

Universität Zürich

Akademischer Bericht 2002

Psychiatrische Universitätsklinik Zürich:

The KEY Institute for Brain-Mind Research

Leitung in der Berichtsperiode:
Frau Dr. Kieko Kochi

Post-Adresse:

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0 Allgemeine Einschätzung

Das mit privaten Mitteln finanzierte KEY Institute ist an der Psychiatrischen Universitätsklinik lokalisiert und mit der Klinischen Direktion von Prof. Dr. Daniel Hell assoziiert. Es führt mit dieser Direktion auch gemeinsame Projekte durch. Im Berichtsjahr setzte das KEY Institute die LORETA Methode zur Analyse von kognitiven und emotionalen Prozessen an gesunden und kranken Personen ein und vermochte dieser Methode zur noch breiteren internationalen Anerkennung zu verhelfen. Daneben fanden auch Untersuchungen des KEY Institutes mit anderen elektrophysiologischen Analysemethoden internationale Beachtung.

1 Forschung

The KEY Institute for Brain-Mind Research Psychiatrische Universitätsklinik Zürich

Leitung

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(Mr) Dr. R.D. Pascual-Marqui pascualm@key.unizh.ch

Überblick und Forschungstätigkeit

Members of the KEY Institute published 16 papers in peer-reviewed scientific journals (see listing). Several Institute members were invited to lecture at other Universities and at scientific congresses. Oral and poster reports were presented at scientific congresses (see listings of lectures, other publications, and abstracts).

Analyses of brain electric field data in acutely ill medication-naïve first-episode schizophrenic patients in comparison with controls were done in collaboration with the University Hospital of Clinical Psychiatry Bern using the newly extended LORETA tomography method that permits to construct tomographic functional images of the brain using the digitized Talairach brain atlas and using the microstate analysis approach that determines the classes of brain functional states in the sub-

second range. The LORETA images showed pathological deviations in the patients primarily in the left anterior to right posterior diagonal axis of the brain with excess activity of inhibitory nature (EEG delta) in frontal areas lack of normal activity (EEG theta and alpha) in left temporal and excess excitatory activity (EEG beta) in right parietal areas. The microstates showed that one of the four classes (about 20% of total time) were spatially different in the patients and shorter in duration than in controls an indication of a temporally intermittent disturbance of information processing.

<http://www.research-projects.unizh.ch/med/unit43500/area455/p2135.htm>

<http://www.research-projects.unizh.ch/med/unit43500/area455/p2143.htm>

In extension of the ongoing work on psychiatric patients with paranoid symptomatology a study on brain electric fields in people who believe in paranormal events and in people who are critical to such reports was conducted in collaboration with Dr. P. Brugger of the Department of Neurology of the University Hospital Zurich. "Believers" showed significantly different brain electric field characteristics as compared with "Disbelievers"; the center of gravity of excitatory brain activity (of the 18.5-21 Hz EEG frequency band) was significantly more to the right in "believers" than in "disbelievers", reminiscent of the findings in the patients but with right anterior (believers) extreme locations i.e. unlike the patients who showed right posterior extrema. Thus the tendency to believe in paranormal events is associated in healthy people with brain field characteristics that differ qualitatively from those in psychiatric patients with paranoid symptomatology.

Statistical evaluation of the LORETA tomographic functional brain images was further developed and utilized in several publications. The adaptation of the LORETA analysis approach to a co-registration with fMRI tomographic images was implemented in collaboration with Dr. D. Brandeis of the Zurich University Center for Child and Adolescent Psychiatry and Prof. E. Martin of the Children's Hospital of Zurich University. Brain electric and fMRI data obtained during language comprehension tasks in normal and dyslexic children were analyzed with the co-registration procedures.

<http://www.research-projects.unizh.ch/med/unit43500/area455/p2138.htm>

<http://www.research-projects.unizh.ch/med/unit43500/area455/p2140.htm>

<http://www.research-projects.unizh.ch/med/unit43500/area455/p2145.htm>

Using microstate analysis, event-related potential (ERP) 39-channel topography while reading Japanese words in Kanji (morphograms) and Kana (syllabograms) was studied. During two ERP microstates, 122-178 and 214-262 ms after onset of word presentation, the brain electric field differed for words in Kanji versus Kana. Thus, different neural populations process the two types of Japanese writing, starting very early after input.

