RESPONSES OF PEOPLE TO THE MOBILE PHONES AND THE INFLUENCE OF THE PROTECTIVE DEVICES

Korotkov K., Ph.D., Prof., Korotkova A., Ph.D., Petrova E.

Saint Petersburg Research Institute of Physical Culture and Sport

Introduction

The problem of the influence of mobile phones radiation to human condition attracts more and more attention. In particular, it was demonstrated by electro-acupuncture analysis that functional state of 80% tested people decreased after 1 minute of using mobile phone [[1]]. In the research work [[2]] it was demonstrated that mobile phone GSM-900 influenced the bio-electric activity of the brain as detected by electro-encephalogram, while having no influence to cardio-vascular system. The GSM-1800 model produced no measurable effects, and application of a special protector practically diminished the influence.

The aim of this study was the detection of responses of people's autonomic nervous system to the mobile phones and the influence to this process of the protective devices using Gas Discharge Visualization (GDV) technique.

Methods

GDV TECHNIQUE

The GDV camera is presently the state-of-the-art in bioelectrography [[3]]. It utilizes a high frequency (1024 Hz), high-voltage (10 kV) input to the finger (or other object to be measured), which is placed on the electrified glass lens of the GDV camera. Because the electrical current applied to the body is very low, most human subjects do not experience any sensation when exposing their fingertip to the camera. In practice, the applied electric field is pulsed on and off every 10 microseconds, and the fingertip is exposed for only 0.5 seconds. This causes a corona discharge of light-emitting plasma to stream outward from the fingertip. The light emitted from the finger is detected directly by a CCD (charge-coupled detector), which is the state-of-the-art in scientific instruments such as telescopes to measure extremely low-level light. The signal from the CCD is sent directly to a computer, and software analysis is done to calculate a variety of parameters that characterize the pattern of light emitted, including brightness, total area, fractality, and density. The software can also provide color enhancement to enable subtle features such as intensity variations of the image to be perceived. The underlying principle of camera operation is similar to the well-known Kirlian effect [[4]] but modern technology allows reproducible stable data with quantitative computer analysis. Purposeful investigations allowed the discovery of the parameters that are optimal from the point of obtaining critical information on the biological object's state with the minimum of invasiveness. These findings are described in more than 200 research works in the international scientific literature, 12 patents, 6 books in English, French, German, Italian, Russian, and Spanish.

This biophysical concept of the principles of GDV measurements is based on the ideas of quantum biophysics [5][7]. This is a further development of well-known ideas of A. Szent-Györgyi concerning the transfer of electron-excited states along the chains of molecular protein complexes [6][8]. The GDV technique measures the level of functional energy stored by the particular systems of an organism. This level is defined by the power of the electron-excited states and the character of their transport along the chains of albumin molecules. The level of functional energy is correlated with health status, but it is only one of many of the components that define health. It works together with genetic predisposition, psycho-emotional states, environmental loading (food, water, air, ecology) and other factors. This approach may be associated with the oriental notion of the energy transfer along meridians.

It was shown in numerous studies that GDV measures the response of the autonomic nervous system to different stimulus.

In assessing human subjects, the GDV-grams (GDV emission patterns after computer processing) of all ten fingers are made and analyzed. All 10 GDV-grams from the fingers then undergo analysis via another software program creating the model of Energy Field around the body and the diagrams showing the energy distribution in the various organ systems. This is based on the map correlating the human fingers with different systems and organs of the body in accordance with Traditional Chinese Medicine (TCM) approach [7].

The technical parameters of the manufactured in Russia "GDV-Camera" (www.korotkov.org) are the following:

- Impulse duration – 10.0 mks;
- Repetition frequency – 11.0 – 3.0 kHz;
- Voltage amplitude – 1000.0 – 4000.0 V;
- Maximum impulse power consumption ~ 80 Watt;
- Schematic impulse current limitation – on the level of 1mA;
- Parameters stability not less than 0.1%;
- Computer control of all the parameters;
- CCD matrix resolution – 800 x 600 .

In general, the principle of obtaining the information, using the developed approach, can be represented as follows. Electric impulse stimulates the response of the subject in form of electron and photon emission. Simultaneously, at the expense of superficial and volume heterogeneity of the object, space-time modulation of the applied electromagnetic field (EMF) takes place. Weak emission and photon radiation of the object increases at the expense of the gas discharge, generating in EMF. The glow of this discharge is transformed by the optical and CCD system into a computer file. On the basis of the calculated parameters and diagnostic hypothesis a certain conclusion or diagnosis is made. The picture, formed after processing and transformations, reveals as a two-dimensional amplitude-modulated fractal image. To study this image the methods of fractal, matrix and probability analysis, realised in form of the original program complex on the basis of Windows are used.

Experimental Procedure

15 practically healthy subjects – volunteers of the age 20-30 years old, all yang women took part in the experiments. The protocol of measurements with the GDV camera of 10 fingers of the subjects was as follows:

1. Initial measurements – 3 times with 5 min difference, no phones are turned on in the room. (denote on the graphs as "initial" – data averaged on 3 measurements)
2. Mobile phone is turned on in transmission mode and kept nearby the ear of the subject.
3. Measurement after 5 minutes with mobile phone on. (tel 5)
4. Measurement after 10 minutes with mobile phone on. (tel 10)
5. Mobile phone is turned off.
6. Measurement after 10 minutes with mobile phone turned off. (after 10)
7. "Aires" protector is attached to the phone.
8. Mobile phone with "Aires" protector is turned on in transmission mode and kept nearby the ear of the subject.
9. Measurement after 5 minutes with mobile phone on. (tel Aires 5)

10. Measurement after 10 minutes with mobile phone on. (tel Aires 10)

As a whole it was 8 measurements for every subject on 10 fingers – 800 images total.

Panasonic EB-G60 and Sony Erickson models were used for the experiment.

Image processing was done in the complex of GDV programs. For every image after noise cleansing two parameters were calculated: Area – the number of exposed pixels of the image after noise processing, and averaged Intensity of the image – in the computer coding range from 0 to 255.

Experimental Results.

Table 1 presents Standard Deviation between 3 subsequent initial measurements of 15 subjects.

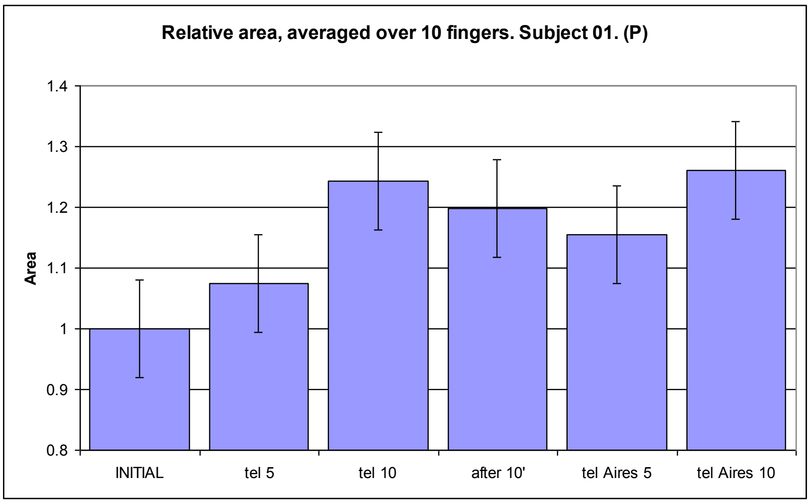
Table 1. Standard Deviation (SD) between 3 subsequent measurements for Area and Intensity averaged for 10 fingers.

	1P	2P	3P	4P	5P	6P	7P	1S	2S	3S	4S	5S	6S	7S	8S
SD% Area	5.4	4.5	5.6	8.2	13.5*	1.1	3.3	10.8*	10.6*	3.3	0.8	8.8	6.4	4.1	2.9
SD% Intens	1.6	1.5	3.0	3.4	2.2	1.4	0.9	3.1	0.7	2.9	1.2	4.8	1.7	0.5	0.8

1P…7P – subjects using Panasonic phones; 1S…8S – subjects using Sony Erickson phones.
*SD for Area is bigger than SD for Intensity due to the difference in size between different fingers of the hand.

As we see from the data of Table 1 SD for Area for 12 subjects was less than 9%, while SD for Intensity was less than 5% for all subjects. In simple words all variations exceeding these numbers should be considered as significant. Theses data were the basis for statistical evaluation.

Example of data processing for the subject 1P is presented at fig.1.



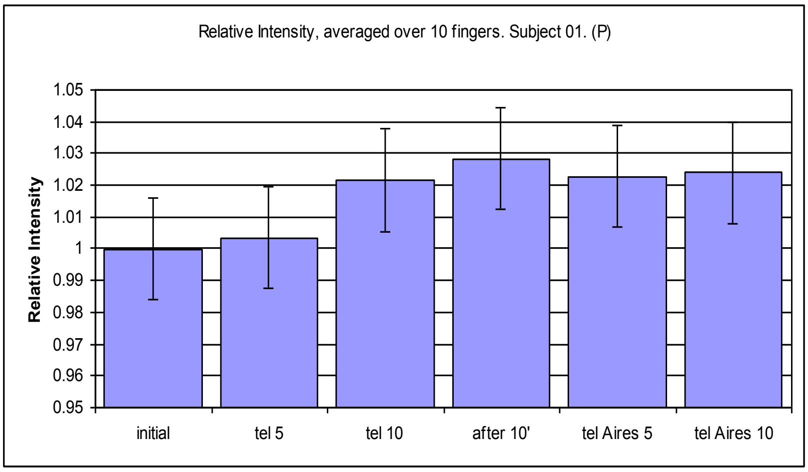


Fig.1. Area and Intensity for different testing for subject 1P. Bars denote the SD.

All graphs are presented in Appendix 1.

Statistical Evaluation of data.

Statistically significant changes of signal were evaluated in Excel and Statistica programs by using t-test (Student test). Table 2-4 demonstrate probabilities that two sets of data are statistically similar (that means they are dissimilar if $p < 0.05$).

Comparisons between 10-finger measurements in different situations are noted by numbers as follows:

T-TEST

1 Initial - phone 5'
2 Initial - phone 10'
3 Initial - after 10'

4 after 10' - phone+Aires 5'
5 after 10' - phone+Aires 10'
6 initial - phone+Aires 5'
7 initial - phone+Aires 10'

Reaction to the telephone.

Table 2. Results of t-test for Area and Intensity after 5' and 10' phone conversation (significant changes are marked in red)

	AREA			Intensity	
People	1	2	**People**	1	2
1P	0.189	0.000	**1P**	0.854	0.329
2P	0.000	0.000	**2P**	0.000	0.000
3P	0.198	0.433	**3P**	0.627	0.248
4P	0.000	0.284	**4P**	0.000	0.838
5P	0.001	0.006	**5P**	0.155	0.038
6P	0.984	0.081	**6P**	0.274	0.057
7P	0.002	0.000	**7P**	0.056	0.025
1S	0.039	0.004	**1S**	0.495	0.512
2S	0.014	0.000	**2S**	0.830	0.748
3S	0.294	0.000	**3S**	0.754	0.020

4S	0.291	0.322	**4S**	0.170	0.023
5S	0.009	0.000	**5S**	0.045	0.000
6S	0.000	0.000	**6S**	0.002	0.002
7S	0.824	0.337	**7S**	0.038	0.504
8S	0.443	0.509	**8S**	0.143	0.058

As we see from the Table 2, for people using Panasonic phone significant changes after 10 minutes are noted for 4 people in Area parameter and 3 people in Intensity parameter. Two people (3P and 6P) did not respond at all, person 1P responded on Area only.

After 5 minutes using the phone reactions were less presented.

