



## The 4<sup>th</sup> International Pediatric Sleep Association Congress

In conjunction with

The 14<sup>th</sup> Annual Meeting of Taiwan Society of Sleep Medicine

March 10-13, 2016

Taipei International Convention Center (TICC)

Taipei, Taiwan

## Program Book



# Contents

01	Welcome Message
05	IPSA Executive Committee
05	IPSA 2016 Local Organizing Committee
06	Organizer
06	Acknowledgement
08	Congress Information
10	Floor Plan
12	Program at a Glance
16	Scientific Program
16	Thursday, March 10
17	Friday, March 11
22	Saturday, March 12
27	Sunday, March 13
31	Abstract of Keynote Speech
35	Poster Session
42	Sponsor Profile
43	Outline of Symposium
74	Abstract of Oral Presentation
104	Abstract of Poster Presentation
205	Abstract of Lunch Seminar



## Welcome Message

### President of IPSA

It is my pleasure to present the IV Congress of the International Pediatric Sleep Association (IPSA), which will be held in Taipei (Taiwan) on March 10-1, 2016.

The appearance of pediatric sleep medicine as an autonomous entity began about 30 years ago and was linked to several important researches in different clinical fields: sleep-related breathing disorders, sudden infant death syndrome (SIDS); insomnia; narcolepsy, sleep movement disorders, parasomnias. However, it was the gradual identification of the importance of sleep for several daytime dysfunctions like neurobehavioral problems, learning difficulties, growth failure, etc. which began to raise awareness on the importance of sleep in infancy and childhood development.

Since the first sleep congresses in the 1970s it was immediately evident that a specific "pediatric sleep knowledge" would have been required in order to identify and treat correctly the different sleep disorders of infants and children. With the efforts of different pediatric sleep researchers and clinicians and with the dedication of André Kahn the International Pediatric Sleep Association was created with the aim to promote research in all areas of sleep in infants, children and adolescents, to increase the awareness on the importance of sleep for an optimal physical and cognitive development and to hold scientific congresses.

The goal of the IPSA Congresses is to lead to a substantial advancement of pediatric sleep medicine, collecting the most renowned International speakers, and giving to all participants the opportunity to share knowledge in sleep medicine and research.

This will be the 4th IPSA congress after the 1st in Rome (Italy) in 2010, the 2nd in Manchester (U.K.) in 2012 and 3rd in Porto Alegre (Brazil) in 2014.

The success of the previous IPSA Congresses has highlighted the magnitude of pediatric sleep medicine in the scientific community and we hope that the 2016 Congress will provide a perfect balance between didactic and practical needs, in order to give the technical knowhow and up-to-date knowledge that will enable participants to improve their practice.

It is very important to hold the 4th IPSA congress in Taipei since in the last few years we have assisted to huge scientific contributions to the pediatric sleep field from Asian countries and this is clearly reflected by the overwhelmingly interesting program of this meeting in which the most important and hot topics in the pediatric sleep medicine are represented.

I hope that the world pediatric sleep community will gather together in the lively city of Taipei to celebrate the best clinical practice and the latest advances in Pediatric Sleep Medicine.

Oliviero Bruni  
President of the International Pediatric Sleep Association



## Chair of IPSA International Scientific Committee

Dear Colleagues and friends

Taiwan, known to the Portuguese navigators as “Formosa” (Beautiful island), is a welcoming place where people will always stop to help you. With its volcanoes, hot-springs (and hot-spring hotels), 4,000 meter peaks, time-honored capitals in the south, venerable temples nested in national forests, trees that grew up at the time of Confucius, and great food from land and sea, Taiwan is a wonderful and exquisite place to visit.

The scientific committee has worked hard to conduct a diversified series of symposia, touching recent advances in the field of pediatric sleep medicine, and to have keynote speakers addressing a variety of issues facing pediatric sleep specialists. The goal of the meeting is to present to the audience the best and most diversified research and clinical advances of the specialty. Specialists from all over the world have contributed to reach this goal: Come see the results, get involved in the discussions, and bring back new ideas for clinical and research avenues from IPSA 2016.

IPSA 2016 is ready for you and invites all of you to participate to the success of the meeting with your continuous involvement and to enjoy the city.

Christian Guilleminault DM, MD, DBiol.

Chair of International Scientific Committee



## Local Organizer of IPSA 2016

Dear distinguished guests,

On behalf of the 4<sup>th</sup> International Pediatric Sleep Association Congress in conjunction with the 14<sup>th</sup> Annual Meeting of Taiwan Society of Sleep Medicine (IPSA 2016), we are extremely happy to invite you to participate in the Congress which will be held on March 10-13, 2016, in Taipei International Convention Center of Taipei, Taiwan.

IPSA 2016 continues the good traditions for the past 3 Congresses, and serves as a new platform for the professionals in the field of pediatric sleep medicine to reunite again. To our great honor, there will be clinical physicians, educators, basic scientists, and sleep technicians joining to our Congress this time. Under the same roof, by delivering several diverse speeches and programs, we hope that the related latest cutting-edge research results and innovative knowledge could be presented and renewed among us. Also, your active feedbacks and discussions are highly encouraged, which would make the Congress a better success!

Lastly, we courteously wish you a fruitful and enjoyable time during your stay in Taipei this time. Do not forget to take time to hang around the scenic Taipei and enjoy our great hospitality of Citizen here! It is definitely worthy to visit one of the most beautiful city and bring back some souvenirs in Taiwan.

Best Regards,

Yu-Shu Huang  
Chair of IPSA 2016 Local Organizer



## Taipei City Mayor

Greetings, dear friends!

On behalf of the people of Taipei, I'd like to welcome you on our visit to our city.

Taipei is a wonderfully diverse international metropolis with a strong and soaring city identity built on our safe travel environment, ultra-convenient transportation network, friendly and hospitable people, unique culture and science attractions. Our objective is now to make Taipei a city of cultural intelligence, synthesizing our unique cultural aesthetics, intelligent technology and cross-industry strength and advantages. I invite you to explore our delicious food and enticing scenery that I am sure will make you stay unforgettable and leave you with many memories that you will cherish.

As part of our efforts to make our city even more welcoming, Taipei has unveiled a new "Taipei ABC" approach built around a new intelligent tourism design, ABC stands for **App, Bus, Culture**. We use high-tech to eliminate travel barriers by offering travel apps in numerous languages and providing cross-functional online services. Our tourism-oriented bus routes connect the many distinctive neighborhoods and scenic sight of city's oldest districts on the west side, immersing you in the Taipei of yesteryear. Finally, the meticulously crafted culture tour itineraries have been developed to transport you deep into the world of Taipei's rich traditional culture, cuisine and historical ambience, so that you can experience first-hand one of the city's most striking features—the harmonious coexistence of traditional culture with the most advanced technology.

Taipei has on several occasions been rated by the international media as one of the world's premier travel destinations. Here is a place where old and new are seamlessly intertwined, where tradition and innovation live in a charming synthesis. We offer the visitor a marvelously diverse array of special themed tour itineraries and delicious local culinary delicacies. By increasing the number and quality of our tourism service, and with our creative added-value, we help you to experience our beautiful and unique city in an authentic and enjoyable way. We're sure you'll love it!

Sincerely,  
Wen-Je Ko  
Taipei City Mayor

## IPSA Executive Committee



President: Oliviero Bruni



Patricia Franco



Ronald Chervin



Christian Guilleminault



Avi Sadeh



Italy



Belgium



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USA



Israel



Leila Kheirandish-Gozal



Rosemary Horne



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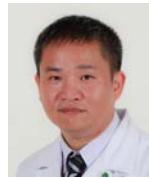


Hong Kong

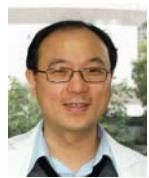
## IPSA 2016 Local Organizing Committee



Chair: Yu-Shu Hung



Chia-Mo Lin



Hsin-Chien Lee



Cheng-Hui Lin



Daniel Ng



Taiwan



Taiwan



Taiwan



Taiwan



Hong Kong



Steve Wong



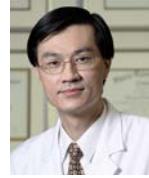
Huei-Shyong Wang



Jen-fu Hsu



Hsueh-Yu Li



Hsin-Ching Lin



Hong Kong



Taiwan



Taiwan



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Taiwan



Li-Chua Chuang



Chih-Huan Wang



Taiwan



Taiwan



## Organizer

### Organizers



International  
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The International Pediatric Sleep  
Association



Taiwan Society of Sleep Medicine

### Co-Organizers



Taiwan Child Neurology Society



Taiwan Pediatrics Association

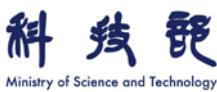


Taiwanese Society of Child and Adolescent  
Psychiatry

## Acknowledgement

The Organizing Committee gratefully acknowledges the contribution from the following sponsors:

### Government Agencies



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Ministry of Science and Technology



Bureau of Foreign Trade



Ministry of Health and Welfare



Department of Information and Tourism, Taipei City Government



Ministry of Foreign Affairs



Ministry of Education

## Corporate Sponsorship

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Tutor ABC



## Congress Information

### Congress Venue

**Taipei International Convention Center (TICC),  
Taipei, Taiwan**

Address: 1 Hsin-Yi Rd., Sec.5, Taipei 11049, Taiwan

Tel: +886(2)2725-5200 ext.3517

Website: <http://www.ticc.com.tw>

### Registration

The registration counter will open at the 1<sup>st</sup> floor Lobby of TICC as follows:

Thursday, March 10	07:30-17:30
Friday, March 11	07:00-17:30
Saturday, March 12	08:00-17:30
Sunday, March 13	08:00-12:00

### Name Badge

Participants are requested to wear their name badges during all the Congress activities and social events. All staff will have the right to refuse entry to any session without a proper name badge. If there is any misspelling or typographic error in your badge, please go to the on-site registration counter for assistance.

### Language

The official language of the Congress is English, which will be used in all presentations and printed materials.

### Exhibition

The exhibition will be held at 1<sup>st</sup> floor lobby and corridor in TICC during the Congress as follows:

Friday, March 11	08:00-17:30
Saturday, March 12	09:00-17:30
Sunday, March 13	08:30-12:30

### Preview Room

#### Room 105, 1F

Speakers / Presenters have the responsibility for their presentation functionalities, including the whole data file, the compatibility of data with the Congress projection system, the USB flash drive, etc. Please check them prior to your presentation to make sure that they could be displayed correctly.

#### Preview Room Opening Hours

Thursday, March 10	08:00-17:30
Friday, March 11	07:30-17:30
Saturday, March 12	08:30-17:30
Sunday, March 13	08:30-17:30

### Lunch

Lunch box will be served at the following places at TICC:

- ♦ Meeting rooms where the lunch seminars are held
- ♦ VIP Room, 4<sup>th</sup> floor (Mar. 11)
- ♦ Banquet Hall, 3<sup>rd</sup> floor (Mar. 12~13)

### Congress Policy

- Smoking is prohibited at all times in the meeting rooms and the entire building.
- Please switch your mobile phones off or to vibration mode during all sessions.



The conference venue provides **free WiFi**. Please search the signal at the venue.

### Social Programs

#### Welcome Party

Date/Time: 17:40~18:10, Friday, March 11

Venue: 201 corridor, 2<sup>nd</sup> floor, TICC

Fee: free



## Gala Dinner

Date/Time: 19:00~21:00, Saturday, March 12  
Venue: Kunlun Hall, 12<sup>th</sup> floor, Grand Hotel  
Address: No.1, Sec. 4, Zhongshan N. Rd.,  
Zhongshan Dist., Taipei City, Taiwan

\*Admission by voucher only

### ★ Access to Grand Hotel from Conference Venue

#### ♦ *Shuttle Bus*



Shuttle bus will be provided at 17:40~18:00. Please gather at the 1<sup>st</sup> floor lobby of the conference venue.

#### ♦ *Public Transportation*

Delegates can take MRT from "Taipei 101/World Trade Center" Station to "Yuanshan" Station without any transferring. There will be shuttle bus to Grand Hotel at exit 1 at "Yuanshan" Station. (Timetable of shuttle bus: 17:40, 18:00, 18:20, 18:40, 19:00)

#### ♦ *Taxi*

Taxi is charged according to the meter. It will cost approx. TWD 250 (USD 8) from conference venue to Grand Hotel.

## Instruction for Presenter

### Oral Presentation

Speaker	Presentation Time ( Per Person)
Keynote	50 minutes
Symposium	20 minutes
YIA Presentation	15 minutes
Oral Submission	10 minutes
Others	depends on the session

★ Please arrive in the session venue at least 10 minutes before the beginning of your session.

### Presentation Notice

- Please note that the computers of the Congress are being supplied with Windows 7 and Office 2010.
- If using a Power Point presentation, please note you need to bring it on a CD or USB

storage device and load it on the Congress's computer in the meeting room or Preview Room (**Room 105**) prior to your session. Our staff will assist you to save your file. You are encouraged to bring your own laptop computer as a back-up.

- If there is combining video files with your presentation, please make sure to check it in the meeting room where your lecture is taking place before the start of the session, or during a coffee break prior to your session.
- Macintosh users: Congress doesn't provide Macintosh computer. Please note that you need to supply your own and confirm that it has a VGA socket for external device. Please check it in the Congress room where your lecture is taking place before the start of the session, or during a coffee break prior to your session.

### Poster Presentation

**Poster Area:** Room 101D, 1<sup>st</sup> floor

#### **Poster Session I: IPSA (PA-01~PA-43)**

*Mounting Time: 07:30~08:00, March 11*

*Open Hour: 08:30~17:30, March 11*

*Presentation Time: 14:20~14:50, March 11*

*Removal: 17:30 , March 11*

#### **Poster Session II: IPSA (PB-03~PB-47)**

*Poster Session: 08:30~09:00, March 12*

*Open Hour: 09:00~17:30, March 12*

*Presentation Time: 14:00~14:30, March 12*

*Removal: 17:30 , March 12*

#### **Poster Session III: IPSA & TSSM (PC-02~PC-17)**

*Poster Session: 08:00~08:30, March 13*

*Open Hour: 08:30~12:00, March 13*

*Presentation Time: 10:00~10:30, March 13*

*Removal: 12:00 , March 13*

### Video Session

Date/Time: 08:30~12:30, Sunday, March 13

Venue: Room 101D, 1<sup>st</sup> floor

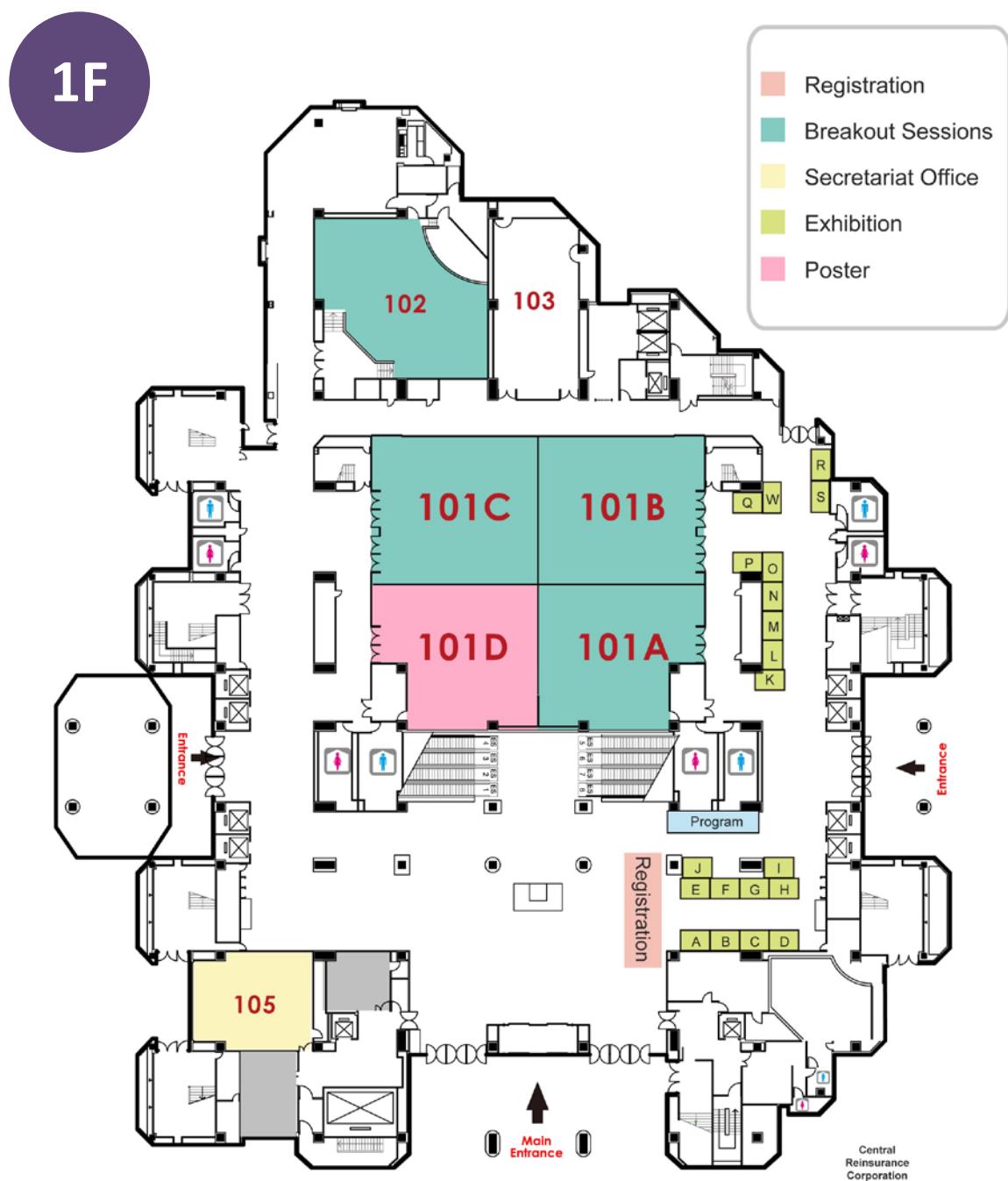
### Painting Exhibition

Date: March 11~12

Venue: Room 101D, 1<sup>st</sup> floor

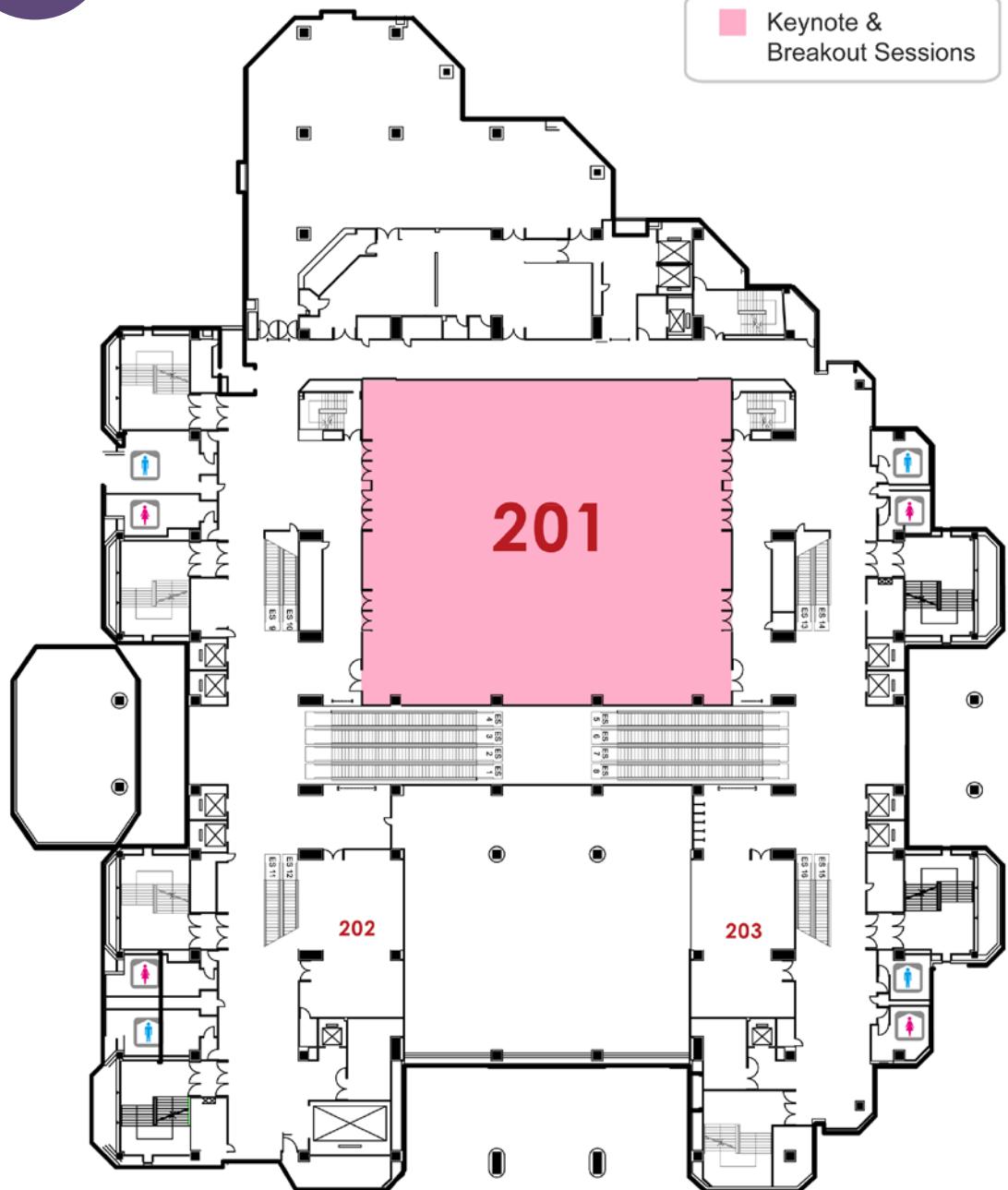


## Floor Plan



Booth No.	Exhibitor	Booth No.	Exhibitor
A	AmyGrant Ltd.	M	MORRIS & TAKEDA
B	E-TOP UNION INC.	N	World Association of Sleep Medicine (WASM)
C	Tutor ABC	O	The Academy of Applied Myofunctional Sciences (AAMS)
D	Apex Medical Corp.	P	DeVilbiss Healthcare
E~J	BROJAW ResMed Taiwan	Q	SOMNOmedics GmbH
K	Somnics, Inc.	R, S	PHILIPS
L	Compumadics Limited	W	Nox Medical

2F





## IPSA 2016 Daily Agenda

March 10 (Thursday)			
Time\Venue	1F	101A	103
08:30-12:30	Registration	Pre-Congress Course ( I-A ) PSG Scoring for Pediatrics	Pre-Congress Course (II) Year in Review
12:30-13:30		Lunch	
13:30-17:30		Pre-Congress Course ( I-A ) PSG Scoring for Pediatrics	WASM Exam

 Pre-Congress Course  
  WASM Exam



March 11 (Friday)							
Time\Venue	1F	1F	101D	201	101A	101B	101C
08:00-08:30	Registration  Commercial Exhibition  Poster Presentation	Poster Presentation	Poster Presentation	<b>Opening Ceremony (2F)</b>			
08:30-09:20				<b>Keynote 1</b> Obstructive Sleep Apnea in Adolescence: A Critical Stage of Development <i>Speaker: Carole Marcus</i>			Pre-Congress Course ( I-B ) PSG scoring for adult (TSSM Technologist program)
09:20-09:40				<b>Coffee Break (1F &amp; 2F)</b>			
09:40-11:10				<b>Symposium 1</b> Surgical Outcomes for Obstructive Sleep Apnea in Children	<b>Symposium 2</b> The Role of Vitamine D Deficiency in Pediatric Sleep Disorders	<b>Symposium 3</b> Child and Adolescent Sleep in the Context of Culture	Pre-Congress Course ( I-B ) PSG scoring for adult (TSSM Technologist program)
11:10-12:40				<b>Symposium 4</b> Surgical and Orthodontic Managements of Pediatric OSA	<b>Symposium 5</b> Sleep Mood and Suicide in Adolescent – Link between Sleep and Psychiatry	<b>Symposium 6</b> Medical Treatment for Childhood Obstructive Sleep Apnoea	Pre-Congress Course ( I-B ) PSG scoring for adult (TSSM Technologist program)
12:40-13:30						<b>Lunch Seminar – ELIA medical</b> Nocturnal Hypoventilation in Children and Its Treatment	<b>Lunch Seminar – Somnics</b> Clinical Efficacy and Safety Evaluation of a Novel Negative Pressure Therapy System for Treatment of Obstructive Sleep Apnea Adult Patients
13:30-14:20				<b>Keynote 2</b> Redefining Sleep Disordered Breathing in Children and Pregnancy <i>Speaker: Colin Sullivan</i>			<b>Lunch Seminar – AmyGrant</b> Clinical Application of Actigraphy: Chronotherapy for Delayed Sleep Phase Syndrome
14:20-14:40				<b>Coffee Break (1F &amp; 2F)</b>			
14:40-16:10				<b>Symposium 7</b> Orthodontics and Sleep Disordered Breathing in Children	<b>Symposium 8</b> Sleep in Young Children: Association With Daytime Functioning, Maternal Sleep, And Long-Term Outcomes	<b>Symposium 9</b> Sleep Variability and Daytime Performance in Young People: as Important as Sleep Duration?	Pre-Congress Course ( I-B ) PSG Scoring for Adult (TSSM Technologist Program)
16:10-17:40				<b>Symposium 10</b> Advances in Pediatric Narcolepsy	<b>YIA Presentation 1</b>	<b>Oral Presentation 1</b>	Pre-Congress Course ( I-B ) PSG Scoring for Adult (TSSM Technologist Program)
17:40-18:10	<b>Welcome Party (2F)</b>						

Keynote

Lunch Seminar

Symposium

YIA Presentation

Oral Presentation

Pre-Congress Course

Poster Presentation



March 12 (Saturday)						
Time\Venue	1F	1F	101D	101A	101B	102
09:00-10:30				<b>Symposium 11</b> Hypersomnias of Central Origin in Childhood and Adolescence: A Challenging Diagnosis	<b>Symposium 12</b> Sleep in Infants and Young Children - Effects on Development and Cognition	<b>Symposium 13</b> Challenges in Surgical Treatment of Asian Pediatric Patients with Obstructive Sleep Apnea
10:30-10:50				<b>Coffee Break (1F)</b>		
10:50-12:20				<b>Symposium 14</b> The Relationship between Sleep and Obesity among Children and Adolescents	<b>Symposium 15</b> Complications Associated with Childhood Obstructive Sleep Apnoea, Are They Reversible?	<b>Symposium 16</b> Pediatric Restless-Leg and Periodic Limb Movement Syndromes
12:20-13:10	Registration	Commercial Exhibition	Poster Presentation	<b>Lunch Seminar –SenTec AG</b> Transcutaneous CO <sub>2</sub> Monitoring and Its Role in Pediatric Sleep Medicine	<b>Lunch Seminar – APPS OSA</b> Consensus on Management of Childhood OSAS in Asia	<b>Lunch Seminar – Lilly</b> The Challenge for ADHD Management: The Relationship between Attention-Deficit Hyperactivity Disorder (ADHD) and Sleep
13:10-14:00						<b>Keynote 3</b> A Rational Approach to Behavioral and Pharmacologic Treatment Options for Insomnia in Children and Adolescents in 2016 <i>Speaker: Judith Owens</i>
14:00-14:20				<b>Coffee Break (1F)</b>		
14:20-15:50				<b>Symposium 17</b> Parental Context for Infant Sleep	<b>Symposium 18</b> Sleepless in the Second Decade: What Cognitive Functions Are Affected by Restricting Teens' Sleep?	<b>Symposium 19</b> The Relationship between Sleep and Performance in Children and Adolescents in Korea
15:50-17:20				<b>YIA presentation 2</b>	<b>Oral presentation 2</b>	<b>Symposium 20</b> Pediatric Obstructive Sleep Apnea- What is New?
19:00-21:00	<b>Gala Dinner (Grand Hotel)</b>					

Keynote

Lunch Seminar

Symposium

YIA Presentation

Oral Presentation

Poster Presentation



March 13 (Sunday)												
Time\Venue	1F	1F	105	101D	201BCDE	101A	101B	101C	102			
08:30-10:00	Registration  Commercial Exhibition  TSSM Election	Poster Presentation & Video Session  The Do's and Don'ts of Phenotyping Sleep/Wake-Behaviours with Video Observations, Annotation and Interpretation	Symposium 21  Pediatric SDB & Craniofacial Growth & Development: Myofunctional Therapy Intervention and Successful Patient Outcomes in an Allied Approach	Oral Presentation 3	Asian Narcolepsy Forum (I)	Basic Research Symposium	Basic Research Symposium	Basic Research Symposium	Basic Research Symposium			
10:00-10:20						Coffee Break (1F)						
10:20-11:50		Poster Presentation & Video Session  The Do's and Don'ts of Phenotyping Sleep/Wake-Behaviours with Video Observations, Annotation and Interpretation	Symposium 22  Sleep in Young Children: Neuro-Developmental Disorders and Sleep Problems in Children	Oral Presentation 4	Asian Narcolepsy Forum (II)	TSSM Member Meeting	TSSM Member Meeting	TSSM Member Meeting	TSSM Member Meeting			
11:50-12:30												
12:30-13:20		Keynote 4  MMA in Adolescent with OSA: Problems and Challenges <i>Speaker: Kasey Li</i>	Lunch Seminar – ResMed  Tailored Therapies for SDB	Lunch Seminar – Medtronic  Latest Development in Surgical Intervention for Sleep Apnea	Lunch Seminar – Medtronic  Latest Development in Surgical Intervention for Sleep Apnea	Lunch Seminar – Medtronic  Latest Development in Surgical Intervention for Sleep Apnea	Lunch Seminar – Medtronic  Latest Development in Surgical Intervention for Sleep Apnea	Lunch Seminar – Medtronic  Latest Development in Surgical Intervention for Sleep Apnea	Lunch Seminar – Medtronic  Latest Development in Surgical Intervention for Sleep Apnea			
13:20-13:50						Closing Ceremony (2F)						
13:50-17:30												

Keynote  
 Lunch Seminar  
 Symposium  
 Oral Presentation  
 Basic Research Symposium  
 Video & Poster Session  
Asian Narcolepsy Forum  
 TSSM Member Meeting  
 Myofunctional Therapy Workshop



**Thursday, March 10**

**08:30-17:30**

**101A**

**Pre-Congress Course ( I-A ): PSG Scoring for Pediatrics**

*Chairs: Sheng-Yi Liu (Taiwan), Chung-Yao Hsu (Taiwan)*

*Interpreter: Chia-Yu Cardell Tu (Taiwan)*

PCIA-1 PSG and Scoring for Pediatrics  
*Sharon A. Keenan (USA)*

**08:30-12:30**

**103**

**Pre-Congress Course (II): Year in Review**

*Chair: Steve Wong (Hong Kong)*

PCII-1 Biomarkers in Childhood OSAS  
*Maria Villa (Italy)*

PCII-2 Positive Airway Pressure Treatment for Childhood OSAS  
*Carole Marcus (USA)*

PCII-3 Surgical Treatment of Childhood OSAS  
*Cheng-Hui Lin (Taiwan)*

PCII-4 New Evidence in the Development of Childhood OSAS  
*Christian Guilleminault (USA)*

PCII-5 Narcolepsy in Children  
*Giuseppe Plazzi (Italy)*

PCII-6 Sleep Movement Disorder in Children  
*Oliviero Bruni (Italy)*

PCII-7 Sudden Unexpected Death of Infancy  
*Rosemary Horne (Australia)*

**13:30-17:30**

**103**

**WASM Exam**



**Friday, March 11**

**08:00-08:30**

**201**

**Opening Ceremony**

**08:30-09:20**

**201**

**Keynote 1**

*Chair: Steve Wong (Hong Kong)*

- K1     Obstructive Sleep Apnea in Adolescence: A Critical Stage of Development  
*Carole Marcus (USA)*

**09:40-11:10**

**201**

**Symposium 1: Surgical Outcomes for Obstructive Sleep Apnea in Children**

*Chair: Hsueh-Yu Li (Taiwan)*

- S1-1   Coblation Adenotonsillectomy for Snoring Children  
*Sung Wan Kim (Korea)*
- S1-2   Surgical Indication for OSA in Children  
*Meiho Nakayama (Japan)*
- S1-3   Clinical Predictors of Pediatric Obstructive Sleep Apnea  
*Hsin-Ching Lin (Taiwan)*
- S1-4   Childhood Obstructive Sleep Apnea, Hypertension, and Adenotonsillectomy  
*Li-Ang Lee (Taiwan)*

**09:40-11:10**

**101A**

**Symposium 2: The Role of Vitamine D Deficiency in Pediatric Sleep Disorders**

*Chair: Rosalia Silvestri (Italy)*

- S2-1   The Role of Vit D in Disrupted Sleep and Hypersomnolence  
*Arthur Walters (USA)*
- S2-2   Vit D Deficiency and OSA  
*Oliviero Bruni (Italy)*
- S2-3   Vit D Deficiency in Growing Pains and RLS  
*Rosalia Silvestri (Italy)*

**09:40-11:10**

**101B**

**Symposium 3: Child and Adolescent Sleep in the Context of Culture**

*Chair: Iris Haimov (Israel)*

- S3-1   Differences in Evening Screen Use Between Australian, Canadian and Dutch Adolescents  
*Kate Bartel (Australia)*
- S3-2   An Overview of Sleep in Young Children in Asia  
*Daniel Goh (Singapore)*
- S3-3   Culture Differences: Sleep Patterns and Screen Exposure among Arab vs. Jewish Israeli Age-School Children  
*Orna Tzischinsky (Israel)*
- S3-4   Sleep Patterns and Screen Exposure in Jewish Ultra-Orthodox (Haredi) and Secular Adolescents in Israel  
*Tamar Shochat (Israel)*



**11:10-12:40**

**201**

#### **Symposium 4: Surgical and Orthodontic Managements of Pediatric OSA**

*Chairs: Myung-Rip Kim (USA / Korea), Stanley Liu (USA)*

- S4-1 Mode of Breathing and Craniofacial Growth of Children with OSA – Management of Skeletal Factors

*Myung-Rip Kim (USA / Korea)*

- S4-2 The Effect of RME on Airway in Children with OSA

*Maria Therese Galang-Boquiren (USA)*

- S4-3 Unrecognized Craniofacial Consequences of Pediatric CPAP

*Hiroko Tsuda (Japan)*

- S4-4 Mini-Implant Assisted Surgical RME in Late Teenagers

*Audrey Yoon (USA), Stanley Liu (USA)*

**11:10-12:40**

**101A**

#### **Symposium 5: Sleep Mood and Suicide in Adolescent – Link Between Sleep and Psychiatry**

*Chair: Colin Shapiro (Canada)*

- S5-1 The Effect Of Sleep Loss on Mood and Emotion Regulation in Adolescents

*Michelle Short (Australia)*

- S5-2 New Frontier in Quantitative Psychiatry: We Can Diagnose Depression Objectively!

