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Place and date: Ljubljana, February 18, 2021
No.: 14/21

ANALYTICAL REPORT ON TESTING PROTECTIVE INFLUENCE ON HUMAN ORGANISM AGAINST MOBILE PHONE RADIATION

FOR THE PRODUCT

T-Shield

(T-Resonance Technology (T-RT) & eT-RT)

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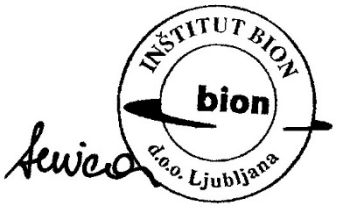

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1 INTRODUCTION

1.1 GENERAL

A fundamental research area at the BION Institute represents measuring the effects/influences of physically as yet undefined and unrecognized (subtle) field(s). Conventional measuring devices cannot measure these fields. However, in the majority of cases, even various unconventional devices, purportedly measuring the subtle field, are not yet capable of measuring this kind of field (influences) reliably enough, although the technology is steadily improving. Mostly, these fields and their effects cannot be explained by commonly accepted theoretical interpretations, even though some scientists have offered possible explanations that span from the quantum vacuum to dark matter.

In more than 20 years of research and testing, the BION Institute developed an alternative path that enables us to use the *human organism* as a reliable detector of such weak or subtle influences. We learned how to express these detections via easily measurable general physiological effects monitored through physiological measurements. Hence, we can reasonably assess the alleged biological influence or non-influence of devices based on a subtle fields' impact. The latter may represent a stimulating factor or a protective shield against supposedly harmful radiation from the environment. If we find the effects of the supposed emission statistically significant, we issue the appropriate certificate.

1.2 SPECIFIC

The company TOGL Technology Sdn Bhd ordered the testing of an alleged protective influence on human organism against different types of harmful non-ionizing radiation for the product T-Shield (Figure 1 and webpage https://yippiweb.com/t-shield/). The customer claims this smartphone application named T-Shield (T-Shield app in short) has a protective influence against radiation during active calling with a smartphone and wanted these claims to be validated. By using methodology grounded on clinical research conditions, we verified the supposed protective influence of the application by exposing volunteers to radiation during active calling with a mobile phone. We monitored various physiological parameters (heart rate, muscle tension, skin conductance, respiration rate, and finger temperature) by physiological measurements.