For people using Sony Erickson phone significant changes after 10 minutes were noted for 5 people in Area parameter and 4 people in Intensity parameter.

It is interesting that for some people we may see reaction after 5 minutes and no reaction after 10 minutes.

So we may conclude that reaction to Panasonic phone after 10 minutes “conversation” was practically the same as to Sony Erickson phone.

Table 3. Results of t-test for Area and Intensity after 10’ rest.

People	3	**People**	3
1P	0.003	**1P**	0.188
2P	0.000	**2P**	0.001
3P	0.180	**3P**	0.221
4P	0.000	**4P**	0.000
5P	0.000	**5P**	0.000
6P	0.000	**6P**	0.001
7P	0.000	**7P**	0.001
1S	0.785	**1S**	0.595
2S	0.443	**2S**	0.260
3S	0.094	**3S**	0.037
4S	0.237	**4S**	0.285
5S	0.000	**5S**	0.000
6S	0.001	**6S**	0.048
7S	0.000	**7S**	0.018
8S	0.339	**8S**	0.027
AREA		**Intensity**	

For people having been using Panasonic phone significant changes after 10 minutes rest were noted for 6 people in Area parameter and 5 people in Intensity parameter.

It is interesting that 3P person had reacted after 10’ rest – seems to be her response to the phone was deferred.

For people having been using Sony Erickson phone significant changes after 10 minutes rest were noted for 3 people in Area parameter and 5 people in Intensity parameter.

So we may conclude that after 10’ rest reaction to Panasonic phone was stronger than to Sony Erickson phone.

Reaction to the telephones with Aires protector.

Table 4. Results of t-test for Area and Intensity after using phone with Aires.

People	4	5	6	7	People	4	5	6	7
1P	0.392	0.299	0.003	0.000	**1P**	0.783	0.878	0.163	0.070
2P	0.023	0.369	0.000	0.000	**2P**	0.022	0.008	0.804	0.226
3P	0.002	0.404	0.002	0.007	**3P**	0.003	0.527	0.012	0.728
4P	0.000	0.001	0.741	0.025	**4P**	0.000	0.000	0.001	0.983
5P	0.670	0.826	0.000	0.000	**5P**	0.883	0.754	0.000	0.000
6P	0.870	0.271	0.002	0.000	**6P**	0.311	0.553	0.114	0.000
7P	0.365	0.711	0.000	0.000	**7P**	0.794	0.761	0.007	0.001
1S	0.239	0.769	0.009	0.223	**1S**	0.718	0.141	0.621	0.029
2S	0.031	0.000	0.038	0.000	**2S**	0.194	0.281	0.028	0.059
3S	0.247	0.080	0.538	0.075	**3S**	0.090	0.027	0.646	0.736
4S	0.330	0.783	0.008	0.304	**4S**	0.100	0.067	0.915	0.651
5S	0.282	0.116	0.000	0.000	**5S**	0.000	0.029	0.000	0.000
6S	0.050	0.001	0.483	0.820	**6S**	0.517	0.681	0.293	0.209
7S	0.275	0.133	0.000	0.000	**7S**	0.066	0.002	0.469	0.638
8S	0.973	0.085	0.299	0.004	**8S**	0.827	0.377	0.101	0.009
AREA					**Intensity**				

4 after 10' - phone+Aires 5'
5 after 10' - phone+Aires 10'
6 initial - phone+Aires 5'
7 initial - phone+Aires 10'

As we see from the columns 4 and 5, the response to the phone with Aires was less compared to the response to the phone without Aires: 1, 2 or 3 significant responses.

Changes of parameters with Aires compared to the initial condition (columns 6 and 7) may be related to the longitudinal effects of the mobile phone, but this topic needs more detailed study.

Conclusions

1. Keeping mobile phone in transmission mode nearby the ear for 10 minutes resulted in significant changes of physiological parameters for most of the tested people, while variations of parameters in initial state during 10 minutes were insignificant. So we may conclude that autonomic nervous system reacted to the influence of the mobile phones of the studied types.
2. The level of influence depended on the time of influence: after 5 minutes of using the phone reactions were less significant than after 10 minutes.
3. Reactions to Panasonic phone after 10 minutes rest were stronger than to Sony Erickson phone.
4. Reactions to the phone with attached Aires protector were less significant compared to the reactions to the phone without attached Aires protector (1-3 people's reactions compared with 5-6 reactions from the group of 7). This may signify at least 50% protective effect of the Aires device. At the same time we can not exclude the adaptation effect of the autonomic nervous system to the mobile phone influence, but this topic needs more detailed study.
5. We may expect longitudinal effects of the mobile phone, but this topic needs more detailed study.
6. From the presented data it is clear that the effect of the mobile hone depends on the time of using, type of the telephone and specific condition of the particular person. In other words, reaction to the mobile phone is very individual and this topic needs attention with elaborated research technique using multiple methodic.
7. Presented above data demonstrate the perspectives and necessity of the further research in this area.

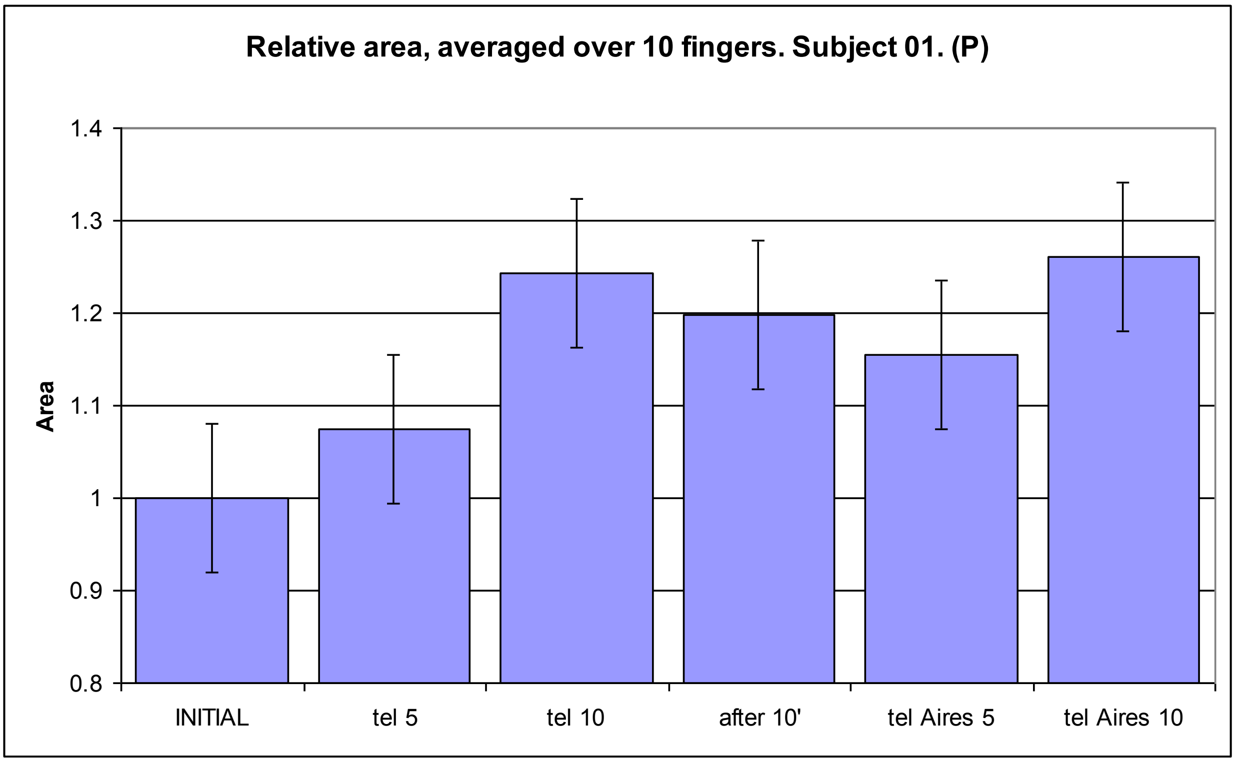
References

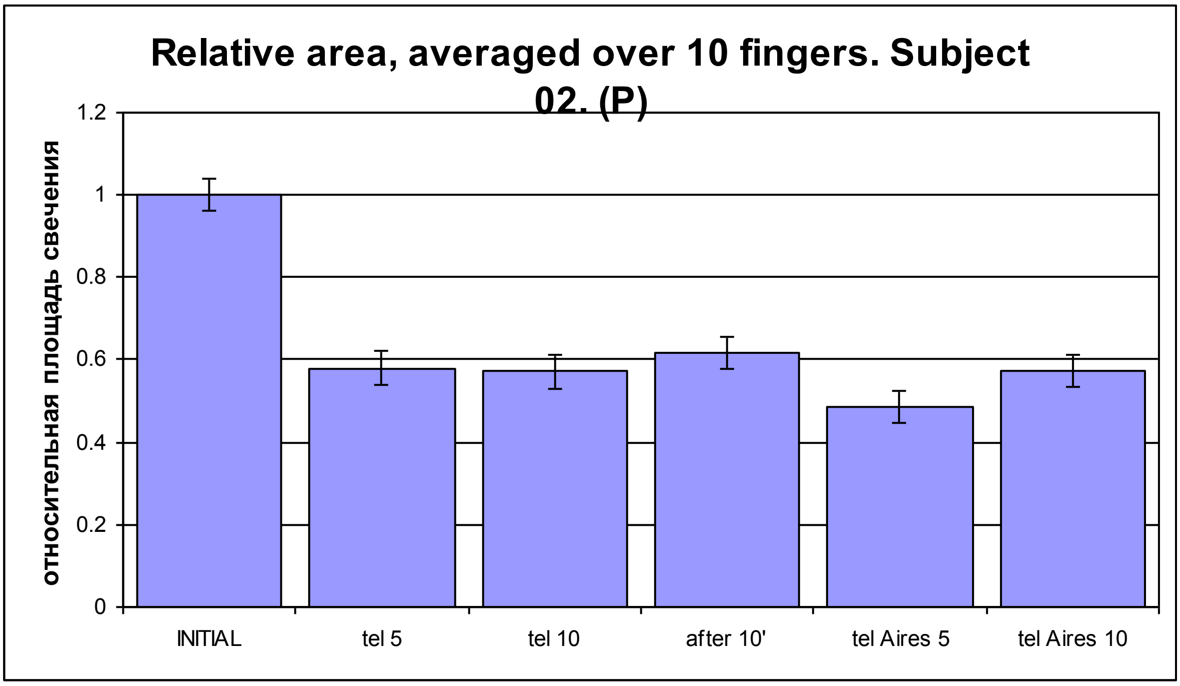
[1] Zaguskina N.A. Evaluation of the functional state of people under the influence of mobile phone. Proceedings of the Neirobiotelecom Conference. St. Petersburg, 2006, p. 252.
[2] Kovaleva A.G. et. al. Analysis of the biological effects of electromagnetic fields. Proceedings of the Neirobiotelecom Conference. St. Petersburg, 2006, p. 290-294.

