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Dr. Thomas Penzel, a renowned German researcher, reports on key findings about sleep recording methods

Dr. Thomas Penzel, a leading specialist in sleep medicine, reports on aspects of his professional career, from the development of his first sleep clinic in Germany to the pioneering research he conducts in this medical field. According to Dr. Penzel, sleep apnea persists as a poorly reported problem: People feel insecure in explaining to doctors that they have sleeping issues.

Dr. Penzel also discusses the main findings regarding sleep recording methods and the cardiovascular consequences of sleep disturbances. Finally, he distinguishes between the simple snoring produced by sleep apnea that is characterized, for example, by inward funneling of the thorax or the presence of other obstructive elements.

Neurovirtual News: Could you tell us briefly about your work and your career?

Dr. Thomas Penzel: I began my career in sleep medicine in 1982 at the University of Marburg. At the time, I was studying physics. The sleep lab, which was still under construction, needed a person to program the computers, install the hardware, and organize the lab. It was necessary to program not only the EEG, but also other blood pressure devices, the ECG and other equipment related to autonomous variables of the nervous system.

NN: In 1982, you founded the first sleep laboratory in Germany, at the University of Marburg, and since then the advances have been remarkable. What was, then, the contribution of this first sleep medicine laboratory in Germany?

Dr. Thomas Penzel: The sleep laboratory in Marburg was one of the first laboratories of its kind in Germany, perhaps even in Europe, which tried to combine traditional sleep medicine derived from neurology and psychiatry, since many people with sleep problems complain of physical manifestations like apnea, hypertension during sleep, or other sleep issues. Therefore, the first contribution was the incorporation of a sleep laboratory within a medical clinic.

NN: How has technology contributed to the diagnosis and treatment of sleep disorders? At the end of the year, in an article on the subject, you discussed the possibility of using modern technologies to perform a sleep evaluation. Could you share some points about this?

Dr. Thomas Penzel: Yes, I think we made some interesting discoveries. One is in the field of disorders related to sleep apnea as a very prevalent disorder. This finding resulted from technological advancements, which may benefit other patients, because it is easy to implement them. We also observed that physicians are becoming aware of this problem and are conducting large epidemiological studies; one can detect the presence of an apnea rate of 30 to 40%. It is surprising to think that at least one third of the population suffers from apnea. If this is the case, we cannot consider this a disorder, but a standard variant. However, we know from careful studies that apnea poses great health risks. People who suffer from apnea die earlier.

If we consider, moreover, other sleep apnea studies in China, in India, in Australia, where they only recruited people on the street, they diagnosed sleep apnea – in a very large number – and then applied CPAP treatment. But they did not find significant effects of CPAP in relation to vascular problems, so it is inferred that if you simply choose people [off the street], the rate of sleep apnea is very high, and for many the treatment does not produce beneficial effects. We believe that nowadays there are patients who have apnea where this condition does not cause problems for their health, and there are others who have severe types of apnea that can cause early death. So, the big challenge is how to identify these people. Thus, in our view, measuring apnea as well as measuring blood pressure is beneficial, and not all those with high blood

pressure or apnea need immediate treatment. The challenge, therefore, is to identify the risk groups that really need treatment, in order to save unnecessary CPAP costs for 30% of the population.

NN: Based on your previous research, do you have any idea about which type of apnea can affect the proper functioning of the heart?

Dr. Thomas Penzel: We believe that previously people knew what to do. Who were the patients and why did all the studies show that there was a benefit in diagnosis and treatment? This occurred because people were already suffering from it and they felt the need to go to the hospital. They had other complaints which we could not treat, but among those who suffered from apnea the treatment and the subsequent study would demonstrate the benefits. If you simply recruit people off the street, this effect will be diluted and will be voided. I believe, then, that in order to identify risk factors such as hypertension or cardiovascular disease, perhaps mental problems, sleep problems, drowsiness at the wheel, concentration and cognitive problems, all together, you could certainly identify risk profiles, which helps us in identifying the persons for whom apnea treatment can actually solve their problems.

NN: In Europe, in your opinion, in general, we can say that we have made significant advances in sleep medicine. What is the biggest complaint among the Germans, for example?