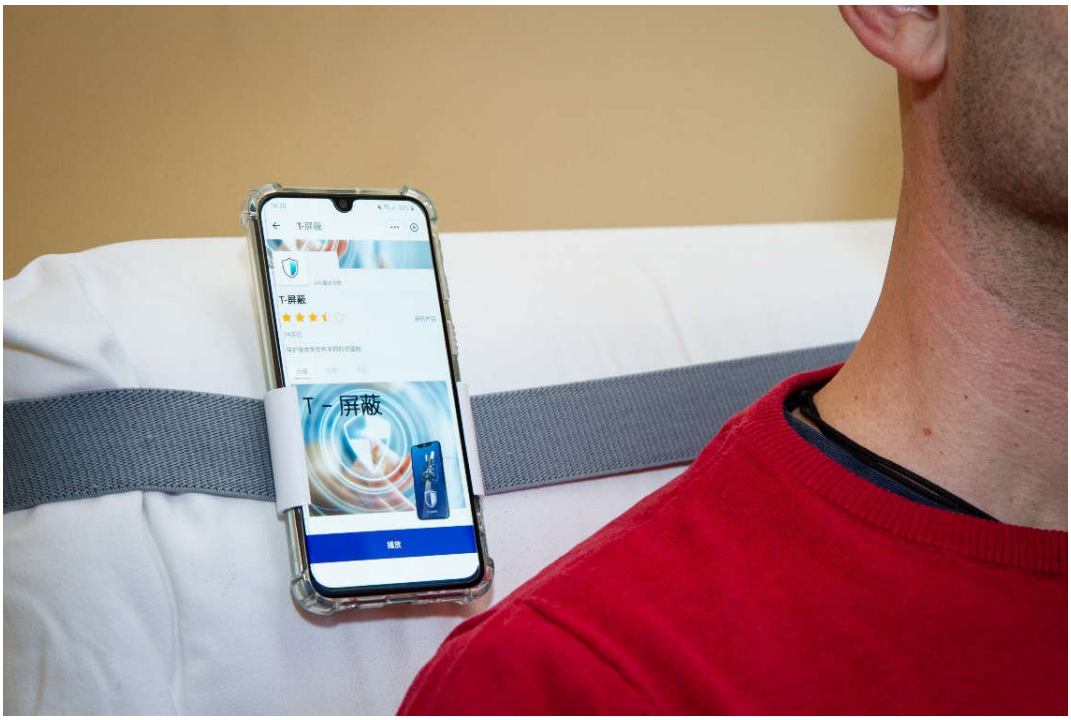

Figure 1: T-Shield application used in testing. (This is a representative picture to see the situation with the smartphone, however, during all measurements the phone was turned towards the chair.)

Figure 2: Test setup during testing the supposed energy influence of the T-Shield app on the human organism. After all the electrodes were attached to a volunteer, he/she sat for 45 minutes while physiological parameters were measured. (This is a representative picture to see the situation with the smartphone, however, during all measurements the phone was turned towards the chair.)

Figure 3: The smartphone is located 10 cm from the volunteer's head and turned towards the chair through the measurement so that the volunteer couldn't see if the app is running or not.

Volunteers were arranged into **two testing situations**. The first situation represented volunteers exposed to the alleged protective influence of the T-Shield app (Figure 1) *running* on the smartphone. The second situation represented volunteers with the T-Shield app *not running* on the smartphone. The smartphone was facing the chair for all the measurements so that volunteers couldn't see if the T-shield app was running or not (Figure 3). A comparison to the control testing situation was used to disclose a protective influence against radiation during active calling with a mobile phone of the T-Shield app on the human organism. We tested each volunteer in both situations, but the volunteers didn't know whether the T-Shield app was running or not.

2 MATERIALS AND METHODS

2.1 TEST DESIGN

The manufacturer's claims were validated by a scientific test including 12 volunteers based on principles of clinical testing. This means that the tests were:

- **prospective** (general criteria for the efficiency of the product's influence were determined in advance);
- **with placebo effect ruled out** (volunteers didn't know whether they were exposed to the product's influence or not);
- **double-blind** (even the test assistant didn't know whether the T-Shield app was running on the smartphone or not);
- **randomized** (the decisions about the order of different situations were made randomly).

We tested the protective influence of the T-Shield app on the physiological parameters of volunteers. Volunteers were subjected to two different experimental situations in random order:

- **T-Shield situation**: the T-Shield application was running on the smartphone.
- **Control situation**: the T-Shield application was not running on the smartphone.

In both situations, the smartphone worked in an identical manner.

Tests were conducted from January 19 to 22 of 2021 at the BION Institute with 12 volunteers aged from 30 to 71 (eight females and four males). Before the tests, we instructed the volunteers not to eat a big meal at least one hour before the test and not to drink coffee, alcohol, or energy drinks at least three hours before the test. We measured the physiological parameters of each person twice on two different days, every time at the same time of the day. This ruled out the effects of other factors as much as possible (e.g., the volunteer could be tired after many hours of work, but is expected to be more or less at the same level of fatigue at the same time of day). Random order of both situations was applied to each volunteer (the principle of randomization). Volunteers sat for 45 minutes in a comfortable wooden chair. During this time heart rate, muscle tension, skin conductance, respiration rate, and finger temperature were measured as presented in Figure 2. An 8 channel Biosignalsplux device was used to measure the aforementioned physiological parameters. The T-Shield app was either turned on or off before starting the measurements. The phone was attached next to the volunteer's head (see Figures 2 and 3). Then the physiological measurements started. After 20 minutes the test assistant called the smartphone with another mobile phone and left it ringing for 5 minutes by redialing as needed. Volunteers were not aware when the calls occurred. After that, the physiological measurements continued for another 20 minutes. The vast majority of volunteers have long-term testing experiences involving various devices and tend to be quite indifferent regarding different testing situations. When measurements started, the test assistant left volunteers alone in the room.