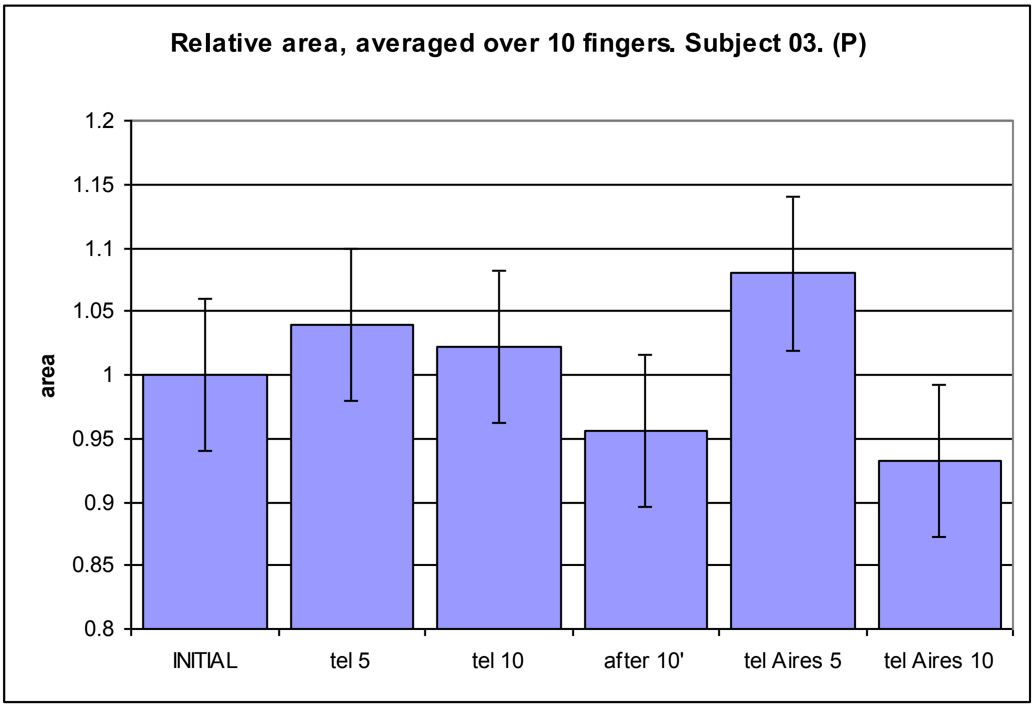
[3] Korotkov K. Human Energy Field: Study with GDV Bioelectrography. Fair Lawn, NJ: Backbone Publishing Co. 2002
[4]Korotkov K. Aura and Consciousness: New Stage of Scientific Understanding. St. Petersburg, Russia: State Editing and Publishing Unit "Kultura". 1998.
[5]Korotkov K., Williams B., Wisneski L. Biophysical Energy Transfer Mechanisms in Living Systems: The Basis of Life Processes. J of Alternative and Complementary Medicine, 2004 10, 1, 49-57.
[6]Szent-Györgyi A. Bioelectronics. New York: Academic Press. 1968.
[7]Measuring Energy Fields: State of the Art. GDV Bioelectrography series. Vol. I. Korotkov K. (Ed.). Backbone Publishing Co. Fair Lawn, USA, 2004. 270 p.

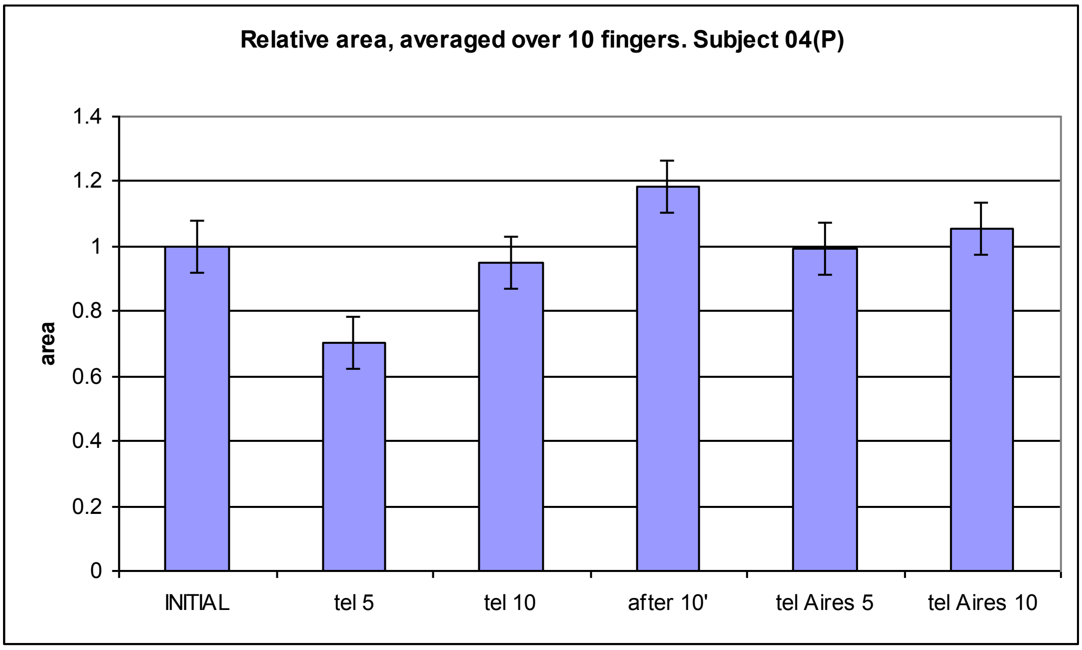
Appendix 1. Experimental graphs.

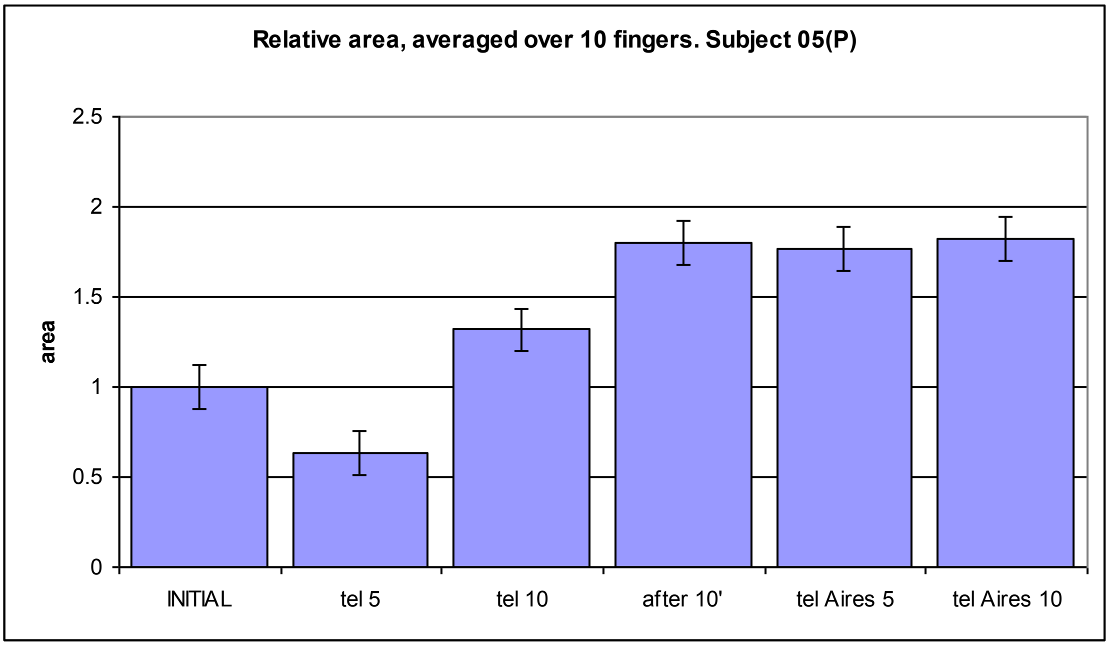
Area.

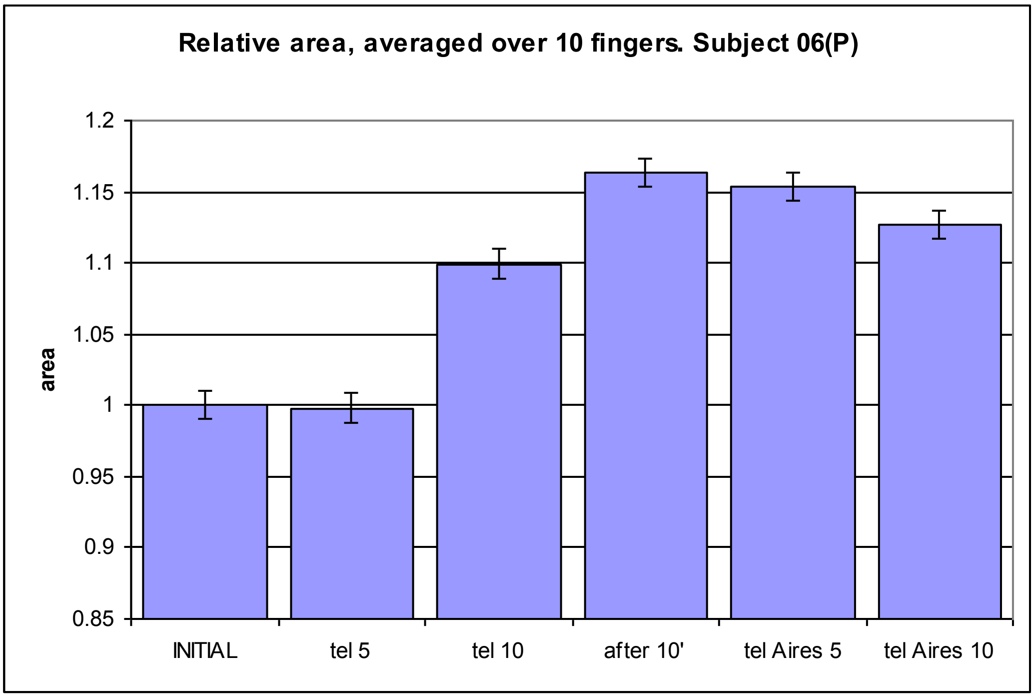


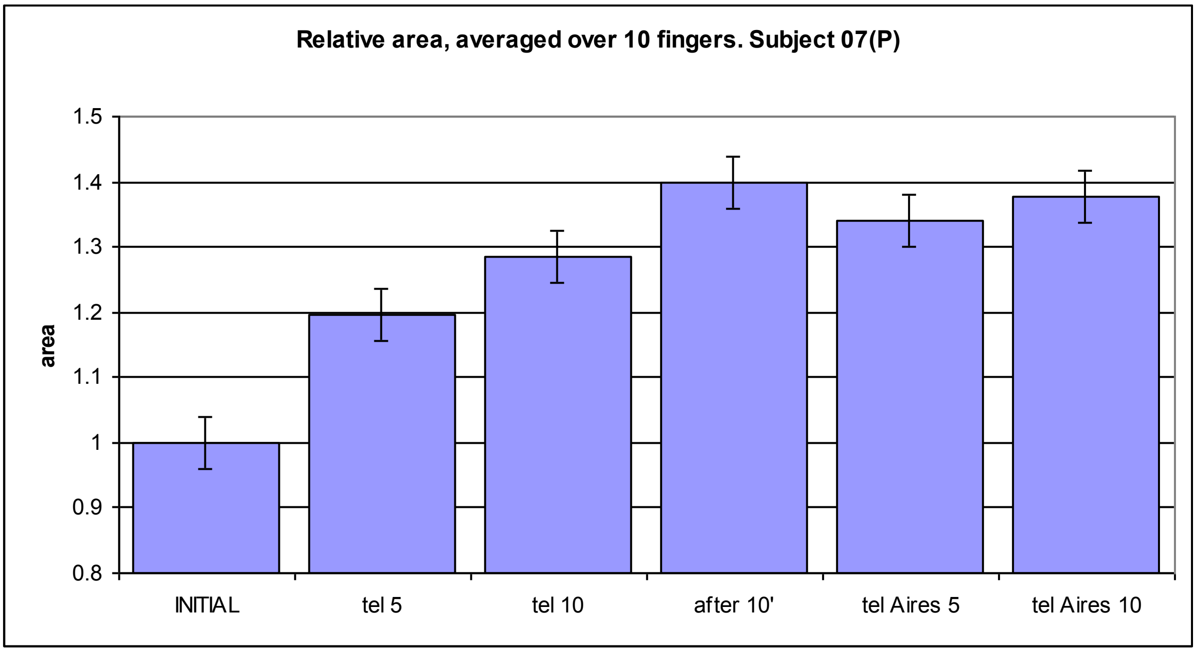

Relative area, averaged over 10 fingers. Subject 02. (P)
относительная площадь свечения
1.2
1
0.8
0.6
0.4
0.2
0
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