*Colin Shapiro (Canada)*

- S5-3 Insufficient Sleep and Suicidality Korean Adolescents

*Yu Jin Lee (Korea)*

- S5-4 Depression, Sleep Difficulties and Suicide Risk in Adolescents

*Azmeh Shahid (Canada)*

**11:10-12:40**

**101B**

#### **Symposium 6: Medical Treatment for Childhood Obstructive Sleep Apnoea**

*Chair: Albert Li (Hong Kong)*

- S6-1 Mild Sleep Disordered Breathing: Who Needs Treatment?

*Zhifei Xu (China)*

- S6-2 Adenotonsillectomy Is Not the Answer to Childhood OSA

*Mahesh Babu Ramamurthy (Singapore)*

- S6-3 Anti-Inflammatory Treatment for OSA – Where Is the Evidence?

*Kate Ching-ching Chan (Hong Kong)*

- S6-4 Should CPAP be First-Line Treatment for Childhood OSA?

*Ignacio Tapia (USA)*

**12:40-13:30**

**101A**

#### **Lunch Seminar: ELIA Medical**

- L1 Nocturnal Hypoventilation in Children and Its Treatment

*Brigitte Fauroux (France)*



**12:40-13:30**

**101B**

### **Lunch Seminar: Somnics**

*Chair: Chia-Mo Lin (Taiwan)*

- 
- L2-1 Treatment Outcomes of the iNAP Sleep Therapy System for the OSA Patient with Different Severity in China  
*Fang Han (China)*
- L2-2 Sharing Feasibility Study Results of the iNAP Sleep Therapy System in Hsinchu Mackay Memorial Hospital (MMH)  
*Tien-Jen Liu (Taiwan)*
- 

**12:40-13:30**

**101C**

### **Lunch Seminar: Amy Grant**

- 
- L3 Clinical Application of Actigraphy: Chronotherapy for Delayed Sleep Phase Syndrome  
*Chia-Shuo Wu (Taiwan)*
- 

**13:30-14:20**

**201BCDE**

### **Keynote 2**

*Chair: Christian Guilleminault (USA)*

- 
- K2 Redefining Sleep Disordered Breathing in Children and Pregnancy  
*Colin Sullivan (USA)*
- 

**14:40-16:10**

**201BCDE**

### **Symposium 7: Orthodontics and Sleep Disordered Breathing in Children**

*Chair: Christian Guilleminault (USA)*

- 
- S7-1 A Cohort of Pre-Pubertal Children with Sleep-Disordered Breathing and Application of Passive Myofunctional Therapy Through a Dental Device  
*Michelle Hervy (France)*
- S7-2 One Year Follow-Up and Imaging Obtained on a Cohort of Pre-Pubertal Children Treated with Passive Myofunctional Therapy Through an Oral Device During Sleep  
*Li-Chuan Chuang (Taiwan)*
- S7-3 The Orthodontic Treatment of Pediatric OSA in China  
*Xuemei Gao (China)*
- S7-4 The Effects of Bone-Borne and Tooth-Borne Surgically Assisted Rapid Maxillary Expansion (SARME) on the Volume of the Nose and Nasal Airway Two Years Post-Surgically  
*Bart Vande Vannet (Belgium)*
-



**14:40-16:10**

**101A**

**Symposium 8: Sleep in Young Children: Association with Daytime Functioning, Maternal Sleep, and Long-Term Outcomes**

*Chairs: Mahesh Babu Ramamurthy (Singapore), Yu-Shu Huang (Taiwan)*

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- |      |   |
|------|---|
| S8-1 | The Dose-Dependent Effect of Bedtime Routines in Young Children<br><i>Albert Li (Hong Kong)</i>   |
| S8-2 | Sleep and Daytime Functioning in Young Children<br><i>Jodi Mindell (USA)</i>  |
| S8-3 | Relationship Between Child and Maternal Sleep<br><i>Daniel Goh (Singapore)</i>  |
| S8-4 | Childhood Sleep Patterns and Practices in Australia and New Zealand: Findings from A Longitudinal Study<br><i>Arthur Teng (Australia)</i> |
- 

**14:40-16:10**

**101B**

**Symposium 9: Sleep Variability and Daytime Performance in Young People: As Important as Sleep Duration?**

*Chair: Colin Sullivan (Australia)*

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- |      |   |
|------|---|
| S9-1 | Sleep Variability in Adolescent Males Over an Entire School Term<br><i>Sarah Blunden (Australia)</i>  |
| S9-2 | Sleep Variability in Preschool Children with ADHD<br><i>Oliviero Bruni (Italy)</i>  |
| S9-3 | Sleep Duration and Sleep Regularity and Their Role in Health of School-Aged Children<br><i>Karen Spruyt (Belgium / The Netherlands / China)</i>   |
| S9-4 | An Eight-Year-Continued Co-Operational Project of Elementary Schools and Regional Society to Improve Child Sleep<br><i>Teruhisa Miike (Japan)</i> |
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**16:10-17:40**

**201BCDE**

**Symposium 10: Advances in Pediatric Narcolepsy**

*Chair: Giuseppe Plazzi (Italy)*

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- |       |  |
|-------|--|
| S10-1 | Clinical Picture and Natural Course of Childhood Narcolepsy<br><i>Giuseppe Plazzi (Italy)</i>                |
| S10-2 | Pandemic Influenza Vaccine and Narcolepsy, the Epidemiological Evidence<br><i>Miriam Sturkenboom (USA)</i>   |
| S10-3 | Different Findings of Characteristics in Type I and Type II Young Narcolepsy<br><i>Yu-Shu Huang (Taiwan)</i> |
| S10-4 | Familial Study of Children Narcolepsy<br><i>Fang Han (China)</i>   |
-



16:10-17:40

101A

## YIA Presentation 1

Chair: Oliviero Bruni

- Y1-1 Obesity in Children at Different Risk Factors for Obstructive Sleep Apnea: A Community-Based Study  
*Miao-Shang Su (China)*
- Y1-2 Clinical Risk Assessment Model for Pediatric Obstructive Sleep Apnea  
*Kun-Tai Kang (Taiwan)*
- Y1-3 Polysomnographic Sleep Abnormalities in Autism Spectrum Disorder – A Prospective Study in Indian Children  
*Anupama Gupta (India)*
- Y1-4 Intrinsic and Extrinsic Predictors of Video Gaming Behaviour and Adolescent Bedtimes  
*Lisa Joanne Smith (Australia)*

16:10-17:40

101B

## Oral Presentation 1

Chairs: Steve Wong (Hong Kong), Teresa Paiva (Portugal)

- O1-1 Influence of Age on Upper Airway in Non-Snoring Male  
*Xuemei Gao (China)*
- O1-2 Increased Aortic Blood Flow Velocity and Inflammation in Children with Sleep Disordered Breathing  
*Anna Kontos (Australia)*
- O1-3 Changes in the Airway Size After Orthodontic Treatment with Premolar Extraction in Adolescents and Adults: A Retrospective Pilot Study  
*Jingjing Zhang (China)*
- O1-4 Inflammation and Metabolic Changes Associated with Obstructive Sleep Apnoea in Asian Children  
*Surendran Thavagnanam (Malaysia)*
- O1-5 Bollard Implant in Pediatric OSA  
*Stacey Quo (USA)*

08:30-17:40

101C

## Pre-Course (I-B): PSG Scoring for Adult (TSSM Technologist Program)

Chairs: Sheng-Yi Liu (Taiwan), Chung-Yao Hsu (Taiwan)

Interpreter: Chia-Yu Cardell Tu (Taiwan)

PCIB-1 Amr Obeidat (USA)

PCIB-2 Kiong Fou Yoom (Germany)

17:40-18:10

201 Corridor

## Welcome Party



**Saturday, March 12**

**09:00-10:30**

**101A**

**Symposium 11: Hypersomnias of Central Origin in Childhood and Adolescence: A Challenging Diagnosis**

*Chair: Rosalia Silvestri (Italy)*

- S11-1 Excessive Daytime Sleepiness: A Diagnostic Algorithm in Children  
*Rosalia Silvestri (Italy)*

- S11-2 The Secondary Form of Narcolepsy in Children  
*Sona Nevsimalova (Czech Republic)*

- S11-3 Confounding Factors of Narcolepsy in Children: The Psychiatrist Comorbidities  
*Francesca Cañellas-Dols (Spain)*

- S11-4 The Narcolepsy Type 2 and in Idiopathic Hypersomnia: A Real Entity?  
*Silvia Miano (Switzerland)*

**09:00-10:30**

**101B**

**Symposium 12: Sleep in Infants and Young Children - Effects on Development and Cognition**

*Chair: Rosemary Horne (Australia)*

- S12-1 Distal Skin Vasodilation Decreases Wakefulness Duration in Preterm Neonates  
*Veronique Bach (France)*

- S12-2 Should We Be Concerned about Periodic Breathing in Infancy?  
*Rosemary Horne (Australia)*

- S12-3 Impact of Sleep on Neurocognitive Development: The AuBE study  
*Patricia Franco (France)*

- S12-4 Sleep in Young Children: Mood and Developmental Outcomes  
*Jodi Mindell (USA)*

**09:00-10:30**

**102**

**Symposium 13: Challenges in Surgical Treatment of Asian Pediatric Patients with Obstructive Sleep Apnea**

*Chair: Song Tar Toh (Singapore)*

- S13-1 Treatment for Pediatric OSA: Principle and Overview  
*Song Tar Toh (Singapore)*

- S13-2 Indication of Pediatric Sleep Surgery. Is the Surgical Treatment Really First Choice?  
*Shintaro Chiba (Japan)*

- S13-3 Adenotonsillectomy and Nasal Surgery for Pediatric OSA  
*Chan-Soon Park (Korea)*

- S13-4 Craniofacial Surgery for Pediatric OSA  
*Cheng-Hui Lin (Taiwan)*



10:50-12:20

101A

## Symposium 14: The Relationship Between Sleep and Obesity Among Children and Adolescents

Chair: Orna Tzischinsky (Israel)

- S14-1 Obesity among Children and Adolescents: Psychological and Biological Perspectives  
*Yael Latzer (Israel)*

- S14-2 Sleep Reduction and Children's Obesity: Is There A Link?  
*Vinai Dott. Piergiuseppe (Italy)*

- S14-3 The Relationship Between Sleeping Disorders and Childhood Obesity: An Updated Review  
*Orna Tzischinsky (Israel)*

10:50-12:20

101B

## Symposium 15: Complications Associated with Childhood Obstructive Sleep Apnoea, Are They Reversible?

Chair: Rosemary Horne (Australia)

- S15-1 Blood Pressure Abnormalities in Children with OSA – Evidence from Cross-Sectional and Longitudinal Studies  
*Albert Li (Hong Kong)*

- S15-2 Long Term Effects of Treatment of Sleep Disordered Breathing on the Cardiovascular System and Daytime Functioning  
*Rosemary Horne (Australia)*

- S15-3 OSA in the Obese and the Lean Child  
*Hemant Sawnani (USA)*

- S15-4 The Effects of Obesity and Age on Children with OSA on Cognition  
*Maria Pia Villa (Italy)*

10:50-12:20

102

## Symposium 16: Pediatric Restless-Leg and Periodic Limb Movement Syndromes

Chair: Richard Bogan (USA)

- S16-1 Pediatric RLS a Clinical Challenge  
*Suresh Kotagal (USA)*

- S16-2 Relationship Between RLS and Childhood Growing Pains  
*Arthur Walters (USA)*

- S16-3 Genetics and Epidemiology of Pediatric RLS  
*Aaro Salminen (Germany)*

- S16-4 Prevalence and Clinical Correlates of PLMS in 11,000 Children  
*Alyssa Cairns (USA)*



**12:20-13:10**

**101A**

**Lunch Seminar: SenTec AG**

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|------|--|
| L4-1 | Principles of TcPCO <sub>2</sub> Monitoring<br><i>Prashant Chhajed (India)</i>   |
| L4-2 | Transcutaneous Carbon Dioxide Recording During Sleep<br><i>Brigitte Fauroux (France)</i>                               |
| L4-3 | Transcutaneous Carbon Dioxide Recording During Noninvasive Ventilation in Children<br><i>Brigitte Fauroux (France)</i> |
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**12:20-13:20**

**101B**

**Lunch Seminar: APPS OSA**

*Chairs: Anne Goh (Singapore), Indu Khosla (India)*

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- |      |   |
|------|---|
| L5-1 | Treatment of OSAS<br><i>Albert Li (Hong Kong)</i>           |
| L5-2 | Medical Rx of Childhood OSAS<br><i>Datian Che (China)</i>   |
| L5-3 | Follow-Up of OSAS<br><i>Steve Wong (Hong Kong)</i>          |
| L5-4 | Dental Treatment of OSAS<br><i>Ooh-Hoe Teoh (Singapore)</i> |
| L5-5 | NIV in OSAS<br><i>Aroonwan Preutthipan (Thailand)</i>       |
| L5-6 | Complications of OSAS<br><i>Zhifei Xu (China)</i>           |
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**12:20-13:10**

**102**

**Lunch Seminar: Lilly**

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- |    |  |
|----|--|
| L6 | The Challenge for ADHD Management: The Relationship Between Attention-Deficit Hyperactivity Disorder (ADHD) and Sleep<br><i>Kwok Ling Chan (Hong Kong)</i> |
|----|--|
- 

**13:10-14:00**

**102**

**Keynote 3**

*Chair: Oliviero Bruni (Italy)*

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- |    |  |
|----|--|
| K3 | A Rational Approach t Behavioral and Pharmacologic Treatment Options for Insomnia in Children and Adolescents in 2016<br><i>Judith Owens (USA)</i> |
|----|--|
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14:20-15:50

101A

## Symposium 17: Parental Context for Infant Sleep

Chair: Avi Sadeh (Israel)

- S17-1 Developmental Trend and Correlates of Parental Perception of Sleep Problems During the First Year Of Life  
*Oliviero Bruni (Italy)*

- S17-2 Household Chaos: Effects on Infant Sleep  
*Douglas Teti (USA)*

- S17-3 Maternal Predictors of Infant Sleep and Co-Sleeping  
*Liat Tikotzky (Israel)*

- S17-4 Parental Factors Predicting the Outcomes of Behavioral Interventions for Infant Sleep  
*Avi Sadeh (Israel)*

14:20-15:50

101B

## Symposium 18: Sleepless in the Second Decade: What Cognitive Functions Are Affected by Restricting Teens' Sleep?

Chair: Michael Gradisar (Australia)

- S18-1 Impact of Multiple Nights of Partial Sleep Deprivation on Adolescent Cognition  
*June Lo (Singapore)*

- S18-2 Sleep Loss Results in Does-Dependent Impairments to Simple and Complex Cognitive Functioning in Adolescents  
*Michelle Short (Australia)*

- S18-3 An Investigation of Cognitive Performance in Adolescents with DSWPD: Treatment Effects and a Comparison with Good Sleepers  
*Cele Richardson (Australia)*

- S18-4 Cognitive Performance and Sleep Spindles in Adolescents: A Summary and Preliminary Data from a Sleep Restriction Protocol  
*Chelsea Reynolds (Australia)*

14:20-15:50

102

## Symposium 19: The Relationship Between Sleep and Performance in Children and Adolescents in Korea

Chair: Seung Chul Hong (Korea)

- S19-1 The Current Sleep Pattern of Adolescents and Its Impact on School Performance and Mood  
*Jee Hyun Kim (Korea)*

- S19-2 The Effect of Delaying School Start Time on Performance and Emotion  
*Tae Won Kim (Korea)*

- S19-3 Sleep parameters and Cognitive Function in Drug-Naïve Children with Attention-deficit Hyperactivity Disorder  
*Yoo Hyun Um (Korea)*



**15:50-17:20**

**101A**

### **YIA Presentation 2**

*Chairs: Umakanth Khatwa (USA), Susan Shur-Fen Gau (Taiwan)*

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|------|---|
| Y2-1 | The Dynamics of Cardiac Autonomic Control in Sleeping Preterm Neonates Exposed in Utero to Smoking<br><i>Erwan Stephan-Blanchard (France)</i>                   |
| Y2-2 | Longitudinal Study of Obstructive Sleep Apnoea from Childhood to Young Adulthood<br><i>Ching Ching Chan (Hong Kong)</i>   |
| Y2-3 | Insomnia Symptoms and Eveningness Chronotype: Independent Associations with Emotional and Behavioural Problems in Adolescents<br><i>Shirley Xin Li (Canada)</i> |
| Y2-4 | Prospective Study of the Association Between Childhood Primary Snoring and Endothelial Function<br><i>Chun Ting Au (Hong Kong)</i>                              |
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**15:50-17:20**

**101B**

### **Oral Presentation 2**

*Chairs: Teresa Paiva (Portugal), Daniel Ng (Hong Kong)*

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- |      |   |
|------|---|
| O2-1 | Development of Cell Culture Model of Intermittent Hypoxia<br><i>Hongfang Mei (China)</i>  |
| O2-2 | Do Urinary Biomarkers Distinguish Primary Snoring from Obstructive Sleep Apnea (OSA) in Children?<br><i>Biju Thomas (United Kingdom)</i>  |
| O2-3 | Effects of Low Intensity Radiofrequency Electromagnetic Fields on Sleep<br><i>Veronique Bach (France)</i>   |
| O2-4 | Increased Resting Brachial Artery Blood Flow Velocity Associated with Increased Sympathetic Nerve Fiber Density on the Dorsal Lingual Artery (Tonsil) in Children with Sleep Disordered Breathing<br><i>Anna Kontos (Australia)</i> |
| O2-5 | Sleep Disorders in Inpatients of Pediatric Pulmonary Departments<br><i>Datian Che (China)</i>   |
| O2-6 | Alterations of Circadian Rest-Activity Rhythms in Pediatric Patients with Narcolepsy During Treatment<br><i>Chen Lin (Taiwan)</i>   |
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**15:50-17:20**

**102**

### **Symposium 20: Pediatric Obstructive Sleep Apnea- What Is New?**

*Chair: Ron Mitchell (USA)*

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- |       |  |
|-------|--|
| S20-1 | Growth Problem in Snoring Children<br><i>Sung Wan Kim (Korea)</i>                                  |
| S20-2 | Blood Pressure in Children with Sleep-Disordered Breathing<br><i>Kun-Tai Kang (Taiwan)</i>         |
| S20-3 | An Update on Results of the Childhood Adenotonsillectomy (CHAT) Study<br><i>Ron Mitchell (USA)</i> |
| S20-4 | Management of Pediatric OSA After T&A<br><i>Wei-Chung Hsu (Taiwan)</i>                             |
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## Sunday, March 13

08:30-12:30

101D

### Video Session: The Do's and Don'ts of Phenotyping Sleep/Wake-Behaviours with Video Observations, Annotation and Interpretation

Chair: Oliviero Bruni (Italy)

- 
- V1-1 Rhythmic Movement Disorders I. Motor Paroxysms in Children And Adolescents  
*Rosalia Silvestri (Italy)*
- V1-2 Rhythmic Movement Disorders II. Typically Developing Children and Children with Down Syndrome  
*Catherine Hill (United Kingdom)*
- V1-3 Rhythmic Movement Disorders III. Spontaneous Arousal in Children with Restless Legs Syndrome  
*Osman Ipsiroglu (Canada)*
- V1-4 Rhythmic Movement Disorders IV. Children with Cerebral Palsy  
*Sue McCabe (Australia)*
- 

08:30-10:00

101A

### Symposium 21: Pediatric SDB & Craniofacial Growth & Development: Myofunctional Therapy Intervention and Successful Patient Outcomes in an Allied Approach

Chairs: Marc Richard Moeller (USA), Christian Guilleminault (USA)

- 
- S21-1 Orofacial Myofunctional Therapy: Form & Function in Pediatric OSA  
*Joy Lea Moeller (USA)*
- S21-2 Breathing Retraining: Addressing Oral and Dysfunctional Breathing Patterns to Improve Outcomes in Pediatric Sleep Medicine  
*Tess Graham (Australia)*
- S21-3 Myofunctional therapy : The Taiwan experience  
*Yu-Shu Huang (Taiwan)*
- S21-4 Objective Measurements in Charting Progress in Myofunctional Therapy & Pediatric OSA  
*Maria Pia Villa (Italy)*
-



**08:30-10:00**

**101B**

### **Oral Presentation 3**

*Chairs: Anne Goh (Singapore), Daniel Ng (Hong Kong)*

- O3-1 Repetitive Negative Thinking Linking Adolescent Sleep Difficulties and Depressed Mood:  
The Moderating Role of Perfectionism  
*Chao Huang (China)*

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- O3-2 Relationships Between Sleep, Behaviour and Diet in Children with and without Autism Spectrum Disorder  
*Amanda Richdale (Australia)*

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- O3-3 The Effects of Maternal Sleep Position and Sleep Disordered Breathing on Fetal Heart Rate  
*Jillian Dorrian (Australia)*

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- O3-4 Sleep Characteristics at One Year Old in the ELFE Study  
*Sabine Plancoulaine (France)*

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- O3-5 Breastfeeding and Infant sleep: A Birth Cohort Study  
*Yuanjin Song (China)*

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- O3-6 Six-Month-Old Infant Long Sleepers Prefer a Human Face  
*Guanghai Wang (China)*

**08:30-10:00**

**101C**

### **Asian Narcolepsy Forum I**

*Chairs: Seung Chul Hong (Korea), Yu-Shu Huang (Taiwan)*

- AI-1 Narcolepsy, Medical/Mental Comorbidity and Mortality  
*Keynote: Maurice Ohayon (USA)*

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- AI-2 Structural Abnormality in Narcolepsy Patients  
*Seang Bong Hong (Korea)*

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- AI-3 Effect of L-Carnitine on Narcolepsy  
*Makoto Honda (Japan)*

**08:30-10:00**

**102**

### **Basic Research symposium**

*Chair: Fang-Chia Chang (Taiwan)*

- B1-1 A Nucleus Accumbens Circuit in Control of Sleep  
*Michael Lazarus (Japan)*

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- B1-2 Chronic Intermittent Hypoxia Induces Airway Hypersensitivity in Rats  
*Ching-Jung Lai (Taiwan)*

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- B1-3 Chronic Intermittent Hypoxia-Induced Deficits in Synaptic Plasticity and Long-Term Memory - Insight from an Animal Model  
*Wing-Ho Yung (Hong Kong)*

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- B1-4 Electroacupuncture on Sleep and Epilepsy-Induced Sleep Disruption  
*Fang-Chia Chang (Taiwan)*

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- B1-5 Development of Sleep-Promoting Supplements  
*Yoshihiro Urade (Japan)*



10:20-11:50

101A

## Symposium 22: Sleep in Young Children: Neuro-Developmental Disorders and Sleep Problems in Children

Chairs: Huei-Shyong Wang (Taiwan), Kyu-Young Chae (Korea)

- S22-1 The Impact of Medical Treatment on Sleep Problems of Taiwanese Children with ADHD  
*Wei-Chih Chin (Taiwan)*
- 
- S22-2 Tourette Syndrome and Sleep in Children  
*Yoshiko Nomura (Japan)*
- 
- S22-3 Enterovirus Infection and Sleep Disorders: A Nationwide Population-Based Cohort Study  
*Vincent Chin-Hung Chen (Taiwan)*
- 
- S22-4 Sleep Problems in Disabled Children and Counselling for Those Children  
*Rie Miyata (Japan)*
- 

10:20-11:50

101B

## Oral Presentation 4

Chairs: Thornton Mason (USA), Kuang-Lin Lin (Taiwan)

- O4-1 Prevalence of Sleep Disordered Breathing in Syndromic Children – Pilot Study  
*Vijaya Krishnan Paramasivan (India)*
- 
- O4-2 Clinical Scores for Sleep Loss and Pruritus in Childhood Eczema  
*Kam Lun Ellis Hon (Hong Kong)*
- 
- O4-3 The Impact of Body Mass on Long-Term Cognitive Performance of Children Treated for Sleep Disordered Breathing  
*Scott Wade Coussens (Australia)*
- 
- O4-4 Atopy and the Impact on Sleep and Psychological Well-Being; Survey of Australian School Children  
*Kurt Lushington (Australia)*
- 
- O4-5 Sleep Characteristics Associated with Neurocognitive Development at 3 Years Old in a French Prospective Birth-Cohort Study (AuBE)  
*Sabine Plancoulaine (France)*
- 
- O4-6 Optimal Sleep Duration is Crucial to Body Length/Height for Infants and Toddlers  
*Qingmin Lin (China)*
-



**10:20-11:50**

**101C**

### **Asian Narcolepsy Forum II**

*Chairs: Chung-Yao Hsu (Taiwan), Fang Han (China)*

- All-1 Sleep Stage Transition in the Diagnosis of Narcolepsy  
*Yun Kwok Wing (Hong Kong)*

- All-2 Risk of Narcolepsy Following Pandemic (H1N1) 2009 Vaccination in Taiwan  
*Wan-Ting Huang (Taiwan)*

- All-3 Symptomatic Narcolepsy among Children and Adolescence, Such as Niemann-Pick Type C and Prader-Willi Syndrome  
*Takashi Kanbayashi (Japan)*

- All-4 Narcolepsy and H1N1 Vaccination. Korean Cases  
*Tae Won Kim (Korea)*

- All-5 Diagnostic Utility of SOREM of Polysomnography in Korean Narcolepsy Patients  
*Yoo Hyun Um (Korea)*

**10:20-11:50**

**102**

### **TSSM Member Meeting**

- T1 Restless Legs Syndrome (RLS) Diagnostic Criteria: Prevalence, Frequency Duration & Severity In The General Population  
*Maurice Ohayon (USA)*

**11:50-12:30**

**101A**

### **Lunch Seminar: ResMed**

- L7 Tailored Therapies for SDB  
*Holger Woehrle (Germany)*

**11:50-12:30**

**101B**

### **Lunch Seminar: Medtronic**

- L8 Latest Development in Surgical Intervention for Obstructive Sleep Apnea Syndrome  
*Li-Ang Lee (Taiwan)*

**12:30-13:20**

**201BCDE**

### **Keynote 4**

*Chair: Cheng-Hui Lin (Taiwan)*

- K4 MMA in adolescent with OSA: Problems and challenges  
*Kasey Li (USA)*

**13:20-13:50**

**201BCDE**

### **Closing Ceremony**

**13:50-17:30**

**201BCDE**

### **Myofunctional Therapy Workshop**

- M1 Achieving Excellence in Therapy  
*Joy L. Moeller (USA)*



## Abstract of Keynote Speech

### Obstructive Sleep Apnea in Adolescence: A Critical Stage of Development

Carole L. Marcus, M.B.B.Ch.  
Professor of Pediatrics  
Children's Hospital of Philadelphia  
University of Pennsylvania

Although much has been written about the obstructive sleep apnea syndrome (OSAS) during childhood, few studies have specifically examined the important developmental stage of adolescence. Adolescence is a critical time of transition from the child to the adult, characterized not only by changes in sexual development, but also in somatic growth and cortical processing. These changes affect sleep in many ways, including changes in circadian rhythm and sleep architecture (decline in slow wave sleep), ventilatory drive, upper airway structure (especially in males) and upper airway function. The prevalence of OSAS in adolescents has been estimated at 2-4%, but better studies are needed. There appears to be a strong male preponderance. Adenotonsillar hypertrophy continues to be an important etiologic factor for OSAS in this age group. Obesity is another major etiologic factor. The upper airway in children is resistant to collapse due to active upper airway reflexes during sleep. These reflexes decline during adolescence, but with much individual variability. Thus, blunted upper airway reflexes during sleep play a major role in the pathophysiology of adolescent OSAS, despite an overall intact ventilatory drive during wakefulness. Further research is needed regarding the optimal treatment of adolescent OSAS. Radiologic studies suggest that adenotonsillectomy is helpful even in this age group, but clinical studies have not been performed. CPAP is effective in obese adolescents but adherence is problematic. Degree of structure in the home, social reactions, mode of communication among family members, and perception of benefits are specific issues affecting CPAP adherence in this age group.



## Redefining Sleep Disordered Breathing in Children and Pregnancy

Colin Sullivan

Department of Medicine, University of Sydney

Sleep disordered breathing (SDB) in children is characterized by long periods of sustained obstructed breathing without discrete apneic events. When discrete events occur, they are relatively few in number. Similarly, the dominant sleep breathing problem that occurs in pregnancy is sustained partial upper airway obstruction. While esophageal pressure recording provides an objective indicator of upper airway resistance, it is not practical in these subjects. Identification of flow limitation with nasal pressure recordings, and phase relationships between abdominal and chest wall expansion are both useful indirect measures, but have significant limitations. In contrast, objectively measured of snoring, the most practical robust indicator of the extent and severity of obstructed breathing in sleep is almost never measured. Innumerable studies that rely on a positive history of snoring (in children, obtained from parent questionnaires) as the independent variable have identified clear links to adverse behavioral, cognitive and physiological measures (blood pressure). In contrast, the studies where objective sleep recordings have been obtained using polysomnography (PSG), where the measure is entirely based on the currently accepted scoring criteria of discrete events (AI, AHI etc), the links to adverse effects of SDB are often less clear. There is now strong evidence that arterial blood pressure is elevated in children in all categories of SDB (including "primary" snoring) even in the absence of any measurable change in arterial oxyhemoglobin desaturation. Similarly, it is very clear that the similar pattern of non-apneic SDB in pre-eclamptic pregnancy is causative of major elevations of systemic arterial pressure. Collectively, these findings demonstrate that the current metrics used to characterize SDB in children (and pregnancy) are inadequate and misleading and do not measure the extent and severity of a key underlying pathological mechanism, that of sustained obstructed breathing.



## A Rational Approach to Behavioral and Pharmacologic Treatment Options for Insomnia in Children and Adolescents in 2016

Jodith Owens

Director of Sleep Medicine, Boston Children's Hospital

Insomnia is broadly defined in the pediatric population as difficulty initiating and/or maintaining sleep that is viewed as problematic by the child and/or caregivers, and is associated with daytime sequelae. A key concept in the evaluation of insomnia in children and adolescents is that of differential diagnosis, as the main presenting complaints of bedtime resistance, sleep onset delay and frequent night wakings may have multiple different etiologies which, in turn, significantly impact diagnostic and management strategies. In addition, comorbid sleep disorders in children and adolescents are common, further complicating the evaluation and treatment of insomnia. While behavioral management strategies for insomnia in young children have considerable empirical support, the evidence for efficacy of these types of treatment modalities in school-aged children and adolescents with insomnia is largely lacking and primarily based on clinical experience. Similarly, because there is so little empirical evidence regarding the efficacy and safety of pharmacologic interventions for insomnia in children, clinicians have often had to rely on anecdotal information to make important treatment decisions.

This presentation will present a "best practices" integrated approach to the treatment of insomnia in children and adolescents based on what we know in 2016, and will identify knowledge gaps to be addressed in the future.



## MMA in Adolescent with OSA: Problems and Challenges

Kasey Li

Plastic Surgery and Sleep Medicine, Stanford University

"Surgery remains a very important treatment option for patients suffering from OSA. This is especially important for children, adolescents and young adults where the long-term use of nasal CPAP is neither desirable or realistic. The presentation will cover a surgical treatment philosophy developed over a 20 year span in addition to discussing the application of maxillomandibular advancement surgery with some emphasis on Far-east Asians. The surgical literature along with the presenter's surgical outcome will be covered as well."