Dr. Thomas Penzel: Well, we know that sleep problems are not attractive and it's also not very nice that people know this. The same also occurs with occupational diseases. So why do people volunteer for treatment? They think, "Ah... it's a spinal problem, something to do with the heart, other concerns." They never report that they sleep poorly or that they get very little sleep. This is a symptom that is not communicated. It is a challenge. This is one of the complaints in which people say, "Oh... I have so many problems... lack of sleep, insomnia" or "I don't feel rested." Problems like excessive sleep are not recognized by the health system. This is one of the complaints: to recognize sleep problems, properly diagnose them as disorders, and then find the appropriate treatment. Discover who suffers from it and who can benefit from this type of treatment.

NN: Where should we invest more on clinical research?

Dr. Thomas Penzel: A study related mainly to apnea and to cases of drowsiness has detected that this is a general problem regarding the development of society, with the stress people feel in the big cities. Let's say, for example, that my day is more efficient in the morning, the clock-like routine, which points to numerous tasks. Even so, I must work efficiently, and at night I have to go home and get a good night's sleep. I am expected to go to bed and close my eyes, and this simply makes me go to sleep immediately – except that it does not work like that. Especially when we get older, there are more worries, and that's why all patients complain about sleeping poorly.

Therefore, the problem of insomnia is also appearing much more at our sleep hospital, and this tells us a lot about the fact that we need to educate ourselves about sleep and that the treatment takes time and the changes do not take effect immediately. Since we cannot make sleep more efficient, we must give ourselves time and remain calm so that sleep comes. So, this is an important issue faced at our sleep hospital.

NN: You are an award-winning scholar in many publications. Part of your research has been focused on new methods of recording sleep and the cardiovascular consequences of sleep disorders. Specifically, what do the most recent studies in this field deal with?

Dr. Thomas Penzel: I will begin with the subjects that were already presented in my book, since at that time there were no internal medicine sleep hospitals. Not one. Zero. The first challenge was to build something. We started with the cardiac catheterization laboratory to install ECG amplifiers along with the blood pressure amplifiers to build the first sleep lab and record patients' sleep. For this laboratory, the biggest challenge was to create equipment to make more records.

In 1984, we started with HST due to the need to conduct sleep studies. At that time there were major challenges because we did not have portable digital technology; we only had tape recorders. First, we introduced electronic devices for PCM coding to digitize moving signals. Then, we put several channels onto four-channel tapes, and as a result we were able to record up to eight channels (ECG), record breathing on two channels, CO₂ and O₂. So, we had five different channels and recorded them with a time strip so we could sync everything with this HST. This device was called the Marburg suitcase, the Marburg lockbox.

Subsequently, the first digital recorder appeared, called a "messam." Some people still use this device, and it was the first digital system. Later, other Stanford people began to make digital recordings. This was one of the great contributions of that time. The latest contributions, in one way or another, are still linked to this one. After establishing the sleep laboratory in Marburg, we assisted in the development of sleep medicine technology, much of which was borrowed from neurology, from epilepsy, all different parts of cardiovascular research, but the fixed statistics can only be done in an established sleep laboratory. Again, the ends justify the means, and the means relate to how we could bring these sophisticated technologies into the home. This is the latest development: how to make a sleep apnea diagnosis with sophisticated sensors in a domestic setting.

NN: Does the Marburg suitcase record on ECG paper or on the eight-channel paper inside the suitcase?

Dr. Thomas Penzel: Yes, we had a rechargeable battery, which was very important. There were recorders that could record for an hour, and if they worked at a slower speed they could record up to 24 hours. The signals, in turn, were digitized and then condensed, from which we could get this coding, which allowed us to store several signals on a single strip. Then, when multiplexing the digital signals, we could place them back on the tape (magnetic tape) analogically.

NN: And it was your team in Marburg that developed all of this?

Dr. Thomas Penzel: Yes, along with some electronic engineers who developed the technique for satellites. We had a brilliant electronic engineer – he's still with us – and he developed a broadcast satellite. To prepare them, we used sophisticated digitizing technologies, finishing with a 65-series microprocessor or two microprocessors. It was the same microprocessor that was used in the Apple II computers and Atari devices, available for our computers at that time.