<http://www.research-projects.unizh.ch/med/unit43500/area455/p2146.htm>

2 Lehre

2.1 Studium

Prof. D. Lehmann with Drs. D. Brandeis, P. Achermann, T. Koenig, J. Steger and R. Pascual-Marqui

each semester teach a 3-day-Block-Course on "EEG-Fields and Brain functions".

2.2 Weiterbildung, Fortbildung

Dr. Roberto D. Pascual-Marqui

- 3-day LORETA training course in Tokyo Japan 26-29 May 2002.
- 3-hour LORETA training course in Barcelona Spain. 11th European Congress of Clinical Neurophysiology August 2002.
- 2-day IPEG (International Pharmaco-EEG Group) training course in Barcelona Spain November 2002.
- 2-day LORETA training course in Barcelona Spain. November 2002.

3 Nachwuchsförderung

4 Gleichstellung der Geschlechter

5 Dienstleistungen

5.1 Dienstleistungen innerhalb der Universität

5.2 Dienstleistungen zugunsten anderer Bildungsinstitutionen

5.3 Dienstleistungen zugunsten der Öffentlichkeit

6 Aussenbeziehungen

6.1 Inneruniversitäre, nationale und internationale Beziehungen in Forschung und Lehre

Dr. Fabio Babiloni
Institute of Human Physiology of Roma
University "La Sapienza"
Rome, Italy

PD Dr. Daniel Brandeis
Brain Mapping Research
Department of Child and Adolescent Psychiatry
University of Zürich
Zürich, Switzerland

Dr. José-María Carazo
Deputy Director for Research
Centro Nacional de Biotecnología.
CSIC.Campus de la Universidad Autónoma de Madrid
Cantoblanco Madrid, Spain

Prof. S. Galderisi
Dept. of Psychiatry
University of Naples
Naples, Italy

Prof. J. Gruzelier
Dept. of Cognitive Neuroscience and Behaviour
Imperial College of Science Technology and Medicine
London, United Kingdom

Prof. W. Herrmann
University Hospital of Psychiatry
Benjamin Franklin University
Berlin, Germany

Prof. Koichi Hirata MD DSc
Dept. of Neurology
Dokkyo University School of Medicine
Mibu Tochigi, Japan

Prof. E.R. John
Brain Research Laboratories
School of Medicine
New York University
New York, USA

Prof. T. Kinoshita
Dept. of Neuro-Psychiatry
Kansai Medical University
Moriguchi Osaka, Japan

Prof. H.-D. Klein
Philosophical-Historical Class
Austrian Academy of Sciences
Vienna, Austria

Dr. T. Koenig
University Hospital of Clinical Psychiatry
Bern, Switzerland

Prof. Dr. E. Martin-Fiori
Dept. Magnetic Resonance
University Children's Hospital
Zurich, Switzerland

Prof. H. Ozaki
Laboratory of Physiology
Faculty of Education
Ibaraki University
Mito Ibaraki, Japan

MD PhD Joachim Roeschke
Dept. of Psychiatry
University of Mainz
Mainz, Germany

Prof. Bernd Saletu
Department of Psychiatry
Vienna, Austria

PD U. Schreiter Gasser
Center of Geriatric Psychiatry (CGP)
Department of Psychiatry
University of Zurich
Zurich, Switzerland

Dr. V. Strelets
Institute of Higher Nervous Activity and Neurophysiology
Russian Academy of Sciences
Moscow, Russia

MD PhD H. Tanaka
Dept. of Neurology
Dokkyo University School of Medicine
Mibu Tochigi, Japan

MD PhD N. Tsuno
Department of Psychiatry
Jikei University School of Medicine
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Tokyo, Japan

Prof. D. Vaitl
Dept. of Psychobiology
University of Giessen
Giessen, Germany

Dr. J. Wackermann
Institut für Grenzgebiete der
Psychologie und Psychohygiene
Freiburg i.B., Germany