## Poster Session I (March 11): IPSA

14:20-14:50

Room 101D

### Circadian Rhythm Sleep-Wake Disorders

- PA-01 *Effectiveness of Suvorexant for Circadian Rhythm Sleep-Wake Disorders Among Adolescents*  
Yasunori Oka, Sakurako Tanno, Yuri Kawasaki, Hiroshi Shimizu, Yoko Fujino, Teruyoshi Uetani, Fumie Horiuchi

- PA-02 (TW) *Shift Work and Sleep: The Impact of Night Work and Rotating Schedule*  
Wan-Ju Cheng

### Insomnia

- PA-03 *The Effect of Daytime Nap on Emotional Perception in Individuals with Insomnia*  
Kristy Nga Ting Lau, Sabrina Ka Po Tong, Esther Yuet Ying Lau
- PA-04 *Is History of Sleep Terrors a Contraindication to Sleep Restriction Therapies for Middle Childhood Insomnia?*  
Neralie Cain, Michael Gradisar, Cele Richardson, Kate Bartel
- PA-05 *Association between Upper Airway Resistance Syndrome and Behavioral Insomnia among Infants in South Korea*  
Seon Keong Rhie, Shinhae Lee, Kyu Young Chae
- PA-06 *Safety, Efficacy and Tolerability of Suvorexant for Insomnia among Children and Adolescents*  
Kentaro Kawabe, Kayoko Nishimoto, Fumie Horiuchi, Marina Ochi, Shu-ichi Ueno, Yasunori Oka
- PA-07 *Clinical Experience with A Dual Orexin Receptor Antagonist, Suvorexant (Belsomra) in Japan*  
Ono Hiroaki, Kanbayashi Takashi

### Hypersomnia and Narcolepsy

- PA-08 *Narcolepsy: Case Series from India*  
Manvir Bhatia, Abdul Muneim
- PA-09 (TW) *Migraine and Risk of Narcolepsy: A Nationwide Cohort Study*  
Chun-Pai Yang, Vivian Chia-Rong Hsieh
- PA-10 (TW) *The Quality of Life in Young Narcolepsy*  
Hsin-yi Tai, Chien-Ming Yang, Chih-Huan Wang, Yu-Shu Huang

### Sleep Evaluation

- PA-11 *Assessment of Activity Rhythm and Metabolism of Melatonin in Patients with Severe Motor and Intellectual Disabilities*  
Michio Fukumizu, Yumi Ohkoshi, Naoyuki Tanuma, Rie Miyata, Masaharu Hayashi, Marie Hayes J, Alan Rosenwasser M
- PA-12 (TW) *A Diagnostic Meta-analysis of Screening Questionnaires for Obstructive Sleep Apnea*  
Hsiao-Yean Chiu, Pin-Yuan Chen, Christian Guilleminault
- PA-13 *The Analysis of the Result of Polysomnography Relevant Factors and Clinical Features in Children of OSAHS*  
Xin Chen, Zhinan Wang, Zhongfang Xia
- PA-14 *Can McGill Oximetry Score Exclude Obstructive Sleep Apnea in Children?*  
Seung Soo Kim, Young Chang Kim
- PA-16 *Sickle Cell Disease- PSG When to Do It?*  
Helena Cristina Loureiro, Maria Inês Mascarenhas, Teresa Ferreira, Alexandra Dias



## Others

- PA-17 *An Unusual Cause of Obstructive Sleep Apnoea in a Spinal Muscular Atrophy Type III Patient*  
Shuk Kuen Chau, So Lun Lee
- PA-18 *Sleep Education among Schoolers – Does It Work?*  
Yun Kwok Wing, Ngan Yin Chan, Wai Man Mandy Yu, Siu Pung Lam, Jihui Zhang, Shirley Xin Li, Alice Pik Shan Kong, Albert Martin Li
- PA-19 *Secular Trends in Sleep Time of School-aged Children, 2005-2014: A Two Waves of Cross-sectional Study in Shanghai*  
Guanghai Wang, Yanrui Jiang, Yuanjin Song, Shumei Dong, Qingmin Lin, Lixia Zhu, Yujiao Deng, Fan Jiang
- PA-20 *Associations among Sleep Quality, Psychosocial Functioning, and Health-Related Quality of Life in Children with Duchenne Muscular Dystrophy*  
Esther Yuet Ying Lau, Oi Ching Tang, Sophelia Hoi Shan Chan, Brian Yee Ting Ip, Camilla Pietrantonio, Francesco Pagnini, Sharon Wan Wah Cherk, Virginia CN Wong
- PA-21 (TW) *Objective and Subjective Assessments of Sleep Quality in Chronic Tinnitus Adults*  
Cheng-Yu Lin, Wen-Kuei Lin, Jiun-Yu Hsu, Li-Chen Lin, Yi-Jung Chen, Hsing-Fang Tsai, Jiunn-Liang Wu
- PA-22 (TW) *Orthodontic Treatment for Adolescent OSAS Patients*  
I-Ling Hong, Chia-Mo Lin
- PA-23 *The Relationship between Sleep Quality and Readiness to Forgive*  
Esther Yuet Ying Lau, Harry Hui, Jasmine Lam, Shu Fai Cheung
- PA-24 *Sleep and Optimism: The Chicken or the Egg?*  
*A Longitudinal Study of Causal Relationships and Mediators in a Chinese Student Sample*  
Esther Yuet Ying Lau, Harry Hui, Shu Fai Cheung, Jasmine Lam
- PA-25 *Acoustic Feature Analysis of Overnight Snoring Sounds in Patients with Obstructive Sleep Apnea*  
Tsuyoshi Mikami, Hirotaka Takahashi, Satoshi Ueki, Kazuki Sakai, Kazuya Yonezawa
- PA-26 (TW) *The Effect of Horticultural Therapy on Personal Interaction of Dementia*  
Xiu-lin Yu, Mei-Yao Yu, Xiu-Fang Yu, Mei-Feng Lin
- PA-27 (TW) *The Role of Estrogen on Cardiovascular Autonomic Regulation During Stress-Induced Insomnia in Ovariectomized Female Spontaneously Hypertensive Rats*  
Yi-Ting Tu, Cheryl C. H. Yang, Chieh-Wen Chen, Chun-Ting Lai, Terry B. J. Kuo
- PA-28 (TW) *Obstructive Sleep Apnea during Pregnancy: What's Different? - A Case Report*  
Chao-Hsien Chen, Ching-Lung Liu
- PA-30 (TW) *CHADS2 Score Predicts the Risk of Subsequent Peripheral Arterial Occlusive Disease (PAOD) in Patients with Sleep Apnea in Taiwan*  
Ming-Ju Tsai, Meng-Chuan Hsieh, Po-Chao Hsu, Chia-Yu Kuo, Meng-Ni Wu, Cheng-Fang Hsieh, Chih-Jen Yang, Jen-Yu Hung, Inn-Wen Chong, Chung-Yao Hsu
- PA-31 (TW) *The Use of Muscle Relaxants on Support Group to Investigate the Effectiveness of Insomnia*  
Shiu-Feng Lu, Ching-Feng Huang
- PA-32 (TW) *Increased Risk of Major Depressive Disorder in Patients with Sleep Apnea in Taiwan*  
Chia Yu Kuo, Meng-Chuan Hsieh, Ming-Ju Tsai, Meng-Ni Wu, Chih-Jen Yang, Jen-Yu Hung, Inn-Wen Chong, Chung-Yao Hsu



## Others

- PA-33 (TW) *The Prevalence of Sleep Disorders of Children in Taiwan- A Population- Based Study from National Health Insurance Research Database, Taiwan*  
Wei-Cheng Yao, Min-Ja Hsu
- PA-37 (TW) *Obstructive Sleep Apnea Syndrome Related to Congestive Heart Failure– A Case Report*  
Yen-Liang Kuo, Tsu-Hui Shiao
- PA-38 *The Impact of a Modest Delay in School Start Time in Hong Kong*  
Ngan Yin Chan, Jihui Zhang, Mandy Wai Man Yu, Siu Ping Lam, Shirley Xin Li, Alice Pik Shan Kong, Albert Martin Li, Yun Kwok Wing
- PA-39 (TW) *Impacts of Sleep Quality Among Noise-exposed Workers with Autonomic Hyperactivity*  
Po-Lan Su, Jiunn-Liang Wu, Yue-Liang Guo, Cheng-Yu Lin
- PA-40 (TW) *Depersonalization during Waking and Dreaming*  
Ming-Ni Lee
- PA-41 *The Relationship between Obesity and Sleep Disorders in Primary School Age Children*  
Thong Felicia Melinda, Rini Sekartini Sumarmo



## Poster Session II (March 12): IPSA

14:00-14:30

Room 101D

### Pediatric Sleep-Disordered Breathing

- PB-03 *How to Measure Quality of Breathing in Children?*  
David Thor Jonsson
- PB-04 *The Odd, the Obvious and the Unexpected: Some Interesting Cases of Sleep Investigations in Children*  
Sonia Scaillet
- PB-05 *Elevated Urinary Leukotriene E4 in Children with Adenoid Hypertrophy*  
Paskorn Sritipsukho, Araya Satdhabudha
- PB-07 *A Review: Questionnaires for Screening Pediatric Obstructive Sleep Apnea*  
Ying Duan, Shuchen Sun
- PB-09 (TW) *Limitations of the Apnea-hypopnea Index for Assessing the Severity of Obstructive Sleep Apnea in Children*  
Yung-Sen Chang, Sheng-Hsuan Lin, Umakanth Khatwa
- PB-10 *Combined Effects of Childhood Obesity and Obstructive Sleep Apnoea on Cardiovascular Parameters.*  
Rosemary Horne, Aidan Weichard, Alexandria Odoi, Knarik Tamanyan, Sarah Biggs, Gillian Nixon, Margot Davey, Lisa Walter
- PB-11 (TW) *Polysomnographic Findings after Adenotonsillectomy for Obstructive Sleep Apnea in Children: A Meta-Analysis*  
Chia-Hsuan Lee, Wei-Chung Hsu, Wei-Hsuan Chang, Ming-Tzer Lin, Kun-Tai Kang
- PB-12 *The Prevalence and Correlate Factors of Sleep-Disordered Breathing in an Orthodontic Population*  
Xu Gong, Jinrong Deng, Xuemei Gao
- PB-13 (TW) *Longitudinal Observation of Obstructive Sleep Apneas in Patients with Prader-Willi Syndrome*  
Shi-Bing Wong, Mei-Chen Yang, Chou-Chin Lan, Yi-Chih Huang, Li-Ping Tsai
- PB-14 (TW) *Childhood Asthma Is a Risk Factor for Pediatric Obstructive Sleep Apnea*  
Chien-Heng Lin, Wei-Ching Lin, Cheng-Li Lin, Chia-Hung Kao
- PB-15 *From Questionnaire to Screening of Pediatric Sleep Disordered Breathing in Romania*  
Mihaela Oros, Florin Mihaltan
- PB-16 *Bi-Level Positive Airway Support (BPAP) with Average Volume Assured Pressure Support (AVAPS) in Children.*  
Natalie Gentin, Bruce Williamson, Sonia Pithers, Ganesh Thambipillay, Arthur Y Teng
- PB-17 *Comparison of OCST Diagnostic Capability between Adults and Children with OSA.*  
Masaaki Suzuki

### Pediatric Sleep-Disordered Breathing

- PB-18 (TW) *Polysomnography for the Diagnosis of Children with Sleep Related Problem: Experience of One Children'S Hospital in Taiwan*  
Chien-Heng Lin, Syuan-Yu Hong, I-Ching Chou
- PB-19 (TW) *Comparison the optimal nasal continuous positive airway pressure from different methods in patients with obstructive sleep apnea syndrome*  
Yu-Chia Lai, Liu Ching-Lung
- PB-20 (TW) *Outcomes of Neurocognitive Function after Adenotonsillectomy in Pediatric Obstructive Sleep Apnea: A Prospective Longitudinal Study*  
Chuan Cheng, Yu-Shu Huang
- PB-21 *Comparison of Night Polysomnogram Findings in Children with Attention-Deficit/Hyperactivity Disorder with and without Sleep Complaints*  
Jee Hyun Kim, Mina Ha, Ho Jang Kwon, Ki Chung Paik, Eun Jung Kim, Seung Jin Yoo, Myung Ho Lim



## Pediatric Sleep-Disordered Breathing

- PB-22 *Assessing the efficacy of management of Sleep Disordered Breathing in Syndromic Children*  
Vijaya Krishnan Paramasivan, Senthil Vadivu Arumugam, Shyam Sudhakar Sudharsan, Mohan Kameswaran
- PB-23 *Assessing the Efficacy & Safety of Coblation Adenotonsillectomy as Compared to Dissection Method in Children with OSAS*  
Vijaya Krishnan Paramasivan, Senthil Vadivu Arumugam, Mohan Kameswaran

## Sleep and Development

- PB-25 *Maternal Emotions during Prenatal and Postnatal Period Affect Preschoolers' Sleep Outcomes: A Retrospective Study*  
Guanghai Wang, Yuli Li, Jianghong Liu
- PB-26 *Development of the Japanese Sleep Questionnaire for Junior High School Students (JSQ-JH) and Its Factor Structure in a Community Sample*  
Arika Yoshizaki, Kyoko Hoshino, Kumi Kato-Nishimura, Naoko Tachibana, Tomoka Yamamoto, Jun Sasaki, Masaya Tachibana, Shigeyuki Matsuzawa, Ikuko Mohri, Masako Taniike
- PB-27 *The Duration of Sleep Spindles Are Correlated with Core Symptoms in Autism Spectrum Disorder Children*  
Midori Kawahara
- PB-29 (TW) *Effects of Ambient Temperature Change on EEG, Sleep Quality and Autonomic Functions in Healthy Subjects: the Mechanism and Representable Indices for Human Comfort during Sleep*  
Yen-Ru Chen, Cheryl Ching-Hsiu Yang, Terry Bo-Jau Kuo
- PB-30 *Individualized Management of Sleep Disorders in Two Slovenian Patients with Smith Magenis Syndrome*  
Barbara Gnidovec Strazisar, Leja Dolenc Groselj

## Cognition , Behavior and Sleep

- PB-31 (TW) *Biological Measurements of Stressful Events*  
Chia-Huei Tseng
- PB-32 *Eight Years Sleep Education during Elementary School Prevents School Non-Attendance In Junior High School Years*  
Teruhisa Miike, Tsutomu Maeda, Seiki Tajima
- PB-33 *Reducing Bedtime Tantrums: The Boss of My Sleep Book in a Toddler with Trauma*  
Sarah Blunden, Kirrilly Thompson
- PB-34 *Influence of Parental Socioeconomic Status on Sleep Duration of Korean Adolescents*  
Yeongsang Jeong, Jung Hyun Kwon, Soohee Eun, Gunha Kim, Byung Min Choi, Won Hee Seo
- PB-35 (TW) *The Impacts of Pre-Sleep Emotion Arousal on Brain Activation and Subsequent Sleep: Preliminary Data of an Fmri Study*  
Fan-Chi Hsiao, Pei-Jung Tsai, Ling-Chun Chen, Chien-Ming Yang
- PB-36 *Behavioral Evaluation by CBCL in Children with Obstructive Sleep Apnea Before and After Treatment*  
Emi Murata, Ikuko Mohri, Kumi Kato-Nishimura, Jiro Iimura, Masaya Tachibana, Shigeyuki Matsuzawa, Makoto Ogawa, Masako Taniike
- PB-37 *Sustained Attention and Sleep Duration in Children: An Observational Study*  
Man-Ian Tam, Chun-Ting Au, Lai-On Wong, Sin-Ying Cindy Yan, Ching-Ching Chan, Albert Martin Li
- PB-38 (TW) *Unplanned Tubbing Removal Accident and Sleep Disturbance*  
Shu Lan Hsu, Kuo Sheng Fan, Hsing Chun Chen, Chun Liang Lai
- PB-39 (TW) *Effect of Sleep Deprivation on Emotional Reactivity*  
Hsin-Yi Chiang, Yu-Che Tsai



## Psychiatric Disorders and Sleep

- PB-40 (TW) *Sleep Problems Predict Mood Disturbance and Risky Behaviors among Adolescents with ADHD*  
Pei-Yin Pan, Chin-Bin Yeh
- PB-41 (TW) *Are There Bi-directional Relationships between Sleep Problems and Depression in Youth?*  
Wen Hsuan Chiu, Po-Hsiu Kuo
- PB-42 (TW) *Evaluating Effect of Sleep Problems on Suicidality in Youth: Is Emotion Regulation a Moderator?*  
Yen-Ling Chen, Wen-Hsuan Chiu, Po-Hsiu Kuo
- PB-43 (TW) *Pediatric Sleep Apnea and Risk of Depressive Disorders: A Nationwide 15-Year Follow-Up Cohort Study*  
Chun-Hung Chang
- PB-44 *Relationship between Sleep Pattern and Internet Addiction / Overuse in Adolescents*  
Fumie Horiuchi, Yasunori Oka, Kentaro Kawabe, Shu-ichi Ueno
- PB-45 (TW) *Sleep Pattern in Newly Diagnosed & Medication Treated Attention Deficit Hyperactive Disorder Children*  
Ming-Yu Wang

## Others

- PB-46 *Validation of the French version of the Severity Hierarchy Score (SHS) for Paediatric Sleep Apnoea*  
X. L. Nguyen, P. Levy, N. Beydon, D. Gozal, B. Fleury
- PB-47 *Intravenous immunoglobulin therapy in two children with type 1 narcolepsy administered early after disease onset*  
Elisabeth Ruppert, Helene Zagala, Ulker Kilic-Huck, Laurence Hugueny, Juliette Chambe, Carmen Schroder, Patrice Bourgin



## Poster Session III (March 13): IPSA&TSSM

10:00-10:30

Room 101D

### Technology/ Technical

- PC-02 *Cardiorespiratory Monitoring by An On-Mattress Piezoelectric Sensor during High Frequency Oscillatory Ventilation*  
Shinichi Sato, Wako Ishida-Nakajima, Akira Ishida, Masanari Kawamura, Shinobu Miura, Tomoo Ito, Takashi Kanbayashi, Tetsuo Shimizu, Tsutomu Takahashi
- PC-03 *Use of iButton Sensors to Measure Children's Skin Temperature during Sleep in the Home Setting*  
Susan McCabe, Catherine Elliott, Katherine Langdon, Chris Abbiss
- PC-06 *Segmental Maxillomandibular Rotational Advancement in Obstructive Sleep Apnea: Long-Term Follow-Up*  
Ryo Sasaki, Cheng-Hui Lin
- PC-09 (TW) *Comparison of An Innovative Smartphone-based Sleep Log and Traditional Two Week Sleep Diary*  
Cheng-Jung Wu, Pin-Zhir Chao, Fei-Peng Lee
- PC-10 (TW) *Sleep Apnea Event Identification Algorithm Using Thoracic-abdominal Motion and Blood Oxygen Saturation*  
Chi-An Hsu, Yu-Lun Lo, Pei-Yu Lai, Sui-Ya Huang, Keng-Han Yang, Hau-tieng Wu, Po-Chun Huang, Yuan-Hao Huang

### Insomnia

- PC-04 (TW) *The Correlations of Different Domains of Work Stress to Emotion and Insomnia*  
Ya-Chuan Huang, Ya-Yuan Hsu, Tzu-Ting Lin, Chyi-Herng Chang, Chuen-Chang Huang, Yu-Chien Hung, Chia-Jung Chou, Chien-Ming Yang
- PC-05 (TW) *The Effects of Jacobson Muscle Relaxation in a Supportive Group for Patients Suffering from Insomnia*  
Shiu-Feng Lu, Ching-Feng Huang
- PC-07 (TW) *The Role of Paradoxical Intention to the Process of Falling Asleep Among the Individuals with Sleep-Onset Insomnia*  
Yun-Hui Wang, Ming-Yih Lee, Hsin-Jung Tsai, Cheryl C.H Yang, Terry B.J Kuo
- PC-08 (TW) *Effects of Classical Music on Cerebral Rhythms, and Autonomic Nervous System in Self-Reported Insomniacs*  
Zih-Yu Hou, Wan-Ching Wu, Cheryl C.H. Yang, Yu-Cheng Lin, Terry B.J. Kuo

### Others

- PC-11 *Combination of Intransal Corticosteroid and Oral Montelukast Therapy for Mild Pediatric OSA*  
Guoping Yin, Jingying Ye, Yuhuan Zhang
- PC-12 (TW) *Nocturnal Oxygenation and Sleep Quality in Patient with Chronic Obstructive Pulmonary Disease*  
Chien-Hung Chin, Yung-Che Chen, Kuo-Tung Huang, Tung-Ying Chao, Chin-Chou Wang, Shih-Feng Liu, Wen-Feng Fang, Meng-Chih Lin and Mao-Chang Su
- PC-13 (TW) *Increased Formyl Peptide Receptor 1 Expressions on Blood Immune Cells in Patients with Obstructive Sleep Apnea*  
Yung-Che Chen, Meng-Chih Lin, Mao-Chang Su, Chien-Hung Chin, Kuo-Tung Huang, Chia-Wei Liou, Chin-Chou Wang, Wen-Feng Fang, Shu-Jun Kong, Lian-Rong Liu, Wei-Zhe Liu, Ting-Ya Wang, Yong-Yong Lin, Yi-Xin Zheng, Yi-Jing Li
- PC-14 (TW) *Evaluating Endothelial Dysfunction in Patients with Obstructive Sleep Apnea with A Novel Method: Arterial Waveforms Measured at the Wrist*  
Kuo-Tung Huang, Wei-Che Liu, Mao-Chang Su, Yung-Che Chen, Hsien-Tsai Wu, Hong-Ruei Chen, Jui-Ting Hsu, Chien-Hung Chin, Chin-Chou Wang, Meng-Chih Lin
- PC-15 (TW) *Multiscale Entropic Assessment of Autonomic Dysfunction in Patients with Obstructive Sleep Apnea and Therapeutic Impact of CPAP Treatment*  
Mao-Chang Su, Wen-Yao Pan, Hsien-Tsai Wu, Meng-Chih Lin, Chen-Hung Chin, Yung-Che Chen, Cheuk-Kwan Sun
- PC-16 *Educating Children and Referring Physicians About Sleep*  
Colin Shapiro, Azmeh Shahid and Arina Bingeliene
- PC-17 *Sleep in Children with FAS*  
Dora Zalai, Sherry Goril and Colin Shapiro



## Sponsor Profile



BROJAW INC. collaborate with Medical Device manufacturers in Australia, Europe and U.S.A., acquiring the sales distributorships from: ResMed , SenTec , Natus , DIMA ,COSMED , BIO-MED DEVICES .

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The global team at ResMed is united in the commitment to change millions of lives with every breath. The company has been pioneering new and innovative devices and treatments for sleep-disordered breathing, chronic obstructive pulmonary disease, and other chronic diseases for more than 25 years.



E-Top Union Inc. was established in 2006, our goal is to focus on develop and sale CPAP and the related products, and we expect to provide handy medical equipment with high quality to our customer, and furthermore to benefit the global society.



Nox Medical develops and manufactures medical devices to improve people's health by making sleep diagnostics more simple, efficient and comfortable in all patient groups, especially children. The company's solutions are intended for medical professionals, hospitals, and independent testing facilities. And the products are sold through an international network of distributors.

# **Outline of Symposium**

## SYMPOSIUM 1

### Surgical outcomes for obstructive sleep apnea in children

#### Learning Objectives

1. The role of surgical indication in pediatric OSA
2. The use of coblation in pediatric OSA
3. Hypertension and BP change in pediatric surgical OSA patient
4. Predictors of surgical outcome for in pediatric OSA

#### Scientific and/or clinical content

Surgical treatment for pediatric OSA is very important to decrease complications of OSA in adult. However, many controversies exist in this issue. This symposium has a comprehensive exploration of surgical outcomes for OSA in children. The symposium starts from the indication of sleep surgery for pediatric OSA patients. The 1<sup>st</sup>presenter concludes that surgical indication is much important than diagnose OSA in children. Surgical tool and technique are variable in the treatment of pediatric OSA. The 2<sup>nd</sup>presenter uses coblation to develop his novel technique involving diggerent technique in heating upper and lower tonsil to enlarge airspace and decrease postoperative bleeding. AHI is not the only outcome in surgery for pediatric OSA. The 3<sup>rd</sup>presenter shows the changes of BP in pediatric surgical OSA patients. How to select good candidate for OSA surgery in children influence surgical outcomes. The 4<sup>th</sup>presenter reveals some clinical predictors that can be used for the selection of pediatric OSA surgery. This integrated program will be helpful to audience in indication, technique, outcome and predictor.



## SYMPOSIUM 2

### The role of vitamine D deficiency in pediatric Sleep disorders

#### Learning Objectives

Learn about the role of vit D as a causative contributing factor to many sleep disorders, via the activation of pro-inflammatory and hypoxic pathways and immune-mediated mechanisms.

#### Scientific and/or clinical content

Vitamin D deficiency has a prominent role in inflammation, immunomodulation and hypoxia related to pediatric sleep disorders. Hypersomnia, whether or not in the context of pediatric narcolepsy, appears to be related, according to several recent accounts, to the increase of cytokines such as PGD2 and TNF alpha in the context of vit D deficiency . The immunomodulatory role of vit D might mediate the risk of developing narcolepsy in the context of its deficiency. Doctor Walters will review relevant literature on this topic.

In obese children and children with OSA, vit D deficiency is significantly associated with increased CRP and insulin resistance. Moreover excessive daytime sleepiness (EDS) which is more severe in Afro-American children, seems to be specifically mediated by vit D deficiency in this population. Doctor Kheirandish Gozal L will deal with the contribution of vit D deficiency to some of the phenotypical aspects of OSA in children.

In children with growing pains and RLS, a significant inverse relationship of symptoms severity and pain with vit D levels has been detected.

Vit D supplementation allows consistent clinical benefit and appears to be related to the specific role that this steroid agent plays on the early development of the dopaminergic pathways besides the consistent association of vit D deficiency to muscle-skeletal pain. Doctor Silvestri will review current literature on this topic.

Most of these pediatric sleep disorders in the long range may impact the child cognitive development and increase the risk of cardiovascular morbidity via the enhancement of a pro-inflammatory pathway.

Doctor Mccarty will elucidate vit D metabolism and its role in human sleep disorders.



## SYMPOSIUM 3

### Child and adolescent sleep in the context of culture

#### Learning Objectives

The objectives of this symposium are to present cross cultural comparisons of sleep patterns and disturbances in normative children and adolescents, and to assess the relative contributions of culture and biology to habitual sleep patterns.

#### Scientific and/or clinical content

Sleep is a biologically driven behavior that is shaped and modified by culture. In past decades, a large body of the scientific literature focused on the biological underpinnings of sleep in childhood and adolescence. Only in recent years has there been a growing scientific interest in assessing the cultural contributions to sleep patterns in youth, and the interaction between culture and biology. The symposium aims to provide an updated overview of novel findings that have been collected in cross cultural as well as subcultural study designs from a variety of countries around the world. The symposium will begin with a talk given by Kate Bartel, (PhD Candidate) from Australia, describing findings from a cross-continent comparison of sleep and evening screen exposure in Australian, Canadian and Dutch Adolescents. The next talk will be presented by Prof Daniel YT Goh from Singapore, who will present cross-cultural data of sleep behaviors in young children in Asia, highlighting the differences in sleep habits, practices and perception with those in predominantly Caucasian populations. The final two talks will zoom in to present findings comparing different cultural groups within a single Mediterranean country: Israel. The first of the two, presented by Prof. OrnaTzischinsky, will discuss sleep patterns, screen exposure and quality of life in Arab and Jewish schoolchildren. The second and final talk, presented by Prof. Tamar Shochat, will explore sleep patterns, lifestyle habits and screen exposure in Jewish ultra-orthodox (Haredi) compared to secular Jewish adolescents. Finally, the Chair, Prof. Iris Haimov from Israel, will provide a summary of the complex pathways by which culture and associated lifestyle factors contribute to observed habitual sleep patterns during childhood and adolescence. These presentations will highlight the subtle implications of culture and related lifestyle practices on various aspects of sleep (i.e., sleep timing, duration, quality and perception), and will thereby increase awareness of these factors among clinicians, educators and researchers.



## SYMPOSIUM 4

### Surgical and orthodontic managements of pediatric OSA

#### Learning Objectives

Evaluating the possible treatments for pediatric OSA

Understanding the scientific background and outcomes of surgical / orthodontic treatments for pediatric OSA

#### Scientific and/or clinical content

The possible treatments for pediatric OSA are ① adenotonsillectomy (T&A) ② positive air pressure (PAP) ③ topical intranasal application of high-potency corticosteroids ④ leukotriene receptor antagonists ⑤ rapid maxillary expansion (RME) ⑥ myofunctional therapy (MT) as an adjunct tool ⑦ distraction osteogenesis / maxillomandibular advancement (MMA) for children with severe OSA or anomalies ⑧ oral appliance / functional appliance. T&A is the first-line treatment. However, current evidences show that residual symptoms and complaints remain even after T&A. As PAP is also a good treatment option, unrecognized facial changes should be also monitored during PAP treatment. The skeletal factors (narrow maxilla and retrusive jaws) are important to manage residual symptoms and complaints. It is crucial to understand the relationship between mode of breathing and craniofacial growth. RME and MT are currently used to manage and prevent pediatric OSA. The evidence shows that the outcomes of oral appliance / functional appliance for pediatric OSA are questionable. At this symposium, the scientific background, evidences and outcomes of surgical / orthodontic treatments (T&A, RME, MT and MMA) for pediatric OSA will be discussed.



## SYMPOSIUM 5

### Sleep Mood and Suicide in Adolescent – link between Sleep and Psychiatry

#### Learning Objectives

The objectives are to highlight the significance of the association between sleep and mood regulation in adolescents population and to describe new findings to diagnose and manage sleep and mood problems in this population.

#### Scientific and/or clinical content

Sleep and psychiatric disorders are inextricably linked. The relationship is generally accepted and acknowledged, but the importance under-appreciated. The symposium aims to focus on recent discoveries and advances in this area. We shall describe and discuss new findings to automatically and objectively diagnose depression by using biological markers extracted from EEG, , and we shall highlight the utility of PSG studies in the identification and management of adolescents with respect to sleep and mood problems and those at risk of suicidal behaviour



## SYMPOSIUM 6

### Medical treatment for childhood obstructive sleep apnoea

#### Learning Objectives

- Understand adenotonsillectomy does not offer total cure to children with OSA
- Discuss role of nasal spray corticosteroids, CPAP and craniofacial myofunction therapy in the management of childhood OSA

#### Scientific and/or clinical content

Obstructive sleep apnoea (OSA) is prevalent in children and if left untreated can lead to a variety of important complications, namely neurocognitive deficits, cardiovascular abnormalities and even metabolic disturbances. Adenotonsillectomy is often suggested to be the first-line treatment for children with OSA but recent data provide conflicting findings regarding its efficacy to offer complete cure. This symposium will start with a review on how effective adenotonsillectomy is for childhood OSA and then the speakers will focus on different medical therapies available or on the horizon in tackling this important childhood condition.

- Dr. Mahesh will review the current literature on the effectiveness of adenotonsillectomy in offering cure to childhood OSA. He will also touch on the potential complications association with this surgical intervention.
- Dr. Chan will present on the usefulness of nasal spray corticosteroids and leukotriene receptor antagonist in the management of childhood OSA.
- Dr. Tapia will examine whether CPAP should be considered as first-line treatment for children with OSA.
- Dr. Huang will look at a newer therapeutic option for OSA, namely craniofacial myofunction therapy. She will review current evidence and share with the audience her experience with this form of therapy.



## SYMPOSIUM 7

### Orthodontia and sleep Disordered Breathing in children

#### Learning Objectives

Presentation of recent approaches in treating using orthodontic approaches sleep-disordered –breathing in children:a)Role of Rapid-maxillary-expansion and its long term follow-up, b) role of passive myofunctional therapy with usage of an orthodontic device at night c) follow-up and imaging of the effect of the orthodontic device on pre-pubertal children d) usage and effect of Bollard implants in children with sleep-disordered-breathing and maxillary deficiency

#### Scientific and/or clinical content

Pediatric obstructive sleep apnea has been treated with adeno-tonsillectomy that has not solve the long term problem of recurrences. Orthodontic treatments have been successfully applied to children: Rapid-maxillary-expansion can lead to permanent control of syndrome as shown by long term follow-up; but other approaches may be needed: active myofunctional therapy has many failure due to non-compliance, passive treatment during sleep using an oral device was more successful, follow-up at one year evaluate gains and side-effects in pre-pubertal children. Finally usage of Bollard implants in children with maxillary deficiencies is a novel approach at treating OSA children with such presentation



## SYMPOSIUM 8

### Sleep in young children: Association with daytime functioning, maternal sleep, and long-term outcomes

#### Learning Objectives

- Discuss role of sleep ecology factors, especially bedtime routines, on sleep in young children
- Understand the impact of sleep in young children on short-term and long-term outcomes, including daytime functioning, maternal sleep, and future sleep outcomes

#### Scientific and/or clinical content

Sleep in young children is known to impact many aspects of individual and family well-being. This symposium will start with attention to the importance of bedtime routines on sleep in young children (0 to 6 years) and then focus on the subsequent association of sleep in these children with daytime functioning, maternal sleep, and long-term outcomes.