NN: You recently published a study of the effects of age on patients with sleep disorders. What were the main conclusions

of this analysis and how can we use the data in the treatment of each group evaluated?

Dr. Thomas Penzel: Well, the older we get, the more fragmented is our sleep. We see that the continuity of the stages of sleep changes. So, even if the elderly still sleep deeply, their sleep becomes more fragmented. The idea of this research was not only to find the percentage of each stage of sleep, but also to find out how this fragmentation occurs and to quantify it, to observe the transitions from one stage of sleep to another, and to prepare statistics on it. Thus, we have been able to separate the results by age brackets, as well as to investigate if individuals present some type of sleep disorder, to subsequently indicate how sleep changes in people with insomnia and sleep apnea. It is noted that in patients with insomnia there are not so many fragmentations and changes, only between wakefulness and light sleep, whereas patients with sleep apnea emit slow waves and sleep deeply, in addition to presenting more transitions from deep sleep to lighter sleep stages. Therefore, the characteristics of the sleep transitions are diverse and the idea of this research is to find these phenotypes. Currently, the AASM rules do not reflect this. We need a new technology to record sleep; this is the purpose of this research.

NN: Since we're talking about the age of the patients, should we all keep a copy of our polysomnograms so we can make the comparison in the future? Would that be helpful?

Dr. Thomas Penzel: That's most useful. The sleep profile the hypnogram – is like a fingerprint, and changes with age, and therefore you are entirely correct. It would make sense to record this information throughout one's life and see if there is a development only due to aging or if the changes occur because of some disturbance. However, up to now this has not been recognized. When we show our technologists the profile of a patient, they say "Oh, I recognize that patient." It really functions like a fingerprint. You can identify people simply by observing the study's hypnogram.

NN: In a recent interview on a German TV show, you talked about children's snoring. What are its causes, what should be observed by the parents, and when is it time for a deeper investigation?

Dr. Thomas Penzel: Snoring is a very important symptom. Snoring is also reported in children. And especially more nowadays, with increasing obesity, a higher frequency of snoring in children is being noted. Snoring alone is not sleep apnea. One must listen carefully and check the nature of the snoring and investigate: Is this the vibrations of collapsed tissue or just a tissue movement? One must also notice if the child has a sinking chest or if there are other obstructive elements. If it is just a noise, the parents should be counseled to consult an ENT. Perhaps it is something that can be easily corrected. That's my advice.

NN: What about adults? When does snoring become a dangerous thing?

Dr. Thomas Penzel: It occurs in a similar manner. Usually, in adults there is no incision in the chest. There are bones and everything else; they are more robust. So, for adults, we listen to the snoring interval. It's common to observe something characteristic of obstructive sleep apnea, an intermittent snoring. Thus, a person snores, stops snoring, has a breathing pause – an apnea – without snoring, and then has that explosive rumble of snoring again. There is a very typical snoring pattern. Since we know that the whole body and sleep also age, the upper airways become more flexible, so the development of regular snoring is more or less normal, perhaps not for everybody but in many people. In most cases, also according to the classification, it is not a disturbance, it is only a nuisance for the person who divides the bed with the patient. Certainly, it is a problem, but it is not a problem for the person who snores. One should only seek medical attention in case of obstruction or apnea.



Neurovirtual hosts second annual distributor meeting at **MEDICA**



The Neurovirtual management team hosted the second annual distributor meeting on Sunday, November 12th, ahead of the 2017 MEDICA Trade Fair in Dusseldorf, Germany.

Attendees this year included our distributors from China, Indonesia, Spain, and Portugal. The meeting started with introductions, followed by a technical presentation from the corporate product manager, Mr. Felipe Lerida, who discussed the exciting new products released this year, and those to debut in 2018. Mr. Lerida also took this opportunity to discuss software updates, and opened the floor for questions and comments from the different teams in attendance, creating an opportunity for the global teams to discuss what their customers are asking for, and ask for targeted support from the Neurovirtual management team.

A catered lunch followed, where the teams could interact and get to better know each other, share more about themselves personally and professionally, and learn about the challenges facing their peers in other parts of the world. Mr. Sergio Solis, corporate account manager, then hosted a presentation on overcoming challenges and objections from a sales perspective, sharing what he has encountered in the North American market, and creating a dialogue among the teams in attendance to discuss their biggest challenges, and

share best practices to overcome them.