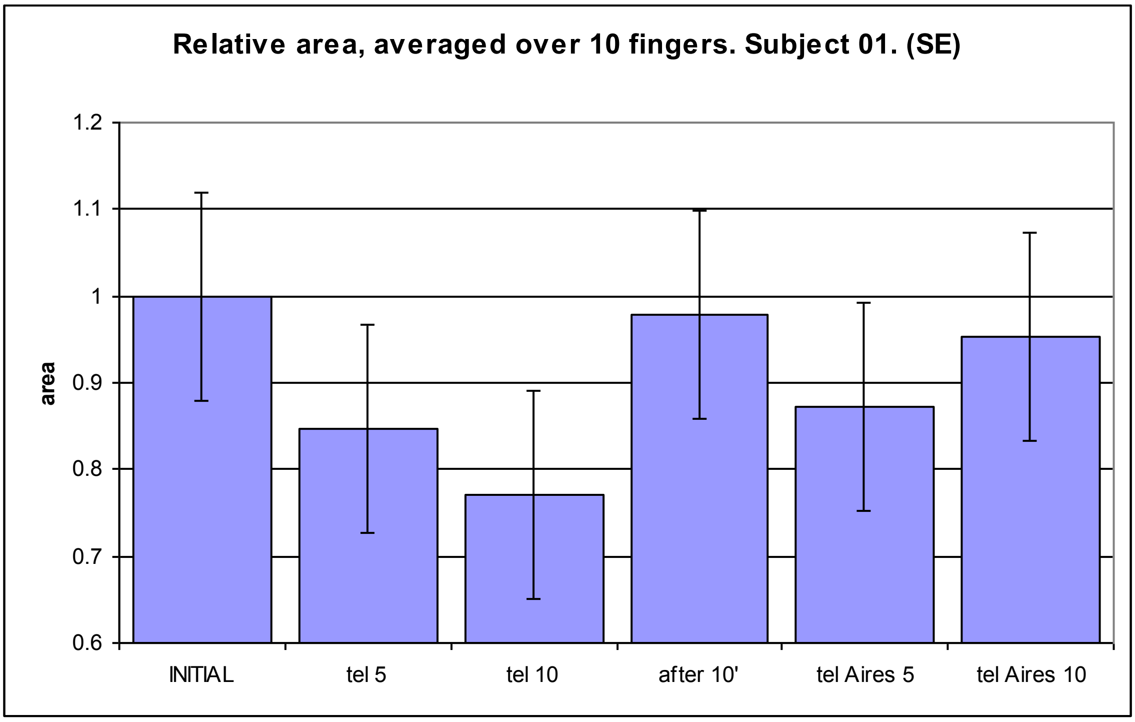

Relative area, averaged over 10 fingers. Subject 03. (P)
area
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative area, averaged over 10 fingers. Subject 04(P)
area
1.4
1.2
1
0.8
0.6
0.4
0.2
0
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative area, averaged over 10 fingers. Subject 05(P)
area
2.5
2
1.5
1
0.5
0
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative area, averaged over 10 fingers. Subject 06(P)
area
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative area, averaged over 10 fingers. Subject 07(P)
area
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative area, averaged over 10 fingers. Subject 01. (SE)
area
1.2
1.1
1
0.9
0.8
0.7
0.6
INITIAL
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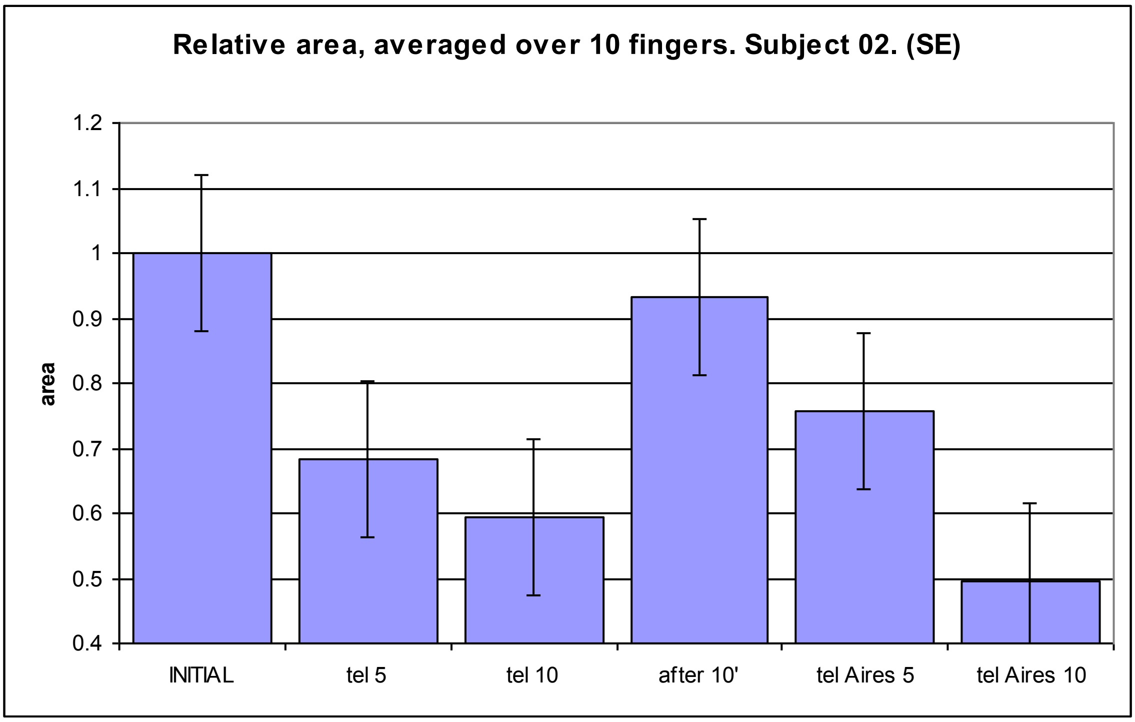
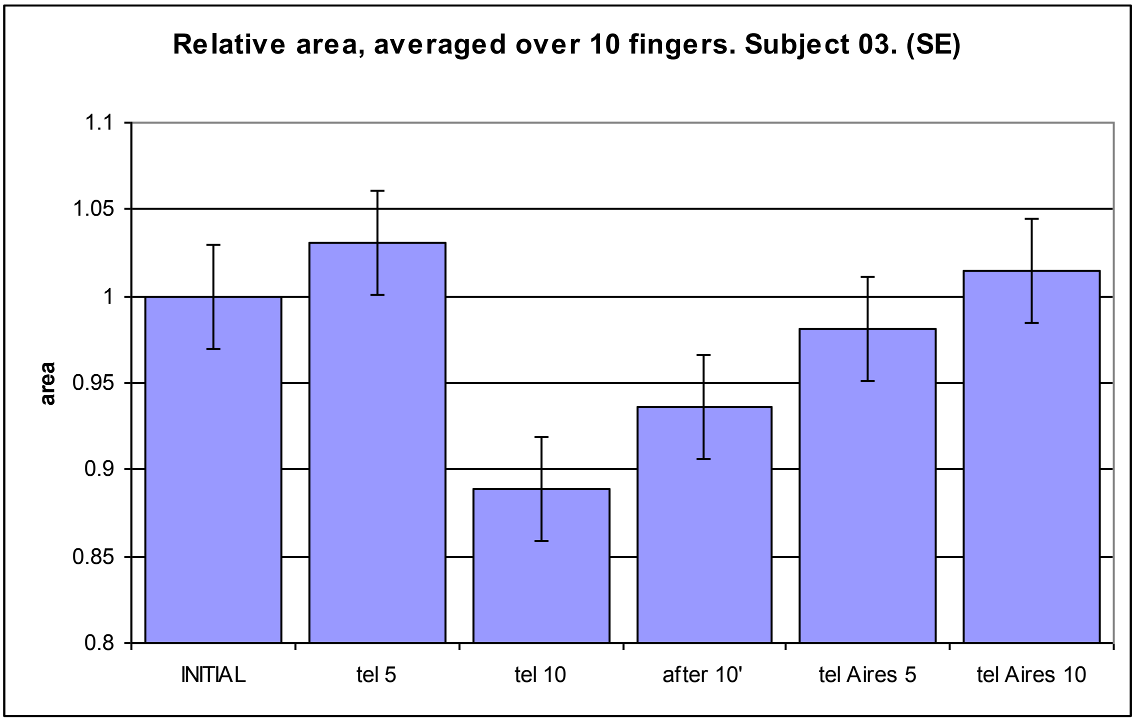
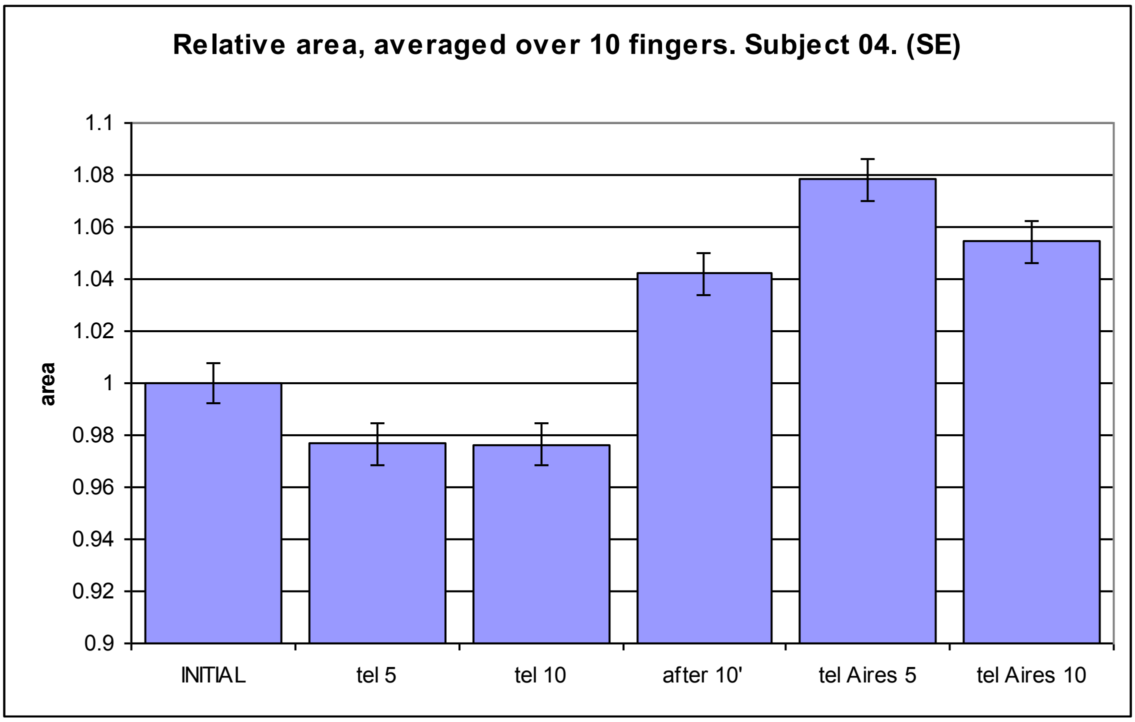
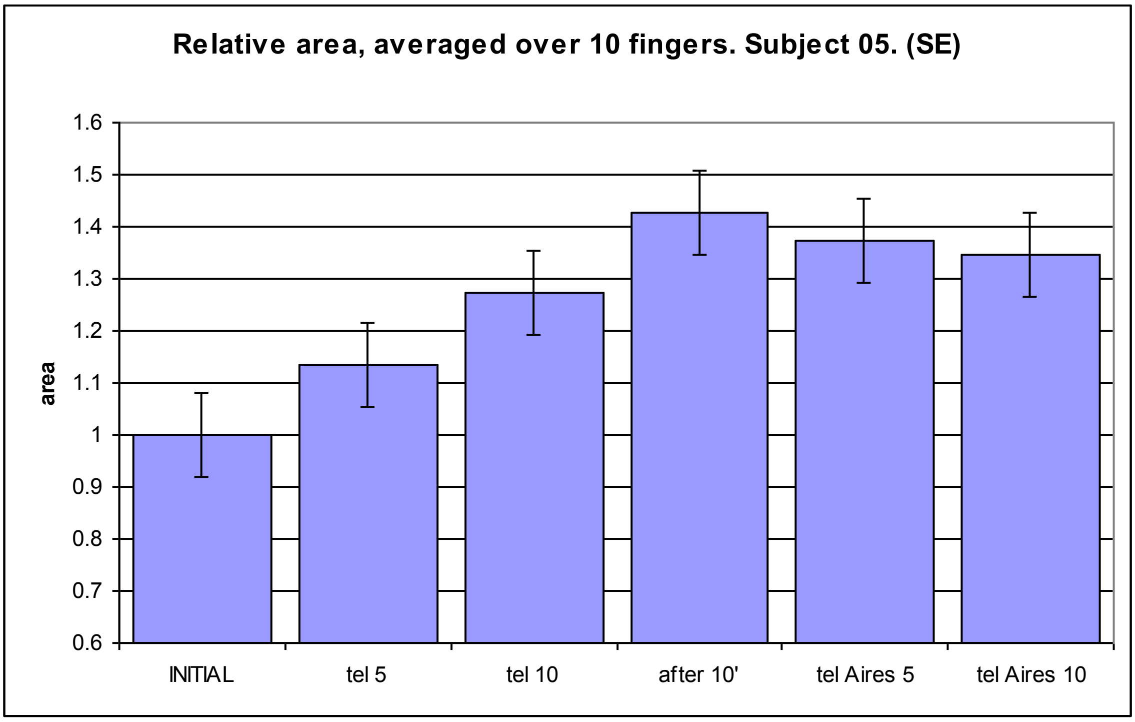
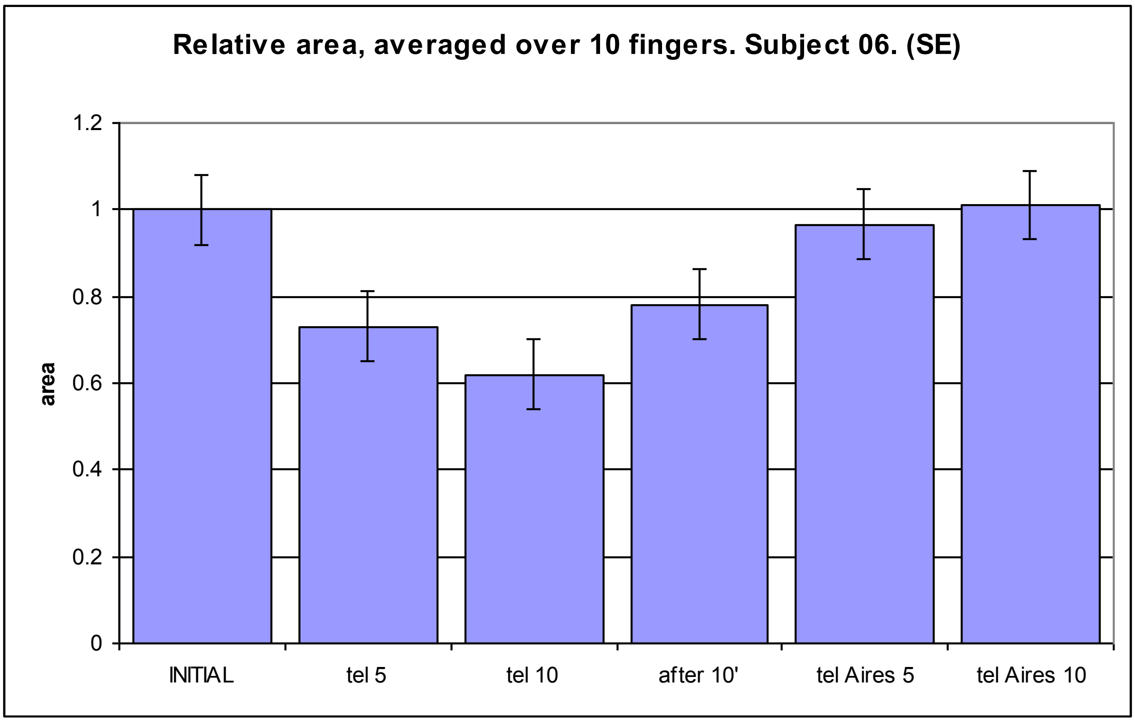
tel 10
after 10'
tel Aires 5
tel Aires 10

