

Editorial

**Dynamic Pulse Reaction – Update 2020**

Gerhard Litscher\*

Research Unit of Biomedical Engineering in Anesthesia and Intensive Care Medicine, Research Unit for Complementary and Integrative Laser Medicine, and Traditional Chinese Medicine (TCM) Research Center Graz, Medical University of Graz, 8036 Graz, Austria; E-Mail: gerhard.litscher@medunigraz.at

\* **Correspondence:** Gerhard Litscher; E-Mail: gerhard.litscher@medunigraz.at

**Collection:** [Trends in Acupuncture and Laser Research and Education](#)

*OBM Integrative and Complementary Medicine*  
2020, volume 5, issue 4  
doi:10.21926/obm.icm.2004043

**Received:** November 11, 2020

**Accepted:** November 12, 2020

**Published:** November 13, 2020

**Abstract**

The Nogier reflex or reflex auriculo-cardiac (RAC) or the dynamic pulse reaction is a physiological phenomenon that is not generally accepted in conventional medicine. Therefore, evidence-based research in this sub-area is important for auricular medicine as it provides appropriate scientific evidence for better acceptance. In this editorial, a RAC measurement based on a modified smartphone registration and analysis is presented. The contribution is intended to stimulate researchers to continue working in this interesting area.

**Keywords**

Nogier reflex; reflex auriculo-cardiac (RAC); dynamic pulse reaction; auricular medicine; basic research; integrative and complementary medicine

**1. Introduction**

The importance of the Nogier reflex or reflex auriculo-cardiac (RAC) or the dynamic pulse reaction as a physiological variable that has so far been almost unknown in conventional medicine



© 2020 by the author. This is an open access article distributed under the conditions of the [Creative Commons by Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium or format, provided the original work is correctly cited.

can be regarded as considerable [1]. It is a dynamic change [1]. Usually, we feel the RAC while micro-stimuli are acting on the patient, which is not a static process. We usually only feel it with a fingertip. There is only one ideal pulse sampling point (in an anatomically predetermined position). The RAC palpation provides reproducible results in double-blind tests [1].

In a (2019/2020) multinational research project of the TCM (Traditional Chinese Medicine) Research Center at the Medical University of Graz funded by IMON (Initiative for Medicine without Side Effects), efforts were made to break new ground, primarily providing quantifiable evidence for the changes in dynamic pulse recording with optical methods and artificial intelligence. The results were registered for the first time using an adapted smartphone and can be used for further research by other groups.

Detailed technical descriptions can be found in a report that was already presented to a broad interest group [2].

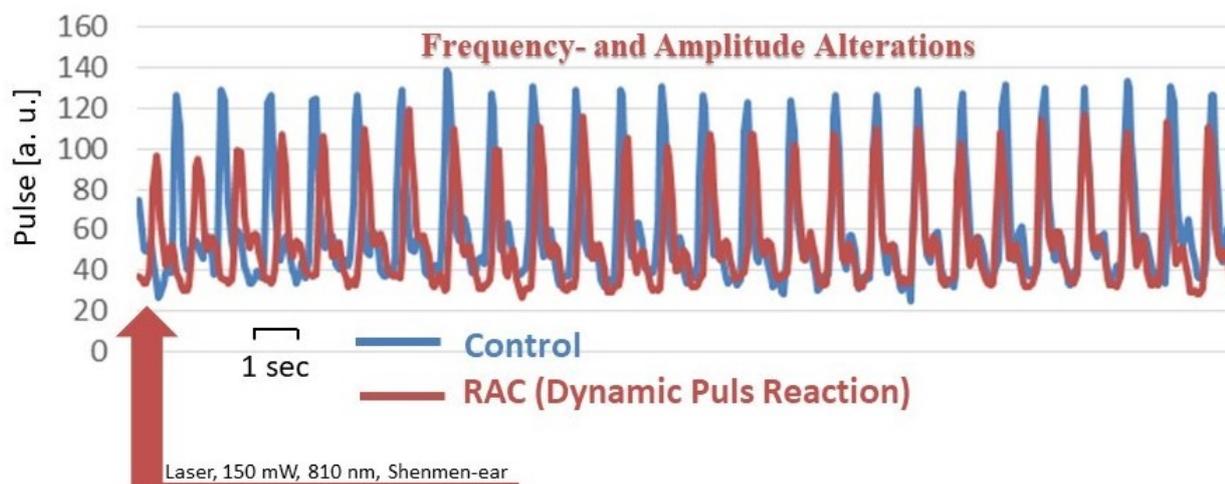
## **2. Information Technology-Based Dynamic ‘Pulse Sensing’ Using an Adapted Smartphone**