Prof. Z. J. Koles
Department of Biomedical Engineering
University of Alberta
Edmonton, Canada

6.2 Forschungsbeziehungen zu Unternehmungen auf nationaler und internationaler Ebene

6.3 Zusammenarbeit mit der ETH Zürich

6.4 Rufe an andere Hochschulen

6.5 Auszeichnungen

7 Akademische Selbstverwaltung

8 Öffentliche Funktionen von Institutsangehörigen

8.1 Institutionen der Forschungsförderung

8.2 Organisation von Kongressen, Kolloquien und Tagungen

8.3 Tätigkeit in Gerichten, Behörden und anderen öffentlichen Institutionen

Prof. D. Lehmann presently serves on the Editorial Boards of the following scientific Journals: „Cognitive Brain Research“, and "Psychiatry Research: Neuroimaging", and "Neuropsychobiology“(Advisory Board)

8.4 Weiteres

"Invited lectures" an Kongressen

Lehmann, D. Hirnelektrische Mikrozustände, die psychophysiologischen Bausteine bewusster Mentation. Universität Jena, Germany, March 6, 2002

Lehmann, D. Atome des Denkens. Studiengang "Das Denken beobachten". Universität Zürich, April 2, 2002

Lehmann, D. Hirnelektrische Mikrozustände: die Atome des bewussten Denkens? Universität Osnabrück, Germany, May 15, 2002

Pascual-Marqui, R.D. Eyes-closed EEG: frequency band structure and neuronal generators. Japanese Pharmaco-EEG Group (JPEG) Meeting, July 2002, Tokyo, Japan.

Pascual-Marqui, R.D. Frequency structure and neuronal generators of eyes-closed EEG. 10th Annual Conference of the Society for Neuronal Regulation (SNR), September 2002, Scottsdale, AZ, USA.

Pascual-Marqui, R.D. Low resolution brain electromagnetic tomography. 13th World Congress, International Society For Brain Electromagnetic Topography (IS-BET), October 2002, Naples, Italy.

Pascual-Marqui, R.D. Standardized low resolution brain electromagnetic tomography (sLORETA): technical details. 12th Biennial Congress of the International Pharmaco-EEG Group (IPEG), November 2002, Barcelona, Spain.

"Oral presentations" an Kongressen

Esslen, M. Brain activation during emotional processing identified with LORETA (low resolution brain electromagnetic tomography): Localization and dynamics. 12th Biennial Congress of the International Pharmaco-EEG Group (IPEG), November 2002, Barcelona, Spain.

Esslen, M. Brain areas and time course of emotional processing activation identified with LORETA. 13th World Congress, International Society For Brain Electromagnetic Topography (ISBET), October 2002, Naples, Italy.

Esslen, M. Functional brain imaging (LORETA) of verbal processing. Japanese Pharmaco-EEG Group (JPEG) Meeting, July 2002, Tokyo, Japan.

Gianotti, L.R.R. Electrophysiological and affective correlates of belief in the paranormal. 13th World Congress of ISBET 2002 (International Society of Brain Electromagnetic Topography), 27-29 Oct., Naples, Italy)

9 Bibliotheken und Sammlungen

10 Publikationen

10.1 In der Berichtsperiode veröffentlichte Arbeiten

- **Aufsätze in wissenschaftlichen Zeitschriften**

- **Originalarbeiten**

Anderer, P., Saletu, B., Semlitsch, H.V., Pascual-Marqui, R.D. (2002). Structural and energetic processes related to P300: LORETA findings in depression and effects of antidepressant drugs. *Methods & Findings in Experimental & Clinical Pharmacology*. 24D:85-91.

Anderer, P., Saletu, B., Semlitsch, H.V., Pascual-Marqui, R.D. (2002). Perceptual and cognitive event related potentials in neuropsychopharmacology: methodological aspects and clinical applications (pharmacology-ERP topography and tomography). *Methods & Findings in Experimental & Clinical Pharmacology*. 24C:121-137.