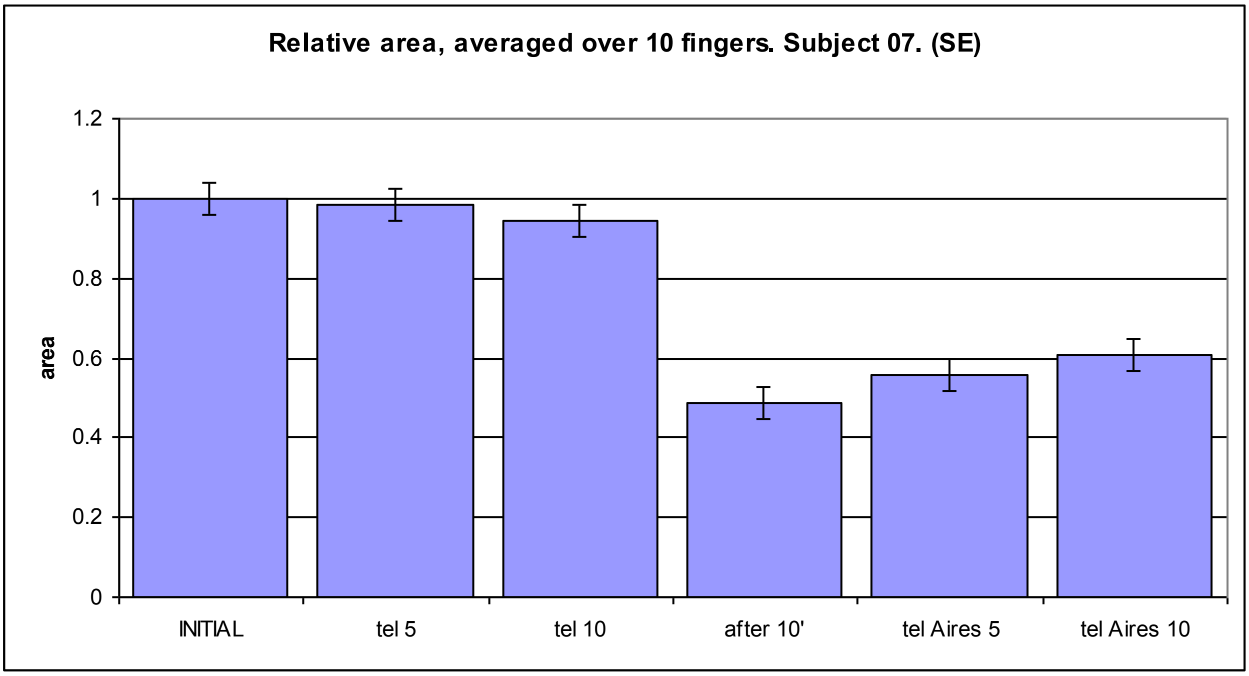

Relative area, averaged over 10 fingers. Subject 02. (SE)
area
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

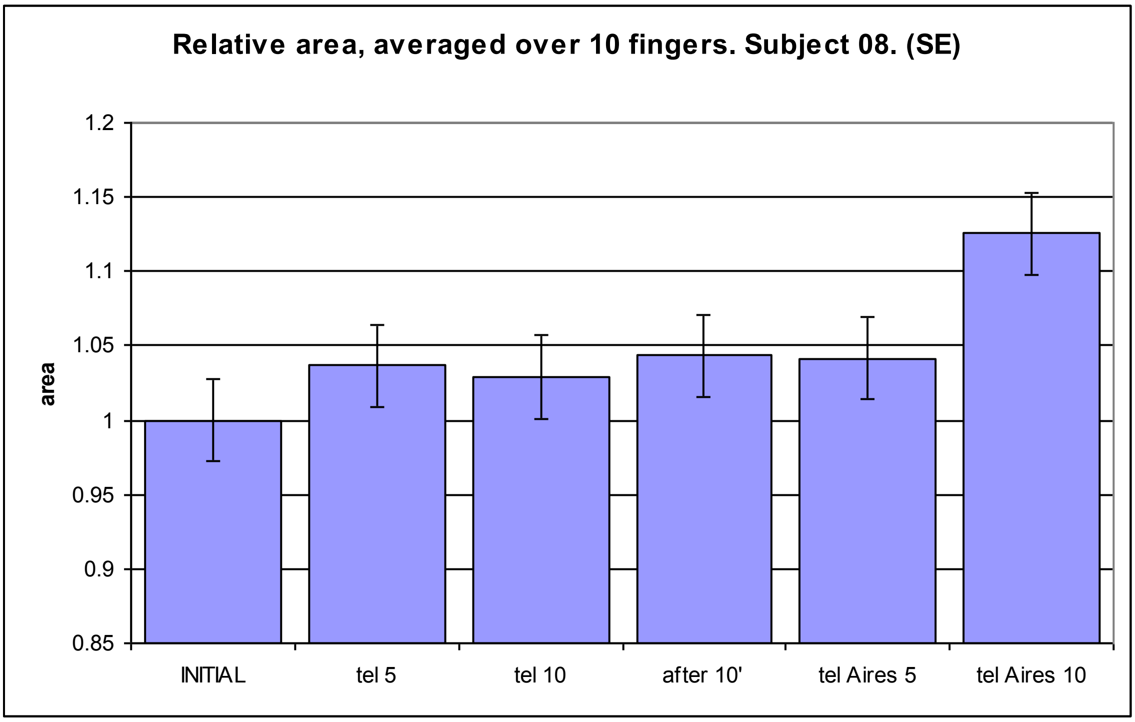

Relative area, averaged over 10 fingers. Subject 03. (SE)
area
1.1
1.05
1
0.95
0.9
0.85
0.8
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative area, averaged over 10 fingers. Subject 04. (SE)
area
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0.94
0.92
0.9
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