The ‘dynamic pulse phenomenon’ described by Bahr [1] was first described by Paul Nogier in the 1970s [3-5]. Based on the assumption that most of the cells of an organism react to stimuli from the autonomic nervous system, Nogier looked for a method with which the body's reaction to acupuncture-induced measures could be represented. He discovered that mechanical pressure on certain points on the auricle caused a cardiovascular reaction. He called this reaction ‘reflexe auriculo cardiaque’, later it was also abbreviated as RAC or, as Bahr preferred, called ‘dynamic pulse reaction’ (to differentiate it from Chinese static pulse sensing) [1]. In the research of Bahr et al., the RAC served for its practical application in the field of auriculomedicine both as an instrument for diagnosis and therapy [6]. The use of the RAC signal enabled the development of interference field acupuncture as well as the therapeutic so-called ‘controlled acupuncture’, in which the acupuncture needle is positioned under dynamic pulse control and not, as in the classical Chinese tradition, based on ‘cun’ and other units of measurement [6]. Litscher et al. [7] published an original article in *Integrative Medicine International* in 2014 together with German and Chinese researchers. A new high-resolution imaging technique for registering pulsating surface changes could make it possible to quantify the RAC reproducibly for the first time even without statistical analysis. This method combines an innovative microscope system, video analysis software, and special image processing software (from the Beijing University of Science and Technology). Even small, pulse-dependent changes in the skin surface could be made visible [7]. Moser et al. [8], also from the Medical University of Graz in Austria, reported in 2017 that the RAC follows the physiological laws quite well. The study, based on an earlier set of tests on measurements and analyses of heart rate variability, showed various reproducible changes in physiological parameters. A total of seven parameters and various external non-invasive stimuli were recorded under a defined setup and test course. The authors assumed that the RAC is a manifestation of a cardiac reaction of the autonomic nervous system, which then triggers a pulse wave. They concluded that the use of subtle stimuli near the limit of perception should be appropriate to allow for repeatable testing of immediate vagal and delayed sympathetic response.

The application presented in this editorial is based, for the first time, on a modified smartphone registration of pulse activity and can be applied to both static and dynamic pulse reactions.

The hardware architecture of the innovative system is divided into three parts, the sensors, the smartphone per se, and the cloud server section. The sensors first register GSR (galvanic skin response) and PPG (photoplethysmography) signals from the patient and transfer them to the smartphone. The mobile unit then transmits the data wirelessly to the cloud server. The RAC is predicted with the help of artificial neural networks [9].

Figure 1 shows the dynamic pulse response (RAC) after triggering by laser stimulation at the Shenmen ear point (810 nm, 150 mW). The changes in amplitude and frequency in the pulse signal of the radial artery can be seen.



**Figure 1** Dynamic pulse response (RAC) triggered by laser stimulation at the Shenmen ear point (modified with permission from Lan KC, Tainan).

### 3. Future Aspects

RAC research is entering a new phase in which modern information technology and artificial intelligence (AI) will play a major role. The RAC could be quantified and documented in the future using adapted smartphones with integrated sensors and analysis methods of AI (neural networks).

In theory, AI will help in making better medical decisions by registering, storing, and analyzing RAC data. However, in practice, it is often difficult to convert the changes in heart rate into usable information. The requirements of medical professionals are different, and the influencing factors too diverse.

Today, we are already taking the opposite step, and the human factor is again playing a bigger role. From the author's point of view, the greatest difficulty is to include human perception in the RAC analysis process. The solution to these questions can only be that AI and information technology processes in RAC research cannot and should not be a substitute for the human factor, but the basis for its data-supported decision-making.