Isotani, T., Kinoshita, T., Lehmann, D., Pascual-Marqui, R.D., Wackermann, J. (2002). Spatial configuration of brain electric activity during positive, neutral and negative emotions. *Methods & Findings in Experimental & Clinical Pharmacology*. 24D:109-110.

Koenig, T., Prichep, L.S., Lehmann, D., Valdes-Sosa, P., Braeker, E., Kleinlogel, H., Isenhardt, R., John, E.R. (2002). Millisecond by millisecond, year by year: normative EEG microstates and developmental stages. *NeuroImage*. 16: 41-48.

Mientus, S., Gallinat, J., Wuebben, Y., Pascual-Marqui, R.D., Mulert, C., Frick, K., Dorn, H., Herrmann, W.M., Winterer, G. (2002). Cortical hypoactivation during resting EEG in schizophrenics but not in depressives and schizotypal subjects as revealed by low resolution electromagnetic tomography (LORETA). *Psychiatry Research*. 116(1-2):95-111.

Pascual-Montano, A., Taylor, K.A., Winkler, H., Pascual-Marqui, R.D., Carazo, J.M. (2002). Quantitative self-organizing maps for clustering electron tomograms. *Journal of Structural Biology*. 138(1-2):114-22.

Pascual-Marqui, R.D., Esslen, M., Kochi, K., Lehmann, D. (2002). Functional imaging with low resolution brain electromagnetic tomography (LORETA): a review. *Methods & Findings in Experimental & Clinical Pharmacology*. 24C:91-95.

Pascual-Marqui, R.D., Esslen, M., Kochi, K., Lehmann, D. (2002). Functional imaging with low resolution brain electromagnetic tomography (LORETA): review, new comparisons, and new validation. *Japanese Journal of Clinical Neurophysiology*. 30:81-94.

Pascual-Marqui, R.D. (2002). Standardized low resolution brain electromagnetic tomography (sLORETA): technical details. *Methods & Findings in Experimental & Clinical Pharmacology*. 24D:5-12.

Pizzagalli, D.A., Lehmann, D., Hendrick, A.M., Regard, M., Pascual-Marqui, R.D., Davidson, R.J. (2002). Affective judgments of faces modulate early activity (approximately 160 ms) within the fusiform gyri. *Neuroimage*. 16(3 Pt 1):663-77.

Pizzagalli, D.A., Nitschke, J.B., Oakes, T.R., Hendrick, A.M., Horras, K.A., Larson, C.L., Abercrombie, H.C., Schaefer, S.M., Koger, J.V., Benca, R.M., Pascual-Marqui, R.D., Davidson, R.J. (2002). Brain electrical tomography in depression: the importance of symptom severity, anxiety, and melancholic features. *Biological Psychiatry*. 52(2):73-85.

Saletu, B., Anderer, P., Saletu-Zyhlarz, G.M., Pascual-Marqui, R.D. (2002). EEG topography and tomography in diagnosis and treatment of mental disorders: evidence for a KEY-LOCK principle. *Methods & Findings in Experimental & Clinical Pharmacology*. 24D:97-106.

Vitacco, D., Brandeis, D., Pascual-Marqui, R., Martin, E. (2002). Correspondence of event-related potential tomography and functional magnetic resonance imaging during language processing. *Human Brain Mapping*. 17(1):4-12.

Saletu, B., Anderer, P., Saletu-Zyhlarz, G.M., Arnold, O., Pascual-Marqui, R.D. (2002). Classification and evaluation of the pharmacodynamics of psychotropic drugs by single lead pharmaco-EEG, EEG mapping and Tomography (LORETA). *Methods & Findings in Experimental & Clinical Pharmacology*. 24C:97-120.

Tsuno, N., Shigeta, M., Hyoki, K., Kinoshita, T., Ushijima, S., Faber, P.L., Lehmann, D. (2002). Spatial organization of EEG activity from alertness to sleep stage 2 in old and younger subjects. *J. Sleep Res.* 11: 43-51.

Wackermann, J., Pütz, P., Büchi, S., Strauch, I., Lehmann, D. (2002). Brain electrical activity and subjective experience during altered states of consciousness: Ganzfeld and hypnagogic states. *Int. J. Psychophysiol.* 46(2): 122-145.