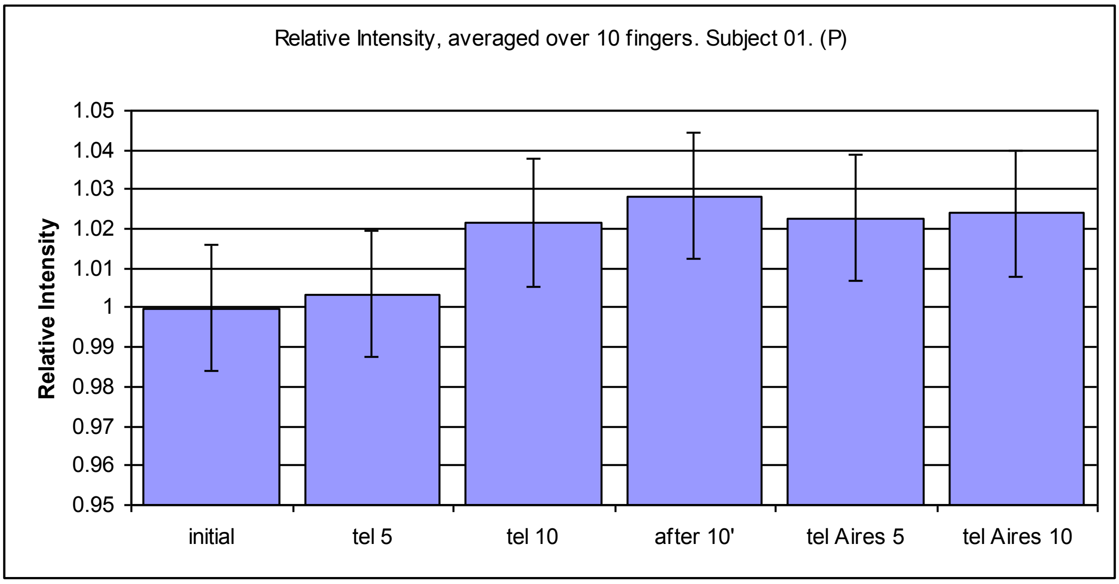

Relative area, averaged over 10 fingers. Subject 05. (SE)
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
area
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

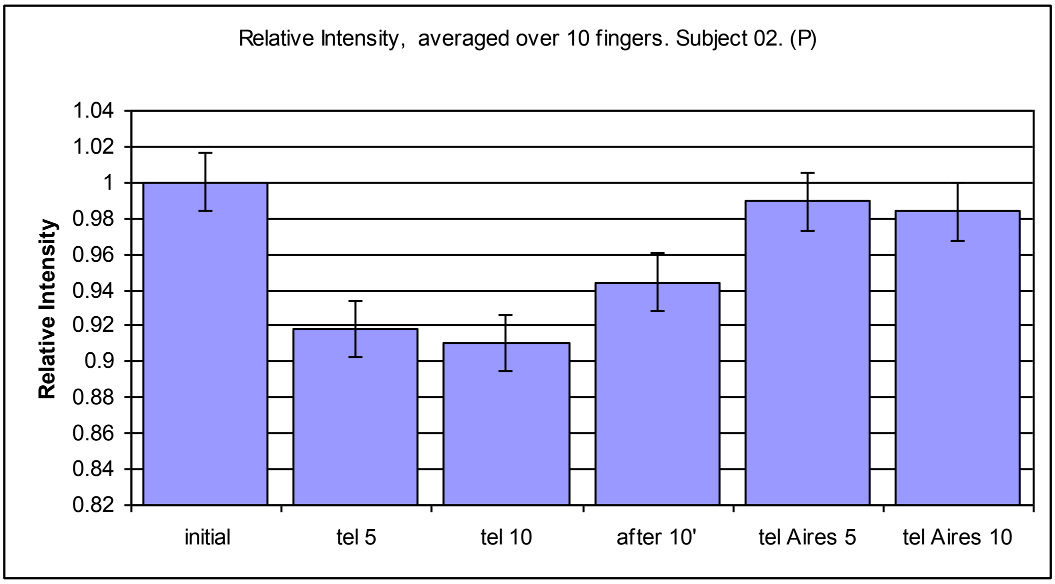

Relative area, averaged over 10 fingers. Subject 06. (SE)
1.2
1
0.8
0.6
0.4
0.2
0
area
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

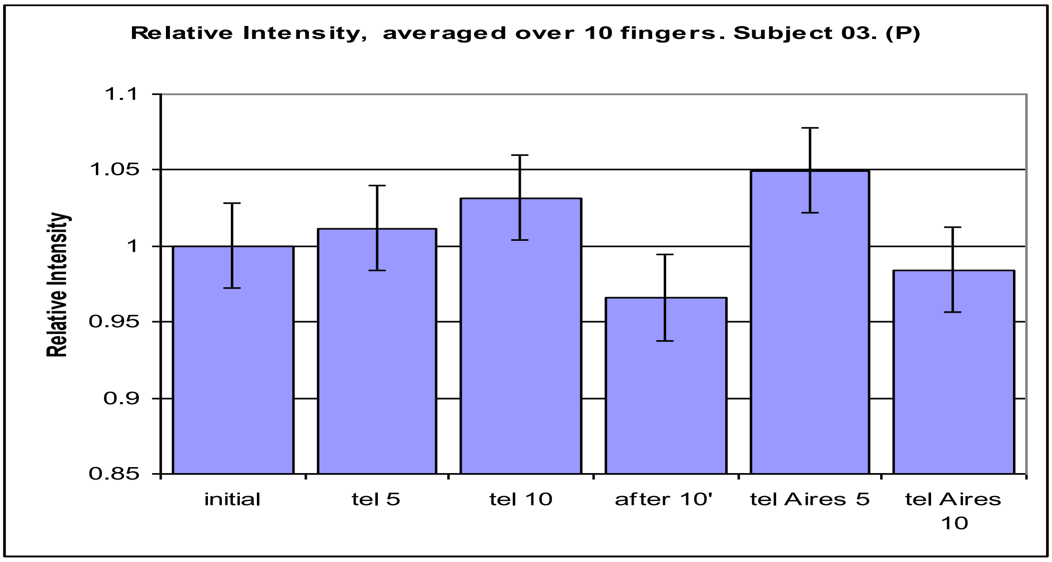

Relative area, averaged over 10 fingers. Subject 07. (SE)
area
1.2
1
0.8
0.6
0.4
0.2
0
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

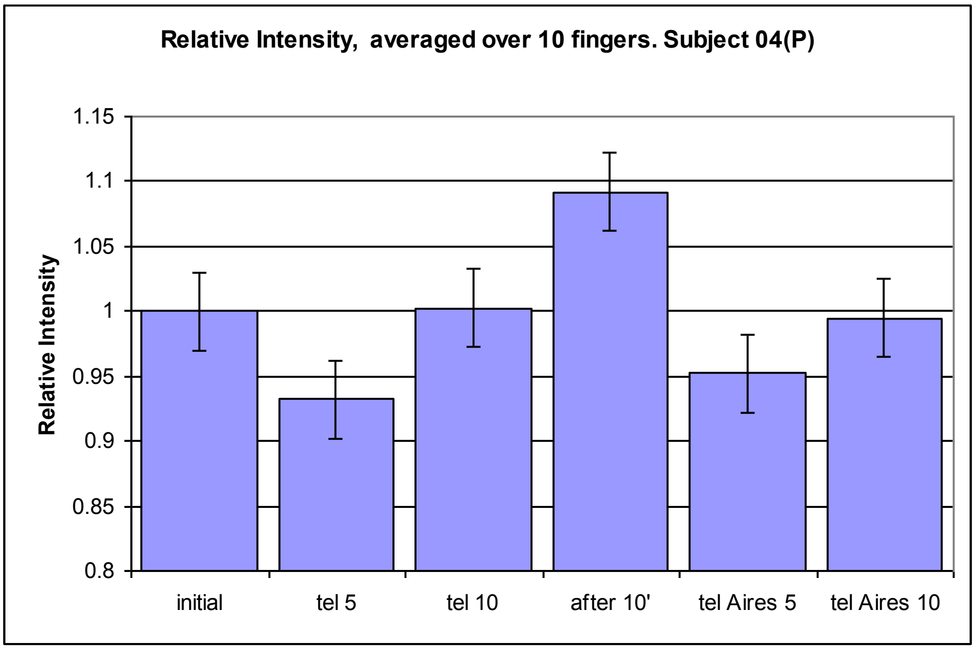

Relative area, averaged over 10 fingers. Subject 08. (SE)
area
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
INITIAL
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

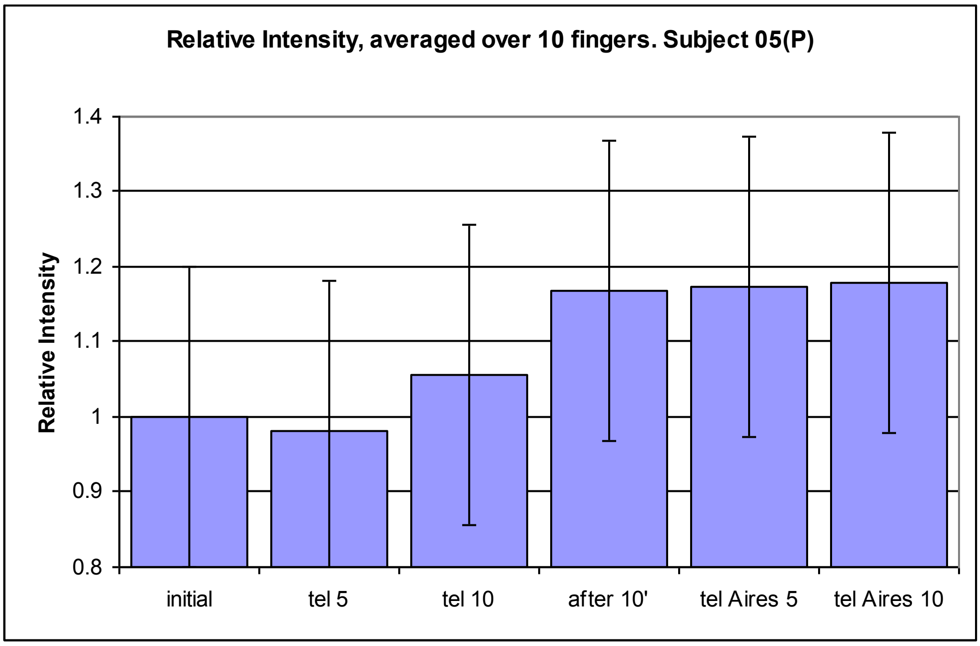
Intensity

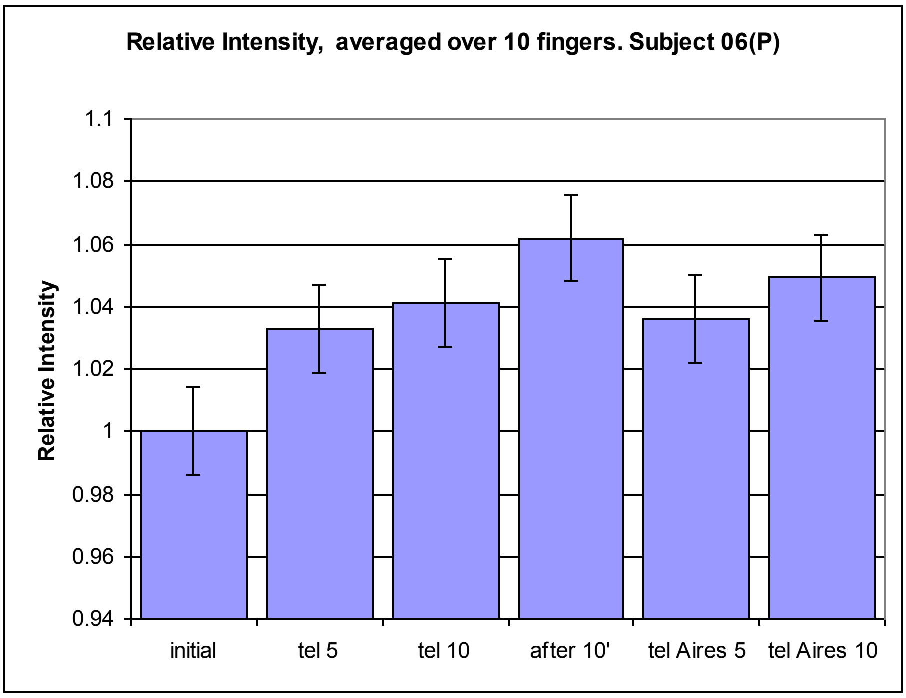

Relative Intensity, averaged over 10 fingers. Subject 01. (P)
Relative Intensity
1.05
1.04
1.03
1.02
1.01
1
0.99
0.98
0.97
0.96
0.95
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