- Dr. Li will present on the dose-dependent relationship between bedtime routines and sleep outcomes in young children, utilizing data collected in a large cross-cultural study.
- Dr. Mindell will present on the relationship between sleep in young children and next day functioning, including mood, visual eye-tracking, and developmental performance.
- Dr. Goh will present on the relationship between child and maternal sleep from a large-cross cultural study of children ages 0 to 6 years.
- Dr. Arthur Teng will present on longitudinal outcomes in a cohort of children from Australia and New Zealand. Results will be presented on sleep patterns and problems collected five years after initial data collection, including factors that impacted sleep outcomes.



## SYMPOSIUM 9

### Sleep variability and daytime performance in young people: as important as sleep duration?

#### Learning Objectives

1. To understand what constitutes sleep variability in children and adolescents and how to calculate it
2. To assess the relative contributions of sleep duration and sleep schedule variability
3. To present the impact of variability on daytime performance and wellbeing in these age groups

#### Scientific and/or clinical content

There has been increasing interest in sleep variability as a contributor to sleep health in the past 10 years. The speakers will present sleep variability data in preschoolers, school aged children and adolescents. Data will show that sleep **schedule** variability (differences in sleep timing and in sleep /wake times) and sleep **duration** variability (differences in sleep duration across time and day types) individually and collectively impact daytime health and performance even when sleep duration is within current guidelines. Together the data will propose that sleep variability should be considered more carefully thus expanding our knowledge of sleep health in the Paediatric age groups.



## SYMPOSIUM 10

### Advances in pediatric narcolepsy

#### Learning Objectives

The clinical picture of childhood narcolepsy in different ethnicities;  
Cataplexy and its mimics;  
Natural course and response to treatment;  
New objective disease markers;  
Functional cerebral correlates of cataplexy;  
The epidemiology Type 1 Narcolepsy related to H1N1 flu, vaccination;  
New insights in immunological disease pathophysiology.

#### Scientific and/or clinical content

Childhood Type 1 Narcolepsy represents a hot topic in the scene of neurosciences, bridging sleep, emotions, movement disorders, puberty, obesity, mood, behaviour, and autoimmunity. Although the diagnosis is still challenging and the cause of the disease unsolved a number of new scientific works contributed to render a detailed picture of the disease at the onset in children and adolescents and to close in on its autoimmune origin.



## SYMPOSIUM 11

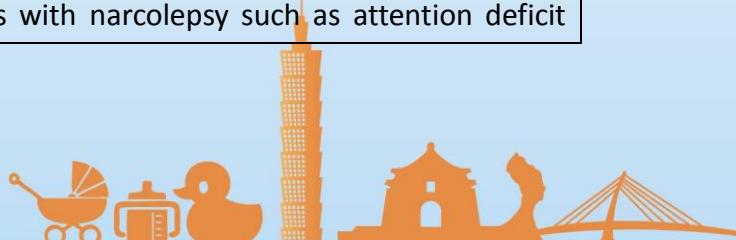
### Hypersomnias of Central Origin in Childhood and Adolescence: a challenging diagnosis

#### Learning Objectives

To document the difficulties of the differential diagnosis of hypersomnias of central origin - narcolepsy type 1and type 2 - in children and adolescents, with other disorder of excessive daytime somnolence and comorbidities.

#### Scientific and/or clinical content

Narcolepsy with cataplexy (NC) is a rare Central Nervous System disease appearing during childhood or adolescence in half of the cases. The classical diagnostic tetrad of excessive daytime sleepiness (EDS) with irresistible sleep attacks, cataplexy, sleep paralysis, and hallucinations, in addition to disrupted nocturnal sleep, may be absent during childhood. Because of its specific manifestations, childhood NC requires tailored approach and further investigations for comorbidities that may not be observed in adults. EDS can manifest as paradoxical hyperactivity (similar to attention deficit hyperactivity disorder) or may be considered as laziness, or misdiagnosed as sleep apnea syndrome. Hallucinations can be under recognized and for the possible coexistence of nightmares, sleep terrors, and confusional arousals. Although NC remains under recognised and misdiagnosed, it is a serious disease with a chronic course and lifespan disabilities due to lack of school performance, and by behaviour and personality changes. Preschool and young children may show inattentiveness, emotional lability and hyperactive behaviour. Cataplexy may appear after the onset of sleepiness and affect mainly muscles of the face, with facial movements mimicking choreic or tics movements. Hypnagogic/hypnopompic hallucinations and sleep paralysis are seldom present, and might be confused with psychotic symptoms. NC occurring during prepubertal age is frequently accompanied by precocious puberty and overweight/obesity, suggesting an extended hypothalamic dysfunction due to the hypocretin deficiency. It has been found an increased psychiatric comorbidity in children and adolescents with narcolepsy such as attention deficit



hyperactivity disorder inattentive type, major depression (especially in girls older than 10 years), general anxiety disorder, oppositional defiant disorder, and rarely pervasive developmental disorder, and 3% of eating disorder not otherwise specified (anorectic type). The diagnosis of narcolepsy type 2 and idiopathic hypersomnia are very rare during childhood and adolescence and the differential diagnosis with insufficient sleep syndrome may be difficult. During adolescence exclusion of other causes of hypersomnolence in that age group, including delayed sleep-wake phase disorder, obstructive sleep apnea, insufficient sleep syndrome, and use of recreational drugs, is mandatory.

For all these reason these symposium will be focused on an update of paediatric criteria of NC and differential diagnosis, including a diagnostic algorithm to help clinicians to recognize and manage sleep disorders during childhood. An overview of the secondary form of narcolepsy will be presented (other forms of autoimmune hypothalamic dysfunction, brain lesions, neuroendocrine and metabolic disorders). Another presentation will be focused to the psychiatric comorbidities which can further delay the diagnosis of narcolepsy in children, in particular the form associated with psychotic disorder are difficult to manage and treat. Finally, the differential criteria between narcolepsy type 2, idiopathic hypersomnia, and insufficient sleep will be discussed since these are specific in adolescence but which required experience and often the diagnosis and treatment are delayed with a negative impact on the outcome of the disease.



## SYMPOSIUM 12

### Sleep in infants and young children - effects on development and cognition

#### Learning Objectives

To discuss the implications of sleep and sleep patterns in preterm and term infants and the implications for development and learning.

#### Scientific and/or clinical content

During infancy and early childhood sleep is at a life time maximum. Sleep states have a significant effect on the cardiovascular system and temperature regulation. As the cardiorespiratory system is immature in the first years of life, particularly in infants born preterm, instabilities in cardiorespiratory control are common. These can have significant long term consequences for infant development.

Prof Veronique Bach will present the first talk focusing on how body temperature (and especially distal skin temperatures) can influence the wakefulness duration in preterm infants in the neonatal intensive care unit. Prof Rosemary Horne will present new findings on the effects of respiratory instability on cerebral oxygenation in preterm infants across the first 6 months after term equivalent age. Prof Patricia Franco will present findings of the relationship between sleep and neurocognitive development at three years of age from the AUBE French birth cohort study. Finally Prof Jodi Mindell will present findings from several cohorts, including the US and Brazil, regarding the relationship between sleep and mood and development in young children.



## SYMPOSIUM 13

### Challenges in Surgical Treatment of Asian Pediatric Patients with Obstructive Sleep Apnea

#### Learning Objectives

The symposium is focused on the surgical treatment of Asian pediatric patients with obstructive sleep apnea. The current challenges in the treatment of OSA and future modifications of surgical protocol will be discussed.

#### Scientific and/or clinical content

The surgical treatment of obstructive sleep apnea is an important option for pediatric patients. However, there are a lot of challenges still. Since children are growing, any surgical procedure may have negative impacts while disease being treated. Also, the surgical outcome is somehow unpredictable due to the ever-changing condition on physiology of growing children. We would like to start the discussion from current principle of surgical treatment, the functional indication, and individual surgical option of soft tissue, till craniofacial surgery for pediatric patients with OSA.



## SYMPOSIUM 14

### The relationship between sleep and obesity among children and adolescents

#### Learning Objectives

The objectives of this symposium are to discuss the relationship between sleep patterns and sleep disorders in Binge eating disorders and obese children and adolescents. In addition, to assess the relative contributions of short sleep duration to the development of obesity.

#### Scientific and/or clinical content

Over the past few decades the prevalence of obesity in children and adolescents has grown to epidemic proportions. Concomitant with the increase in obesity, over the past 40 years our society has experienced a progressive reduction in sleep duration, with sleep duration decreasing by about 1.5-2 hours. As a result, children and adolescents get an insufficient amount of sleep. They report fatigue and sleepiness, depressed mood and caffeine consumption.

Evidence supports an inverse relationship between sleep duration and body weight. Sleep plays an important role in energy balance. Several studies in recent years report that short sleep duration is a major risk factor for weight gain and obesity. The mechanism linking short sleep duration with weight gain is unknown, but growing evidence suggests that two key opposing hormones are involved: leptin and gheralin.

The symposium aims to provide an overview of novel findings from the last few decades regarding the association between binge eating disorders and obesity and short sleep duration among children and adolescents.

The symposium will begin with a talk by Prof. Latzer from Israel, whose expertise is eating



disorders include obesity and overweight. She will talk on "Obesity among Children and Adolescents: Psychological and Biological Perspectives".

The next talk will be given by Dr. St-Onge from the USA on the impact of sleep duration on energy balance regulation.

The next talk will be by Dr. Piergiuseppe from Italy, who will talk about the topic of "Sleep Reduction and Children's Obesity: Is there a link?" The talk will focus on the findings of studies that examined the open question of the link between short sleep and obesity during childhood.

The final talk will be given by the symposium chair, Prof. Tzischinsky from Israel. She will present the results of original research on the relationship between sleep disorders and children and adolescents with obesity and binge eating disorders. Her talk will include updated data and a summary of the complex pathways by which sleep duration contributes to obesity.

These presentations will highlight the short- and long-term morbid consequences of obesity and stress the importance of increasing public awareness of this problem and of prioritizing overweight children and adolescents as a major public health concern.



## SYMPOSIUM 15

### Complications associated with childhood obstructive sleep apnoea, are they reversible?

#### Learning Objectives

To discuss the consequences of obstructive sleep apnoea (OSA) in children on the cardiovascular system and behaviour and neurocognition and the findings of studies investigating the effectiveness of treatment in ameliorating these.

#### Scientific and/or clinical content

In adults obstructive sleep apnoea (OSA) is strongly associated with the occurrence of adverse cardiovascular events and deficits in daytime functioning. There is accumulating data to suggest children with OSA are also predisposed to the development of cardiovascular abnormalities and especially blood pressure elevation and deficits in behaviour and neurocognition. This is despite the fact that the etiology of OSA is very different in children compared to adults and the severity of the disorder is usually much milder. In children OSA is usually due to enlarged tonsils and adenoids and the main treatment is adenotonsillectomy. Studies have shown that adenotonsillectomy is effective in most cases in reducing the severity of sleep and respiratory problems associated with OSA but there are few studies which have examined the effectiveness in ameliorating the cardiovascular, behavioural and neurocognitive deficits long term. One factor which is emerging as a growing confounder to treatment is that of obesity.

In this symposium, we will review the current literature on blood pressure, behavioural and neurocognitive abnormalities in children with OSA and the effectiveness of treatment in both the short and long term. Prof Li will discuss the importance of cardiac health in children and how baseline OSA severity could predict blood pressure levels at 4-year follow up. Prof Horne will discuss the long term outcomes of treatment and resolution of OSA in primary school aged children on blood pressure, cardiovascular control and behaviour and neurocognition. Prof Amin will discuss effects of obesity on outcomes for cardio metabolic function in children with OSA. Prof Villa will discuss the effects of obesity and age on children with OSA on cognition.



## SYMPORIUM 17

### Parental context for infant sleep

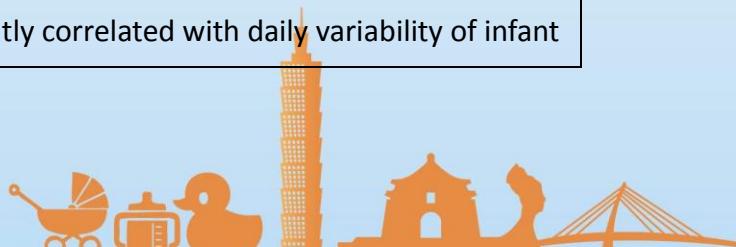
#### Learning Objectives

- Understanding the role of parents in normal infant sleep development and in behavioural infant sleep interventions.
- Learning about different manifestations of infant sleep as documented by parental reports, actigraphy and nocturnal video recordings.

#### Scientific and/or clinical content

Dr. Bruni will present results from a longitudinal study in the first year highlighting the course of parental perception of sleep problems. Data was collected at 1, 3, 6, 9, and 12 months of infant age. Parents reported a low level of problems at 3 months that increased at 9 months. Parental perception of an overall sleep problem at all ages significantly correlated mainly with nocturnal awakenings and difficulties falling asleep. Parental active involvement in settling the child to sleep correlated with poorer sleep quality. The frequency of nighttime awakenings and falling asleep difficulties are the main factors by which parents judge the quality of their child sleep, and key questions should be focused on these variables to screen for infants with sleep problems.

Dr. Teti will introduce the impact of chaotic family environment on infant sleep and infant-mother attachment. This presentation is based on data collected at 1, 3, 6, 9, and 12 months of infant age ( $N = 167$  at recruitment). Data showed that family chaos was a stable family characteristic. Household chaos was significantly correlated with daily variability of infant



sleep. Higher levels of chaos were associated with greater variability in infant sleep duration, efficiency, minutes asleep, and percent sleep. Household chaos predicted maternal sleep and infant-mother attachment. These results suggest that family structure as imposed by parents serves to regulate and stabilize infant and maternal sleep patterns in normal developmental context.

Dr. Tikotzky, will present data on how maternal sleep, stress and psychopathology symptoms predict infant sleep patterns and co-sleeping choices. This study included 135 families assessed during pregnancy and at 3 and 6 months postpartum, using actigraphy, diaries and questionnaires. Mothers with higher depressive, anxiety and stress scores were more likely to perceive their infant sleep as problematic. Mothers of co-sleeping infants reported more infant night-wakings than mothers of solitary sleeping infants, and poorer maternal sleep predicted higher levels of co-sleeping. These results suggest that maternal sleep patterns and emotional distress may play a role in shaping infant sleep and co-sleeping choices.

Dr. Sadeh will present results from a study assessing the role of parental and infant's characteristics in predicting the benefits of behavioral interventions for infant sleep problems. This study included 80 sleep-disturbed infants and their parents who received a behavioral sleep intervention. Infant sleep was assessed using actigraphy, video monitoring, and questionnaires. Results demonstrated significant improvement in actigraphic and reported sleep following the intervention and in a follow-up assessment. Higher maternal stress and psychopathology scores at baseline predicted significantly smaller reduction in night-waking following the intervention. Results suggest that behavioral interventions may need to be modified to better serve parents with high level of stress and psychopathology.



Taken together, these presentations used similar methodologies to demonstrate the potential impact of parenting on infant sleep in normal sleep development and in clinical setting during interventions. They suggest that parental perceptions, psychopathology, lack of family structure and high stress levels play a role in determining infant sleep development and response to sleep interventions.



## SYMPOSIUM 18

### Sleepless in the Second Decade: What Cognitive Functions Are Affected by Restricting Teens' Sleep?

#### Learning Objectives

- 1) To inform attendees of common simple and complex cognitive abilities that are affected by experimentally restricting adolescents' sleep,
- 2) To provide initial data on cognitive abilities affected by chronic sleep restriction, and whether treatment can reverse these deficits, and
- 3) To propose an underlying neural mechanisms linking restricted adolescent sleep and cognitive abilities.

#### Scientific and/or clinical content

Academic performance during the adolescent years predicts future career prospects. Paradoxically, teenagers are one of the most sleep restricted groups in society, and meta-analyses have shown not obtaining enough sleep negatively impacts school performance. But which underlying cognitive abilities are affected by restricted sleep?

This symposium's objective is to provide contemporary results to address the abovementioned question using a variety of methodologies. First, Drs. June Lo and Michelle Shortwill provide findings from their own independent laboratory-based sleep restriction studies on older adolescents, and the resultant effects on simple and complex cognitive abilities. Similarities and differences between these two independent studies will be highlighted. Then, Ms. Cele Richardson will extend these findings by analysing the deficits in the cognitive functions of adolescents experiencing chronic sleep restriction – that is, those diagnosed with Delayed Sleep-Wake Phase Disorder. Comparison against good sleeping adolescents, and preliminary findings of whether light therapy improves the cognitive abilities of those with DSWPD will be presented. Finally, Ms. Chelsea Reynolds will summarise findings from the literature and propose a potential mechanism for impaired cognitive abilities in sleep-restricted teenagers. Specifically, Ms Reynolds will present results of a systematic review and meta-analysis of the relationship between cognition and sleep spindles in adolescents, and supplement this with her findings from a sleep restriction protocol with older adolescents.

By using the methodologies of multiple, independent (experimental) studies, systematic reviews and meta-analysis, as well as quasi-experimental between-group comparisons and within-subjects treatment, the symposium's objective is to observe concordant patterns of positive and negative findings in these new studies. In doing so, future research directions will



more efficiently yield similar findings that will increase our confidence of which adolescent cognitive abilities are most affected by restricted sleep. Sleep and educational interventions can then be developed to assist sleep-restricted adolescents' learning and school performance.



## SYMPOSIUM 19

### The Relationship between Sleep and Performance in Children and Adolescents in Korea

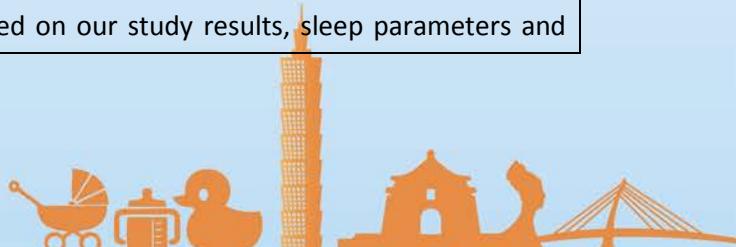
#### Learning Objectives

1. Review the characteristics of melatonin rhythm in adolescents
2. Review the current sleep pattern of adolescents and its impact on school performance and mood
3. Discuss the impact of social intervention on adolescent sleep and school life
4. Discuss the sleep parameters as predictors of cognitive function in ADHD children

#### Scientific and/or clinical content

##### Summary of symposium:

- Melatonin rhythm in children and adolescents has not been well investigated. We compared the characteristics of melatonin rhythm and Morningness-Eveningness of adolescents with those of other age groups. We will also discuss a practical way of measuring the melatonin rhythm using saliva samples. (*Jung Hie Lee, MD, PhD*)
- Globally, adolescents are prone to sleep deprivation and social jet lag. The current sleep status of adolescents and its impact on mood, daytime function and academic performance will be reviewed. Adolescents' perception on their actual sleep duration will be discussed. (*Jee Hyun Kim MD, PhD*)
- Beginning at the onset of puberty, adolescents develop as much as a 2-hour sleep-wake phase delay (later sleep onset and wake times) relative to sleep wake cycles in middle childhood. We will investigate the effects of delaying school start time on sleep, emotion and behaviors of adolescents. (*Tae Won Kim, MD*)
- Sleep problems are common among patients with attention-deficit hyperactivity disorder(ADHD), and are considered major causes of behavioral and cognitive dysfunction in ADHD patients. We will explore the relationship between sleep parameters and cognitive function in drug-naïve children with ADHD. Based on our study results, sleep parameters and



cognitive function were closely associated in ADHD patients.(Yoo Hyun Um, MD)

In summary, we attempted to elucidate the critical relationship between sleep and performance in children and adolescents by reviewing the pertaining contents mentioned above.



## SYMPOSIUM 20

### Pediatric Obstructive Sleep Apnea- What is New?

#### Learning Objectives

1. Examine the challenges in managing children with OSA
2. Assess the Impact of T&A on blood pressure and growth in children with OSA
3. Assess the advantages and disadvantages of adenotonsillectomy (T&A) versus observation in children with OSA
4. Propose an algorithm for the management of children with persistent OSA after T&A

#### Scientific and/or clinical content

Obstructive sleep apnea (OSA) occurs in 2-4% of children. It is a respiratory disorder characterized by upper airway collapse that can lead to hypoxemia during sleep. OSA is the severe part of the spectrum of sleep disorders known as sleep disordered breathing (SDB). SDB ranges from primary snoring to upper airway resistance syndrome, and to OSA at the severe end. Untreated OSA in children is associated with cardiovascular, neurocognitive, and somatic growth consequences. Although the pathophysiology of childhood OSA is multifactorial, it is mainly due to enlarged adenotonsillar tissue. Therefore adenotonsillectomy (T&A) is the first-line therapy for pediatric OSA worldwide. However, it is unknown if T&A is appropriate in all children with OSA. A recent randomized controlled trial comparing T&A to observation (the Childhood Adenotonsillectomy Trial or CHAT) has shown that in approximately 40% of children observed over 7 months without T&A there was resolution of OSA. Furthermore, despite considerable evidence demonstrating the benefits of T&A, a proportion of children remain with persistent OSA. This is highest in children with severe pre-operative OSA, obesity, craniofacial, genetic and neuromuscular disorders. In this symposium, we will present the impact of OSA on children including the effects on growth (Pr. Sung Wan Kim) and blood pressure (Dr. Kun-Tai Kang). One of the leading investigators of the CHAT study (Pr. Ron Mitchell) will present the key results of the study and their impact on the current management of pediatric OSA. Finally, treatment options for residual OSA after T&A will be discussed (Dr. Wei-Chung Hsu).



## SYMPOSIUM 21

### Pediatric SDB & Craniofacial Growth & Development: Myofunctional Therapy Intervention and Successful Patient Outcomes In An Allied Approach

#### Learning Objectives

- Identify Orofacial Myofunctional Disorders and their relationship to sleep disordered breathing
- Identify frenum restriction as a clinical marker for OSA and understand frenum surgery in conjunction with myofunctional therapy as a critical treatment modality.
- Examine complimentary orthodontic & surgical treatments with myofunctional therapy

#### Scientific and/or clinical content

Orofacial Myofunctional therapy is critical to craniofacial growth and development and the latest studies have shown that it is effective treatment option. However, often it is overlooked when physicians plan for SDB treatment (sleep disordered breathing). This symposium focuses how orofacial myofunctional therapy can complete airway management treatment modalities to enhance the outcome and prevent the relapse / re-occurrence in the future.

We also will introduce the latest orthodontic and surgical interdisciplinary airway management techniques and present a call for new standards of care of orofacial myofunctional assessment, including frenum inspection and revision, and critical thinking of breathing to achieve optimal treatment results.

Marc Richard Moeller will be able to add context and perspective on the emerging field of myofunctional therapy and provide context for each speaker.

Christian Guilleminault will introduce the field of myofunctional therapy and its application to pediatric SDB treatment.

Joy Lea Moeller will explain the principles and practices of myofunctional therapy and assessment of myofunctional disordered patients.

Audrey Yoon will present orthodontic consideration of sleep apnea treatments as an orthodontist in conjunction with Myofunctional therapy, reporting early data of a preliminary study of maxillary distraction in conjunction with myofunctional. She will present the



comprehensive exam protocol of orofacial structure in SDB patients and will suggest the different orthodontic techniques at different ages and show her successful outcomes with Myofunctional therapy.

Stanley Liu will present his newest technique of maxilla-mandibular advancement surgery in conjunction with frenuloplasty and myofunctionaltherapy. He will suggest his sleep surgery philosophy, "beauty, bite and breathing " as comprehensive approach of sleep treatment. He will also discuss about different frenuloplasty technique and suggest the standard protocol.

Tess Graham will explain the fundamental principles of and critical role provided by breathing re-education as a part of myofunctional therapy.

Maria Pia Villa will provide data on a preliminary study on pediatric OSA treated with myofunctional therapy and provide objective assessment techniques to chart progress.



## SYMPOSIUM 22

### Sleep in young children: Neuro-developmental disorders and sleep problems in children

#### Learning Objectives

- Understand the subjective and objective sleep findings in children with common psychiatric /neurologic disease and its impact for management.
- Discuss the association between CNS enteroviral infection and subsequent sleep &mental problems in children.
- Discuss the clinical approach for the sleep problems in children with autism

#### Scientific and/or clinical content

Sleep problems are common in children and adolescents with psychiatric/ neurologic disorders, especially in those suffering ADHD, Tourette syndrome and restless leg syndrome. This symposium will start with attention to the importance of sleep study as a primary diagnostic and therapeutic evaluation and then focus on the subsequent association of sleep and mental problems in children who had enteroviral CNS infection.

- Dr. Chin will present on the common sleep problems in children with ADHD
- Dr.Nomura will present on the dopaminergic alteration, its impact of sleep-wake rhythms, and practical strategy for treatment in children with Tourette syndrome.
- Dr. Chen will present on the association between enterovirus infection and subsequent neurodevelopmental problems in a nationwide population-based children sample in Taiwan.
- Dr. Miyata will discuss the clinical approach and management for the sleep problems in autism.



## VIDEO SESSION

### The Do's and Don'ts of Phenotyping Sleep/Wake-Behaviours with Video Observations, Annotation and Interpretation

#### Learning Objectives

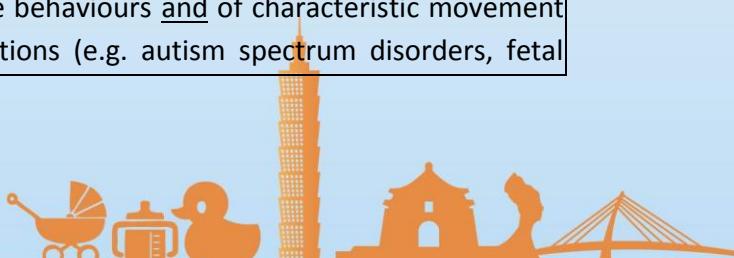
1. To present a *framework* for where and how patient narratives and associated video observations of sleep *and* wake-behaviours can and should be used.
2. To provide a *guideline* for reviewing and analyzing challenging/ disruptive sleep *and* wake behaviours of children/adolescents with neurodevelopmental conditions.

#### Scientific and/or clinical content

Analyses of behaviours and movement patterns have always been of interest in the domain of sleep and wake behaviours. The introduction of video technology into the field has catalyzed widespread research concepts and supported new clinical understandings. Currently, the use of video technology is booming thanks to the widespread use of user-friendly smartphones and tablets. Parents use these clips to underline or explain their child's story and get medical/psychological attention.

In this Satellite Workshop, research teams with varying backgrounds will present their suggestions for how to analyse video recordings of movement and behavioural patterns in patients of various ages, conditions, and in various states of wakefulness and sleep. Clinicians, who attend the meeting, present their own video-recordings and combine that with relevant clinical questions, will receive free-downloadable annotation software (copyrighted by Sleep/Wake-Behaviour Clinic BC Children's Hospital, Vancouver, and Austrian Institute of Technology, Vienna). This software will allow them to upload and annotate their clips; this way presentation of recorded features will focus on periods and regions of interest at various speeds and with zooming in or out options. In addition, clinicians will be able to download patient profiling forms, which have been created in collaboration with members of the International Restless Legs Syndrome Study Group, to start phenotyping restless legs syndrome and its main differential diagnoses.

The goals of the participating teams are to 1) present the best (state-of-the-art) technical solutions (hard- and software) for conducting and viewing video recordings; 2) create common algorithms for analysing video-taped movement patterns; 3) develop a library of common movement patterns associated with challenging/disruptive sleep and wake behaviours and of characteristic movement patterns in children with neurodevelopmental conditions (e.g. autism spectrum disorders, fetal



alcohol spectrum disorders, cerebral palsy, Down syndrome). Our observation has been that missed interpretations of sleep and wake behaviours can possibly lead to inappropriate diagnoses and overmedication of patients and thus iatrogenic harm. Dr. Hill (Sleep Medicine), Dr. Ipsiroglu (Developmental Paediatrician), Ms. McCabe (Occupational Therapist), and Dr. Silvestri (Neurologist), will present video clips from their clinical practice, which helped make a diagnosis. Our aim is to develop a framework for analyses of movement patterns of challenging/disruptive sleep and wake behaviours and a collaborative consensus for how video technology should be implemented and reviewed in the clinical setting.

Independent of the four symposium speakers, there will be a group of experts, who will review and support establishing what is state-of-the-art in reviewing clinical phenotyping video clips. Drs. Suresh Kotagal (University of Minnesota Rochester and Mayo School of Health Sciences, Judy Owens (Harvard University, USA), and Arthur Walters (Vanderbilt University, USA), Karen Spruyt (Vrije Universiteit Brussel) have kindly agreed on participating as experts.

**Target group:** Physicians (developmental paediatricians, neurologists, child-psychiatrists), psychologists, occupational/physio-/behavioural-therapists, pharmacists & pharmacologists.



# **Abstract of Oral Presentation**

# INFLUENCE OF AGE ON UPPER AIRWAY IN NON-SNORING MALE

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**Background:** The aim of the study was to clarify the characteristics of upper airway in children and the effects of age on upper airway.

**Methods:** The study was a part of a long span observation research on non-snoring males. 28 volunteers (range 8~12 yrs) were selected as children group to compare with other three groups of adults: 30 in youth group (22~29 yrs), 53 in middle-aged group (36~57 yrs), and 31 in senior group (70~78 yrs). All children were proved to be non-snorers by polysommongraphy (PSG). MRI scans were performed on all subjects under custom-made instrument during wakefulness.

**Analysis:** Statistical analysis was done by Stata 11.0. Data were expressed as the mean and standard deviation (SD). The shapiro-wilk w test was applied in normality test. Two sample t test was used to compare the children group and other 3 groups. The significant level was adjusted with Bonferroni method ( $P=0.017$ ) .

**Result and Conclusion:** As well as the total volume ( $P=0.000$ ), airway volume of each region in children group was significantly smaller than that in adults, like many other physical parameters. In the children group, the smallest cross-sectional area sometimes located in nasopharynx (7.14%). The upper airway of children might be affected by pharyngeal lymphatic ring. However, the nasopharynx maintained constantly increasing with age. The lager nasopharynx was not only an age-related change, but also a probable anatomical advancement in non-snoring subjects.

# **Increased aortic blood flow velocity and inflammation in children with sleep disordered breathing**

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## **Abstract**

**Background:** In children, sleep disordered breathing (SDB) results in a generalised inflammatory response and also adversely affects endothelial function of small and medium sized vessels. It remains to be established whether major blood vessels are similarly affected.

**Methods:** Seven controls and twelve children with mild SDB (aged 5-14y) underwent overnight polysomnography, cardiac magnetic resonance imaging (cMRI) and intracellular cytokine analysis of T-cells by flow cytometry.

**Results:** Children with mild SDB exhibited increased ascending aortic peak systolic blood flow velocity compared to controls (SDB: 112.0m/s vs Control: 101.5 m/s,  $p < 0.05$ ). No group differences were observed for left and right ventricular EF and mean aortic blood flow velocity from either the ascending aorta or pulmonary artery. Children with SDB also had increased inflammatory marker expression as demonstrated by elevated T-cell interferon gamma (IFN $\gamma$ ) (SDB: 42 $\pm$ 18% vs Control: 23 $\pm$ 10% positive cells,  $p < 0.05$ ) and tumor necrosis factor alpha (TNF $\alpha$ ) (SDB: 32 $\pm$ 12% vs Control: 20 $\pm$ 8% positive cells,  $p < 0.05$ ) expression from CD8 $^{+}$  cells. A positive correlation was observed between ascending aortic peak blood flow velocity and both CD8 $^{+}$  cell derived TNF $\alpha$  and IFN $\gamma$  (TNF $\alpha$ ,  $r = 0.54$ ,  $p < 0.03$ ; IFN $\gamma$ ,  $r = 0.63$ ,  $p < 0.01$ , respectively). Oxygen saturation nadir was significantly lower in children with SDB (Control: 94.4 $\pm$ 1.6% vs SDB: 92.3 $\pm$ 2.7%,  $p < 0.05$ ) and was inversely correlated with ascending aorta peak systolic blood flow velocity ( $r = -0.48$ ,  $N = 19$ ,  $p < 0.05$ ) but no other PSG parameter.

**Conclusion:** Children with mild SDB demonstrated increased ascending aortic peak systolic velocity, which was correlated with up-regulation of CD8 $^{+}$  TNF $\alpha$  and IFN $\gamma$ . These results suggest that the effects of mild SDB on vascular function maybe greater than hitherto realized.