– **Sonstige Beiträge in wissenschaftlichen Zeitschriften**

Faber, P.L., Lehmann, D., Pütz, P., Gianotti, L.R.R., Strauch, I., Wackermann, J. (2002). EEG source locations during ganzfeld, sleep onset and waking. *Brain Topography* 14: 349-350. (presented at the 10th German Mapping Meeting [DMM], Giessen, Germany, 28-29 Sept. 2001).

Faber, P.L., Wohlgemut, P., Gianotti, L.R.R., Lehmann, D. (2002). EEG source locations during voluntary and hypnotic arm levitation in a pilot study. *Psychiatry Research: Neuroimaging*, 114: 175/76. (presented at the ISNIP 2001 (International Society of Brain Electromagnetic Topography), Bern, August 29. - September 2)

Gianotti, L.R.R., Faber, P.L., Lehmann, D. (2002). EEG source locations in believers and skeptics of paranormal phenomena after guessed random events. *Brain Topography* 14(3): 257. (presented at the 12th International Symposium of the International Society for Brain Electromagnetic Topography (ISBET), Utsunomyia, Japan, March 8-10, 2001).

Gianotti, L.R.R., Faber, P.L., Lehmann, D. (2002). Event-related brain microstates when reading emotionally positive, negative and neutral words. *Brain Topography* 14: 350. (presented at the 10th German Mapping Meeting [DMM], Giessen, Germany, 28-29 Sept. 2001).

Gianotti, L.R.R., Lehmann, D., Faber, P.L., Schreiter Gasser, U. (2002). Resting EEG microstates in Alzheimer patients before and after rivastigmine medication. *Psychiatry Research: Neuroimaging*, 114: 178/79. (presented at the ISNIP 2001 (International Society of Brain Electromagnetic Topography), Bern, August 29. - September 2)

Lehmann, D. (2002). On the interpretation of EEG and ERP analysis results. *Brain Topography*. 14: 349-352. (presented at the 10th German Mapping Meeting [DMM], Giessen, Germany, 28-29 Sept. 2001).

Strelets, V., Golikova, J., Novototsky-Vlasov, V., Gianotti, L.R.R., Faber, P.L., Lehmann, D. (2002). Shortened EEG microstate duration in schizophrenics with positive symptomatology. *Psychiatry Research: Neuroimaging*, 114: 193. (presented at the ISNIP 2001 (International Society of Brain Electromagnetic Topography), Bern, August 29. - September 2)

Tanaka, H., Lehmann, D., Hirata, K. (2002). Evaluation of information processing in reading task between Kanji and Katakana with low resolution electromagnetic tomography. *Clin. Neurophysiol.* 113: 973-974.

Tsuno, N., Shigeta, M., Hyoki, K., Kinoshita, T., Ushijima, S. Faber, P.L., Lehmann, D. (2002). EEG frequency band sources from alertness to sleep stage2 in old and younger subjects. *Brain Topography* 14: 349-351. (presented at the 10th German Mapping Meeting [DMM], Giessen, Germany, 28-29 Sept. 2001).

– **Dissertationen**

Michaela Esslen. (2002). Human brain imaging of emotion and language using low resolution brain electromagnetic tomography. Presented to the Faculty of Arts/Philosophy of the University of Zürich for the degree of Doctor of Philosophy. Accepted on the recommendation of Professor Inge Strauch Ph.D. and Professor Dietrich Lehmann Dr. med. Dr. med. h.c.

– **Kongress-, Tagungs- und Workshopbände**

- **Eigene Beiträge**

Gamma, A., Lehmann, D., Frei, E., Pascual-Marqui, R.D., Vollenweider, F.X. (2002). The relationship between co-recorded [H215O]-PET and EEG functional tomography (LORETA) before and during pharmacological activation. In: K. Hirata, Y. Koga, K. Nagata, K. Yamazaki (eds.): *Recent Advances in Human Brain Mapping* [International Congress Series 1232C]. Amsterdam, Elsevier, 0-444-50755-8, pp. 247-251.