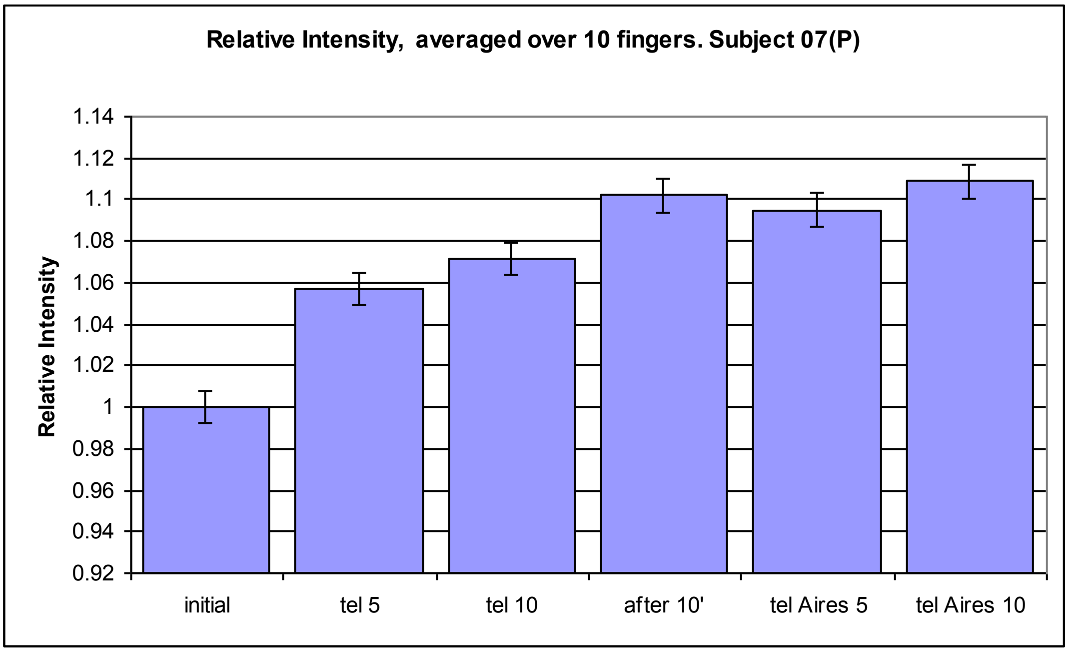

Relative Intensity, averaged over 10 fingers. Subject 02. (P)
Relative Intensity
1.04
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0.84
0.82
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

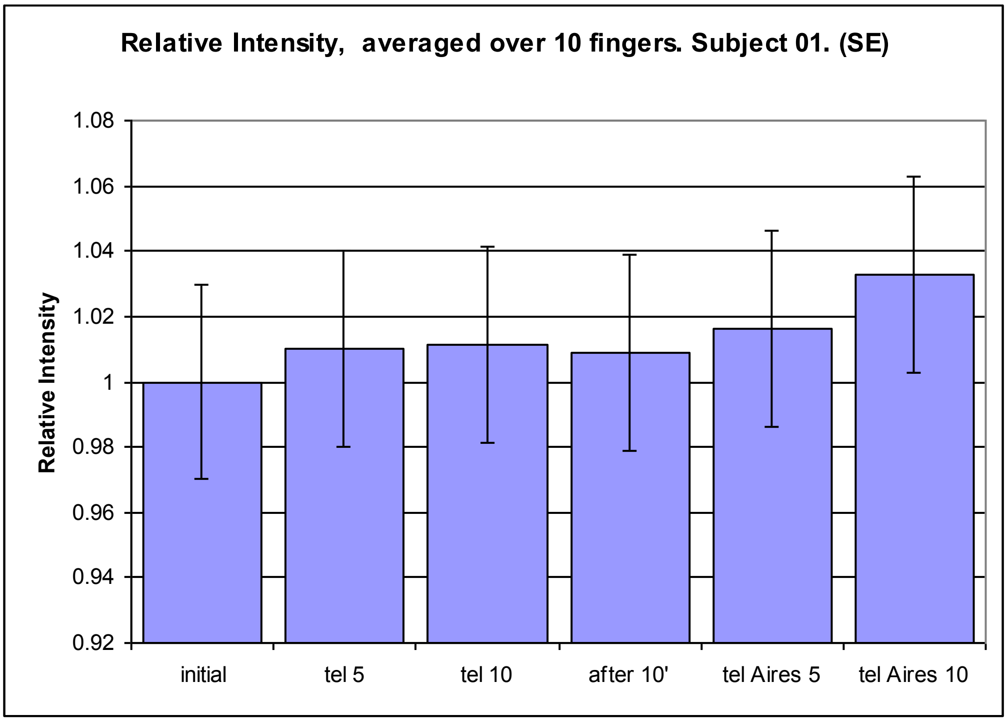

Relative Intensity, averaged over 10 fingers. Subject 03. (P)
Relative Intensity
1.1
1.05
1
0.95
0.9
0.85
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

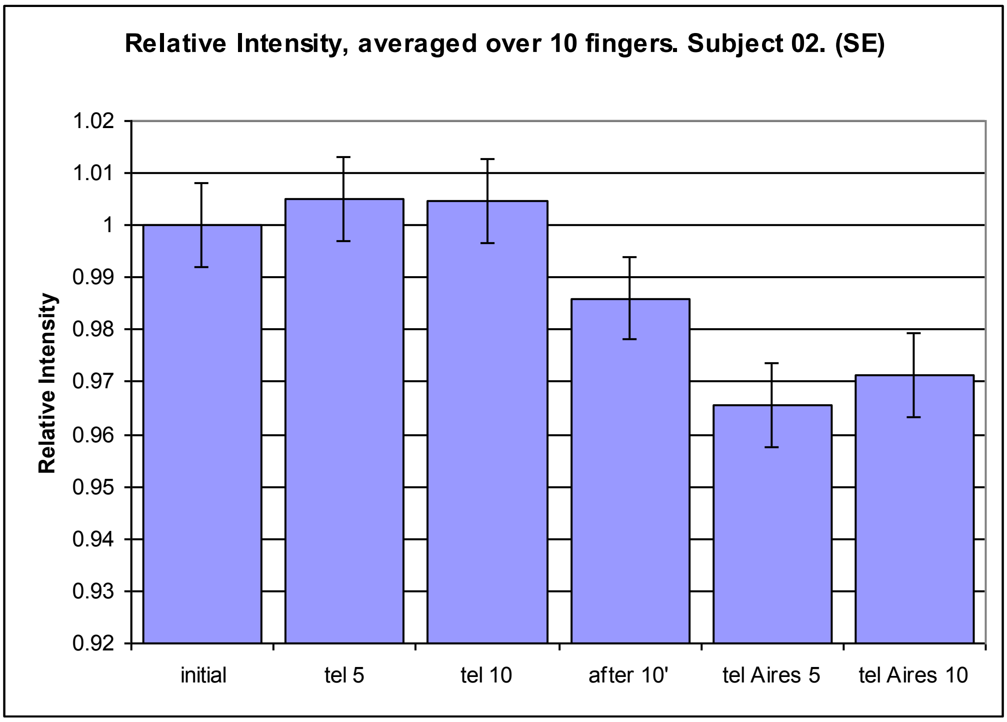

Relative Intensity, averaged over 10 fingers. Subject 04(P)
Relative Intensity
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

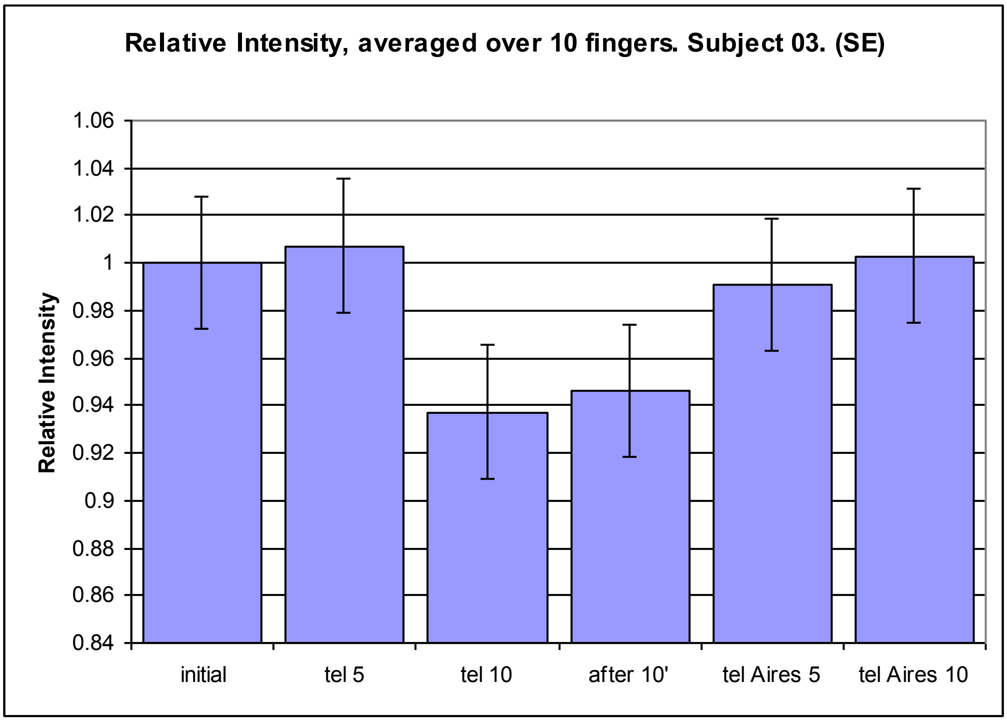

Relative Intensity, averaged over 10 fingers. Subject 05(P)
Relative Intensity
1.4
1.3
1.2
1.1
1
0.9
0.8
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

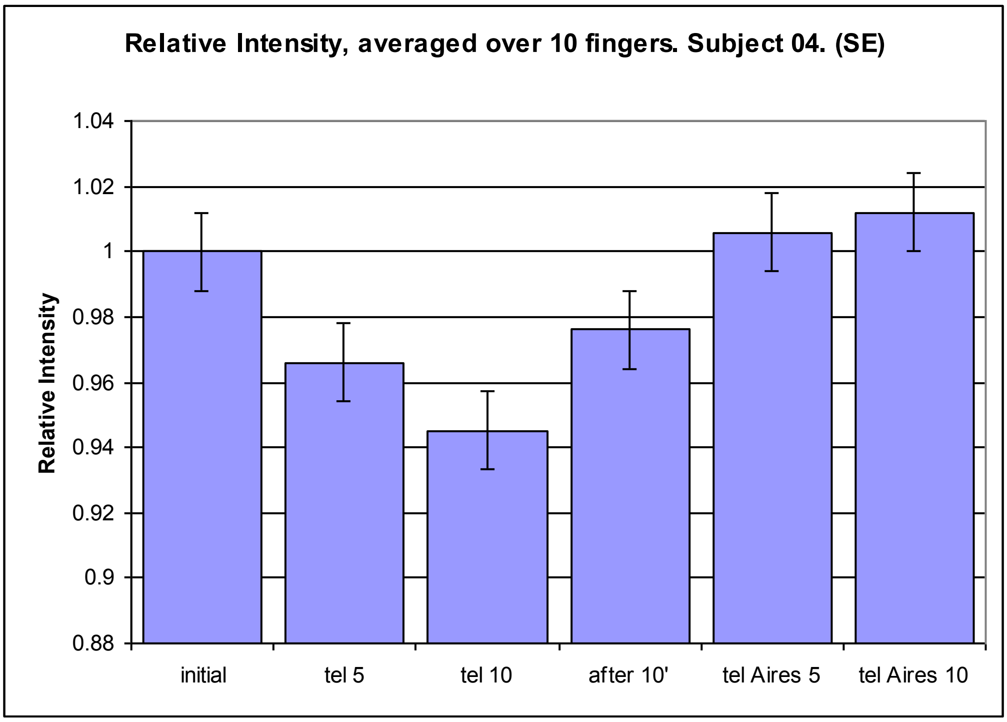

Relative Intensity, averaged over 10 fingers. Subject 06(P)
Relative Intensity
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0.94
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