2.2 MEASUREMENT OF PHYSIOLOGICAL PARAMETERS

Measurements of physiological parameters by physiological methods enable us to monitor dynamic responses to any influencing agent working on the human organism in real-time. We measure the following parameters: heart rate, muscle tension, skin conductance, finger temperature, and respiration.

- **Heart rate** (frequency of heartbeat, HR) is calculated from the electrocardiogram (ECG).
- **Muscle tension** (electromyogram, EMG) is measured on the right forearm. The EMG shows us any artifacts that could appear on the ECG due to arm movements.
- **Skin conductance** (SC) is measured on the fingertips of the right hand, where skin conductance varies the most. Skin conductance measurements are part of lie detectors because both, sweating as well as blood flow affect skin conductance and are regulated by the parasympathetic nervous system. The latter is a part of the autonomic nervous system that is not controlled by our consciousness, so we cannot regulate it just by simple intention. In general, skin conductance is higher when a person is under stress (more sweating, higher blood flow), but sometimes the response may be much more complex.
- **Respiration rate** (RR) is calculated from thorax expansion (TE) that is measured with a special extendable elastic belt.
- **Finger temperature** (TEMP) is measured on the tip of the middle finger on the right hand.

3 DATA ANALYSIS

After the measurements, the raw data with the sampling frequency of 1000 samples per second were imported into *Matlab*. Within *Matlab*, the electrocardiogram (ECG) data were analyzed with the Pan-Tompkins algorithm from which the inter-beat interval (IBI) data was obtained. Heart rate was derived from IBI data. Analysis of the thorax expansion data gave us the respiration rate (RR). All data were then resampled to one-second intervals by averaging the inter-second data points. The first five minutes of the measurements were cut to account for the time needed for the volunteer to calm down at the beginning of the measurements. Then a geometric median of all volunteers was calculated for each measured physiological parameter. Three-time groups, each one 10 minutes in length, were selected. The first one represents the time before the call (5 min – 15 min time window), the second one represents the calling time and five minutes after (25 min – 35 min time window) and the third one represents the time after the call (35 min – 45 min time window). Geometric medians were then resampled so that each 10 min time window got represented in 15 steps. Afterward, the data were renormalized to an average of the first five minutes. This means the whole session was divided into three parts and statistically evaluated for every parameter and each part separately. The first part is named **Part A**, the second one **Part B** and the third one **Part C**.

To check for the difference between both test situations we used the Wilcoxon signed-rank test. The results of all statistical tests were corrected with the Holm-Bonferroni correction for multiple comparisons.

4 RESULTS WITH DISCUSSION

An overview of the Wilcoxon signed-rank test results demonstrates that there are statistically significant differences between the two experimental situations for finger temperature parameter (TEMP) in all parts of the measurement. There are statistically significant differences in Part A and Part C of the measurement for the heart rate (HR) parameter. There is a statistically significant difference in Part A of the measurement for the muscle tension (EMG) parameter and a statistically significant difference in Part B of the measurement for the skin conductance (SC) parameter (see Table 1).

Table 1: Summary of Wilcoxon signed-rank test corrected with Holm-Bonferroni correction for multiple comparisons. Values shaded in green represent statistically significant differences between two experimental situations ($p < 0.05$). Marks: HR – heart rate, EMG – muscle tension, SC – skin conductance, RR – respiration rate, and TEMP – finger temperature.

	HR	EMG	SC	RR	TEMP
Part A	0.0137	0.0043	0.1445	1.0000	0.0009
Part B	1.0000	1.0000	0.0009	1.0000	0.0009
Part C	0.0013	1.0000	0.4460	1.0000	0.0008

In the following, we represent bar graphs for each measured parameter, belonging to both situations and all three measurement parts. The height of bars represents normalized averages (to the first five minutes) so that all parameter measurements can be compared.

In Figure 4, the control shows a significant drop in comparison to the T-Shield situation. Two (A and C) parts show statistically significant differences, although in an opposite manner.

