high values were reduced. Thus, an increased number of values was observed within the optimal “balanced” range. These effects are demonstrated by figures 5 to 7. The figures show the average frequencies of measured values within the different categories.

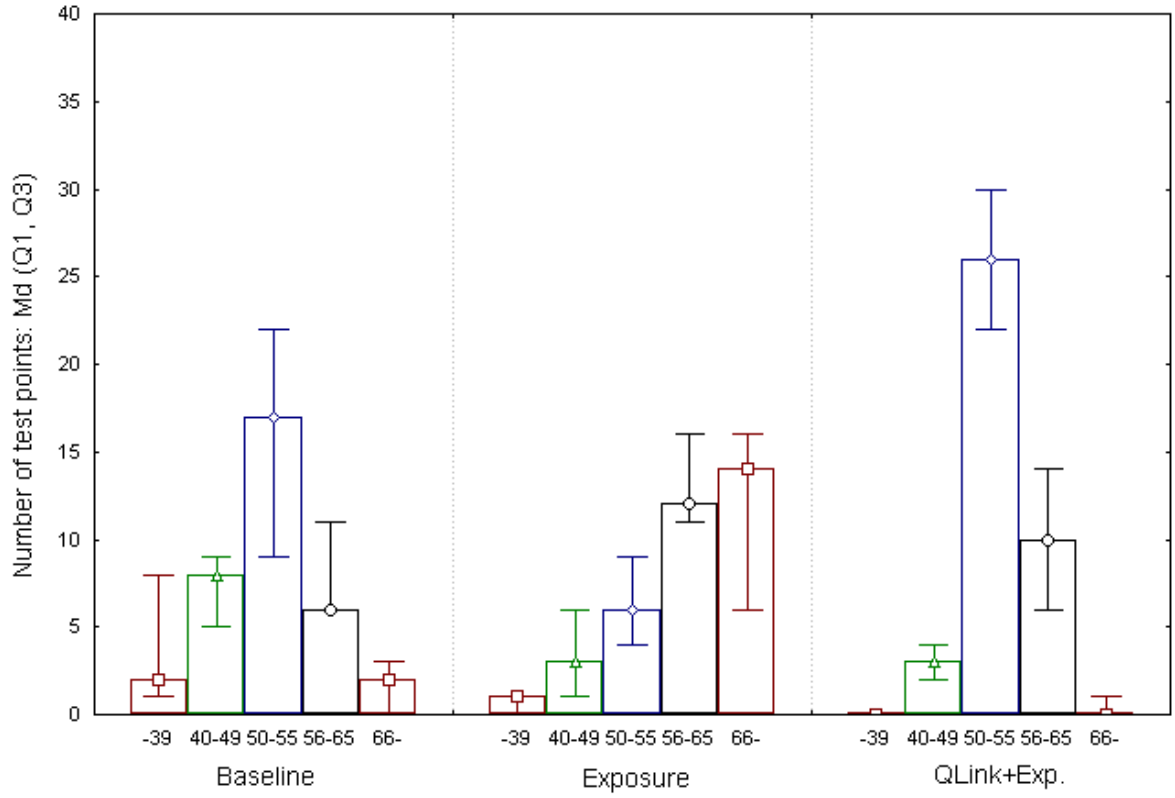


**Fig. 5:** Median (and first as well as third quartile) of the number of measured values (of 40) per person and test condition within the different categories of measured values for group A (exposed to a facial muscle stimulator). Values within category 50 to 55 are considered balanced.

In case of group A a pronounced shift of the distribution towards higher values due to the exposure was noticed. The use of the QLink pendant not only reduces these high values again but even leads to a substantially increased number of values within the optimal range than was observed at the baseline measurement. A statistical comparison of the test conditions showed

Table 1. Results of the multivariate analysis of variance for group A (exposed to a facial muscle stimulator) and univariate tests for the ranges 40 to 49, 50 to 55, 56 to 65 and 65 and above. The difference between the test conditions is analysed. The last column shows the results of Tukey's HSD test, which compares the individual conditions to each other (B=baseline, E=exposure, Q=QLink during exposure)

| variable | testsize | df1/df2 | p-value | post hoc comparison (p<0.05) |
|---|---|---|---|---|
| total | Wilk's 0,04032 | 5/ 8 | 0,0043 | |
| range | F-value | | | |
| 40-49 | 3,85227 | 2/24 | 0,0354 | B-Q |
| 50-55 | 42,83636 | | 0,0000 | B-E B-Q E-Q |
| 56-65 | 2,30075 | | 0,1219 | |
| 66- | 17,82986 | | 0,0000 | B-E E-Q |

Significantly less persons exposed to one of the electronic devices show values between 50 and 55, which are the optimal values. This effect is reversed by the use of the QLink pendant: A significantly higher proportion of measurements reveal balanced values than at the time of the baseline measurement. The frequency of values indicating excitement in case of exposure (values above 55 and, in particular, above 65) was much higher, with regard to the latter category even significantly higher than at the time of the baseline measurement when exposed to an electric device. If the QLink pendant is worn this effect cannot be noticed and the frequency drops to that of the baseline measurement.