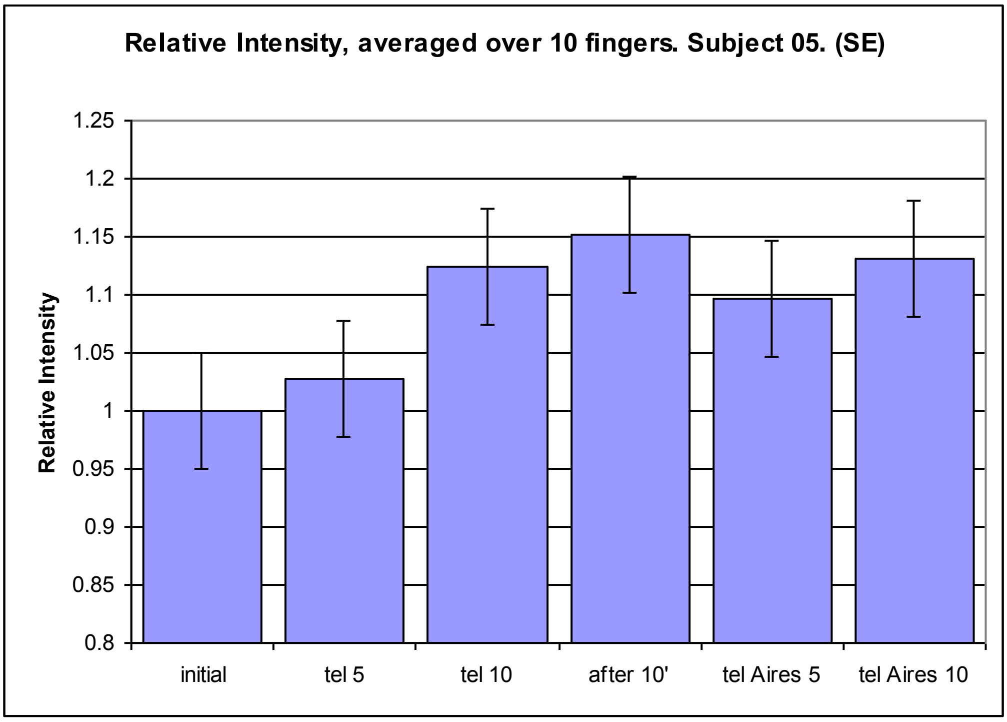

Relative Intensity, averaged over 10 fingers. Subject 07(P)
Relative Intensity
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0.94
0.92
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

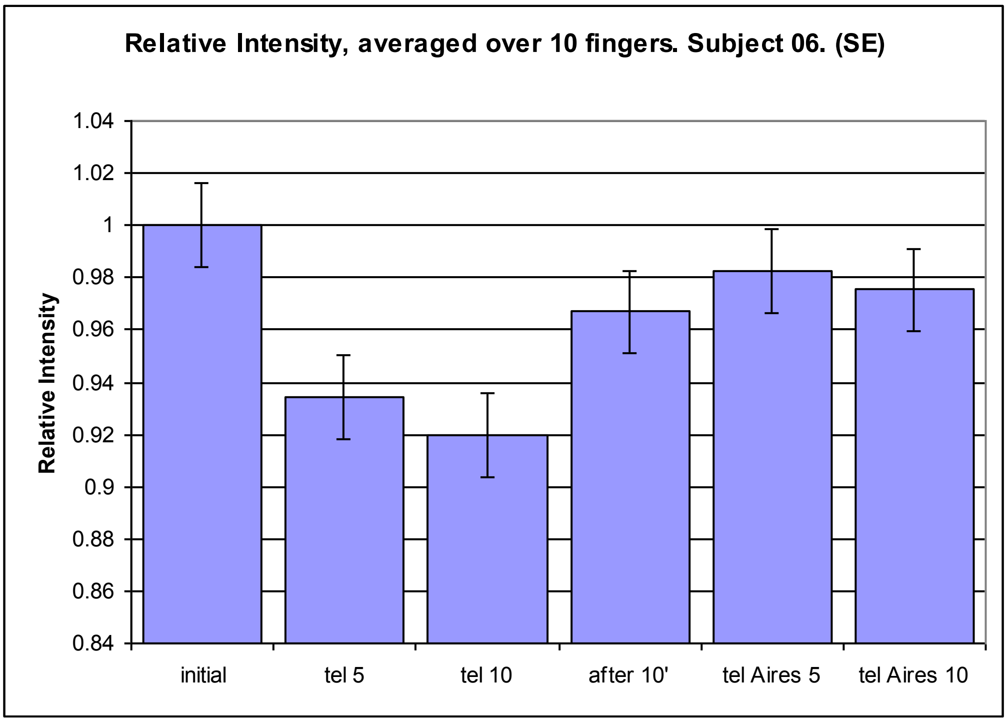

Relative Intensity, averaged over 10 fingers. Subject 01. (SE)
Relative Intensity
1.08
1.06
1.04
1.02
1
0.98
0.96
0.94
0.92
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

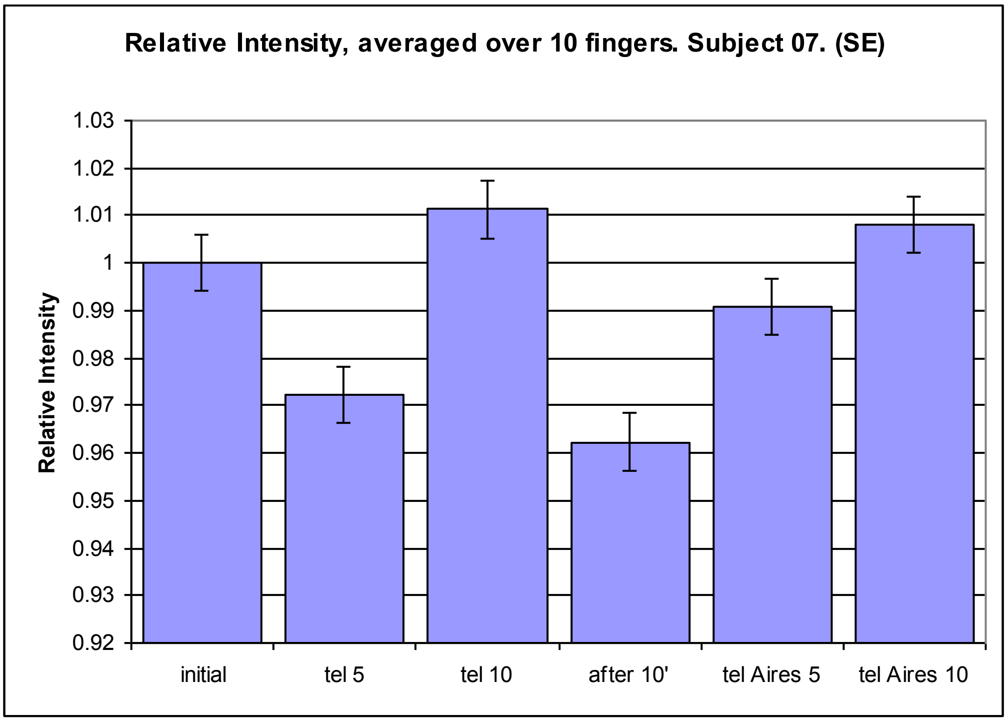

Relative Intensity, averaged over 10 fingers. Subject 02. (SE)
Relative Intensity
1.02
1.01
1
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10

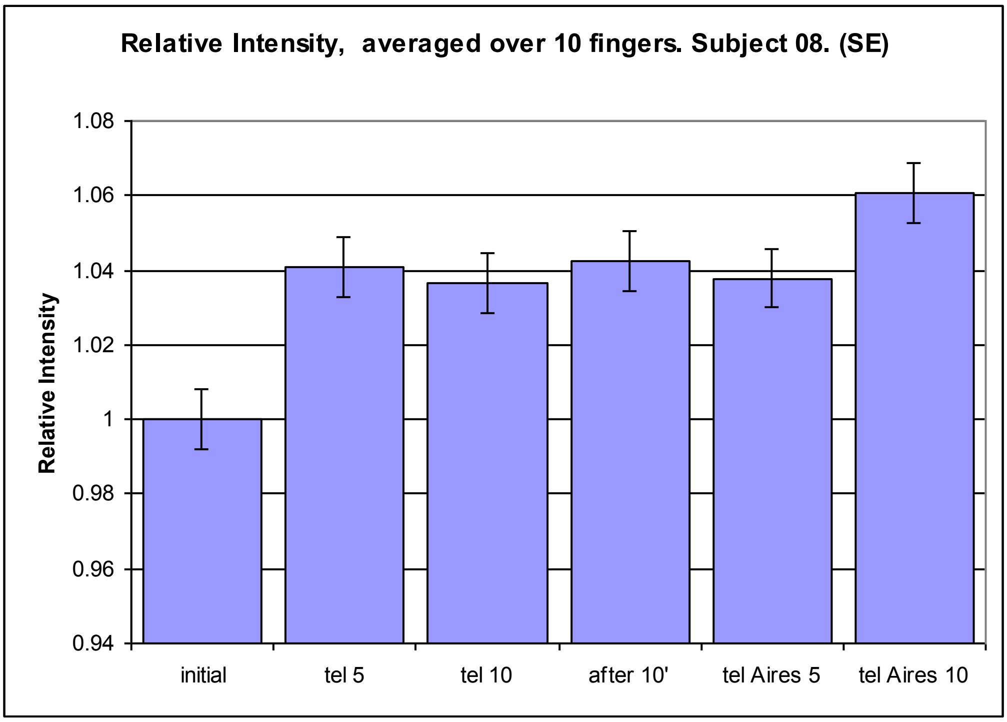

Relative Intensity, averaged over 10 fingers. Subject 03. (SE)
Relative Intensity
1.06
1.04
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0.84
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative Intensity, averaged over 10 fingers. Subject 04. (SE)
Relative Intensity
1.04
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative Intensity, averaged over 10 fingers. Subject 05. (SE)
Relative Intensity
1.25
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative Intensity, averaged over 10 fingers. Subject 06. (SE)
Relative Intensity
1.04
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0.84
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative Intensity, averaged over 10 fingers. Subject 07. (SE)
Relative Intensity
1.03
1.02
1.01
1
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10


Relative Intensity, averaged over 10 fingers. Subject 08. (SE)
Relative Intensity
1.08
1.06
1.04
1.02
1
0.98
0.96
0.94
initial
tel 5
tel 10
after 10'
tel Aires 5
tel Aires 10