The meeting later closed with a presentation by Mr. Ed Faria, CEO of Neurovirtual, who shared his vision for global growth and Neurovirtual's aggressive plans for sustaining this trajectory. The presentation covered the importance of branding and consistency, and reassured the distributor teams that the corporate office is there to help facilitate their success in any challenges they may encounter. The company's goal remains to humanize the neuro-diagnostic experience and make sure that every customer feels they are supported every step of the way. Starting Monday,



the Neurovirtual management team was present in Hall 9, Booth B58, and featured our latest products, including our new line of sensors and belts for sleep diagnostics, and gold cup electrodes for EEG studies. The company also presented their long-term monitoring, and ICU monitoring device, mounted on an attractive and ergonomic cart, designed specifically for Neurovirtual products.

The show was a resounding success, allowing Neurovirtual to secure orders and develop new partnerships for further building a successful global brand.





Neurovirtual attends the American Epilepsy Society Annual Meeting 2017

Neurovirtual presented its latest products at the 2017 annual meeting of the Epilepsy Society in Washington, DC. The meeting brought together the brightest minds in the treatment and research of epilepsy in the Walter E. Washington Convention Center. Specialists from all over the world were present, including some notable Neurovirtual clients, like Dr. Elza Marcia Yacubian (Brazil), Dr. Carlos Luis Maior (Colombia) and Dr. Jaime Parra (Spain).

The new and amazing BWMini II was displayed during the event, an update of our popular BWMini product, with sufficient channels to perform extended monitoring LTM studies, PSG type 1 and 2 studies, along with HST functionality. The Neurovirtual management team was available for answering questions, made demonstrations and participated in the professional's dialogue using the device, showing how it can improve the user experience.

New exciting partnerships are rising from this program and Neurovirtual is excited about a reserved booth space for December 2018.





Argentine League against Epilepsy promotes congress in **Buenos Aires**

Doctors and experts from several countries participated on the 5th and 6th of October at the Latin American Congress on Epilepsy (LACE) presented by the Argentine League against Epilepsy, which presented, in addition to relevant studies and lectures, several cases for analysis by the participants.

Among the speaker highlights were Dr. Andres Kanner, an American physician who spoke about psychiatric disorders in patients with epilepsy, and Dr. Helen Cross from the UK, who gave lectures on therapeutic approaches to difficult-to-treat epilepsy. Another highlight of the congress was the eighth course of epilepsy surgery in Latin American epilepsy centers and the Cleveland Clinic Foundation, taught by Dr. Imad Najm. The congress was finalized with a case study session at the end of the second day.

During the congress, Neurovirtual presented its line of equipment with the latest technology. A highlight was the BWIII EEG Plus ICU Monitoring EEG, which allows the customization of protocols for the Neuro-ICU and video EEG with online medical evaluation from any workstation, among other possibilities.

“Neurovirtual is present at most congresses and conferences on the subject in many parts of the world. Showing our equipment for doctors and technicians and emphasizing our mission to increasingly humanize the diagnoses is our main objective to participate in events such as this.” – Dubi Quevedo, account executive , Neurovirtual Argentina.



41st Annual Conference Of The Mexican Academy Of Neurology

Opening paths and knocking walls down. That was the theme that has guided one of the most important events of neurology in Mexico, which took place between October 31st and November 5th at the World Trade Veracruz Center in Boca del Rio, Veracruz. The XLI AMN brought together about 500 doctors, specialists and residents in the neurology area, as well as teachers from different parts of the world, such as United States, Canada, Colombia, Germany, Ecuador, Argentina and Mexico.

The conference served to bring major neurological updates to these professionals, as well as emphasizing issues related to epilepsy, sleep disorders and Parkinson’s disease, sleep disturbances and neurological disorders, neuro-oncology, cerebrovascular disease, and neonatal epileptic seizures, among other topics of interest.

The closure was held at a gala dinner, where some of the Neurovirtual equipment was shared among participants. It was a privilege for us to participate in this event of extreme importance for neurology, which facilitated the exchange of experience and knowledge among specialists in the field. We thank the Mexican Academy of Neurology for the excellent opportunity!