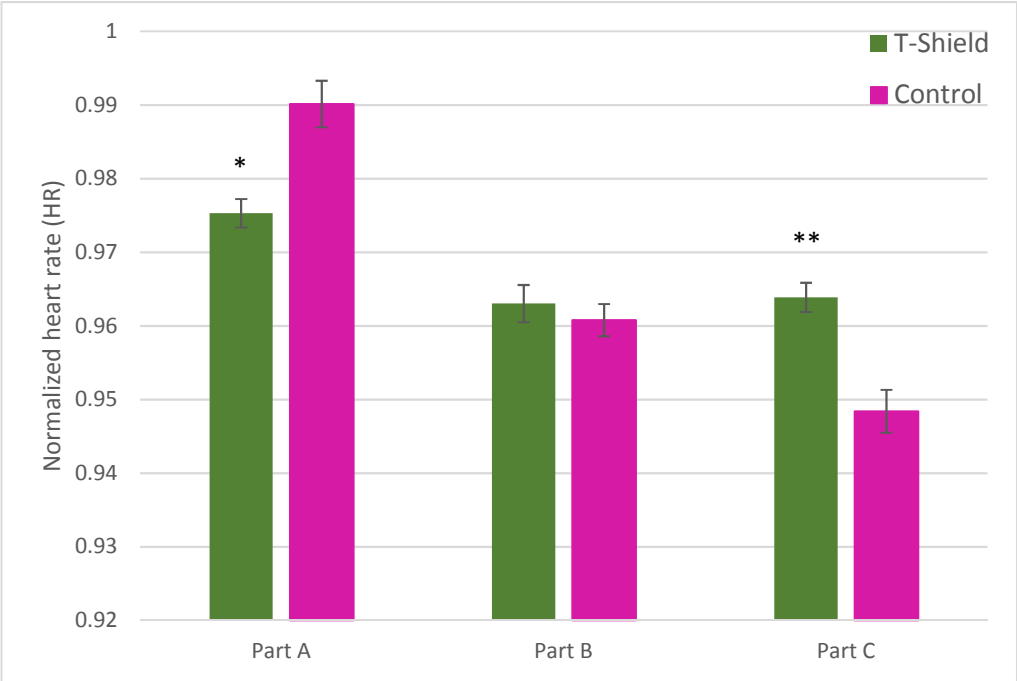

Figure 4: Normalized heart rate (HR) from twelve volunteers during two parts of measurements for two test situations (*T-Shield*: T-Shield app running on the smartphone, *control*: T-Shield app not running on the smartphone). Mean values ± standard error (N = 12) are shown. A single asterisk (*) represents a statistically significant difference between two situations with $p < 0.05$. A double asterisk (**) represents a high statistically significant difference between two situations with $p < 0.01$.