# **Changes in the airway size after orthodontic treatment with premolar extraction in adolescents and adults: a retrospective pilot study**

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**Background:** To test the null hypothesis that there was no significant difference in the upper airway changes after orthodontic treatment with four-premolar extraction compared with matched non-extracted controls in both adolescent and adult patients.

**Methods:** The retrospective study enrolled a total of 236 patients who met the eligibility criteria from a pool of 1387 consecutive orthodontic cases. 118 patients (28 male and 90 female) treated with extraction of four premolars were allocated in the extracted group, and the other 118 non-extracted controls, who were strictly matched for age, gender, body mass index, and skeletal pattern, were allocated into the non-extracted group. Each group included 81 adolescents (22 male, 59 female; range, 10-17 years; mean age, 13.5 years) and 37 adults (6 male, 31 female; range, 18-28 years; mean age, 20.5 years). The craniofacial structures, sagittal dimension of the upper airway, and position of hyoid bone were assessed on pre and post lateral cephalograms using Dolphin Imaging 11.0.

**Analysis:** Paired sample t test was used in evaluation of intra-group changes, and independent t test in comparisons between groups. Pearson correlated analysis was used to evaluate the associations between the upper airway changes and the changes in craniofacial structures, and hyoid position in adolescent and adult patients. Significant level was set at 0.05.

**Results:** The changes in the sagittal dimension of the upper airway in adolescent extracted group were similar with non-extracted controls. The increased width of the upper airway in the middle part in extracted adults was significantly smaller than that in matched non-extracted controls ( $P <0.05$ ). The hyoid bone tended to move anteriorly and inferiorly after extracted treatment in both adolescents and adults. No significant correlation was found between the airway changes and the changes of craniofacial and hyoid parameters.

**Conclusion:** The null hypothesis was not rejected.

## **Inflammation and metabolic changes associated with obstructive sleep apnoea in Asian children.**

Background: Changes in inflammatory cytokines and adipokines are described in obese children with obstructive sleep apnoea (OSA) but limited information is available in Asian children. We hypothesised OSA is associated with alterations in T lymphocyte and adipokines and aimed to define these changes according to OSA severity.

Method and Analysis: 64 children (37 obese) were recruited; 86% were boys with an average age of 11.9 years. Overnight polysomnography (PSG) was performed and patients were divided into three groups based on their PSG: control (apnea-hypopnea indices [AHI] < 1/h total sleep time [TST]), mild OSA ( $1 \leq AHI < 5/h$  TST), moderate-severe OSA ( $AHI \geq 5/h$  TST). Plasma samples of all of these children were assessed for inflammatory cytokines and adipokines using a bead-based multiplex immunoassay technique. Variance of the groups was statistically compared using one-way ANOVA, and significances ( $p < 0.05$ ) were reported according to post-hoc and *a priori* analysis.

Results: Children with moderate-severe OSA were older [mean: 13.14 years] and differed across the groups. Obesity was more prevalent in children with moderate-severe OSA [21.8%]. *a priori* analysis showed that both Ghrelin with  $F(1,60)=3.895$ ,  $p=0.05$  and Resistin with  $F(1,60)=3.850$ ,  $p=0.05$  was significantly regulated in these children. Interestingly, there were also significant differences in the T helper 2 (Th2) related lymphocytes in this group as IL-9 showed  $F(1,60)=8.242$ ,  $P=0.006$  and IL-

$F(1,60)=5.826$ ,  $P=0.019$ . There was a strong, positive correlation between these two variables,  $r = 0.549$ ,  $n = 64$ ,  $p < .0005$ .

Conclusion: Adipokines could be considered as independent markers for the severity of OSA disease. This study also showed that severe OSA in paediatrics was associated towards Th2 predominance (IL-9 and IL-13). These associations suggest a priori involvement of complex sets of metabolic and inflammatory pathways in our Asian children with OSA.

## Additional Information

Association between AHI and Th2, resistin and ghrelin ( $p=$ ,  $r=$ ) emerged. Can you do a pearson coefficient correlation? There is a negative (sig.) association between resistin and ghrelin using spearman's correlation as;

**Correlations**

			Hu_Ghrelin_	Hu_Resistin
Spearman's rho	Hu_Ghrelin_	Correlation Coefficient	1.000	-.256*
		Sig. (2-tailed)	.	.041
	N		64	64
			Hu_Resistin	1.000
			-.256*	
			.041	.
			N	64

\*. Correlation is significant at the 0.05 level (2-tailed).

Pearson correlation was not significant as.

**Correlations**

		Hu_Ghrelin_	Hu_Resistin
Hu_Ghrelin_	Pearson Correlation	1	-.147
	Sig. (2-tailed)		.247
	N	64	64
		Hu_Resistin	1
		-.147	
		.247	
		N	64

These tables obtained from [file: Revised OOR For OSA abstract.xlsx; Sheet: One way ANOVA (OSA subgroups)] as you have it before in your email.

		N	Mean	
Hu_Ghrelin_	Normal	27	1482.5206	
	OSA_Neg	11	1095.9383	

	OSA_Mild	12	864.6528
	OSA_ModSev	14	846.2820
	Total	64	1161.0494

	Hu_Resistin	Normal	27	7470.7414
		OSA_Neg	11	14111.7267
		OSA_Mild	12	14097.0618
		OSA_ModSev	14	8396.9876
		Total	64	10057.2122

	Hu_IL_9	Normal	27	11.5410
		OSA_Neg	11	14.3220
		OSA_Mild	12	10.5466
		OSA_ModSev	14	25.5393
		Total	64	14.8946

	Hu_IL_13	Normal	27	2.8588
		OSA_Neg	11	17.5632
		OSA_Mild	12	7.2041
		OSA_ModSev	14	25.8954
		Total	64	11.2401

## Midface retrusion and bone anchored maxillary protraction

Stacey Quo, Kasey Li, Christian Guilleminault

Midface retrusion creates a size deficiency problem in the upper airway that has been improved in children using surgical midface advancement and orthopedic protraction of the maxilla. The results of these treatments have been mostly promising at enlarging the pharyngeal airway. Recently introduced bone anchored maxillary protraction (BAMP) uses implant inserted devices to the jaws to bring the maxilla forward against a backward pressure to the lower jaw.

**Objective:** This retrospective study examines the use of BAMP as a strategy to treat maxillary retrusion, including children with obstructive sleep apnea.

**Materials and Methods:**

17 children, ages 11-17, with maxillary hypoplasia with a resulting malocclusion had bimaxillary traction against four bone anchors placed in the maxilla and mandible. 100-200 grams of elastic traction was applied full time, over an average duration of 12 months. Pre and progress treatment cephalometric films were taken to measure skeletal changes. Of the 17 children, 5 children had polysomnography at the onset and progress of treatment.

**Results:**

Preliminary results show improvement in respiratory and cephalometric parameters, with the outcomes dependent on the length of treatment. The maxilla was advanced in a forward direction. The mandibular growth direction was variable. Positive outcomes were not seen in all patients, with the results dependent on compliance wearing the elastic traction.

The PSG studies similarly show variable results. The small sample size precludes any conclusive findings, but offers another possible treatment option for pediatric SDB that should be further investigated.

**Conclusion:** The application of Bollard implants may be an approach for children older than 10 years of age with important maxillary restriction. But these results must be balanced against the long term effect of BAMP, as there is growth restraint against the lower jaw and this may impact the size of the hypopharyngeal airway space. This suggests that BAMP offers potential improvement for those patients with maxillary retrusion.

## **Development of cell culture model of intermittent hypoxia**

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**Background:** To establish and validate a novel model of cultured cells for imitating intermittent hypoxia.

**Methods:** In a chamber with experiment cabin and simulated air control cabin, we decided the frequency and duration of the intermittent hypoxia model according to the time of hypoxia and reoxygenation. The subcultured A549 cells were randomly divided into 7 groups, respectively named as control group (C); 6 h intermittent hypoxia group (6IH); 9 h intermittent hypoxia group (9IH); 6 h simulated air control group (6AC); 9 h simulated air control group (9AC); 4 h sustained hypoxia group (4SH); 6 h sustained hypoxia group (6SH). When the model establishment finished, the cellular morphology was observed under inverted microscope. The mRNA expression of HIF-1 $\alpha$  was detected by real-time fluorescence quantitative PCR. The protein expression of HIF-1 $\alpha$  was determined by immunohistochemistry.

**Analysis:** The intermittent hypoxia cycle was 5% O<sub>2</sub> 60 min/20% O<sub>2</sub> 30 min for 6 cycles. The damaged A549 cells were observed in 6IH group, 9IH group and 6SH group among which the 9IH group was the most serious one. Compared with 6IH group, the expression of HIF-1 $\alpha$  at mRNA and protein levels was significantly increased in 9IH group ( $P<0.05$ ). The expression of HIF-1 $\alpha$  at mRNA and protein levels in 6IH group and 9IH group was higher than that in 4SH group and 6SH group respectively ( $P<0.05$ ). No significant difference among the control group, 6AC group and 9AC group was found ( $P>0.05$ ).

**Result and Conclusion:** The model of 5% O<sub>2</sub> 60 min/20% O<sub>2</sub> 30 min for 6 cycles can simulate the pathological mechanism of OSAHS. This model is suitable for studying intermittent hypoxia in adherent cells.

**[KEY WORDS]** Intermittent hypoxia; Model; Human lung adenocarcinoma cell;

## Hypoxia-inducible factor-1

## **IPSA 2016 ABSTRACT**

### **DO URINARY BIOMARKERS DISTINGUISH PRIMARY SNORING FROM OBSTRUCTIVE SLEEP APNEA (OSA) IN CHILDREN?**

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**Background:** There is growing interest in the use of biomarkers in the diagnosis of OSA. Our aim was to determine if urinary biomarkers reliably distinguish Primary Snoring (PS) from OSA in children.

**Methods:** We recruited children >2 years with snoring and suspected OSA. Children with syndromes, neuromuscular, renal or genetic diseases, were excluded. Demographic and clinical details were collected. Subjects underwent an overnight polysomnogram (PSG). First morning urine sample was centrifuged and stored at -80°C after adding a protease inhibitor cocktail.

**Analysis:** PSGs were scored as per the AASM 2012 scoring rules. OSA was defined as Obstructive Apnoea Hypopnoea Index (OAHI) >1 (<12 years) or >5 (>12 years). Quantitative analyses of the urinary biomarkers (Uromodulin, Orosomucoid, and Kallikrein) were done, blinded to the subject phenotype and PSG report, using commercially available ELISA kits.

**Results and Conclusion:** 146 children (mean [SD] age = 9.0 [3.7] years, 70% males) were studied. 11 (7.6%) had PS and 135 (92.4%) had OSA. The mean ( $\pm$  SE) Uromodulin in ng/ml/mg creatinine was 5551 (1060) in PS compared to 8696 (724.7) in OSA ( $p=0.13$ ). The mean ( $\pm$  SE) Orosomucoid-1 in ng/ml/mg creatinine was 705.7 (222.6) in PS compared to 615.3 (65.8) in OSA ( $p=0.77$ ). The mean ( $\pm$  SE) Kallikrein-1 in pg/ml/mg creatinine was 47256 (6720) in PS compared to 75587 (5403) in OSA ( $p=0.15$ ). There was no significant difference in the biomarker concentration between PS and OSA, irrespective of OSA severity. Early morning urinary Uromodulin, Orosomucoid, and Kallikrein do not distinguish PS from OSA in children.

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# EFFECTS OF LOW INTENSITY RADIOFREQUENCY ELECTROMAGNETIC FIELDS ON SLEEP

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**Background:** The exposure to radiofrequency electromagnetic fields(RF-EMF)could have negative impacts on several physiological processes involved in the regulation of circadian system involving melatonin and cortisol(Lewczuk Bat al., 2014).The present preliminary study assessed the changes in sleep and circadian distribution when the animals are free to choose between a RF-EMF exposed and shielded environment.

**Methods:** Three weeks-old male Wistar rats (n=3) were chronically exposed to low RF-EMF (900 MHz, 1V/m). During the 5th week of exposure, the RF-EMF preference was assessed in four consecutive days with an experimental chamber made of 2 interconnected compartments at 24°C ambient temperature and 12h-12h light-dark cycle. Each day, alternatively, one compartment was exposed to RF-EMF and the other one was covered with a Faraday shield. Sleep was recorded by a telemetric system.

**Analysis:** Wakefulness (W), NREM Sleep (NREMS) and REM Sleep (REMS) were scored every 4 seconds. Statistical analysis was assessed with non-parametric Wilcoxon test evaluating behavioral states differences between the compartments.

**Result and Conclusion:** Data showed a significant increase of NREMS and REMS time spent in the exposed compartment respect to the shielded one ( $172.88 \pm 12.35$  min,  $45.56 \pm 3.54$  min and  $56.93 \pm 10.14$  min,  $15.38 \pm 4.3$  min respectively,  $p < 0.05$ ), no changes were observed in W amount. No statistically significant changes in W, NREMS and REMS amount were observed during 12-h light period.

RF-EMF exposition probably induced sleep quality modifications during the day leading to an increase of sleep during the night, rat's active period, meaning that it could disrupt the regulation of circadian sleep distribution.

# **Increased resting brachial artery blood flow velocity associated with increased sympathetic nerve fiber density on the dorsal lingual artery (tonsil) in children with sleep disordered breathing**

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## **ABSTRACT**

**Introduction:** Children with sleep disordered breathing (SDB) present with increased blood flow velocity in the brachial artery compared to controls. Whether blood flow velocity changes are associated with augmented autonomic functional response and autonomic structural vascular changes was examined.

**Methods:** Fifteen children, scheduled for adenotonsillectomy to treat SDB, aged 6.3 – 17.3y, underwent, pupillometry, polysomnography and flow-mediated dilation (FMD). The participants' dorsal lingual artery was stained using immunofluorescence techniques for tyrosine hydroxylase (sympathetic nerve fiber marker, SNFD). A custom-made algorithm calculated FMD at 60s, maximal dilation and time to reach FMD maximal dilation (FMD<sub>time to max</sub>). The SNFD was determined using a region of interest pixel ratio algorithm (custom-made), from confocal images.

**Results:** Resting blood flow velocity time integral (VTi) and peak systolic velocity (PSV) were positively correlated to FMD<sub>time to max</sub> ( $r = 0.70, p < 0.01$ ;  $r = 0.72 p < 0.01$  respectively) and also SNFD ( $r = 0.63, p < 0.05$ ;  $r = 0.63, p < 0.05$ ). An inverse relationship was demonstrated between peak pupillary constriction velocity and both VTi and PSV ( $r = -0.77, p < 0.005$ ;  $r = -0.64, p < 0.05$ ). Post pupillary constriction recovery and VTi, PSV and FMD time to maximal dilation were also inversely associated ( $r = -0.79, p < 0.005$ ;  $r = -0.78 p < 0.005$ ,  $r = -0.66, p < 0.05$ ). SNFD was negatively associated with percentage change from baseline pupillary diameter ( $r = -0.69, p < 0.05$ ) mean and peak pupillary constriction velocity ( $r = -0.65, p < 0.05$ ;  $r = -0.62, p < 0.05$ ).

**Conclusion:** In children, SDB alters autonomic and vascular function. Blood flow velocity variables using standard ultrasound techniques and pre-sleep pupillometry maybe a useful tools to measure increased sympathetic activity and vascular changes in children with SDB.

# **SLEEP DISORDERS IN INPATIENTS OF PEDIATRIC PULMONARY DEPARTMENTS**

## **Background:**

The purpose of this study is to assess sleep disorders in children with pulmonary disease and the correlation with severity of disease.

## **Methods:**

We conducted the prospective study. Total 1178 children were enrolled in this study. Parents of patients who admitted in pulmonary department were invited to complete Michigan Questionnaires, Epworth Scare Score, and sleep screening questionnaire(BEARS) . And we conducted medial records such as BMI, medical diagnosis and hospitalization duration which indicated the severity of disease, and overnight polysomnography (PSG) were performed in patient whose PSQ score >0.33 or ESS>11.

## **Analysis:**

The correlation between hospitalization duration and SDB parameters was calculated by linear regression analysis. T-test was used to calculate the difference in BMI in children with OSA.

## **Results:**

The prevalence of SD was 83% in our research. 165(14.0%) have difficulty in falling sleep, 93(7.9%) have excessive day time sleepiness, 285(24.1%) have nocturnal awaking, 291(24.7%) have irritable sleep schedules, 349(29.6%) have Primary snoring. Total 25 patients (25%) had a PSQ score >0.33, predictive of SDB. 16 of 25 patients were diagnosed with OSA ( $OI \geq 1/\text{hr}$ ), 3 of 25 patients were diagnosed with central sleep apnea (central index  $> 5/\text{hr}$ ), 1 of 25 patients were diagnosed with hypoventilation. The linear regression analysis revealed no significant correlation between disease severity and AHI or obstructive index ( $p = \text{NS}$ ). There was a significant higher BMI in children with OSA (  $P < 0.05$ )

## **Conclusion:**

Sleep disorders was common in children inpatients with pulmonary disease .Primary Snoring and nocturnal awaking were the most common complaints. Patients whose PSQ score >0.33, most met criteria for OSA. There is no significant relationship between disease severity and OSA. BMI seems to play a role in the occurrence of OSA in this population.

## **Alterations of circadian rest-activity rhythms in pediatric patients with narcolepsy during treatment**

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**Background:** In addition to the sleep parameters derived from actigraphy, the rest-activity rhythm can provide additional trait about the life behaviors and the fragmentation of rest-activity patterns or circadian rhythmicity may potentially serve as useful markers to assess daytime excessive sleep or disrupted nocturnal sleep induced by different sleep disorders. Narcolepsy is associated with daytime hypersomnolence which can be alleviated after treatment. We hypothesized that the parameters derived from circadian rest-activity patterns of actigraphy can be potential markers to evaluate the response of treatment.

**Methods:** The pediatric patients, newly diagnosed with narcolepsy, were recruited in this study and were treated with sodium oxybate. The patients underwent at least 6 days of actigraphic monitoring during baseline and after administrating sodium oxybate. Two nonparametric parameters, Interdaily stability (IS) and intradaily variability (IV), were calculated to estimate the degree of fragmentation of the rest-activity rhythm and the stability of day-light cycle. We also examine the sleep parameters derived from actigraph such as estimated total sleep time (eTST), estimated sleep efficiency (eSE), and estimated wake after sleep onset (eWake).

**Result and Conclusion:** The actigraphy data from thirty patients with narcolepsy (10 males and 20 females) before and after treatment was collected. There is no significant difference between eTST, eSE, and eWake before and after treatment. Significantly increase of IS was found before and after treatment ( $0.225 \pm 0.15$  vs  $0.231 \pm 0.08$ ;  $p < 0.05$ ). The stable circadian profile, estimated by IS of daily activities, can be an objective marker related to the effectiveness of treatment. Since the actigraphy can provide an easy way to access the circadian rhythmicity for long time ( $>1$  week), it can be beneficiary to incorporate the parameters related to daily behavioral rhythm to track the disease course.

# **Repetitive Negative Thinking Linking Adolescent Sleep Difficulties and Depressed Mood: The Moderating Role of Perfectionism**

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**Background:** Sleep problems have been associated with the development of depression in adolescents; however, little explanation of this relationship is provided. Repetitive negative thinking (RNT) has been suggested as a possible mechanism. The Sleep–RNT–Depression mediation may also be influenced by the associated factor of perfectionism. Knowledge on the role of RNT and perfectionism may advance our understandings on the high co-occurrence of sleep problems and depressive symptoms in adolescents. Based on a theoretical model, this study examined whether RNT mediates the relationship between difficulty initiating sleep (DIS) and depressed mood, as well as whether the associated factor of perfectionism plays a role in influencing this mediation.

**Methods:** 202 adolescents (age range = 14 – 20 years) from South Australia completed online questionnaires, with measures assessing levels of DIS, RNT, perfectionism and depressed mood.

**Analysis:** Moderated mediation analysis with bootstrap method was conducted. A mediation model was firstly tested, followed by integrating the moderator into the mediation model. The moderating role of perfectionism was tested in the path between DIS and RNT, as well as the path between RNT and depressed mood.

**Results and Conclusion:** RNT was found to fully mediate the relationship between DIS and depressed mood. This mediating relationship was moderated by perfectionism, specifically through the path between RNT and depressed mood. Adolescents with higher levels of perfectionism reported greater depressed mood in the context of higher levels of RNT and DIS. These findings provide a theoretical framework by which RNT, as a transdiagnostic factor, may link DIS and depressed mood. Further, perfectionism influences the sleep-depression relationship through RNT. Relevant treatment programs could target maladaptive RNT and perfectionism to ameliorate the development of depressive symptoms in adolescents that result from sleep disturbance.

# **RELATIONSHIPS BETWEEN SLEEP, BEHAVIOUR AND DIET IN CHILDREN WITH AND WITHOUT AUTISM SPECTRUM DISORDER**

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**Background:** Behavioural and sleep problems and gastrointestinal symptoms are common in autism, and many families believe this is associated with diet. The aim of this study was to examine relationships between these variables in children with autism and an age-matched control group.

**Methods:** Parents of completed an anonymous, online survey including demographics, and questionnaires about their child's diet (GDQ), autism symptoms (SCQ), adaptive behaviour (SIB-R), behaviour problems (RBRI), diet-related symptoms (DSQ), and sleep (SDSC). Of 145 consenting families, 120 (82.8%) children aged 4-11 years ( $M=7.8$  years,  $SD=2.2$ ), 73 (60.8%) in the autism group, were included in the data analyses.

**Analysis:** Non-parametric analyses were used.

**Result and Conclusion:** Groups did not differ on age ( $p=.234$ ) or BMI ( $p=.266$ ). Compared to the control group, the autism group was more likely to be medicated, have specific foods removed from their diet and take dietary supplements, but equally likely to experience food-related behavioural symptoms, have been on a special diet, have shown diet-related behaviour change, currently be on a special diet, or have consulted a health professional about diet. The autism group had poorer sleep ( $p=.005$ ), poorer adaptive behaviour ( $p<.001$ ), more behaviour problems ( $p<.001$ ), more DSQ-total diet-behaviour symptoms ( $p<.001$ ), and more DSQ-gut symptoms ( $p=.004$ ) than the controls. In the autism group sleep (SDSC total score) was related to autism symptoms ( $p=.048$ ), medication ( $p=.045$ ), behaviour problems ( $p=.005$ ), DSQ-total diet-behaviour symptoms ( $p<.001$ ), and DSQ-gut symptoms ( $p=.001$ ). Similarly, in the control group poor sleep was also related to medication ( $p=.031$ ), behaviour problems ( $p=.035$ ), DSQ-total diet-behaviour symptoms ( $p=.003$ ), and DSQ-gut symptoms ( $p=.002$ ). Thus while sleep and behaviour problems and diet-related issues are more severe in children with autism, poor sleep is similarly related to problem behaviour and diet-related symptomatology in both groups. Implications will be discussed.

# THE EFFECTS OF MATERNAL SLEEP POSITION AND SLEEP DISORDERED BREATHING ON FETAL HEART RATE

*Associate Professor Jillian Dorrian<sup>1</sup>, Jacinta Carpentieri<sup>1</sup> Dr Jane Warland<sup>1</sup>*

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**Background:** Maternal sleep position may be associated with increased risk of fetal growth restriction and stillbirth. It has been suggested that inferior vena cava compression by the gravid uterus can reduce blood flow, and ultimately oxygen, to the fetus, particularly when the mother is supine. Studies have also shown relationships between maternal sleep disordered breathing (SDB), sleep loss and poor fetal outcomes. The current study aimed to investigate the relationship between maternal sleep position, sleep, SDB and fetal heart rate.

**Methods:** Seventeen women in late pregnancy (34th-37th week) undertook a home study with recording during their sleep periods over three nights. To measure sleep patterns (via actigraphy) and indicators of SDB symptoms, they wore a Watch-PAT 200. To measure fetal heart rate they wore a Monica A24 Fetal heart monitor. Snoring and sleep position were visually scored from infra-red video camera recordings. Consistent with current healthcare messages, participants were instructed to sleep on their left side as much as possible.

**Analysis:** Mixed effects regression with subject ID on the intercept to account for repeated observations.

**Result and Conclusion:** On average, participants slept 6.6h ( $\pm 1.3\text{h}$ ) per night with an average wake after sleep onset of 1.2h ( $\pm 0.9\text{h}$ ), and spent an average of 17.4% ( $\pm 13.6\%$ ) of their time in bed supine, and 60.0% ( $\pm 14.7\%$ ) on their left. More than half of the participants (n=10) were identified as snorers, and four met the criterion for mild SDB (apnea/hypopnea index > 5). Analyses are ongoing, and will test whether changes in maternal sleep position, breathing and snoring across the night are associated with changes in fetal heart rate.

## SLEEP CHARACTERISTICS AT ONE YEAR OLD IN THE ELFE STUDY

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**Background.** Sleep evolves rapidly during the first year of life. Night waking and difficulty to fall asleep are the main factors by which parents judge the quality of their child's sleep. We aimed at describing sleep at 1 year of age among a representative sample of children born in France in 2011 (ELFE study, n=18,014).

**Methods.** We included children with sleep data at 1 year old (N=12,558, 87% of responders at this age). Information on mothers and children were collected through self-questionnaires and phoned interviews.

**Analysis.** We performed descriptive and adjusted multivariable regression analyses.

**Results.** Mean total sleep duration was 13h40±1h30 with a wide range (9 to 17h15) reflecting both large variations in night and day sleep durations. Fifteen percent of the children frequently experienced difficulties to fall asleep and 20% frequent night awakenings ( $\geq 3$  times/week). Common associated factors were parental presence when falling asleep, need of bottle-feeding to fall asleep and fall sleep elsewhere than in his/her own bed. Moreover, frequent difficulties to fall asleep were independently associated with symptoms of maternal depression; frequent night awakenings with breastfeeding duration, sleeping in the parents' room, and use of pacifier. Sleep duration was associated with maternal age, education and parity, and with principal childcare arrangement.

**Conclusions.** One-year old French children sleep in means longer than their British and American counterparts. However, 15 to 20% of them showed troubles to initiate or maintain sleep. Associated risk factors are mostly behavioral and accessible to prevention.

Max 250 words (ici=242)

# Breastfeeding and Infant sleep:A Birth Cohort Study

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**Background:** Findings from previous studies into theeffect of feeding methods on infant sleep were inconsistent. The aim of our study was to examine infants' sleeppatterns by feeding methods using longitudinal study design.

**Methods:**A total of 261 healthy pregnant women and their infants were enrolled during August 2012 to August 2013 in Shanghai. The sleep and feeding information of the infants were assessed by the Brief Infant Sleep Questionnaire (BISQ) and the Infant Feeding Questionnaire (IFQ) at 6 weeks and 3, 6, 9 months.  
Besides,actigraphywas also used to objectively measure infant sleep at 6 months .

**Analysis:**The analysis ofvariance (ANOVA) was conducted to assess sleep variables among different feeding groups. Toevaluate longitudinal associations of feeding method on infant sleep over time, we usedthe multiple linear regressionmodel.

**Result and Conclusion:**Boys accounted for 51.3 % of the sample. At 6 weeks, 3 months, and 6 months, the proportion of breast fed infants accounted for 42.9%, 52.8%, and 37.6%, respectively. Using linear regression adjusted for confounders, comparing with breast fed infants,mixed fed infants at 6 months had objective recorded later bedtime( $\beta=0.22, p=0.015$ ) and shorter sleep duration ( $\beta=-0.24, p=0.010$ ) at 6 months. In addition, the breast fed infants at 3 months had shorter objective night sleep time at 6 months than the mixed fed( $\beta=-0.19, p=0.035$  )and artificial fed ( $\beta=-0.22, p=0.011$ ) infants.

Breast feeding may protect infants' night sleep time to some extent. We should monitor infant feeding behaviors and promote more breast feeding, which would be beneficial for the development of infant sleep and their later eating habits.

# Six-Month-Old Infant Long Sleepers Prefer a Human Face

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**Background:** Sleep influences socio-emotional regulation among children and pre-schoolers, while little is known about the role of sleep on social preference during infancy.

**Methods:** This study assessed 49 six-month-old infants' sleep and orientation towards social stimuli (e.g., human and animal face), and tested the hypothesis that infants with sufficient sleep and/or advanced sleep development (e.g., less frequent night awakenings) would develop a more stable preference toward socially rich images. Habitual sleep were assessed by a questionnaire and social preference was revealed by preferential gaze in three conditions: 1) human face paired with an object (i.e., a cup), 2) human face paired with an animal face (i.e., dog), and 3) dog face paired with a cup. Infants' gaze patterns were measured with a Tobii TX300 near infrared eye tracker.

**Analysis:** Total gaze duration and social preference score (the percentage of total fixation duration on human face) were compared among three conditions. Moreover, a 2 (long sleep vs. short sleep) x 3 (conditions) mixed ANOVA was conducted to examine the impact of sleep on infants' social preference scores.

**Result and Conclusion:** Images with richer social information (i.e., human face and dog) attracted infants' gaze significantly more than non-social images (i.e., cup). Infants with shorter sleep duration (i.e., less than 13 hours a day) show a significant reduction in their preference towards a human face when paired with a dog than longer duration infants. Our findings suggest an early link between sleep and social preference developed during pre-verbal infancy.

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(11SG19), Shanghai Key Discipline of Public Health.

# **Prevalence of Sleep Disordered Breathing in Syndromic Children**

## **– Pilot Study**

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**Background:** Snoring is the shared feature of the three clinical syndromes of sleep-related upper airway obstruction in children. Knowing the prevalence and risk factors for childhood OSAS is key to assessing the magnitude of the public health impact and identifying children at highest risk for developing OSAS and benefiting from early and effective intervention. OSAS is also associated with a number of craniofacial syndromes, in which it has a much higher incidence. Aim of our study is to identify the prevalence of Sleep Disordered Breathing in Syndromic children (Down syndrome (DS) and Mucopolysaccharidoses (MPS)). Epworth Sleepiness Scale-Children (ESS-C) and SHER Clinical score were correlated with Apnoea Hypopnea Index (AHI).

**Methods:** MPS and DS syndromic children, age between 6 and 12 years were included in the study and they were screened (Phase - 1) using SHER Clinical Score, ESS-C questionnaire. Children with ESS-C > 10 and SHER Clinical Score > 1 were considered as positive. All children underwent Polysomnogram (PSG) (Phase - 2).

**Analysis:** SHER Clinical Score and ESS-C questionnaires along with PSG were done for 125 Syndromic children. The Sensitivity and specificity for both the questionnaires were analyzed and also correlated with AHI Value using Pearson-Correlation.

**Result and Conclusion:** Out of 125 syndromic Children, 73 (58.4%) were Down syndrome and 52 (41.6%) were MPS Children. Among them, 99 (79.2%) children were positive with Questionnaires. Out of 125, 96 (76.8%) were having AHI more than 1 and were diagnosed to have OSA. Among 96, 55 (57.3%) were Down syndrome and 41 (42.7%) were MPS Children. SHER Clinical Score and ESS-C were correlated with AHI for all 125 children using Pearson-Correlation and found to be statistically significant. Early recognition of the symptoms and consequences of SDB is important for practitioners involved in the care of high-risk children.

## **Clinical scores for sleep loss and pruritus in childhood eczema**

**Hon KL, Kung JSC, Wong Steve TK**

**AIM:** Sleep loss and pruritus are the cardinal symptoms of childhood eczema. This study aims to investigate correlations among clinical scores for sleep loss, pruritus, disease severity and quality of life.

**METHODS:** Nottingham Eczema Severity score (NESS,), Scoring Atopic Dermatitis (SCORAD), Children Dermatology Life Quality Index (CDLQI), use of oral anti-histamine (in days per week) were reviewed. The sleep loss and pruritus components in these scores were compared and correlations (Spearman's rho) were evaluated.

**RESULTS:**Clinical scores of 180 patients (mean age:12.7±4.5years; 58.3% male) with eczema were evaluated. Sleep loss was reported in 85%, 81% and 85% patients according to NESS, SCORAD, and CDLQI, respectively.

The extent of sleep loss measured by the three clinical scores correlated with each other (rho:0.67-0.73; p=0.01). Pruritus measured in the clinical scores also correlated with each other (rho:0.58; p=0.01) and with sleep loss (rho:0.42-0.73; p=0.01)

Sleep loss and pruritus were correlated with NESS (rho:0.51-0.76; p<0.001), SCORAD (rho: 0.42-0.54; p<0.001) and CDLQI (rho:0.48-0.65; p<0.001)

The use of anti-histamine was common among these patients with eczema (59%), 21% of patients reported taking antihistamines every day. Antihistamine usage (in days per week) was weakly correlated with all clinical parameters of sleep loss (rho:0.32-0.37; p<0.01), pruritus (rho:0.32-0.37; p<0.01), disease severity (rho:0.32-0.37; p<0.01) and CDLQI (rho:0.22; p<0.01).

**CONCLUSION:**Sleep loss is common among patients with eczema, and correlated with pruritus, disease severity, quality of life and antihistamine usage. The use of anti-histamine did not appear to be associated with less sleep disturbance or pruritus, or better quality of life. Alternative management strategy is necessary for these symptoms.