### Acknowledgments

The author of this editorial would like to thank all members of the Initiative for Medicine without Side Effects (IMON, non-profit association), the European Academy of Traditional Chinese Medicine (EATCM), and especially its president Professor Frank Bahr for the support made to the Medical

University of Graz. Many thanks also to the project partners and employees from Austria, China and regions of China, especially Professor Kun-Chan Lan, PhD, Department of Computer Science and Information Engineering, National Cheng Kung University, Tainan, Taiwan and Priv.-Doz. Lu Wang, MD LAc, Research Unit for Complementary and Integrative Laser Medicine, Research Unit of Biomedical Engineering in Anesthesia and Intensive Care Medicine, and TCM Research Center at the Medical University of Graz, Austria. Parts of this editorial will be published in modified form as a short report in German language in *Akupunktur & Aurikulomedizin* in vol.4, December 2020 [10].

### **Author Contributions**

Gerhard Litscher did all work.

### **Funding**

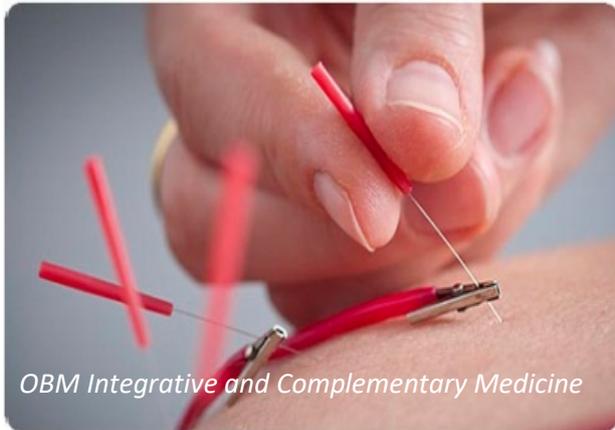
IMON/EATCM, Germany and TCM Research Center Graz, Medical University of Graz.

### **Competing Interests**

The author does not declare any conflict of interest.

### **References**

1. Bahr F. Personal communication 8.7. und 22. 10. 2020.
2. Litscher G. Dynamic pulse reaction and auricular medicine. Preliminary results from innovative transcontinental developments and basic research. Project report including 10 peer reviewed manuscripts. Graz: TCM Research Center Graz; 2020.
3. Nogier P. Le Réflexe Auriculocardiaque (RAC). Paris: Lyon Méditerranée Medical; 1972. p. 1709-p. 1738.
4. Nogier R. How did Paul Nogier establish the map of the ear? *Med Acupunct.* 2014; 26: 76-83.
5. Oleson T. Auriculotherapy stimulation for neuro-rehabilitation. *NeuroRehabilitation.* 2002; 17: 49-62.
6. Bahr F, Strittmatter B. *Das große Buch der Ohrakupunktur.* Stuttgart: Hippokrates; 2014.
7. Litscher G, Bahr F, Litscher D, Min LQ, Rong PJ. A new method in auricular medicine for the investigation of the Nogier reflex. *Integr Med Int.* 2014; 1: 205-210.
8. Moser M, Frühwirth M, Messerschmidt D, Goswami N, Dorfer L, Bahr F, et al. Investigation of a micro-test for circulatory autonomic nervous system responses. *Front Physiol.* 2017; 8: 448.
9. Lan KC, Litscher G, Hung TH. Traditional Chinese medicine pulse diagnosis on a smartphone using skin impedance at acupoints: A feasibility study. *Sensors.* 2020; 20: 4618.
10. Litscher G. Ein Projektkurzbericht zur dynamischen Pulsreaktion in COVID-19-Pandemie-Zeiten. *Akupunktur Aurikulomedizin.* 2020.



Enjoy *OBM Integrative and Complementary Medicine* by:

1. [Submitting a manuscript](#)
2. [Joining in volunteer reviewer bank](#)
3. [Joining Editorial Board](#)
4. [Guest editing a special issue](#)

For more details, please visit:

<http://www.lidsen.com/journals/icm>