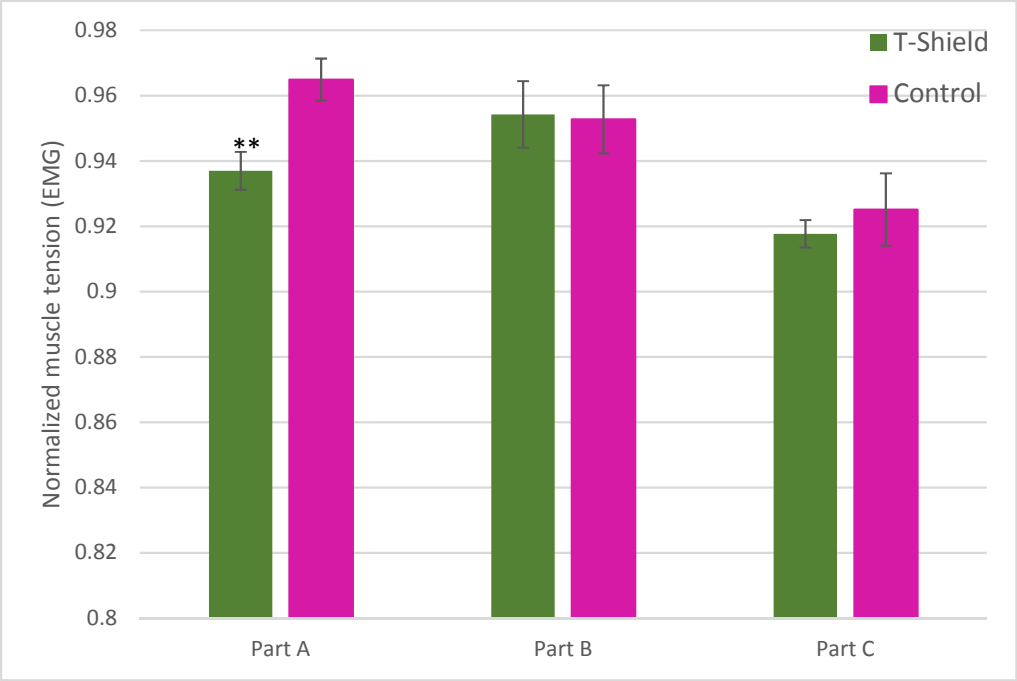

Figure 5: Normalized muscle tension (EMG) from twelve volunteers during two parts of measurements for two test situations (*T-Shield*: T-Shield app running on the smartphone, *control*: T-Shield app not running on the smartphone). Mean values ± standard error (N = 12) are shown. A double asterisk (**) represents a high statistically significant difference between two situations with $p < 0.01$.

In Figure 5, we may see that the muscle tension shows a highly statistically significant difference in Part A. We may interpret it in the sense that with this parameter (somatic), the T-Shield app impact shows itself the most at the beginning of exposure to the smartphone microwave radiation.

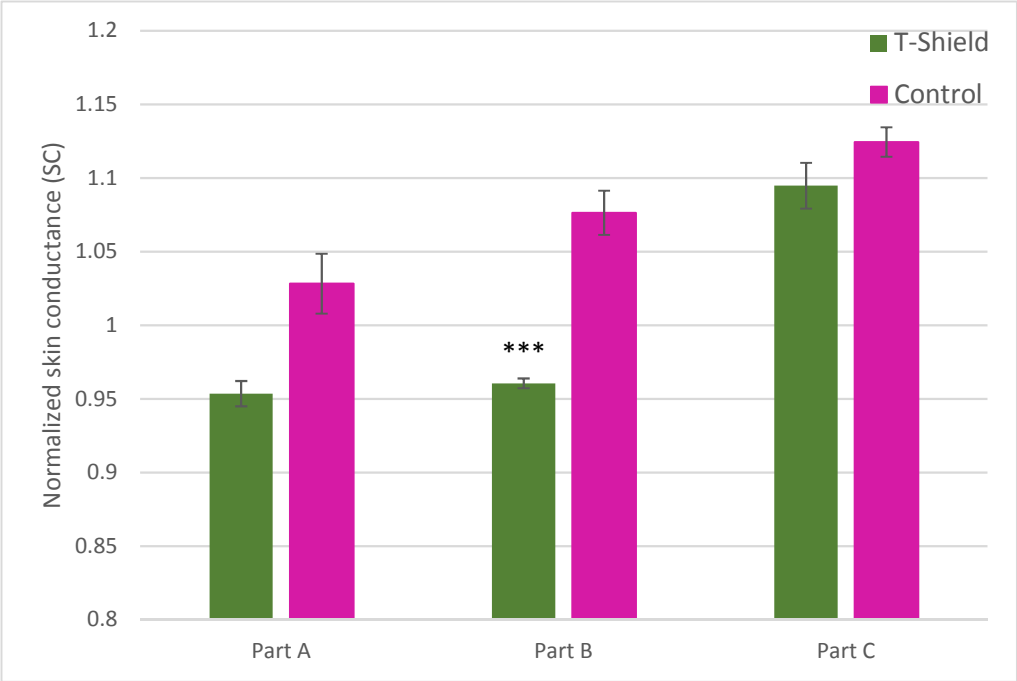

Figure 6: Normalized skin conductance (SC) from twelve volunteers during two parts of measurements for two test situations (*T-Shield*: T-Shield app running on the smartphone, *control*: T-Shield app not running on the smartphone). Mean values ± standard error (N = 12) are shown. A triple asterisk (***) represents a very high statistical significance with $p < 0.001$.

In Figure 6, a high difference (see Cohen's D in Table 2, column SC) in the sense of calming (lesser stress) is revealed in the first two parts; part B shows also a high statistical significance.