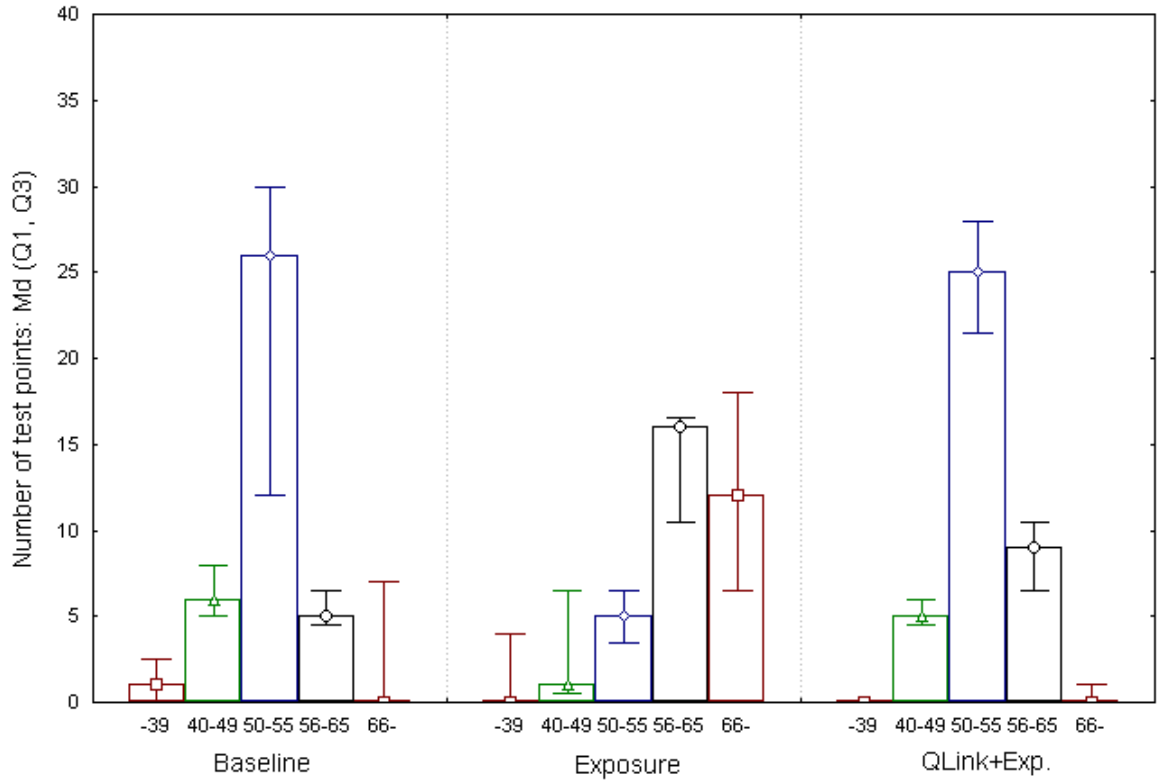


**Fig. 6:** Median (and first as well as third quartile) of the number of measured values (of 40) per person and test condition within the individual categories of measured values for group B (exposed to hair-dryer). Values within category 50 to 55 are considered balanced.

The results of group B exposed to a hair-dryer are very similar to those of group A. Table 2 shows the results of the significance test.

Table 2: results of the univariate analysis of variance for group B (exposed to hair-dryer) for ranges 40 to 49, 50 to 55, 56 to 65 and above 65. The difference between the individual test conditions is tested. The last column shows the results of Tukey's HSD test, which compares the individual conditions (B=baseline, E=exposure, Q=QLink during exposure)Bedingungen einzeln vergleicht (B=Basismessung, E=Exposition, Q=QLink+Exposition)

| variable ranges | testsize F-value | df1/df2 | p-value | post hoc comparison (p≤0.05) | |
|---|---|---|---|---|---|
| 40-49 | 1,90190 | 2/12 | 0,1917 | | |
| 50-55 | 20,86344 | | 0,0001 | B-E | E-Q |
| 56-65 | 4,39670 | | 0,0369 | B-E | |
| 66- | 9,76914 | | 0,0030 | B-E | E-Q |

The reduction in the number of values in the optimal range and the increase in the number of measurements with increased conductivity through stimulation by means of a hair-dryer is reversed by the use of the QLink pendant.