# **The impact of body mass on long-term cognitive performance of children treated for Sleep Disordered Breathing**

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**Background:** Children with sleep disordered breathing (SDB) have been shown to have reduced neurocognitive function and are routinely treated by adenotonsillectomy. This study aimed to determine the efficacy of that process on recovery of cognitive function four years post-treatment, and whether other factors such as body mass status influence such outcomes.

**Methods:** Prospective longitudinal study examining changes in sleep, ventilation, cognitive performance and body mass from pre-operative baseline to four-year post-treatment. Children 3-12 years old were recruited from an otolaryngology clinic while awaiting adenotonsillectomy for SDB of normal weight ( $n = 18$ ) or overweight/obese ( $n = 11$ ), compared to healthy non-snoring control children of normal weight ( $n = 33$ ).

**Analysis:** Cognitive performance, sleep, ventilation and body mass were measured. Mixed Models Analysis were used to compare effects of time from treatment, BMI, weight change from baseline and disease severity.

**Result and Conclusion:** There was an improvement in SDB children for neurocognitive performance across the 4-year follow-up compared to controls. However, despite no elevation in SDB severity post-adenotonsillectomy, obese and overweight SDB children showed significant decrements on a range of cognitive tasks when compared to controls and normal weight SDB children at both baseline and 4 years post-treatment. Children with SDB who are overweight/obese are at greater risk

of cognitive decrements both before and after treatment. Analysis of arousal response indicate that children with mild SDB do not benefit from adenotonsillectomy. Results suggest that more emphasis should be placed on weight control and other non-surgical interventions in the management of obese children with SDB.

# ATOPY AND THE IMPACT ON SLEEP AND PSYCHOLOGICAL WELL-BEING; SURVEY OF AUSTRALIAN SCHOOL CHILDREN

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**Background:** Atopic Disorders which include eczema, asthma and rhinitis, are prevalent among Australian children. In addition to their medical difficulties, children with atopy are more likely to report lower psychological well-being and although not as well documented poorer sleep. Given the association reported between poor sleep and psychological well-being in other medical disorders, this raises the possibility that the poor sleep of children with atopy may mediate the relationship between atopy and problematic behaviour.

**Methods:** According to the question; ‘In the last 12 months has your child had an episode of eczema/asthma/rhinitis (yes/no)?’, we identified from a sample of 1845 South Australia school children (mean (SD) age = 7.6 (1.7)y): 65 asthma, 135 eczema, 190 rhinitis, 620 with two or more atopies and 835 controls. Children’s parents completed the Strengths and Difficulties questionnaire (six scales: Emotional Symptoms, Conduct Problems, Hyperactivity, Peer-problems, Pro-social Behaviour and Total Difficulties) and the South Australian Paediatric Sleep Survey Questionnaire (six scales: Sleep Routine, Bedtime Anxiety, Morning Tiredness, Night Arousal, Sleep Disordered Breathing and Restless Sleep)

**Analysis:** Multiple Analysis of variance tests and structural equation modelling (SEQ).

**Result and Conclusion:** Compared to controls, children with rhinitis either as a single diagnosis or in combination with other atopies had significantly impaired sleep and a higher frequency of psychological problems. SEQ revealed that poor sleep mediated the relationship between rhinitis and psychological well-being. The present findings suggest that attention to the treatment of sleep in children with rhinitis is likely to improve psychological well-being and daytime functioning.

## Sleep characteristics associated with neurocognitive development at 3 years old in a French prospective birth-cohort study (AuBE)

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**Introduction.** Sleep quantity and quality were associated in school-aged children to cognitive development. Few studies were conducted among preschoolers from healthy general population and usually focused on only verbal or executive functioning. We aimed at identifying, among 3 years old children, factors associated with IQ estimated through WPPSI-III and its indicators i.e. full-scale (FSIQ), verbal (VIQ) and performance (PIQ) scores.

**Methods.** We included 194 3-years-old children from the French birth-cohort AuBE. Information was collected through self-questionnaires at birth, 6, 12, 18, and 24 months of age. We considered mother's age at birth, working category, parity, pre-pregnancy BMI, smoking during pregnancy, gender, term, birth weight, breastfeeding duration, childcare arrangement and child's TV viewing duration. Child's sleep duration, snoring ( $\geq 3/\text{week}$ ) and night awakenings were also collected at each age. A day/total sleep duration ratio (DNR) was calculated. Analyses were performed using linear regressions.

**Results.** Mean scores were 106 (range: 62-138), 92 (61-140) and 99 (61-138) for VIQ, PIQ and FSIQ, respectively. Being a  $\geq 3$  born-child, watching TV  $\geq 1$  hours/day at 24 months were negatively associated with all IQ scores while collective care arrangement was positively associated. Night awakenings at 6 months and snoring frequently at 18 months were negatively associated with PIQ and FISQ contrary to DNR at 12 months. No association was observed between early sleep characteristics and VIQ.

**Conclusions.** Early features including infant sleep characteristics influence IQ scores at 3 years old. Some of these may be accessible to prevention.

Keywords (max3): cohort study; neurocognitive development; sleep

Max 300 words (ici=297)

## ***Optimal Sleep Duration is Crucial to Body Length/Height for Infants and Toddlers***

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**Background:** Early life is a critical period to enhance the optimal child growth and development, and sleep is an essential influential factor as well as indicator of well-being. However, little is known about the relationship between sleep and length/height growth. This study aims to examine the associations in infants and toddlers based on a national multicentre sample.

**Methods:** A total of 1056 (males 54.5%) full term and healthy children aged 3-36 months were recruited through stratified, cluster and random sampling from 8 provinces in China from 2011 to 2013. Anthropometric data (length/height and weight) were conducted by experienced pediatricians, and the validated Chinese version of the Brief Infant Sleep Questionnaire (BISQ) was completed by parents/caregivers. Total sleep duration (TSD) was categorized as short, optimal and long according to the age-specific recommendations in 2015 from the National Sleep Foundation.

**Analysis:** Multivariable linear regression was used to evaluate the associations between TSD categories and length/height with adjustment for age, gender, birthweight, feeding methods, parental height, parental education, sampling sites and seasons which would affect the child sleep.

**Result and Conclusion:** Mean age was 14.5 months (SD 9.5). Overall, 1.6% of children showed stunting growth, 12.7% had short TSD, and 5.3% had long TSD. Compared to those children with optimal TSD, the length/height was 1.1cm (95% CI: -1.8, -0.3; p=0.006) shorter in children with long TSD and 0.1cm (95% CI: -0.6, 0.4; p=0.733) shorter in children with short TSD, though the later did not reach statistical significance. In conclusion, although the effect size was very small, the short and long sleep duration were both negatively associated with body length/height for the infants and toddlers. And this topic warrant further examination with more objective measures in the prospective cohort studies.

The study was supported by Chinese National Natural Science Foundation (81422040, 81172685); MOE New Century Excellent Talents (NCET-13-0362); Ministry of Science and Technology (2010CB535000); Ministry of Health (201002006), Shanghai Science and Technology Commission (12411950405, 13QH1401800); Shanghai Municipal Committee of Education (11SG19), Shanghai Key Discipline of Public Health

# **Abstract of Poster Presentation**

# **Effectiveness of Suvorexant for Circadian Rhythm Sleep-Wake Disorders Among Adolescents**

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**Background:** Adolescents with circadian rhythm sleep-wake disorders (CRSD) often consult sleep specialists complaining difficulty initiating sleep, difficulty in waking up in the morning or daytime sleepiness. Treatments such as bright-light therapy or melatonin do not show good efficacy in some cases of CRSD.

**Methods:** Three cases of adolescent CRSD who received medical treatment with suvorexant were reported. Clinical characteristics, pattern on CRSD, and response to treatment were described.

**Analysis:** Change of sleep-wake pattern before and after the treatment with suvorexant was compared using sleep log

**Result and Conclusion:** **Case 1:** 13 year old junior high-school student who presented with difficulty initiating sleep was diagnosed with autistic spectrum disorder (ASD). She showed delayed sleep phase pattern. After the treatment with 20 mg of suvorexant, she was able to fall asleep 2 hours earlier. **Case 2:** 18 year old senior high-school student presented with difficulty initiating sleep and difficulty waking up in the morning. She showed delayed sleep phase pattern. After the treatment with 15 mg of suvorexant, her sleep phase advanced 2 hours. **Case 3:** 19 year old student presented with difficulty waking up in the morning since she was a junior high-school student. She was diagnosed with ASD. She showed non-24-hour sleep-wake pattern. After the treatment with 15 mg of suvorexant, she was able to fix nocturnal sleep schedule. In conclusion, suvorexant was effective in some cases with CRSD among adolescents. Although mechanism of action of suvorexant on CRSD is uncertain, suvorexant could be a useful treatment option for adolescent CRSD who are not well controlled with other treatments.

## **Shift work and sleep: the impact of night work and rotating schedule**

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**Background:** Shift work is increasing and found to be associated with health problems. Latest studies suggested that insomnia is an important component of health problems in shift workers. However, various shift schedules in different industries and nations limited the possibility to identify what characteristics in shift work are pathogenic. In this study, we examined the effect of two main characteristics of shift work, night work and rotating shift schedule, and their interactions on sleep time and insomnia.

**Methods:** We utilized secondary data from the National Occupational Health and Safety Survey in 2013 conducted by the Ministry of Labor. A total of 19,662 employees were included. Participants reported their shift schedules as fix/rotating and day/non-day one week before the survey. They also reported their sleep time during work days, and if they suffered from insomnia, including difficult falling asleep, easily wakening and early wakening. Their demographic data were collected.

**Analysis:** Descriptive analyses were performed to compare sleep time and prevalence of insomnia in workers with different work schedules. Linear regression and logistic regression were used to analyze the effect of night work and rotating schedules on sleep time and insomnia respectively, controlling for age, gender and educational level.

**Result and Conclusion:** Night work is significantly associated with shorter sleep time ( $\beta=0.37$ ,  $p<0.001$ ) and insomnia ( $OR=1.4$ ,  $p<0.01$ ); while rotating schedule is associated with longer sleep time ( $\beta=0.23$ ,  $p<0.001$ ) but not insomnia ( $OR=1.1$ ,  $p=0.6$ ), after controlling for age, sex, and educational level. The interaction of night work and rotation is significantly associated with sleep time as well ( $p<0.001$ ), and we found that rotation is more associated with increased sleep time in night workers than in day workers. The results suggested that future studies of shift workers should distinguish night work and rotating schedule because they had different impact on sleep.

# IPSA 2016 Abstract Title

## The effect of daytime nap on emotional perception in individuals with insomnia

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**Background:** Previous research found that individuals with insomnia would have altered intensity ratings of emotional expressions. While an experimental study showed that an intervening nap could recalibrate the emotional reactivity to emotional expressions in individuals with normal sleep-wake rhythm, it remained unclear whether a nap could affect the intensity ratings to emotional expressions in individuals with insomnia. The current study aimed to investigate the effect of nap on emotional perception of faces of varied intensity in insomnia individuals.

**Methods:** Thirty-six university students assessed by the Brief Insomnia Questionnaire. Seventeen insomnia participants (mean age=19.85, SD=1.55) and nineteen non-insomnia participants (mean age=20.02, SD=1.5) performed a facial recognition task, in which they rated intensity of happy, sad, fear, angry and neutral faces across intensity spectrum, before and after a 90-minute daytime nap or wakefulness.

**Analysis:** Two way Analyses of variance (ANOVA) with group (insomnia, control) and condition (nap, wake) as between-subject variables were conducted to compare the changes in intensity ratings.

**Result and Conclusion:** Results showed that across the day, individuals with insomnia had reduced intensity rating for moderately positive (happy) faces [ $F(1,30)=4.199, p=.049$ ] and heightened intensity ratings for moderately negative faces including sadness [ $F(1,30) = 4.957, p=.034$ ], fear [ $F(1,30)=8.848, p=.006$ ] and anger [ $F(1,30)=5.123, p=.031$ ], when compared to controls. In addition, our findings showed that daytime nap modulated emotional perception by reducing intensity ratings for sad [ $F(1,30) = 4.846, p=.036$ ] and angry faces [ $F(1,30)=4.693, p=.038$ ] in both individuals with or without insomnia. The study first demonstrated that socio-emotional processing of individuals with insomnia was not static across the day but became negative progressively. This study also provided the first evidence that daytime nap modulated the emotional perception among individuals with insomnia.

# **Is History of Sleep Terrors a Contraindication to Sleep Restriction Therapies for Middle Childhood Insomnia?**

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**Background:** There is a good evidence base for sleep restriction therapy for adult insomnia. Recent studies suggest sleep restriction therapies (e.g., bedtime fading) may also be effective in middle childhood. However, these techniques may be under-utilised due to lack of knowledge about possible contraindications in this population. In particular, sleep terrors are common and may be exacerbated by sleep deprivation.

**Methods:** As part of a randomized controlled trial, this study observed changes in occurrence of sleep terrors during insomnia treatment using sleep restriction therapies. 34 participants (6-13 years) were randomly allocated to one of three groups: sleep restriction (TIB reduced to 30mins less than baseline average TST), bedtime restriction (TIB reduced to match baseline average TST), or regular sleep schedule (i.e., control; TIB scheduled to match baseline average TIB). Treatment was provided in 2 sessions over 2 weeks. Children were then monitored (via 7-day sleep diaries) for a further 4 weeks.

**Analysis:** Descriptive statistics.

**Results:** 8 out of 34 children reported a history of sleep terrors (24%). 75% of children with a history reported no re-occurrence of sleep terrors. For one child (sleep restriction group) sleep terror frequency during treatment was equal to baseline. For the other child (bedtime restriction group) the frequency of sleep terrors increased, the treatment plan was immediately modified to increase TIB, and education was provided about scheduled awakenings as the recommended treatment for sleep terrors. There were no reports of onset of sleep terrors in children without such history.

**Conclusion:** History of sleep terrors may not be an outright contraindication to sleep restriction therapies for insomnia in middle childhood.

# **Association between Upper Airway Resistance Syndrome and Behavioral Insomnia among Infants in South Korea**

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## **Purpose**

The infantile behavioral insomnia which is induced by inappropriate sleep trainings has been known to be effectively treated through behavioral therapy.

Meanwhile, many infants with frequent night awakenings are often found to have underlying conditions such as snoring, adenoid hypertrophy, or sinusitis which can develop the upper airway resistance syndrome (UARS). This study delineates the characteristics of infantile behavioral insomnia associated with underlying conditions that lead to the UARS.

## **Method**

We conducted a retrospective study on the infants with behavioral insomnia, sleep onset association type. We classified sleep onset association disorder (SOAD) into two groups: 1) without any symptoms or signs of the UARS (i.e. habitual snoring, adenoid hypertrophy, sinusitis) as primary SOAD, 2) having any symptoms or signs of UARS as secondary SOAD.

## **Result**

Fifty-seven infants consisting of 39 males and 18 females ( $15.6 \pm 9.3$  months) were selected for the study. The number of infants with primary SOAD was 15, whereas secondary SOAD was 42. No statistical difference was found between two groups regarding sex ratio, co-sleeping rate, sleep site, regularity of bed time, night feeding, frequency of night waking, sleep position and inappropriate sleep intervention. However, night terror and excessive nocturnal perspiration, and froglike position (bending knees with prone position) were significantly increased in the infants with secondary SOAD ( $(P = 0.016, 0.015, 0.027)$ ).

## **Conclusion**

Among patients with SOAD, infants with night terror, excessive nocturnal perspiration or froglike sleeping position frequently have upper airway obstructive diseases such as adenoid hypertrophy and sinusitis. Therefore, proper evaluation and medical treatment should be provided along with behavioral therapy whenever suspected UARS symptoms or signs are combined.

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# **Safety, Efficacy and Tolerability of Suvorexant for Insomnia among Children and Adolescents**

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**Background:** Suvorexant is the first dual orexin receptor antagonist approved in 2014. Orexin receptor antagonists represent a new therapeutic drug class for treating insomnia. The aim of this study was to elucidate the safety, efficacy and tolerability of suvorexant for insomnia among children and adolescents.

**Methods:** Thirty patients (8 male and 22 female; mean age,  $15.7 \pm 2.4$  years; age range, 10-20 years) with insomnia disorder according to the International Classification of Sleep Disorders-third edition criteria who had been treated with suvorexant were included in this study. Percentage of patients who continued medication and the reasons for discontinuation were analysed. Athens Insomnia Scale was compared between patients who continued and discontinued medication. The study was approved by the Institutional Review Board of the Toyokokei Hospital. Informed consent was obtained from all individuals in the study.

**Analysis:** Descriptive statistics were used for participant characteristics. Mann-Whitney U test was employed to compare the Athens Insomnia Scale between continued and discontinued groups. All tests were two-sided and assumed a 5% significance level.

**Result and Conclusion:** Among the 30 patients, 19 patients (63.3%) successfully continued the treatment with suvorexant. Reasons of discontinued treatment were loss of follow up in 5 patients, owing to their decision in 4 patients, insufficient efficacy in 2 patients. No patient discontinued suvorexant due to side effects. The score of sleep quality in Athens Insomnia Scale was significantly higher in patients who discontinued suvorexant than in patients who continued suvorexant. In conclusion, our data indicated that suvorexant exhibited good efficacy in the treatment of insomnia disorder and was well-tolerated for children and adolescents.

## Clinical experience with a dual orexin receptor antagonist, Suvorexant (Belsomra) in Japan

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**Background:** Suvorexant (SUV, MK-4305, Merck), a dual orexin (OX1R and OX2R) receptor antagonist, is the first in a new class of drugs in development for the treatment of insomnia by inhibiting the wake promoting orexin neurons of the arousal system. Currently, there are not many clinical information about SUV. We summarize our SUV administering experiences. In addition, we introduce some case reports which shows the effects of SUV on insomnia patients who have not been satisfied with current hypnotics.

**Methods:** Intuition site is Yuri Kumiai General Hospital in Akita prefecture, Japan. We administered SUV to 28 patients who have sleep disorder. 20 patients out of 28 were examined. As dosage of SUV 20 mg was used for <65 years old patients, 15 mg was used for > 65 years old patients. Types of insomnia are classified into 2 groups; one has difficulty in getting to sleep (12 patients), and the other has difficulty in nocturnal awakening/early morning awakening (11 patients). Most patients were added on SUV with their current hypnotics. The examination was performed every 2-4 weeks. Primary diseases were mood disorder (11 patients), schizophrenia (3 patients), PTSD (1 patient), and primary insomnia (5 patients).

**Analysis:** SUV showed more effectiveness on WASO compared to sleep onset (9/11 vs 7/12). 3 patients complain about the somnolence on the first day. More than half of the patients took 7.5mg or 10mg at the end. Some adverse events were observed, such as dizziness or headaches, but those were not serious and patients (including patients with >75 years) could keep taking SUV.

**Result and Conclusion:** SUV works more on WASO than sleep onset. There were many patients who felt the somnolence on the next day, but it was diminished by using the half tablet. Because adverse events were minimal, we can safely administer SUV.

## ABSTRACT

### Narcolepsy: Case Series From India

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**Background:** Narcolepsy is a sleep disorder of central origin in which patients have irresistible, disabling day time sleepiness with cataplexy, hypnagogic hallucinations, sleep paralysis and disturbed nocturnal sleep. The prevalence of narcolepsy varies across different populations. The highest reported prevalence in Japan at 160–590 per 100,000 population. Extrapolated data for prevalence of Narcolepsy for India, with population of 1 billion is 587355. Narcolepsy has significant impact on driving skills, education, social life, work and personal life. There is very limited data about narcolepsy from India. We present a review of case series of narcolepsy from our centre.

**Methods:** Retrospective analysis of all level I polysomnographies at the Neurology and Sleep Centre were analyzed, from year 2013 to 2015. Total number of patients who underwent polysomnography(PSG) during this period was 500 .Out of them 7 were found to have narcolepsy. The clinical details, investigations, management and follow up of the patients was noted.

**Analysis and Results:** 7 patients were diagnosed as Narcolepsy, confirmed by PSG followed by MSLT fulfilling the diagnostic criteria. The age of patients ranged from 14 years to 33 years,mean age of 20.57years . The male to female ratio was 1:1.33.All of them had excessive daytime sleepiness, 2patients had cataplexy,1 patient had hypnagogic hallucinations. Their evaluation, follow up shall be discussed.

**Conclusions:** Narcolepsy is associated with significant disability. Lack of awareness leads to delay in diagnosis with profound effect on quality of life. Early diagnosis with appropriate intervention are required .

## **Migraine and Risk of Narcolepsy: A Nationwide Cohort Study**

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*Keywords:* narcolepsy, migraine, cohort study,

**Running Title:**Migraine and risk of narcolepsy

## **Abstract**

**Background:** The association between migraine and narcolepsy is still controversial. This study is to determine whether migraine is associated with an increased risk of developing narcolepsy.

**Method:** Medical records of patients with migraine who were entered in the National Health Insurance Research Database (NHIRD) between 1997 and 2011 are retrieved from the NHIRD in Taiwan. Two cohorts are selected between 1997 and 2010: migraine patients ( $n = 34,155$ ) and propensity score-matched to controls ( $n = 102,465$ ). Individuals with previous history of narcolepsy before index date are excluded.

**Analysis:** Cohorts are followed-up until the initial narcolepsy diagnosis, end of 2011, or last date of their insurance enrollment. A Cox proportional hazards regression model is used to calculate the hazard ratios (HRs) and 95% confidence intervals, which are used to compare narcolepsy risk between cohorts.

**Result:** A total of 21 subjects are newly diagnosed with narcolepsy during follow-up, with incidence rates of 0.04 and 0.01 per 1000 person-years in migraine and non-migraine individuals, respectively. After a mean follow-up period of 7.20 years in control and 7.35 years in migraine, the migraine cohort exhibited a greater risk of developing subsequent narcolepsy compared to the control cohort (hazard ratio (HR)= 3.36, 95% confidence interval (CI): 1.84-6.13;  $p < 0.001$ ). This finding persisted after excluding potential confounders during sensitivity tests. Moreover, the significant association between migraine and narcolepsy remained after the adjustment for potential risk factors of comorbidities. However, different migraine subtypes showed no significant differences.

**Conclusion:** Migraine is a risk factor for narcolepsy development. Further studies are needed to validate our findings and to delineate the exact pathophysiological mechanisms linking migraine and narcolepsy.

## The quality of life in young narcolepsy

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### △Background :

Narcolepsy is a chronic brain disorders. The common symptoms are daytime sleepiness, cataplexy, and REM related symptoms. Children diagnosed with narcolepsy often exhibit underachievement in school, inattention, lack self control, difficulties in dealing with friends or family. Currently, treatments for narcolepsy mainly focus on reducing sleepiness and decreasing cataplexy medications. Assuming, the sleepiness of patients has reduced with treatment, patients' quality of life will improve as well. This study focuses on whether the daytime functions and quality of life of those young patients with 1-year-on-going treatment improves and the correlation between reduced sleepiness and improvement in quality of life will be discussed.

### △Method :

The data used for this study was collected from 60 patients (average age: 20.5y/o, Male: 61.67%) at one medical center for Sleep disorder and department of Pediatric Psychiatry. Using polysomnography, multiple sleep latency test, human leukocyte antigen (HLA DQ0602) to diagnose narcolepsy and the self-filled Epworth sleepiness scale, Pediatric daytime sleepiness Scale and short form-36 items of health related quality of life to determine the effect of treatment.

### △Results :

Result of the study shows after one year of treatment, the occurrences of sleepiness has significantly improves ( $t=6.046 p<.001$ ), however the overall quality of life has not improve significantly ( $t=-.778 p=.440$ ). Short form-36 shows, role functioning-physical( $t=-4.178 p<.001$ ), body pain( $t=2.208 p=.031$ ), role functioning-emotional( $t=-2.728 p=.008$ ) has significantly improved, however physical function( $t=-1.226 p=.225$ ), general health( $t=.306 p=.760$ ), vitality( $t=-.448 p=.656$ ), social functioning( $t=1.233 p=.222$ ) and mental health( $t=-1.231 p=.223$ ) have not experienced significant improvement. What should be noted is that reduction in sleepiness and improvement in body pain( $r=.301$ ), mental health( $r=-.315$ ) has a strong correlation.

### △Conclusion :

The result shows pharmaceutical treatment reduces sleepiness and as a result greatly improves patients' physical health and mood, specifically body pain and mental health. There needs to be further study to discover whether other indicators of quality of life also improve as sleepiness of patients reduce.

## **Assessment of activity rhythm and metabolism of melatonin in patients with severe motor and intellectual disabilities.**

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**Background:** Patients with severe motor and intellectual disabilities have multiple psychoneurological symptoms as well as the other medical disabilities. They might feel nervous and have anxiety under much daily stress due to the disabilities. It follows that they have sleep-wake rhythm disorder and poor sleep quality. We evaluated their sleep-wake rhythm referring to melatonin metabolite.

**Methods and Analysis:** All of the 13 patients aged 33 to 84 years are women with adequate oral intake who injured under 18 years of age on a life care ward. They have mild to profound intellectual disabilities and also move upper limbs well. However they are bedridden or unable to walk. We assessed circadian behavior of them by use of chi-square periodogram analyzing actogram. The amplitude (Qp) of the activity rhythm was the peak value of the chi-square periodogram. 6-hydroxymelatonin sulfate (6-OHMS) in the urine was measured additionally in the early morning which is when 6-OHMS secretion shows its maximum level in the patients..

**Results:** The medical staffs were convinced based on observation that 5 women had sleep problems such as insomnia and unstable sleep because of nocturnal seizures and etc. Patients who suffered from sleep problems had relatively low maximum Qp value and significantly high 6-OHMS value. Some of 6-OHMS values in the patients were extremely high compared with controls.

**Conclusion:** Qp value and high 6-OHMS value might reflect vulnerability of sleep-wake rhythm in the patients. Melatonin is known as one of powerful antioxidative substances. Extremely high 6-OHMS value also might mean profound brain damage and chronic intense stress due to neuropsychiatric symptoms and low sleep quality.

# A Diagnostic Meta-analysis of Screening Instruments for Obstructive Sleep Apnea

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**Background:** Obstructive sleep apnea(OSA) is prevalent in the modern societies; however, it remains under-diagnosed and under-treated. Although screening tools including the Berlin questionnaire (BQ), STOP-Bang questionnaire (SBQ), and STOP questionnaire (STOP) are widely used for identifying OSA, the diagnostic properties of the three questionnaires have yet to be summarized in a systematic manner.

**Methods:** We systematically searched EMBASE, PubMed, PsycINFO, and China Knowledge Resource Integrated Database from their inception to Aug 25, 2015.

**Analysis:** Summary sensitivity, specificity and diagnostic odds ratios (DOR) against apnea-hypopnea index (AHI) obtained from polysomnography were calculated using a random-effects bivariate model.

**Result and Conclusion:** We identified 70 studies comprising 32, 216 participants. The summary estimates for the BQ, SBQ, and STOP in identifying mild ( $AHI \geq 5$ ), moderate ( $AHI \geq 15$ ), and severe OSA ( $AHI \geq 30$ ) were calculated respectively. Regarding mild OSA, the pooled sensitivity was 77%, 86%, and 87%; the pooled specificity was 58%, 43%, and 43%; and the pooled DORs was 4.50, 4.85, and 5.19, respectively. Regarding moderate OSA, the pooled sensitivity was 76%, 89%, and 89%; the pooled specificity was 46%, 39%, and 32%; and the pooled DORs was 2.61, 5.25, and 3.96, respectively. Regarding severe OSA, the pooled sensitivity was 83%, 92%, and 88%; the pooled specificity was 46%, 38%, and 32%; and the pooled DORs was 4.21, 6.85, and 3.31, respectively. In terms of identifying mild and moderate OSA, the sensitivity of the SBQ and STOP were higher than that of the BQ (all  $p < 0.05$ ). Moreover, the sensitivity of the SBQ in screening severe OSA was significantly superior to the BQ ( $P = 0.02$ ). Specificity estimates were unsatisfied and comparable at all level of severity. In summary, we suggest that the SBQ is an accuracy instrument in identifying mild, moderate, and severe OSA and should be adopted into clinical settings.

# **The analysis of the result of polysommography relevant factors and clinical features in children of OSAHS**

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**Background:** Obstructive sleep apnea hypopnea syndrome in children is a disease that is frequently occur on some or all of the airway obstruction, disrupt the normal ventilation and sleep structure, caused hypoxia and hypercapnia at night,sleep disorder, the incidence is 1%-4%.To provide more evidence for clinical diagnosis of obstructive sleep apnea hyponea syndrome(OSAHS) by comparing clinical correlation factors and polysomnogram (PSG)results.

**Methods:** Study the clinical symptoms correlation factors and PSG results of 150 cases of children with data for statistical analysis.Including general information: name, age, height, body weight, grinding,mouth breathing, body movement,etc.

**Analysis:** Provide reference for clinical treatment and nursing through the research, and investigate the relevance between the disease and its clinical features.

**Result and Conclusion:** According to the result of questionnaire, it is found that there was no significant difference in grinding,mouth breathing, body movement, ( $P>0.05$ ). There was significantly difference in snoring sound,sleep uneasy dyspnea, apnea( $P<0.05$ ); According to the result of polysomnogram monitoring, it is found that there was no significantly difference in oxygen desaturation index and arousal index ( $P>0.05$ ), there was significantly difference in longeset apnea time and snoring degree ( $P<0.05$  ).There were different characteristics in clinical feature and symptoms, polysomnography monitoring can better reflect the changes of the indexes in the night sleep, it's better able to assess the severity of OSAHS.

# Can McGill Oximetry Score Exclude Obstructive Sleep Apnea in Children?

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**Background:** The McGill oximetry score has high positive predictive value in a diagnosis of moderate-to-severe obstructive sleep apnea. But low sensitivity and negative predictive value compared with polysomnography(PSG) had been reported. The aim of this study was to evaluate the diagnostic value of the McGill oximetry score to rule out obstructive sleep apnea in Korean children.

**Methods:** We performed a cross-sectional study by using medical and PSG records from our pediatric sleep center. We assessed 24 PSG records conducted from January 2012 to April 2015. The McGill oximetry score was calculated from the overnight oximetry tests performed as part of PSG.

**Result and Conclusion:** Twenty one(87.5%) and 3(13.5%) records, respectively, showed inconclusive(score 1) and abnormal(score 2-4) results by the McGill oximetry score. And obstructive sleep apnea were diagnosed in 18(75%) records based on the apnea-hyponea index. The McGill oximetry score had a positive predictive value of 100%, a negative predictive value of 29% and a sensitivity of 17% for detecting obstructive sleep apnea. In our small group study, the McGill oximetry score cannot exclude obstructive sleep apnea. Further prospective studies are needed.

# Sickle Cell Disease- PSG when to do it?

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## Introduction:

Sickle Cell Disease (SCD) is associated with sleep disturbances mostly related to respiratory issues. In our Hospital we performed a Polysomnography (PSG) test in two different times in order to establish a protocol of evaluation.

## Material and Methods:

A sample of children with SCD, performed a PSG in two different times three years apart. Values were compared for each person with T test in order to establish the optimal age to evaluate these children the first time. The need of Adenoamigdalectomy (AAT) procedure and its timing was also analyzed. PSG were compared for each person and correlated with the AAT procedure in three different groups of ages.

## Results:

A sample of 45 children with SCD performed a PSG in two different times. Children had in the first evaluation age mean 7.5 years  $\pm$  SD 3.9 and in the second, age mean 9.6 years  $\pm$  S.D. 4.0. Gender 55.6% male. The mean time between the PSG was three years in 62.2% of cases. 4 children had previous AAT and in 35.6% the AAT was performed after the PSG. In the second evaluation, when comparing PSG values, an improvement with statistical significance was observed in N 1 % ( $p < 0.000$ ), AHI value ( $p < 0.008$ ) and minimal sp O<sub>2</sub> ( $p < 0.000$ ).

## Conclusion:

Performing a PSG is a fundamental procedure in SCD. In this study we suggest that the optimal age to perform a PSG is 3 years, meaning before hyperplasia of lymphoid tissue, and reevaluation should be scheduled each 3 years or before in clinical deterioration.

# **AN UNUSUAL CAUSE OF OBSTRUCTIVE SLEEP APNOEA IN A SPINAL MUSCULAR ATROPHY TYPE III PATIENT**

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## **Background**

Patients with spinal muscular atrophy (SMA) type III are known to have profound symptom heterogeneity. Some of them preserve relatively normal lung function and respiratory muscle strength when reach adulthood while others may develop obstructive sleep apnoea (OSA) and hypoventilation. This case report presents a patient with SMA type III complicated by an unusual cause of OSA.

## **Case Presentation**

The index case was diagnosed to have SMA type III in early childhood with genetic confirmation. He became wheelchair-bound at 15 years old. He was noticed to have snoring and mild speech slurringsince 16years old. Polysomnography (PSG) revealed obstructive apnoea-hypopnoea index of17/hour. His symptoms were initially attributed to respiratory and oro-bulbar muscle weaknessashis lung function showed mild deteriorationsince he entered into non-ambulatory phase,with forced vital capacity dropped from 2.25 to 1.85 litres.Nocturnal continuous positive airway pressure was started with adequate titration achieved at 5cmH20. Over the next few years, he showed continued worsening of OSA whichrequired pressure escalation, despite hislung function wasotherwise maintained. Hestarted complaining a globus sensation in the tongue.MRI revealed a 5x4 cm genioglossus muscle tumour.Histology confirmedschwannoma. His symptomsimproved after tumour excision. Repeated PSG showedthat his OSA resolved.