Gianotti, L.R.R, Faber, P.L., Lehmann, D. (2002). EEG source locations after guessed random events in believers and skeptics of paranormal phenomena. In: K. Hirata, Y. Koga, K. Nagata, K. Yamazaki (eds.): *Recent Advances in Human Brain Mapping* [International Congress Series 1232C]. Amsterdam: Elsevier [0-444-50755-8], pp. 439-441.

Isotani, T., Lehmann, D., Pascual-Marqui, R.D., Fukushima, M., Saito, N., Yagyu, T., Kinoshita, T. (2002). Source localization of brain electric activity during positive, neutral and negative emotional states. In: K. Hirata, Y. Koga, K. Nagata, K. Yamazaki (eds.): *Recent Advances in Human Brain Mapping* [International Congress Series 1232C]. Amsterdam, Elsevier [0-444-50755-8], pp. 165-173.

Koukkou M., Lehmann D. Memory adaptive orienting and psychosomatics: a brain model. (2002). In: T. Sivik D. Byrne D.R. Lipsitt G.N. Christodoulou and H. Dienstfrey (eds.): *Psycho- Neuro- Endocrino- Immunology (PNEI). A common language for the whole human body*. [Int. Congr. Series ICS 1241C]. Amsterdam Elsevier [ISBN 0-444-50989-5] pp. 305-311.

Koukkou, M., Lehmann, D. Gehirn - Gedächtnis – Kreativität. (2002). In: G. Reising (ed.): *Ein träumendes Bewusstsein* [ISBN 3-925212-52-3]. Karlsruhe: Staatliche Kunsthalle, pp. 220-231 & [references] 248-255.

Lehmann, D. (2002). Das Mentale und die funktionellen Zustände des Gehirns: zu den Atomen des Denkens. In: P. Giampieri-Deutsch (ed.) *Psychoanalyse im Dialog der Wissenschaften*, Bd. 1. Europäische Perspektiven. Stuttgart: Kohlhammer, pp. 123-142.

Tanaka, H., Lehmann, D., Hirata, K. (2002). Microstate analysis of information processing in a reading task with Kanji and Katakana. In: K. Hirata, Y. Koga, K. Nagata, K. Yamazaki (eds.): *Recent Advances in Human Brain Mapping* [International Congress Series 1232C; ISSN 0531-5131]. Amsterdam, Elsevier [0-444-50755-8], pp. 397-401.

– Sonstige Buchveröffentlichungen

"Abstrakte in Abstrakt-Büchern"

Gianotti, L.R.R., Faber, P.L., Lehmann, D. (2002). Differences and consistencies for valence distinction in ERP microstates when reading emotionally positive and negative words. Abstract Book, p.33.
(presented at the 11. German EEG/EP Mapping Meeting 2002, , September 20-21, Giessen, Germany)

Gianotti, L.R.R., Faber, P.L., Lehmann, D. (2002). Belief in the paranormal and affective attitude: an electrophysiological study. Abstract #5, Abstract Book p. 9-10.
(presented at the Neuroscience Center Zurich (ZNZ) Symposium 2002, 18 Oct 2002, Zurich, Switzerland)

Gianotti, L.R.R., Faber, P.L., Lehmann, D. (2002). Event-related potential fields when reading emotionally positive and negative words. Abstract Book, p.11.
(presented at the Joint Meeting of the Swiss Society for Neuroscience (SSN) and the Swiss Society for Sleep Research, Sleep Medicine and Chronobiology (SGSSC), Geneva, Switzerland, 12 Jan. 2002)

Gianotti, L.R.R., Faber, P.L., Lehmann, D. (2002). Reading emotional words: event-related potential maps. Abstract Book, p.282.
(presented at the 12th World Congress of Psychiatry 2002, 24-29 Aug., Yokohama, Japan)

Gianotti, L.R.R., Faber, P.L., Lehmann, D. (2002). Electrophysiological and affective correlates of belief in the paranormal. Abstract Book, p.42.
(presented at the 13th World Congress of ISBET 2002 (International Society of Brain Electromagnetic Topography), 27-29 Oct., Naples, Italy)