Sleepvirtual participates in the XVI Brazilian Sleep Congress in Joinville

Organized by ABS, Associação Brasileira do Sono, the 16th Brazilian Sleep Congress took place in Joinville (Santa Catarina) from November 1st to the 4th. In addition to national and international lectures, the congress offered courses on topics such as apnea treatment updates, diagnosis challenges, and treatment in difficult clinical cases in sleep medicine, polysomnography interpretation and cognitive-behavioral therapy in sleep disorders.

Speakers dealt with various subjects under macro-themes such as “chronobiology,” “neurosciences” and “respiratory.” Among the highlights were four international guests who shared their experiences with the participants: Dr. Debra J. Skene from the United Kingdom, Dr. Hernan Andrés Marin Agudelo from México, Dr. Patrick J. Strollo from the United States, and Dr. Miguel Meira e Cruz from Portugal.

Sandro Senra, product manager at Neurovirtual, represented the company at the congress alongside Alex de Oliveira, a business consultant. Highlights include the BWMini PSG, a lightweight and compact amplifier with excellent performance for HST or laboratory polysomnography, an LCD screen with electronic impedance, and up to three days of recording with the same set of batteries .






NEUROVIRTUAL
sleep VIRTUAL
Humanizing diagnostics

New BWMini
all-in-one EEG/PSG/HST
recommended by
leading specialist



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Neurovirtual participates on average in 20 to 30 congresses and conferences in different countries around the globe. Taking our goal to humanize the diagnostic, we pride ourselves to be part of this community and be able to give our contribution to clinicians and patients.

Below you will find the list of events for 2018, where Neurovirtual will be presenting its solutions to make neurology and sleep diagnostic more human! We hope to see you there!

USA	BRAZIL	COLOMBIA	ARGENTINA
AAN 2018 ANNUAL MEETING Los Angeles, California 21 - 27 April 2018	Congresso Paulista de Medicina do Sono Milenium Centro de Convenções 4 - 5 May 2018	XVIII Simposio Internacional de Neumología y Alergia Pediátrica Cartagena - Colombia 20 - 21 April 2018	LACE - Congreso da liga Argentina contra la Epilepsia Buenos Aires 13 - 15 September 2018
ACNS/ICCN 2018 Washington, DC 1 - 6 May 2018	Hospitalar 2018 Expo Center Norte 22 - 25 May 2018	Curso Latino-Americano de EEG e Vídeo EEG Bogotá- Colombia 22 - 23 June 2018	55º Congreso Argentino de Neurología Mar del Plata del Plata 30 October - 2 November 2018
SLEEP 2018 Baltimore, MD 2 - 6 June 2018	37º Congresso da Liga Brasileira de Epilepsia Hotel Maksoud Plaza, São Paulo 6 - 9 June 2018	IV Congreso Internacional de Medicina Física y Rehabilitación Santa Marta – Colombia 16 - 18 August 2018	LATAM
AES ANNUAL MEETING New Orleans, LA 30 November – 4 December 2018	Simpósio: "Sono e Comportamento" São Paulo, Brazil 16 June 2018	MEXICO	XVII Congreso Centroamericano Neurología 2018 El Salvador 23 - 25 May 2018
EUROPE	17º Congresso da Fundação Otorrinolaringologia Centro Internacional de Convenções do Brasil, Brasília- DF 16 - 18 August 2018	77 CONGRESO DE NEUMOLOGIA Y CIRUGIA DE TORAX Leon, Guanajuato Mexico 2 - 6 April 2018	XXVII Congreso Internacional de Neurología y Neurocirugía Dominican Republic 31 May – 3 June 2018
XXVI Reunión Anual de la Sociedad Española de Sueño 2018 Barcelona 26 - 28 April 2018	XXVII Congresso Brasileiro de Neurologia São Paulo- SP 11 - 14 October 2018	XXVII Congreso de la Sociedad Mexicana de Neurologia Pediatrica Chihuahua, Mexico 22 - 26 May 2018	XXVI Congreso Peruano de Neurología Trujillo, Peru 28 - 30 June 2018
MEDICA 2018 Düsseldorf, Germany 12 - 15 November 2018			

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