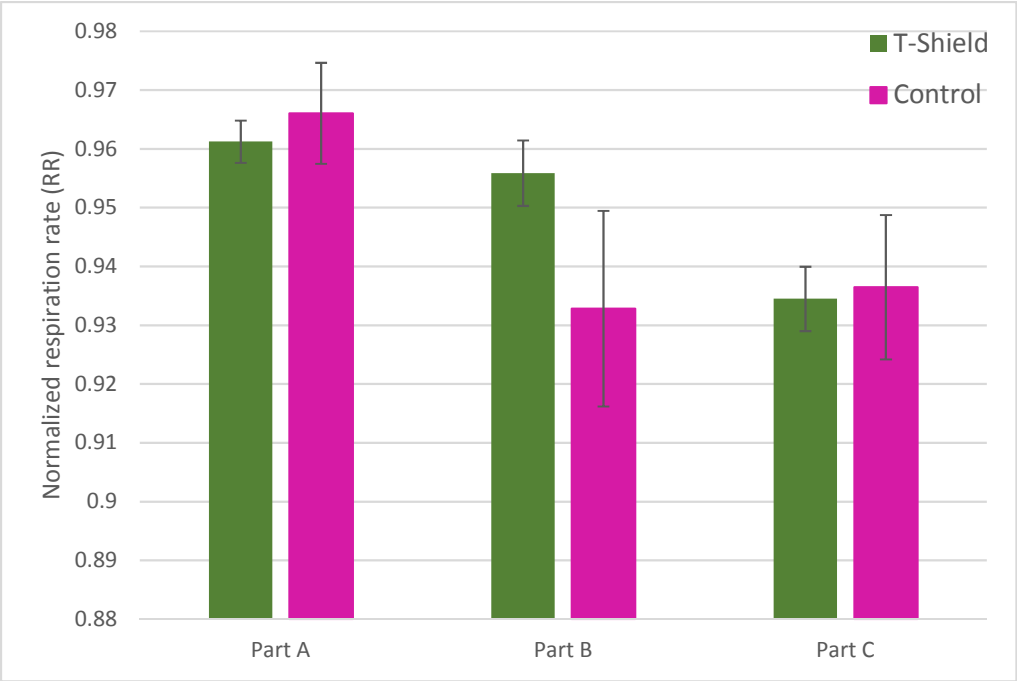

Figure 7: Normalized respiration rate (RR) from twelve volunteers during two parts of measurements for two test situations (*T-Shield*: T-Shield app running on the smartphone, *control*: T-Shield app not running on the smartphone). Mean values ± standard error (N = 12) are shown.

In Figure 7 no significant difference is seen in the respiration rate parameter.