## **Conclusion**

This was the first reported case of a slow-growing lingual schwannoma mimicking OSA in patients with SMA.Despite its rare occurrence, clinicians should be alert to a potential second pathology when OSA progresses out of proportion to the muscle weakness of patients with neuromuscular disorders.

## Sleep Education among Schoolers – Does it work?

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**Background:** Sleep deprivation is a worldwide problem among school aged children and adolescents with a constellation of negative impacts to academic, mood, cognitive, cardiovascular, metabolic and general well-being. There is a web of internal and external factors contributing to sleep deprivation among students, such as biological and circadian factors, school work, parental sleep schedule, extracurricular activities and school start time. However, the importance of adequate sleep and related consequences of sleep deprivation has not been well addressed at both community and individual level.

**Methods:** A cluster randomized controlled trial with 26 secondary schools and primary schools in Hong Kong were involved in the study. Interventions consist of town hall seminar, small class workshops, a slogan competition, a brochure, and an educational Web site. Their parents and teachers were also invited to participate in an educational seminar. For the control schools, they did not receive any sleep program. Data were collected before and 5 weeks after the intervention.

**Analysis:** Generalized estimating equations (GEE) was used with age and sex as adjustment.

**Results and conclusions:** Sleep education was effective in enhancing sleep knowledge in adolescents with significant improvement in behavioural and mental health. However, the impacts on primary school children were limited. For both primary and secondary students, no significant impact on sleep duration were found, albeit there was improvement in behavioural and mental health among the students who has received sleep research.

### Reference:

Wing, YK, Chan, NY, Yu, MWM, Lam, SP, Zhang, J, Li, SX, Kong, AP, Li, AM. (2015). A school-based sleep education program for adolescents: a cluster randomized trial. *Pediatrics*, 135(3):e635-43

## **Secular Trends in Sleep Time of School-aged Children, 2005-2014: ATwo Waves of Cross-sectional Study in Shanghai**

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**Background:** There are substantial evidence that school-aged children are subject to insufficient sleep, and sleep duration has been declining. This study aimed to explore the secular trends of sleep time in Chinese school-aged children in Shanghai from 2005 to 2014, and examine factors associated with insufficient sleep.

**Methods:** The data were from the two waves of cross-sectional surveys in Shanghai in 2005 and 2014, which comprised 4,135 and 15,564 school-aged children (6-12 years) in grade 1-5, respectively. Sleep patterns (i.e., bedtime, wake time and sleep duration) were assessed with items adapted from the Children's Sleep Habits Questionnaire (CSHQ).

**Analysis:** Sleep duration and prevalence of insufficient sleep (defined as < 9 h) in 2005 and 2014 were reported and compared. Multilevel binary regression was applied to examine factors associated with insufficient sleep.

**Result and Conclusion:** Average sleep durations were  $9.58 \pm 0.52$  h and  $9.75 \pm 0.54$  h in 2005 and 2014, respectively, indicating a significant increase ( $P < 0.001$ ). The respective prevalence of insufficient sleep in 2005 and 2014 were 10.5% and 7.2%, indicating a significant decrease (OR [95%CI]: 0.67 [0.60, 0.76],  $P < 0.001$ ). Multilevel binary logistic regression results showed that boys were more likely to have insufficient sleep (OR [95%CI]: 1.27 [1.14, 1.41],  $P < 0.001$ ); children in higher grade were linked to increased odds for insufficient sleep (e.g., ORs [95%CI] for 5<sup>th</sup> graders was 4.18 [3.46, 5.06],  $P < 0.001$ ); children with mother education of middle school or below were more likely to have insufficient sleep compared to those with mother education of college and above (OR[95%CI]: 1.3[1.16,1.49],  $p < 0.001$ ). Our findings indicate that over the past decade, sleep time of school-aged children in Shanghai have increased, which might be partially due to delaying school start time. Despite the fact, there are still a substantial number of school-aged children suffering from insufficient sleep, particularly in some sub-populations.

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# **ASSOCIATIONS AMONG SLEEP QUALITY, PSYCHOSOCIAL FUNCTIONING, AND HEALTH-RELATED QUALITY OF LIFE IN CHILDREN WITH DUCHENNE MUSCULAR DYSTROPHY**

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## **Abstract**

**Objectives:** Duchenne Muscular Dystrophy (DMD) is the most common genetically caused neuromuscular disorder. Previous studies in western patient samples have found issues in some aspects of psychosocial functioning but there has been no comprehensive study on sleep quality and no study on the associations among sleep quality, psychosocial functioning, and health-related quality of life (HRQOL). We aimed to provide some preliminary data for the role of sleep in psychosocial outcomes and HRQOL in patients with DMD.

**Methods:** Fifteen boys with DMD and 15 unaffected boys, case-matched on age, were recruited in Hong Kong together with their parents from September 2013 to March 2014. Information was collected through the completion of the Children's Sleep Habits Questionnaire (CSHQ), the Child Behavior Checklist (CBCL), the self-reported and parent proxy-reported *Pediatric Quality of Life (PedsQL)* modules.

**Results and conclusion:** Parents of 2-12 year-old children with DMD perceived lower HRQOL in their children as compared to their healthy peers, with the 8-12 years old being the most affected age group characterized by lower total HRQOL, physical QOL, and social QOL. Close to three-quarters of patients had significant sleep problems, which were significantly correlated with both patient-reported and parent-reported HRQOL in children with DMD as well as with many emotional-behavioral outcomes on the CBCL.

This study was the first to investigate sleep quality, psychosocial functioning, and HRQOL in a Chinese DMD sample and also the first to demonstrate the associations between sleep variables and the QOL and psychosocial outcomes in DMD populations. Our findings suggest that routine monitoring and intervention for sleep-related conditions should be considered in clinical service for children with DMD.

## **Objective and Subjective Assessments of Sleep Quality in Chronic Tinnitus Adults**

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**Background:** Sleep difficulties are among the frequent complaints associated with chronic tinnitus. Most studies reporting on this problem are questionnaire-based. We aimed to investigate the characteristics of sleep quality among adult subjects with subjective tinnitus.

**Methods:** Adult patients with subjective tinnitus who visited the department of otolaryngology in National Cheng-Kung University Hospital were recruited since 2013. The duration of tinnitus complaint was required to be at least 6 months. Objective assessments included pure-tone audiometry and over-night hospital polysomnography. Subjective questionnaire assessments were Pittsburgh Sleep Quality Index and Tinnitus Handicap Inventory. Participants (with and without tinnitus) were matched for health and relevant socioeconomic factors.

**Results:** There were 20 tinnitus patients (9 male, 11 female) and 21 control subjects without tinnitus (10 male, 11 female) completed the whole protocol. Tinnitus patients were older than non-tinnitus subjects ( $p<0.05$ ). Characteristics of hearing status among tinnitus patients included poor hearing threshold and poor uncomfortable loudness level. Tinnitus patient complained worse sleep quality ( $p<0.001$ ). Total sleep time among tinnitus subjects was significantly less than non-tinnitus subjects (338.3 and 371.6 minutes, respectively) ( $p=0.045$ ). In addition, longer sleep latency, more sleep arousal index, less percentage of deep sleep and lower sleep efficiency were also found among tinnitus patients.

**Conclusion:** It revealed that sleep complaints with less total sleep time in the tinnitus population was significant. According to these findings, further clinical interventions to improve the sleep quality among tinnitus patients may be considered.

**Keywords:** Sleep quality, chronic tinnitus, over-night polysomnography

## **Orthodontic treatment for adolescent OSAS patients**

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**Background:** Recently, the concern of sleep apnea was extended from adults to children. Children who suffered from sleep apnea could interfere not only sleep quality, but also development of intelligence and behavior! The supportive devices such as C-pap is inconvenient and temporary, the pressure of devices might also prevent the normal growth of facial profile. Due to the growth potential of children, especially adolescent with growing spurt, proper orthodontic/orthopedic treatment could induce jaw growth to enhance airway and decrease the necessity of orthognathic jaw surgery after they grown up.

**Methods:** Those who came to our orthodontic department was requested to do PSG test, then orthodontic routine including clinical photos, cephalometric and panoramic x-ray, intraoral impressions was taken. After evaluation, according to arch form, upper arch expansion with rapid maxillary expansion(RPE)or not would be decided. Then full mouth orthodontic appliances were applied with different type elastics to decrowd or enhance lower jaw growth. 2 cases were presented this time.

**Analysis:** During treatment, clinical photos and cephalometric x-ray was taken to evaluate what progressing treatment need to add. After orthodontic treatment finished, final record including clinical photos, cephalometric and panoramic x-ray, impressions and PSG were taken again to compare the amount of jaw growth and differences between AHI before and after treatment.

**Conclusion:** Compare the cephalometric datas showed that the jaw growth did happened, and AHI improved. Though the jaw growth might also happened in growing children without treatment, but the arches expanded for tongue spaces, jaw growth amount surely should be better than those who jaw locked behind, and the retrognathia spaces increased will give these patients better airway and life quality. Long term follow up for these patients should be done due to getting older might make AHI worse, but if initially we give them better jaw condition, they would have more potential to getting worse.

# THE RELATIONSHIP BETWEEN SLEEP QUALITY AND READINESS TO FORGIVE

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**Objective.** The link between forgivingness (which is a social-personality construct) and sleep quality (which is primarily a biological construct) is virtually unexplored. There are three theoretical possibilities. First, given the well-documented health benefits of forgiveness, it could be expected that as one component of health, sleep quality could be a consequence of forgiveness. A person who does not harbor anger would sleep well at night. Holding a grudge disturbs sleep, as cognitive arousal before bedtime can result in longer sleep latency. A second possibility is that sleep quality affects forgiveness. The bad mood and hostility resulting from poor sleep make one unforgiving. A third possibility is that forgiveness and sleep quality are under the influence of the same set of external factors, and so are correlated with each other. The present study sought to evaluate these possibilities.

**Method.** Two waves (about five months apart) of online survey data were collected from 165 Chinese teenagers. Sleep quality was measured with the 19-item Pittsburgh Sleep Quality Index; readiness to forgive was measured with the 6-item “forgiving others” subscale from the Chinese translation of the Heartland Forgiveness Scale.

**Analyses and Results.** Correlational analyses of data collected at Time 1 showed that having good sleep and a willingness to forgive a transgressor were correlated with each other ( $r=-.16$ ,  $p<.05$ ), suggesting possible causal relationship. However, cross-lagged analyses revealed no evidence of sleep quality or forgiveness predicting each other five months later.

**Conclusion.** Causality between sleep quality and readiness to forgive a transgressor is not supported in our teenage sample. However, the two appear to be under the influence of some common factors, to be explored further in future research.

Keywords: forgiveness; sleep quality; Chinese; longitudinal study

# SLEEP AND OPTIMISM: THE CHICKEN OR THE EGG?

## A Longitudinal Study of Causal Relationships and Mediators in a Chinese Student Sample

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**Objective.** While both sleep and optimism have been found to be predictive of physical and psychological well-being, very few studies have examined their relationship with each other and the potential mediators of their link. This study investigated the cause-and-effect relationship between sleep quality and optimism, as well as the role of symptoms of depression, anxiety, and stress in the relationship.

**Method.** Internet survey data were collected from 1,684 full-time university students (67.6% female, 84.7% Hong Kong residents, mean age=20.9) at three time-points, spanning about 19 months. Measures included a Chinese attributional style questionnaire (for the measurement of optimism), the Pittsburgh Sleep Quality Index, and the Depression Anxiety Stress Scale.

**Results.** Moderate correlations among sleep quality, depressive mood, stress symptom, anxiety symptom and optimism were found in cross-sectional analyses. Moreover, bidirectional effect between optimism and sleep quality was shown in cross-lagged analyses. Path analysis demonstrated that anxiety and stress symptoms partially mediated the influence of optimism on sleep quality, while depressive mood partially mediated the influence of sleep quality on optimism.

**Conclusion.** Findings from our students' sample showed that optimism and sleep were both cause and effect of each other. While depressive mood partially explained the effect of sleep quality on optimism, whereas anxiety and stress symptoms were one of the mechanisms bridging optimism to sleep quality. This was the first study examining the complex relationships among sleep quality, optimism, and mood symptoms altogether longitudinally in a student sample. Clinical implications on prevention and intervention for sleep problems and mood disorders are discussed.

Keywords:attributional style; Chinese; longitudinal study; depression, anxiety, stress

# **Acoustic Feature Analysis of Overnight Snoring Sounds in Patients with Obstructive Sleep Apnea**

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**Background:** Snoring sounds have useful information about the condition of Obstructive Sleep Apnea (OSA), and have been analysed by many researchers. The conventional reports indicated some specific properties of snoring sounds in OSA patients, but the results are inconsistent with each other. In addition, the diversity of the acoustic properties during overnight sleep has not been focused on at all, although the snoring sounds are highly influenced by various physiological conditions. The purpose of the study is to clarify the diversity of the acoustic properties during overnight sleep and the non-stationarity in a snoring episode.

**Methods:** The authors firstly recorded overnight sleep sounds of five OSA patients during sleep, including snoring sounds and the other environmental sounds. The instrument is a portable linear PCM recorder, Olympus LS-11, whose setting is 44.1kHz sampling rate and 16-bit resolution. Snoring episodes are manually cut out from the recorded sounds by hearing and identifying the sounds. About 3000 episodes per night were obtained from one person.

**Analysis:** All snoring episodes are transformed into the frequency domain using FFT, and summarized with Kohonen's Self-Organizing Map (SOM) to visualize the diversity. In addition, the non-stationarities in some representative snoring episodes are clarified with Hilbert-Huang Transform (HHT).

**Result and Conclusion:** According to the SOM's results, snoring sounds are largely composed of three types of acoustic properties: noisy-, complex-, and simple-waveform. Especially, many noisy-waveform snores are found in an early stage of sleep (3 hours), but the last two waveforms gradually increase as time passes. In the HHT spectra, the fluctuation of the fundamental frequencies can be detected everywhere in time domain. These results have not been reported in conventional studies. It is possible that these acoustic properties may have important information about the severity of OSA or the patients' condition during sleep.

# The Effect of Horticultural Therapy on Personal Interaction of Dementia

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**Background:** The Dementia patients can find their own advantages, cultivate the properly social skills, and then improve the relationship with others through Horticultural Therapy, which is the process for communication with the vegetation and the members among them.

**Methods:** The research design was quasi-experimental. Selecting criteria of the case including: (a) the patients was diagnosed by the DSM-V with Dementia , (b) MMSE 16~23 points, (c) CDR  $\leq$  1 points. We had finished Pretest for the experimented group and control group of the compared one before a week of the therapy proceeding towards.

**Analysis:** Research instruments for this study included a demographic questionnaire, and the scale of interpersonal communication. Only the experimented group implements Posttest after Horticultural therapy in order to evaluate the effects. Statistical analysis used was performed using SPSS for Windows version 12.0 software.

**Result and Conclusion:** The Dementia patients can Increase their attention, recollect, and build their self-confidence, and improve the communication with others in the mind by such a method. It provides the clinic not only Medical Therapy but also Horticultural Therapy to improve the patients' self-esteem, happiness, and the better quality of life.

**Keyword:** Horticultural Therapy, Dementia, Personal Interaction

# ***The role of estrogen on cardiovascular autonomic regulation during stress-induced insomnia in ovariectomized female spontaneously hypertensive rats***

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**Background:** Postmenopausal women have higher prevalence of vasomotor dysfunction, sleep disturbance, hypertension and mood dysfunction. However, it is still unknown whether these symptoms are more serious in hypertension women, and estrogen replacement therapy can restore it. We hypothesize that the ovariectomized (OVX) spontaneously hypertensive rats (SHRs) exaggerate stress-induced sleep disturbances and autonomic imbalance, and these symptoms can be improved by estrogen replacement. This study aimed to investigate the differences of sleep disturbance and autonomic imbalance between the OVX-Sham and OVX groups, the differences of those problems between the vehicle (OVX-Oil) and estrogen supplement (OVX-Estrogen) OVX groups, and further to compare the differences between the hypertensive and normotensive rats.

**Material and methods:** The female SHRs were divided into four groups: OVX-Sham, OVX, OVX-Oil and OVX-Estrogen groups. Electroencephalogram, electromyogram, electrocardiogram, and blood pressure were recorded for 24 hours in three different cages (clean, dirty cages: occupied by self or another rat) by crossover changes.

**Analysis:** Due to the small sample size, we used Dunn's *post hoc* comparison of Friedman test for the within-group differences, and Mann-Whitney *U* test for the between-group differences ( $p<0.05$ ).

**Results and conclusion:** The OVX group had more awake times than OVX-Sham group and showed more obvious phenomenon among three different cages. Compared with baseline, OVX-Sham group living in clean and self-dirty cage had lower sympathetic activity of quiet sleep during light period, but OVX group did not. Otherwise, compared with OVX-Oil group, the OVX-Estrogen group showed higher parasympathetic activity when living in three different cages during light period. It is more obvious when the rats lived in other's dirty cage. In conclusion, the ovariectomized rats have poor sleep quality. Estrogen supplement cannot reverse the sleep problems, but it can improve the parasympathetic activity during sleep which may have effects on resilience.

## **Obstructive sleep apnea during pregnancy: what's different? - A case report**

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**Background:** Obstructive sleep apnea (OSA) is a disorder as a result of repetitive episodes of shallow or paused breathing frequently accompanied with hypoxemia during sleep. That is less prevalent in women of reproductive age, but the occurrence of OSA increased during pregnancy, especially in the 3<sup>rd</sup> trimester. The women with OSA during pregnancy had more frequent to develop hypertension and preeclampsia, which may cause higher maternal and infant morbidity or mortality.

**Case report:** We reported a 30-year-old female, who was subsequently diagnosed with hypertension during her 3<sup>rd</sup> trimester of pregnancy. Polysomnography revealed severe OSA, and then she started on a nasal CPAP therapy. The blood pressure value normalized, and she had a safe and smooth delivery fortunately. Repeated diagnostic PSG was done 4 months after delivery. During pregnancy, she had more apnea-hypopnea index (AHI) value (51.3/hr vs 44.6/hr), more frequent arousals (47.9/hr vs 32.4/hr), but a less desaturation time (the SpO<sub>2</sub> measured < 90%, 0.8% vs 9.5% of the total sleep time).

**Conclusion:** The occurrence of OSA increased in pregnant women, worsening high blood pressure. But they are experienced more arousals and less desaturation during her sleep. Increased sympathetic tone might contribute to the consequences of hypertension.

## **CHADS<sub>2</sub> Score Predicts the Risk of Subsequent Peripheral Arterial Occlusive Disease (PAOD) in Patients with Sleep Apnea in Taiwan**

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**Background:** Sleep apnea (SA) was associated with an increased risk of PAOD. However, predictors for subsequent risk of PAOD in SA patients have not been well-established yet. CHADS<sub>2</sub> score(heart failure, hypertension, age  $\geq$ 75years, diabetes, prior stroke) was developed to be a simple and reliable clinical score for assessing the risk of stroke in patients with atrial fibrillation. Our previous studies showed it as a useful predictor for newly-onset PAOD in patients without atrial fibrillation. We conducted a nationwide population-based study using Taiwan National Health Insurance (NHI) database to investigate the usefulness of CHADS<sub>2</sub> score to predict the risk of subsequent PAOD in SA patients.

**Methods:** The dataset was a cohort of 1 million subjects randomly sampled from individuals enrolled in the NHI system in 2010. We enrolled patients aged 18~90 years with a diagnosis of SA after polysomnography in the dataset. Patients having PAOD prior to SA diagnosis were excluded. The first day of SA diagnosis was defined as the index day. The diagnosis of PAOD was identified by the occurrence of the diagnosis in at least one inpatient claim or at least three outpatient claims.

**Analysis:** From the dataset, 2497 patients were identified for further analysis, and 1345(54%), 654(26%), and 498(20%) patients had a CHADS<sub>2</sub> score of 0,1, and  $\geq$ 2, respectively. The SA patients with higher CHADS<sub>2</sub> score had higher rate of incident PAOD (27%,33%, and 39% in patients with CHADS<sub>2</sub> score of 0,1, and  $\geq$ 2, respectively; $p=0.0034$ ). The cumulative PAOD incidence was also significantly increased in SA patients with higher CHADS<sub>2</sub> score ( $p=0.0003$ ).

**Result and Conclusion:** Our study showed that CHADS<sub>2</sub> score usefully predicted the risk of subsequent PAOD in SA patients. Aggressive risk modification must be applied to prevent subsequent PAOD in SA patients with increased CHADS<sub>2</sub> score.

# The use of muscle relaxants on support group to investigate the effectiveness of insomnia

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**Background:** muscle relaxation group therapy intervention way to explore the effectiveness and quality of sleep in patients with insomnia experience connotation and satisfaction.

**Methods:** Income subject to long-term insomnia cases (more than three weeks), voluntary eight patients progressive muscle relaxation group of the research object, fixed for 15 minutes on Tuesday after muscle relaxation exercises, and then 30-40 minutes cognitive and experience sharing of the support group, each group about 55 minutes, for a period of six weeks to design quintiles self-administered satisfaction questionnaire and data content analysis.

**Analysis:** 1. Experience of tension - relaxation process, you can feel comfortable and relaxed mood and emotional catharsis. 2. The proper operation of muscle relaxation, practical application in everyday life. 3. aware of sleep or insomnia have misunderstood, and rebuild a correct perception, to be replaced with positive attitudes and emotions. 4. promote sleep hours: up to 6-8 hours from 3-5 hours of sleep.

**Result and Conclusion:** To promote a progressive muscle relaxation group ways to assist patients with insomnia learning relaxation techniques, supplemented by cognitive therapy to understand the causes and types of insomnia, the analysis of which related to life events and insomnia, treatment of sleep disorders, and insomnia after life habits, emotions triggered by sleep, because sleep insomnia generated myth, to assist adjust thoughts and behavior, and create a successful sleep experience, reduce anxiety, insomnia, enhance self-confidence to sleep. This program was found to achieve the purpose of relaxation, concepts and emotions can be positive to replace. Forward the proposal for the routine of medical care model to enhance the capacity of the nursing profession and promote the quality of care in patients with insomnia.

# **Increased Risk of Major Depressive Disorder in Patients with Sleep Apnea in Taiwan**

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**Background:** Few prevalence studies showed increased prevalence of obstructive sleep apnea (SA) in individuals with major depressive disorder (MDD). However, whether SA increases the risk of MDD has not been well studied yet. Since SA has been associated with various comorbidities, which might contribute to the development of MDD, we postulated that patients with SA have increased risk to develop MDD. We conducted a nationwide population-based study using Taiwan National Health Insurance (NHI) database.

**Methods:** The dataset used for this study is a cohort of 1 million subjects randomly sampled from individuals enrolled in the NHI system in 2010. We enrolled patients aged 18~90 years with a diagnosis of SA after polysomnography (PSG) in the dataset. Patients had a diagnosis of MDD prior to SA diagnosis were excluded. The first day of SA diagnosis was defined as the index day. Each patient was matched to 30 randomly-selected, age- and gender-matched control subjects without any diagnosis of SA. The control subjects were given the same index day as their matched case. The diagnosis of MDD was identified by the occurrence of at least one time of inpatient diagnosis or at least three times of outpatient diagnosis.

**Analysis:** From the dataset, patients with a diagnosis of SA after PSG were identified. After excluding patients by algorithm and matching to control subjects, 2471 patients and 74130 control subjects were identified for further analysis. The SA patients have higher rate of incidentMDD as compared with the control subjects (1.58% versus 0.94%,  $p=0.0013$ ). The cumulative MDDincidence was also significantly higher in patients of SA than the control subjects ( $p=0.0012$ ).

**Result and Conclusion:** Patients with SA have increased risk to develop MDD.

# **The Prevalence of Sleep Disorders of Children in Taiwan- A Population- Based Study from National Health Insurance Research Database, Taiwan**

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**Background:** Sleep disorders in children may jeopardize quality of life (QOL) of both children and families. Furthermore, chronic sleep deprivations may cause abnormal development in learning and cognition, overweight and behavioral problems. The prevalence of sleep disorders during childhood has been reported to range from 25 to 43 % from literatures. This study aims at the prevalence of sleep disorders in Taiwanese children

**Methods:** This population base study is conducted from randomized sample from National Health Insurance Research Database, Taiwan. This study is focused on the diagnosis as sleep disorder with ICD-9 coding such as 307.4 and 780.5 in children (0~18 years old).

**Analysis:** The descriptive statistics are by use of IBM SPSS 22 Edition. The demographic characteristics are analysed.

**Result and Conclusion:** Results will be presented at the conference.

# ***Obstructive Sleep Apnea Syndrome Related to Congestive Heart Failure– A Case Report***

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**Background:** Accumulating literature has suggested a bidirectional relationship between sleep disturbance and heart disease. Patients with cardiovascular disease have high prevalence of sleep-disordered breathing. In addition, sleep apnea have been associated with an increased incidence of cardiovascular disease.

**Case:** We reported a case of severe obstructive sleep apnea syndrome (OSAS) with congestive heart failure and coronary artery disease with complete recovery of OSAS after adequate treatment of coronary artery disease and heart failure.

The 30-year-old man with history of obesity and hypertension was admitted for progressive productive cough, blood tinged sputum, chest tightness, and orthopnea for 1 month. Patient reported loud snoring, daytime hypersomnolence and poor sleep quality. Chest X ray showed cardiomegaly and mixed pattern over bilateral lung. Chest CT further presented multiple ill-defined consolidative patches with predominant bronchogenic distribution over lower lung field. During hospitalization, acute decompensated heart failure and coronary artery disease were diagnosed. Polysomnography showed severe OSAS with poor sleep efficiency. After adequate medical treatments and percutaneous coronary angioplasty with stent implantation, BMI decreased and repeated polysomnography showed OSAS recovery.

**Conclusion:** It has been proposed fluid overload or rostral fluid shift lead to increase pharyngeal resistance and worsening OSAS, however, the significance is often overlooked. In this case we demonstrated the severity of OSAS can be resulted in decompensated heart failure and coronary artery disease. While CPAP treatment for moderate to severe symptomatic OSAS is generally accepted, promptly diagnose and treat underlying cardiovascular disease certainly provided the ultimate solution.

# The impact of a Modest Delay in School Start Time in Hong Kong

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**Background:** Sleep deprivation in adolescents is an emerging epidemic phenomenon across the world. During adolescence, teenagers experience a natural delay in their biological clock, leading to a shift in their bedtime. However, the natural delay of circadian clock was in direct conflict with the early school start time. Thus, the current study aimed to examine the effect of a modest delay (15 minutes) in school start time on adolescent sleep patterns, mood, and behaviors.

**Method:** Current study used a quasi - experimental design with two secondary schools in Hong Kong. A total of 1173 students were involved. The school start time was delayed by 15 minutes from 7:45am to 8:00am in the intervention group. For the control group, the school remained their regular school start time at 7:55am.

**Analysis:** A 2 \* 2 repeated analysis of variances (ANOVA) was used to evaluate the effect of delayed school start time on various sleep related outcome measures controlling for gender, age, and family status.

**Result and Conclusion:** After school delayed their start time, the intervention school significantly increased their weekday sleep duration and delayed their wakeup time relative to control school. In addition, students in intervention school had better mental health as measured by General Health Questionnaire and overall less behavioral difficulties as measured by Strengths and Difficulties Questionnaire when compared with control school. However, there are no significant differences in the Pediatrics Daytime Sleepiness Scale between two groups before and after intervention. Current findings have significant implications towards the education policy, suggesting that school administrators and policy makers should systematically consider delaying school start time to promote sleep, well-being, and functioning of growing school-aged adolescents.

# Impacts of Sleep Quality Among Noise-exposed Workers with Autonomic Hyperactivity

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**Background:** Because of abrupt and harmful effects on quality of life, in recent decades, noise induced hearing loss has become one of the most extensively studied occupational diseases. In addition to its effect on hearing, noise is also one of the most commonly encountered stressors in today's environment. Noise exposed workers complained mostly of nervous irritability, lessened capacity for work, palpitation and sleeplessness. As we known, the common assessment tool in these sleep quality related studies was questionnaire. The objective evaluation methods, e.g. over-night polysomnography and autonomic nerve system function test and stress-related biomarkers, were not applied popularly.

**Methods:** Our study was a prospective and cross-over design to document the changes in the nocturnal sleep architecture of workers exposed to loud occupational noise during daytime. In addition, it aimed to evaluate effects of noise stress on their sleep quality.

**Analysis:** The workers with decreased sleep efficiency and decreased percentage of deep sleep were defined by over-night polysomnography. The risk factors were analyzed by comparing the baseline characteristics and the data from objective evaluation methods.

**Result and Conclusion:** Total 40 noise-exposed workers (20 male, 20 female) were included in present study. The average age was 45.1 years and the average employment was 10.0 years. The characteristic of hearing status among these workers was high-tone hearing impairment. The workplace noise was continuous and variable pattern. The personal noise exposure level (TWA\_8h) was 72.9 dBA. For decreased sleep efficiency, the significant risk factors were daily personal exposure level, daytime cortisol level, hyperactive autonomic function. For decreased percentage of deep sleep, the significant risk factors were age and daily personal noise exposure level. Our major finding was that noise-exposed workers with hyperactive autonomic function revealed poor quality sleep, including poor sleep efficiency and less deep sleep percentage.

## **Depersonalization during Waking and Dreaming**

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According to the continuity hypothesis, which has been consistently supported by empirical research (Domhoff, 1996, 1999), most aspects of dream content correspond with waking thoughts and concerns. However, there is little empirical evidence supporting the specific hypothesis that waking reflective awareness is continuous with dream reflective awareness. According to Lee (2010), the experiences of trauma and the timeframe of trauma or loss both predicted depersonalization in dreams. Thus, the objective of this study was to investigate the relationships between depersonalization during waking and general dreaming patterns, as well as to explore the continuity of depersonalization across waking and dreaming states. For comparison reasons, this study also examined the tendency of depersonalization with dissociation regarding these issues.

Seventy-eight Taiwanese undergraduate students participated in this study. These participants remembered dreams and experienced impactful dreams on a frequent and intense basis. During the lab session, participants completed a series of background measures, including the Cambridge Depersonalization Scale (Sierra & Berrios, 2000), State Scale of Dissociation (Krüger & Mace, 2002), Dissociative Experiences Scale (Bernstein & Putnam, 1986; Carlson & Putnam, 1993), General Dream Pattern Questionnaire (Lee, 2013). Afterwards, participants were asked to record, immediately after awakening, the first impactful dream that they had experienced following the lab session. In addition to the dream report, participants were also asked to complete the Impactful Dreams Questionnaire (Busink & Kuiken, 1996; Kuiken & Sikora, 1993) and Dream Reflective Awareness Questionnaire (Lee, Kuiken, & Czuprynski, 2007). The results and implications of this study will be further discussed.

# The Relationship between Obesity and Sleep Disorders in Primary School Age Children

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**Background:** Obesity occurs because of an imbalance of energy. Lately, the prevalence of obesity has increased due to changes in lifestyle, including in children. The prevalence of obesity in primary school age children in Jakarta reached 14% in 2013. Obesity can cause a variety of disorders, one of which is sleep disorders. However, sleep disorders in children is often overlooked by parents, even though sleep disorders can cause growth disorders, cardiovascular disorders, impaired cognitive function and behavioral disorders. Therefore, it is necessary to know the relationship between obesity and sleep disorders in children.

**Methods:** This study was conducted in July-September 2015 with a cross-sectional study design on 107 children in Sekolah Dasar Negeri 01 Menteng Jakarta. Children's weight and height were measured and then their parents filled out Brief Infant Sleep Questionnaire (BISQ). The collected data were analyzed using chi-square.

**Analysis:** The prevalence of child obesity in SDN 01 Menteng much higher than in Jakarta (14%). The prevalence of sleep disorders is also higher when compared to other studies. Sleep disorder most often caused by lack of sleep duration at night and influenced by the child's sleep habits and parents' opinions regarding the child's sleep patterns. Statistical analysis showed there is a significant association between obesity and sleep disorders ( $p<0,05$ ).

**Result and Conclusion:** In this study, 20.6% of the subjects were obese and 62.6% of the subjects experienced sleep disorders. There is a significant association between obesity and sleep disorders ( $p=0,037$ ) so that children who are obese tend to experience sleep disorders.

## How to Measure Quality of Breathing in Children?

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**Background:** Determine prevalence of obstructive sleep apnea (OSA) in obese Icelandic adolescents using respiratory polygraphy (PG), and compare PG and polysomnography (PSG) in subgroup. Compare traditional indices with a novel index, Breathing Efficiency (BE). BE is a surrogate measure of respiratory effort calculated from calibrated respiratory plethysmography. BE quantifies respiratory drive and divides it into obstruction and tidal volume. AHI is based on a few breaths, while BE is based on every breath during the night.