Gianotti, L.R.R., Lehmann, D., König, G., Faber, P.L., Schreier Gasser, U. (2002). LORETA analysis of an EEG microstate class affected by rivastigmine in Alzheimer patients. Abstract Book, p.43.
(presented at the 13th World Congress of ISBET 2002 (International Society of Brain Electromagnetic Topography), 27-29 Oct., Naples, Italy)

Gianotti, L.R.R., Strelets, V., Faber, P.L., Gruzelier, J.H., Lehmann, D. (2002). EEG microstates are shortened in schizophrenia. Abstract Book, p.323.
(presented at the 12th World Congress of Psychiatry 2002, 24-29 Aug., Yokohama, Japan)

Hebert, R., Lehmann, D., Koenig, T., Travis, F.
Global field synchronization during the transcendental meditation technique: a case study.
(presented at the 3th World Congress of ISBET (International Society of Brain Electromagnetic Topography), 27-29 Oct. 2002, Naples, Italy.)

Isotani, T., Lehmann, D., Pascual-Marqui, R.D., Gianotti, L.R.R., Kochi, K., Wackermann, J., Saito, A., Kinoshita, T.
Ethanol effects on the spatial configuration of brain electric activity.
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Lehmann, D., Faber, P.L., Galderisi, S., Herrmann, W.M., Kinoshita, T., Koukkou, M., Mucci, A., Saito, N., Wackermann, J., Winterer, G., Koenig, T. (2002). Syntax of EEG microstate concatenations is altered in acute, medication-naive, first-episode schizophrenics. Abstract Book, p.26.
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(presented at the Neuroscience Center Zurich (ZNZ) Symposium 2002, 18 Oct 2002, Zurich, Switzerland)

Lehmann, D., Faber, P.L., Galderisi, S., Herrmann, W.M., Kinoshita, T., Koukkou, M., Mucci, A., Pascual-Marqui, R.D., Saito, N., Wackermann, J., Winterer, G., Koenig, T. (2002). Deviant syntax of EEG microstate concatenations in acute medication-naive first-episode schizophrenics. Abstract Book, p.59.
(presented at the 13th World Congress of ISBET 2002 (International Society of Brain Electromagnetic Topography), 27-29 Oct., Naples, Italy)

Lehmann, D., Faber, P.L., Strelets, V., Gianotti, L.R.R., Novototsky-Vlasov, V., Gruzelier, J.H., Koenig, T. (2002). Subsecond EEG microstates with different topographies differ in EEG temporal wave frequency. Abstract Book, p.38.
(presented at the 11. German EEG/EP Mapping Meeting 2002, , September 20-21, Giessen, Germany)

Lehmann, D., Faber, P.L., Strelets, V., Gianotti, L.R.R., Novototsky-Vlasov, V., Gruzelier, J.H., Koenig, T. (2002). Topography-defined, subsecond EEG microstates vary in temporal wave frequency. Abstract #7, Abstract Book, p. 11.
(presented at the Neuroscience Center Zurich (ZNZ) Symposium 2002, 18 Oct 2002, Zurich, Switzerland)

Lehmann, D., Faber, P.L., Strelets, V., Gianotti, L.R.R., Novototsky-Vlasov, V., Gruzelier, J.H., Koenig, T. (2002). EEG temporal wave frequency differs between topography-defined EEG microstates in subseconds. Abstract Book, p.60.
(presented at the 13th World Congress of ISBET 2002 (International Society of Brain Electromagnetic Topography), 27-29 Oct., Naples, Italy)

Strelets, V., Golikova, J., Novototsky-Vlasov, V., Gianotti, L.R.R., Faber, P.L., Gruzelier, J.H., Lehmann, D. (2002). Schizophrenics with positive symptomatology have shortened EEG microstate durations. Abstract Book, p.7.
(presented at the Joint Meeting of the Swiss Society for Neuroscience (SSN) and the Swiss Society for Sleep Research, Sleep Medicine and Chronobiology (SGSSC), Geneva, Switzerland, 12 Jan. 2002)

10.2 Arbeiten im Druck

- **Aufsätze in wissenschaftlichen Zeitschriften**
 - **Originalarbeiten**

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