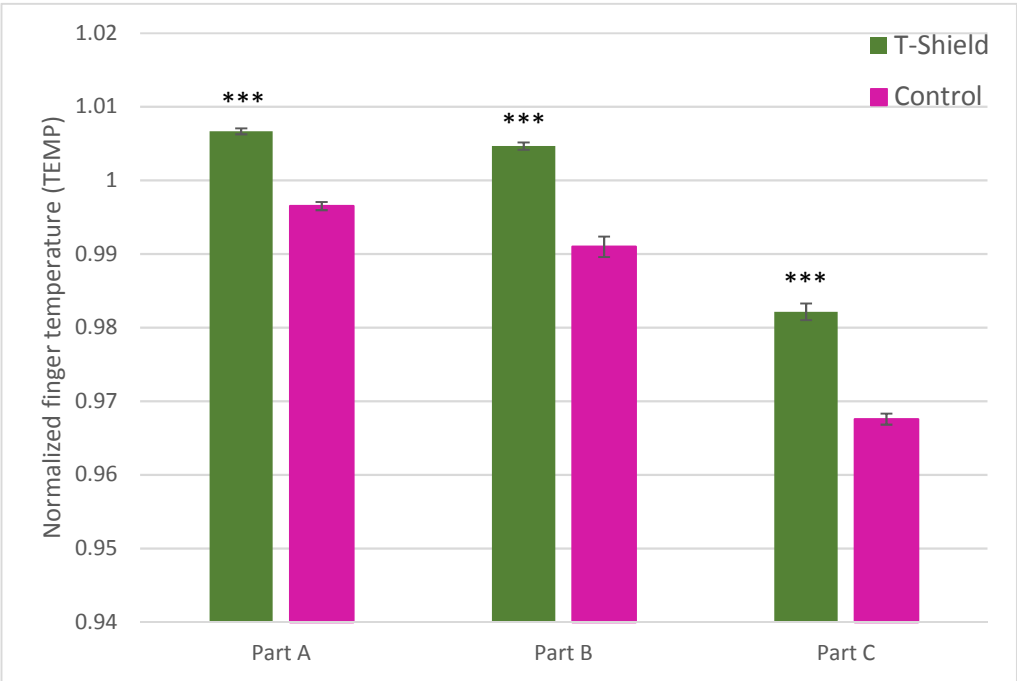

Figure 8: Normalized finger temperature (TEMP) from twelve volunteers during two parts of measurements for two test situations (*T-Shield*: T-Shield app running on the smartphone, *control*: T-Shield app not running on the smartphone). Mean values ± standard error (N = 12) are shown. A triple asterisk (***) represents a very high statistical significance with $p < 0.001$.

In Figure 8, we may observe that the TEMP is significantly higher (see also very high Cohen's D, Table 2, column TEMP) in the exposed situations (vs. control) in all three parts; in all of them, it is also highly statistically significant. Considering a concomitant decrease in SC, the increase in the peripheral temperature indicates a dilation of capillaries, which connotes a more relaxed state.

As already said, besides statistical differences, we also calculated the standardized effect size, which speaks about the magnitude and the sign (direction) of the influence. To calculate the standardized effect size, we used Cohen's D with color-coding for the intensity and the direction of influence. The values are presented in Table 2 below.

Table 2: Overview of Cohen's D effect size on different physiological parameters. Three different comparisons between the two test situations are presented. Negative values (blue color) signify that the first situation decreased the parameter compared to the second situation, while the positive values (red color) signify an increase of the parameter. Values with an underlined black font signify parameters yielding a statistically significant difference between two chosen situations, other values are not statistically significant, at least after the Holm-Bonferroni correction. The intensity of the background color signifies the difference magnitude (an absolute value less than 0.2 indicates a *small difference*, an absolute value between 0.2 and 0.8 indicates a *medium difference*, an absolute value between 0.8 and 2 indicates a *large difference* and an absolute value above 2 indicates a *huge difference*). Marks: HR – heart rate, EMG – muscle tension, SC – skin conductance, RR – respiration rate, and TEMP – finger temperature.

	HR	EMG	SC	RR	TEMP
Part A	**-1.460**	**-1.176**	-1.236	-0.189	**5.402**
Part B	0.245	0.037	**-2.747**	0.480	**3.358**
Part C	**1.602**	-0.229	-0.587	-0.054	**3.958**

Table 3: Effects in parts. The nature of the effect of the exposed situation as compared to the control one. *Red*: a difference in the direction of stimulation, *blue*: a difference in the direction of calming, relaxing, *pale blue*: the same effect, high in standardized effective size but not statistically significant.

	HR	EMG	SC	RR	TEMP
Part A					
Part B					
Part C					

As may be observed from Table 3, all colored parameters except heart rate in Part C point in the direction of an anti-stress, calming effect.

5 CONCLUSION

As seen in various graphs and tables and particularly in Table 3, the overall influence of T-Shield app as monitored by physiological testing demonstrates a significant difference between the two tested situations in the direction of calming (stress-reducing). The effects may be seen in all parts of testing, with the majority in Part A. This may be interpreted as if the T-Shield app exerts its protective influence from the very beginning of the exposure.

From the results, we may also infer that the calling with its higher radiation burden does not invoke a much higher difference; the calming effect is even more prominent before calling. In this sense Part C is somewhat weaker; maybe the organism has already adapted to the new situation.

Based on sufficient statistically significant differences between T-Shield and Control situation, as well as a clear indication of the stress-reducing impact demonstrated in the testing of the protective influence of the product *T-Shield (T-Resonance Technology (T-RT) & eT-RT),* we acknowledge that the product meets all the criteria required to obtain the *Certificate of Protective Influence on Human Organism against mobile phone radiation* No. 0602, which is announced on the webpage: http://bion.si/en/testing-certificates.

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