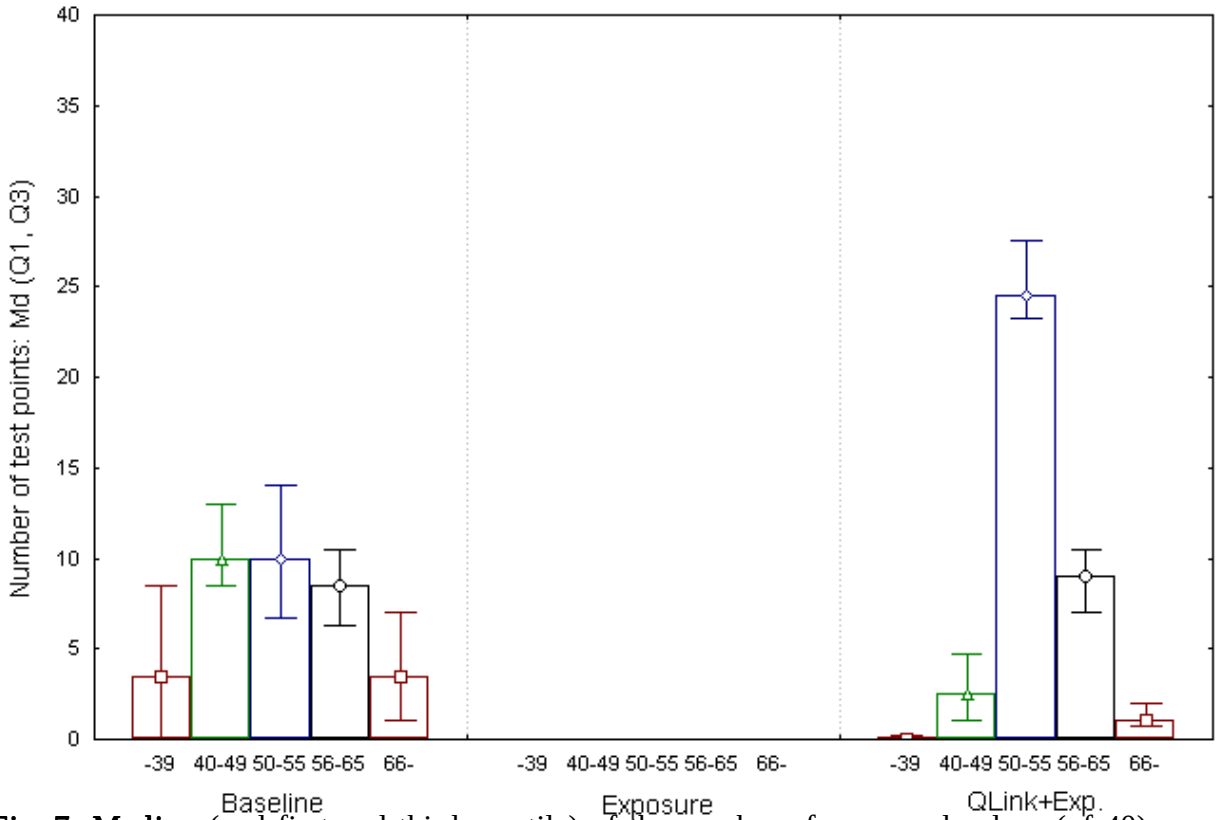


**Fig. 7: Median** (and first and third quartile) of the number of measured values (of 40) per person and test condition within the individual categories of measured values for group C (no exposure). Values within category 50 to 55 are considered balanced.

A comparison of the baseline measurement and the use of the QLink pendant without exposure to an electronic device showed that the use of the QLink pendant increased the number of optimum values. However, as a result of the small number of persons tested only a tendency for these effects can be demonstrated. (see Table 3)

Table 3: results of the univariate analysis of variance for group C (no exposure) for ranges 40 to 49, 50 to 55, 56 to 65 and above 65.
The baseline measurement is compared to the use of the QLink pendant.

| variable ranges | test-size F-value | df1/df2 | p-value |
|---|---|---|---|
| 40-49 | 5,802842 | 1/ 3 | 0,0951 |
| 50-55 | 9,707070 | | 0,0527 |
| 56-65 | 0,014778 | | 0,9109 |
| 66- | 4,373494 | | 0,1276 |

## 4. Summary

The present study was carried out in order to provide a first indication of the effects of the QLink pendant on skin conductivity when exposed to stress caused by various electric devices. The data of 22 persons were analysed. 18 of them were either exposed to a facial muscle stimulator or to a hair-dryer as "source of interference". Four persons were tested only with regard to the effects of the QLink pendant without being exposed to any stress. A baseline measurement at 40 acupuncture points was carried out for each person. In case of the 18 persons exposed to stress caused by an electric device a series of measurements was carried out at the same 40 points with and without the use of the QLink pendant. As this was a pilot study, neither the sequence of the tests was varied nor was the study conducted under single or double blind conditions. This will have to be done in future studies.
The use of the QLink pendant without exposure to stress led to an increase in the number of measurements in the balanced range (scale values 50 to 55). This result, however, was statistically not significant because of the small number of cases (only four persons). In case of exposure to stress caused by an electric device the skin conductivity was increased at almost all test points. This increase results in a significant increase in the number of measurements above the optimal range. The use of the QLink pendant while exposed to stress reduces the number of values which indicate excitement of the respective meridians and increases the number of values within the optimal range.

Ao.Univ.Prof.Dr.Michael Kundi Vienna, 26.12.2000