**Methods:** Cross-sectional, prospective study including 47 children, randomly selected from a population of obese children referred to the children's hospital. Respiratory events were scored using AHI according to AASM 2012. Medical history of all children was viewed.

**Analysis:** Correlations between clinical markers and respiratory indices were investigated. Interscorer variability scoring the PG study and the variability between PSG and PG was investigated.

**Result and Conclusion:** The study group mean age was  $14.2 \pm 1.8$  and mean BMI-Z was  $3.4 \pm 0.8$ . Prevalence of OSA in the study ranged from 11% to 100%, depending on the diagnosis criteria and selected AHI cutoffs. No correlation was found between traditional indices and clinical markers. Correlation between BE and BMI-Z was 0.37 (p-value: 0.01). The large range of possible diagnosis outcomes using conventional AHI makes OSA an unreliable method of predicting clinical outcomes. AHI focuses on counting respiratory events and ignores the quality of breathing. A non-invasive measure to determine the respiratory effort may be more suitable for children and adolescents. Further validation of the BE is needed.

## **The odd, the obvious and the unexpected : some interesting cases of sleep investigations in children**

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**Background :**Patients referred to the pediatric sleep unit of the Hôpital Universitaire des Enfants Reine Fabiola (HUDERF) can be sent by specialists working either inside or outside the hospital. The population of children who undergo a sleep polysomnography is therefore varied in both their underlying pathology and their age. This work concerns four children who benefited from a sleep study for a suspicion of sleep disordered breathing.

The first one was a healthy 9 months old boy, who presented with failure to thrive. The second child was a healthy 17 years old girl, sent for snoring in a context of obesity. The third child was an otherwise healthy obese 8 years old with a BMI at 42.6, and no particular symptoms of sleep disordered breathing. And the fourth child was a 16 years old autistic boy, who presented with hypertension and snoring.

**Methods:** The children spent one night in the sleep laboratory of HUDERF with a parent. The sleep study for each child involved full polysomnography.

**Analysis:** The recordings were analyzed by the Unit's sleep specialists the day that followed the sleep study. The patients were given the results on that day and treatment was initiated, when applicable.

**Result and conclusion:** All children investigated, apart from the 8 years old obese boy, presented with severe OSAS. Their subsequent visit to the otolaryngologist revealed that both the 17 years old girl and the 9 months old boy could benefit from appropriate surgery. The 16 years old autistic boy received CPAP therapy. The 8 years old obese boy suffered from a compensated Pickwickian syndrome, for which the only treatment proposed was dietary.

Snoring, failure to thrive and hypertension in children of all ages are symptoms that need to be investigated regardless of any other underlying pathology. Moreover, treatment options do exist.

## Elevated Urinary Leukotriene E4 in Children with Adenoid Hypertrophy

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**Background:** Cysteinyl leukotrienes, the major mediators of inflammation, may play an important role in pathogenesis of adenoid hypertrophy. Urinary leukotriene E4 (uLTE4) is a non-invasive marker of leukotriene production. This study aimed to compare the adjusted uLTE4 levels for creatinine between children with adenoid hypertrophy and normal controls.

**Methods:** A case-control study was studied. Cases were children who presented with sleep disordered breathing (SDB) and had adenoidal-nasopharyngeal ratios of more than 70% by lateral neck film. Children without history of SDB were recruited as controls. Body measurement were recorded. Spot urine samples of all participants were measured for uLTE4 levels by enzyme immunoassay and creatinine levels. The study was approved by the Ethical committee of Thammasat University.

**Analysis:** The adjusted uLTE4 levels for creatinine were compared between cases and controls with Mann–Whitney U test.

**Result:** The mean age of cases and controls were 7.5 years (SD=2.5 years) and 8.1 years (SD=3.4 years) respectively. The adenoidal-nasopharyngeal ratios in cases were ranged between 71.3% and 93.3%. The weight for height in cases and controls were 122.5% (SD= 36.7%) and 114.2% (SD= 38.5%). The medians of adjusted uLTE4 in cases and controls were 950.1 pg/mg and 335.2 pg/mg respectively ( $p<0.001$ ).

**Conclusion:** Paediatric patients with adenoid hypertrophy had substantially increased adjusted uLTE4 levels for creatinine, compared to children without history of SDB. This finding indicates that cysteinyl leukotrienes participate in the pathogenesis of adenoid hypertrophy.

# A Review: Questionnaires for Screening Pediatric Obstructive Sleep Apnea

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**Background:** Pediatric Obstructive Sleep Apnea (OSA) not only cause sleep disturbances during night, but also can negatively affect children's academic and behavior performance in daytime. Pediatric OSA is an under-diagnosed disorder, which need more awareness from clinicians and parents. The standard diagnosis tool is polysomnography (PSG). Considering the high cost and inaccessible of PSG, other screening tools are in need to detect pediatric OSA.

**Methods:** A literature search for original researches was completed through PubMed and Medline with the key search terms. Articles were included if they met the following criteria: (a) population ranged from 0-18 years old. (b) Validation against standard PSG. (c) Articles were published in English. Case reports, letters, published reviews and personal opinions were excluded.

**Analysis:** 16 articles were selected. 7 questionnaires were described, including OSA-18, Pediatric sleep questionnaire (PSQ), Tucson Children's Assessment of Sleep Apnea Study questionnaire, I'M SLEEPY questionnaire and Pediatric Sleep Survey Instrument (PSSI), OSA-6 and Hong Kong children sleep questionnaire (HK-CSQ). OSA-18 is most widely used, followed by PSQ and OSD-6. The versions of other languages of these three questionnaires have been validated. The sensitivity and specificity of OSA-18 were (24.6%-40%) and (40.9%-73%) in different age group. PSQ had the best sensitivity (72%-88%) and specificity (78%-86%) in reports. The sensitivity and specificity of HK-CSQ were 75.4% and 80.5% in Chinese population. I'M SLEEPY has a high sensitivity (82%) and a modest specificity (50%). PSSI had a sensitivity of 0.94 and a specificity of 0.76 in 5-10 years old children.

**Result and Conclusion:** PSQ can be used as a screening method, while OSA-18 can be used as an indicator of quality of life in pediatric OSA patients. Considering the different characteristic of infant and adolescent, more studies are needed to identify the applicable age range of these questionnaires.

**Key Words:** Questionnaire; pediatric OSA; screening tool.

## **Limitations of the Apnea-hypopnea Index for Assessing the Severity of Obstructive Sleep Apnea in Children**

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**Background:** The apnea-hypopnea index (AHI) is the most widely used measure for assessing the severity of obstructive sleep apnea (OSA) in children. However, it is often not as sensitive to identify OSA in children who have fewer discrete respiratory events where treatment may be indicated.

**Methods:** We reviewed the polysomnography (PSG) reports of children between 2 to 13 years of age performed at the Boston Children's Hospital for diagnosis of OSA between January 2012 and June 2014. We compared the overall clinical severity of OSA reported by the interpreting physician with the total obstructive AHI severity. We identified parameters which influenced the overall clinical OSA severity and proposed a flowchart that may be used to better assess the severity of OSA.

**Results:** Of the 1878 records reviewed, 649 patients were eligible for the analysis. An abnormal obstructive AHI of  $\geq 1.5/\text{hour}$  only identified 62.9% of the patients with clinical symptoms of OSA who were recommended treatment. Patients with a normal AHI were likely to be diagnosed as mild OSA if at least 2 of the following factors were present: obstructive RDI  $\geq 2$ ; respiratory arousal index  $\geq 1.5$ ; snoring on PSG; and ETCO<sub>2</sub>  $> 50 \text{ mmHg}$  for  $> 20\%$  of the time. Patients with a mild AHI category (1.5 to 4.99/hour) were more likely to be called as moderate degree if the nadir O<sub>2</sub> saturation was  $< 92\%$ .

**Conclusions:** In children with a normal or low AHI, other parameters should be taken into consideration before making a final interpretation about the severity of OSA.

## **Combined effects of childhood obesity and obstructive sleep apnoea on cardiovascular parameters.**

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**Background:** Being overweight in childhood is associated with major co-morbidities, including obstructive sleep apnoea (OSA), which affects up to 50% of overweight and obese children, compared to 5% of the general population. Both OSA and obesity are associated with elevated blood pressure. In this study we aimed to examine the separate and combined effects of OSA and obesity on blood pressure (BP) and heart rate (HR) in children.

**Methods:** Children aged 8-18 y were recruited from the Melbourne Children's Sleep Centre. 16 were obese (defined as  $\geq 95^{\text{th}}$  percentile with a BMI z-score  $\geq 1.65$ ) and 22 were normal weight. 23 non-snoring normal weight children were recruited from the community as controls. All children underwent overnight polysomnography.

**Analysis:** Data were compared between the three groups with either One Way ANOVA and Newman Keuls posthoc testing or Kruskal-Wallis One Way ANOVA on Ranks with Dunn's post testing if not normally distributed.

**Result and Conclusion:** BMI z-score was not different between the control and normal weight OSA groups and both groups were lower than the obese OSA group ( $P<0.001$ ). Obstructive apnoea hypopnoea index (OAHI) was not different between the two OSA groups. HR was higher during N3 in the obese OSA group ( $77\pm2$  bpm) compared to the control ( $68\pm3$  bpm,  $P<0.05$ ) group. Awake systolic BP was significantly higher in the obese OSA group ( $123\pm2$  mmHg) compared to both the control ( $116\pm2$  mmHg) and normal weight OSA ( $116\pm2$  mmHg) groups ( $P<0.05$ ). BP in N3 tended to be higher in the obese OSA group ( $P=0.058$ ). This study has provided preliminary evidence that obesity in childhood has an independent effect on the cardiovascular effects of OSA during both wakefulness and sleep. Treatment of OSA is associated with improvements in cardiovascular health, thus routinely screening for OSA in the growing number of obese children will likely have significant benefits.

# **Polysomnographic Findings after Adenotonsillectomy for Obstructive Sleep Apnea in Children: A Meta-Analysis**

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**Background:** To comprehensively review polysomnographic findings after surgery for children with obstructive sleep apnea (OSA)

**Methods:** A comprehensive review for literature of surgical outcomes in OSA children was conducted. Two authors independently searched databases including PubMed, MEDLINE, EMBASE, and Cochrane Review from 1997 to 2014. The keywords used included: sleep apnea, OSA, sleep apnea syndromes, tonsillectomy, adenoidectomy, infant, child, adolescent and Humans.

**Analysis:** Random effects model was applied to determine postoperative sleep parameter changes and the surgical success rate. The quality of studies was assessed using the Newcastle-Ottawa Scale.

**Result and Conclusion:** In total, 51 studies with 3413 subjects were enrolled. After surgery, sleep architecture was altered by a significant decrease in sleep stage 1, and an increase in slow wave sleep and the rapid eye movement stage, and enhanced sleep efficiency. The mean difference between pre- and post-operative was a significant reduction of 12.4 event/hour in apnea-hypopnea index (AHI), along with a reduction of obstructive index, hypopnea index, central index, and arousal index. Mean and minimum oxygen saturation increased significantly after surgery. The overall success rate was 51% for postoperative AHI <1, and 81% for AHI <5. Meta-regression analyses demonstrate that postoperative AHI was positively correlated with AHI and body mass index z score before surgery. Meta-analysis of current literature shows T&A offers prominent improvement in a variety of sleep parameters. However, postoperative residual OSA remained in roughly half of the children, especially those with severe disease and obesity, making additional treatment strategies and/or long-term follow-up highly desirable.

# The prevalence and correlate factors of sleep-disordered breathing in an orthodontic population

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**Background:** It aimed to estimate the prevalence and correlate factors of sleep disordered breath in children with malocclusion.

**Methods:** The patients in the study all came from first visit patients of Stomatology Hospital of Peking University during July 2008 and February 2009. A set of modified questionnaire combined with clinical examination was used to estimate the sleep disordered breathing state of those patients.

**Analysis:** The questionnaire was completed by the parents of the child. A doctor examined the tonsil and recorded it. Lateral cephalogram was also used to give a quantitative analysis of the tonsil and adenoid. 36 volunteers were arranged to do the whole night PSG to validate the questionnaire results.

**Result and Conclusion:** There were 2658 valid questionnaires among 3000 questionnaires, with a questionnaire collected ratio of 88.6%. According to combined judgment, 48 children were found having frequent snoring during sleep and the proportion was 1.8%. From multiple step regression analysis, the frequent snoring was related with male sex, BMI index, sleep situation, other sleep disorders, swelling adenoid, and oral breathing. Based on the background of OSA rate in Chinese children, the disordered breathing in children with malocclusion was not with a significant higher rate. (This study was supported by grants from Capital Research Fund of Science Development (2007 - 3009) and National Science Foundation of China (30872915).)

## **Longitudinal Observation of Obstructive Sleep Apneas in Patients with Prader-Willi Syndrome**

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**Background:** Obstructive sleep apnea is frequently observed in patients with Prader-Willi syndrome (PWS), and there is no consensus on whether to aggressively treat the condition or not. We provide longitudinal polysomnography (PSG) data up to 4 years from PWS patients in order to analyze the longitudinal changes on sleep-disordered breathing.

**Methods:** Sleep PSG was done annually up to three or four years for patients with PWS treated in Taipei Tzu Chi General Hospital. The annual results of BMI, BMI z-score, PSG parameters including respiratory distress index (RDI), central apnea index (CAI), obstructive apnea-hypopnea index (OAHI), and minimal blood oxygen saturation (SpO<sub>2</sub> nadir) were compared.

**Analysis:** Relationships between age, BMI, BMI z-scores and sleep PSG variables were tested using Spearman's correlation. Paired t test was used to compare annual AHI, obstructive AHI and CAI data. Two-sided p values of less than 0.05 were considered to indicate statistical significance.

**Result and Conclusion:** Fourteen patients with molecular-confirmed PWS were recruited. Thirteen of them were treated with growth hormone. During these four years, all participants had obstructive sleep apnea syndrome. Central apnea index tended to improve from 1st to 3rd year follow-up ( $p=0.058$ ). BMI, BMI z-scores, RDI and OAHI had no significant changes during GH therapy up to 4 years. Three patients had great fluctuation in OAHI. Their OAHI may drop more than 10/hour without surgical or CPAP intervention during annual PSG study. In conclusion, obstructive sleep apnea syndrome developed in all patients with Prader-Willi syndrome in our hospital. Some patients improved without surgical or CPAP intervention. Further anatomical effects of upper airway in patients with PWS should be explored.

# **Childhood Asthma Is a Risk Factor for Pediatric Obstructive Sleep Apnea**

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**Background:** Asthma is a risk factor for obstructive sleep apnea (OSA) in adult patients. However, the relationship between pediatric OSA and childhood asthma remains unclear. Here, we conducted a large-scale population-based cohort study for evaluating our hypothesis that childhood asthma is a risk factor for pediatric OSA.

**Methods:** From 2000 to 2007, children with and without asthma who were frequency matched by age, sex, urbanization level, comorbidities, and baseline year were enrolled from the Taiwan National Health Insurance Research Database (NHIRD).

**Analysis:** We compared pediatric OSA risk between asthma and nonasthma cohorts by using multivariable Cox regression analysis.

**Result and Conclusion:** We observed a significant relationship between asthma and OSA. In total, we included 305 094 children with asthma and 305 094 without asthma. The overall incidence rate ratio of OSA was 3.56-fold higher in the asthma cohort than in the nonasthma cohort (566 vs 249 per 1000 person-year). After adjustment for potential risk factors, the adjusted hazard ratio (HR) of OSA was 1.82 [95% confidence interval (CI) = 1.56-2.13]. Regardless of sex, the asthma cohort had a higher OSA risk than the nonasthma cohort did. Patients with asthma having different follow-up durations had an equal OSA risk compared with those without asthma. Patients with asthma, excluding particular comorbidities, had a significantly increased OSA risk. Compared with those without asthma, patients with asthma who had more medical visits per year (particularly >5 visits per year) had a higher subsequent OSA risk (adjusted HR, 10.1, 95% CI = 8.13-12.6). This nationwide retrospective cohort study demonstrated that childhood asthma may increase subsequent pediatric OSA risk.

**Keywords:** asthma, ICD-9-CM code, National Health Insurance Research Database (NHIRD), population-based study, obstructive sleep apnea (OSA).

# **From questionnaire to screening of pediatric sleep disordered breathing in Romania**

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**Background:** Although the first Romanian sleep laboratory for adult patients was opened in 1996, a recent study we performed has shown that 50% of the family doctors and physicians of various pediatric specialties don't have knowledge on the sleep-related breathing disorder (SRBD) in children. It was necessary to develop or adapt an instrument for screening and determining the children at risk for SRBD in our country.

**Methods:** From the literature review we chose the pediatric sleep questionnaire (PSQ) SRBD Scale, developed by the University of Michigan. Using an already existing questionnaire, whose original version is a proven instrument proper for administration to heterogeneous populations from the country of origin, may anticipate high success potential for its adaptation into other languages and countries.

**Analysis:** The process of translation and cross-cultural adaptation into Romanian followed a systematic multistep approach. The Romanian version of the SRBD scale was then used at national level, on a sample of 1272 households, representative for the Romanian population, to determine the percentage of children who are at risk for SRBD.

**Result and Conclusion:** The percentage of Romanian children, aged between 18 months and 18 years, who are at risk for SRBD is 9.6%. The administration of the questionnaire at national level proved the reliability of the scale, and its availability in Romanian language may represent a support for doctors for an early recognition and treatment of SRBD. The knowledge of the real dimension justifies future efforts for an overall advancement of pediatric sleep medicine in our country.

## **Bi-level positive airway support (BPAP) with average volume assured pressure support (AVAPS) in children.**

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Background: Volume-targeted support is known by its proprietary name "average volume assured pressure support (AVAPS®)" on certain Bi-level positive airway pressure (BPAP) machines. A consistent pre-set target volume is delivered by automatically adjusting the pressure support within a pre-determined range. Lower pressure settings are possible with a targeted volume delivery. There have been some case series of adults on AVAPS showing improved sleep quality and gas exchange with equivalent compliance. There are almost no studies of AVAPS in children.

Methods: This is a retrospective case series of paediatric patients with nocturnal hypoventilation. All patients had a diagnostic polysomnogram (PSG), a PSG on conventional BPAP and a PSG on BPAP with the AVAPS feature.

Results: Patient age range: 4 months to 17 years. Medical diagnoses included neuromuscular disorders, cerebral palsy, brainstem tumours, chromosomal abnormalities and congenital central hypoventilation syndrome.

With AVAPS, patients received an appropriate tidal volume with each breath, but with lower pressure settings. The automatically adjusted pressure allowed lower pressures to be given in non-REM sleep and higher pressures to achieve the same tidal volume in REM. With AVAPS, baseline saturations and transcutaneous CO<sub>2</sub> profiles improved. It was well tolerated by the patients and compliance surpassed conventional BPAP. In some patients, tracheostomies would have been required without the AVAPS feature as they failed conventional BPAP therapy.

Conclusion: AVAPS is a potentially useful and safe feature of BPAP machines in paediatric patients including infants, with nocturnal hypoventilation. Lower pressures were required, compliance improved and invasive ventilation was avoided.

## **Comparison of OCST diagnostic capability between adults and children with OSA.**

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**Background:** There have been several researches that evaluate OCST devices for diagnosing adult patients with OSA, however, few have been done for children.

**Methods:** OCST and PSG were measured in 686 adults [age  $47.9 \pm 14.0$  (18-88), BMI  $25.7 \pm 5.7$  (14.2-51.8kg/m<sup>2</sup>), AHI  $31.9 \pm 28.2$  (0-147.5/h), prevalence rate 84.8%] and 119 children [age  $7.0 \pm 2.6$  (4-12), AHI  $12.8 \pm 17.6$  (0-94.6/h), prevalence rate 90.6%].

**Analysis:** Sensitivity (Se), specificity(Sp), positive/ negative likelihood ratio (PLR/NLR), and positive/ negative predictive value (PPV/ NPV) with several cut off values of 3% ODI measured with OCST were analyzed for each AHI measured with PSG.

**Result and Conclusion:** AUC of PSG-AHI  $\geq 5/h$  for adults and children were 0.88, and 0.67, respectively. For definitive diagnosis of AHI  $\geq 5/h$  for adults, Sp, PLR, and PPV with cut off vale of OCST-ODI 15/h were 99%, 46.2, and 99.6%, respectively. On the contrary, those with cut off vale of OCST-ODI 25/h were 98.1%, 8.28, 90.9%, respectively, for children. For exclusive diagnosis of AHI  $< 5/h$  (screening) for adults, Se, NLR, and NPV with cut off vale of OCST-ODI 5/h were 84.1%, 0.21, and 45.9%, respectively. On the contrary, those with cut off vale of OCST-ODI 10/h were 45.3%, 0.67, and 55.1%, respectively, for children. Those for AHI  $< 1/h$  were much worse than those for AHI  $< 5/h$ .

In conclusion, first, we should not decide surgical indication for children only with OCST, because there were more than 9% normal children in the OCST positive group. Second, we should not exclude adults and children who may have OSA only with OCST, because there were more than 44% patients with OSA in the OCST negative group. Thirdly, we may be able to use OCST for definitive diagnosis only for adults.

# **Polysomnography for the diagnosis of children with sleep related problem: experience of one children's hospital in Taiwan**

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**Background:** Polysomnography (PSG) is an accepted standard method to assess sleep disordered breathing (SDB) in children. We report the experience of one children's hospital in Taiwan.

**Methods:** We retrospectively collected and reviewed the medical records of children (< 18 years old) undergoing PSG due to sleep-related problem from April to November 2015.

**Result and Conclusion:** A total of eighty-five patients (55 males and 30 females) undergoing PSG were collected. The apnea& hypopnea index (AHI) of these 85 patients was as follows: the AHI was 0-5 in 60 patients, AHI was 5.0-10 in 14 patients; and AHI was over 10 in 11 patients.

The final diagnoses in male patients is that: other sleep-related breathing disorder(1.81%), obstructive(58.18%), central(0%) ; limb movement sleep disorder(30.90%), snoring(36.36%), sleep seizure(1.81%), sleep terrors (5.45%), insomnias(3.63%), parasomnias(5.45%), narcolepsy(1.81%), hypersomnias(3.63%).

The final diagnoses in female patients is that: other sleep-related breathing disorder(6.66%), obstructive(53.33%), central(6.66%), limb movement sleep disorder(20%), snore(36.66%), sleep seizure (6.66%), sleep terrors(3.33%), insomnias(6.66%), parasomnias(3.33%).

The management of these 85 patients is that: operation with adenoidectomy and tonsillectomy in 6 patients (7.05%), continuous positive airway pressure (CPAP) in 1 patient (1.17%), and medical treatment or observation in 69patients (81.17%).

PSG may help detect significant sleep related problems and application of the PSG results is useful for treatment decisions in children. In our experience, most of the children with sleep related problem can be managed with medical treatment and observation, only 7% of them required surgery.

## Titrating continuous positive airway pressure

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**Background:** Standard practice for continuous positive airway pressure(CPAP) treatment in obstructive sleep apnea (OSA) requires pressure titration during attended hospital polysomnography. Besides, the optimal CPAP pressure has been calculated by a published equation. The aim of this study was to compare CPAP titration performed by standard full polysomnography, auto-adjusted CPAP device, or with a predicted formula.

**Methods and Results:** We prospectively analyzed 10 consecutive patients who were diagnosed as severe OSA and referred for CPAP titration. They underwent pressure titration with a standard manual method, an auto-adjusted device and a predicted formula. The final CPAP pressure was significantly lower in the predicted ( $8.0 \pm 1.0 \text{ cmH}_2\text{O}$ ), than in standard ( $10.0 \pm 1.0 \text{ cmH}_2\text{O}$ ) and auto-adjusted ( $10.0 \pm 2.0 \text{ cmH}_2\text{O}$ ) methods.

**Conclusions:** Auto-adjusted CPAP titration is an alternative to standard CPAP titration. The predicted equation, however, tends to underestimate CPAP level for Asian patients.

# **Outcomes of Neurocognitive Function after Adenotonsillectomy in Pediatric Obstructive Sleep Apnea: A Prospective Longitudinal Study**

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**Background:** Obstructive sleep apnea (OSA) affects children in many aspects. This study aims to evaluate the impact on neurocognitive function in OSA children after intervention with adenotonsillectomy (A+T).

**Methods:** In this prospective study, 80 individuals with pediatric OSA and 41 healthy participants matched for age, gender and body mass index (BMI) were enrolled. Children with snoring symptoms and apnea-hypopnea index (AHI)>1 documented with polysomnography (PSG) are categorized in the OSA group; and healthy children in control group. Half of children in OSA group underwent A+T for intervention, others remain untreated. All Participants are documented with OSA-18, overnight PSG, neurocognitive function tests including Wisconsin Card Sorting Test (WCST) and Continuous Performance Test (CPT) and questionnaires at entry and 3 month, 6 month and one year periods of postoperative follow up.

**Analysis:** Analyses were performed with SPSS version 18 package. The data are shown as means±standard deviation. All the reported p-values are two-tailed with statistical significance set at <0.05.

**Result and Conclusion:** 121 non-obese children (aged 3-12 years; F: M = 39: 82, mean age=  $7.11\pm2.45$ y; body mass index [BMI] = $17.12\pm3.44$  kg/m<sup>2</sup>) were enrolled. 39 participants with OSA underwent A+T between January 2013 and September 2015. The mean follow-up period was  $8.31\pm5.26$  months. Initially, the OSA group not only had high AHI, but also had poor performance in the domain of inattention and impulsivity in CPT and overall performance in WCST. After A+T, their sleep quality and neurocognitive function improved and return to normal in average of 6 month follow up. The mean postoperative AHI at 6 month significantly reduced from  $12.95\pm14.02$  to  $1.80\pm1.92$  ( $P =0.001$ ). In CPT, the mean postoperative clinical confidence index also reduced from  $49.93\pm16.90$  to  $44.13\pm14.33$  ( $P =0.002$ ).

In conclusion, the A+T surgery not only improves the sleep quality in OSA children, but also reverses their neurocognitive function.

# **Comparison Of Night Polysomnogram Findings In Children With Attention-deficit/hyperactivity Disorder With And Without Sleep Complaints**

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**Background:** Our previous research using questionnaires revealed that 11.3% of Korean children with attention-deficit/hyperactive disorder (ADHD) symptoms have habitual snoring whereas only 5.88% of normal children have it. The aim of this study is to evaluate the objective sleep quality in children with ADHD depending on the presence of sleep complaints.

**Methods:** Children with ADHD who completed the sleep questionnaire were grouped as those with sleep complaints and those without sleep complaints. Each group of 19 age-, sex- and BMI matched children underwent a night PSG. Sleep structure, respiratory disturbance index (RDI), apnea-hypopnea index (AHI), periodic limb movement index (PLMI), oxygen saturation and end-tidal CO<sub>2</sub> were analyzed.

**Analysis:** Total 38 children (mean age 7.5±1.0yrs, 32 male) performed a night PSG. There was no difference in sleep latency, REM sleep latency, sleep efficiency, arousal index and sleep architecture between groups except for the percentage of N2 sleep, which was higher in children with sleep complaints. PLMI was significantly higher in children with sleep complaints (0.25±0.95/h vs. 2.5±4.5/h, p=0.020). AHI and RDI were similar between two groups (AHI, 0.9 ±0.7/h vs. 1.2±0.8/h; RDI, 3.0±2.1/h vs. 3.2±1.8/h). Oxygen saturation and ETCO<sub>2</sub> did not reveal a difference.

**Result and Conclusion:** Our study showed that children with ADHD have sleep-disordered breathing despite the lack of sleep complaints. Evaluation of their sleep should include not only sleep questionnaire but also night PSG.

## **Assessing the efficacy of management of Sleep Disordered Breathing in Syndromic Children**

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**Background:** Obstructive Sleep Apnea (OSA) is a common medical problem in adults that is becoming increasingly recognized in children. It occurs in the pediatric age group, from newborns to teens. In syndromic children, the prevalence of OSA can be from 50 to 100%, having a significant effect on their Quality-of-Life. As they are a challenging population for management, it is essential to evaluate them thoroughly before planning appropriate intervention. Our aim is to assess the efficacy of Adenotonsillectomy (T&A) and Continuous Positive Airway Pressure (CPAP) in syndromic children [Down syndrome (DS) and Mucopolysaccharidoses (MPS)] with Obstructive Sleep Apnea (OSA).

**Methods:** It is a prospective, randomized, cohort comparative study, 124 syndromic children (DS and MPS) aged between 6 and 12 years were recruited from a private MPS support group and the Down Syndrome Society, Chennai. A standard assessment was performed on all children who entered the study including a full overnight Polysomnogram (PSG), Epworth Sleepiness Scale-Children (ESS-C) and Quality-of-Life (QOL) tool OSA-18.

**Analysis:** The children with positive PSG who consented for the study ( $n = 80$ ) were randomly distributed to two groups, T&A group & CPAP group. The children were followed up with repeat PSG, clinical evaluation, ESS-C and Quality-of-Life (QOL) tool OSA-18 for a period of 1 year.

**Results and Conclusion:** Both the groups, T&A group and CPAP group, showed statistically significant ( $p < 0.05$ ) improvement in Apnea-Hypoapnea Index (AHI), ESS-C, QOL from the intervention. In our study, T&A showed equal outcome compared to CPAP. The contrasting feature between the two groups was that CPAP use gave immediate sustained improvement while T&A gave gradual progressive improvement of symptoms over a period of 1 year. On average, T&A gives equal outcomes as CPAP and it can be suggested as a first-line treatment in this group of syndromic children.

## **Assessing the efficacy & safety of coblationadenotonsillectomy as compared to dissection method in Children with OSAS**

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**Background:** Adenotonsillectomy is one of the most common surgical procedures throughout the world for children in otolaryngology. One of the current indications for adenotonsillectomy is adenotonsillar hypertrophy causing Obstructive Sleep Apnoea (OSA). The choice of surgical tools and technique affects the outcome and morbidity due to adenotonsillectomy. Our aim is to assess the efficacy & safety of coblationadenotonsillectomy as compared to dissection method. To evaluate the morbidity & to study complications associated with each procedure.

**Methods:** This prospective and comparative study of dissection and coblation method of adenotonsillectomy was conducted in our institute, Madras ENT Research Foundation, Chennai over a period of 6 months. 50 cases of children with OSA age group between 5 and 12 years were randomly selected for each group and studied.

**Analysis:** Duration of surgical procedure, blood loss, post operative pain, post operative reactionary and secondary bleeding was noted and compared.

**Results and Conclusion:** Operative time was more in dissection method compared to coblation technique. Blunt dissection tonsillectomy was associated with greater blood loss than coblation tonsillectomy. Post operative pain was more in dissection method and it was less in coblation technique. Post operative bleeding in both the techniques were found to be minimal. We conclude that the use of coblation for adenotonsillectomy may have several advantages over standard methods for the treatment of children with Obstructive Sleep Apnoea. It is highly efficacious, practical and safe with less morbidity and less complications.

## **Maternal Emotions during Prenatal and Postnatal Period Affect Preschoolers' Sleep Outcomes: A Retrospective Study**

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**Background:** Maternal emotional status (e.g., depression) during and after pregnancy have been associated with young children's sleep problems. Few studies have examined this relationship for different trimesters of pregnancy. We aimed to investigate whether the mother's happiness status during three trimesters of pregnancy and whether their perceived depression of prenatal and postnatal were associated with preschooler's sleep problems.

**Methods:** Participants were 876 preschool children (457 boys) with a mean age of 5.57 (0.40) years. When children entered their last year of preschool, we asked mothers to recall their emotions during prenatal and postnatal period and rate their children's sleep behaviors during the past year. Mothers' emotional statuses, including happiness for each of the three trimesters, were rated by a self-designed set of questions with a 5-point scale for happiness and a 3-point scale for depression. Sleep problems were assessed using the Chinese version of the Child Behavior Checklist (CBCL).

**Analysis:** General linear models were performed to examine the adjusted associations between childhood sleep problems and maternal emotional status.

**Result and Conclusion:** After controlling for confounders, mothers who were unhappy during pregnancy were associated with children's sleep problems ( $P < 0.05$ ). The degree of unhappiness in the mother during pregnancy was associated with sleep problems across the three trimesters, with the third trimester having the worst sleep problems. Postnatal perceived depression were also significantly related to children's sleep problems ( $P < 0.05$ ). Our findings suggest that maternal emotions during the prenatal and postnatal periods are associated with preschoolers' overall sleep problems. Measures promoting maternal emotional status may help alleviate sleep problems in early childhood.

# **Development of the Japanese Sleep Questionnaire for Junior High School Students (JSQ-JH) and its factor structure in a community sample**

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**Background:** Although sleep health is especially important for physical/mental development in children and youth, sleep problems have been revealed to be quite common among the Japanese youth through current research. For the appropriate assessment and treatment, there is an urgent need to develop an adequate screening tool that is suitable for the Japanese cultural background. The authors' group has developed a series of sleep screening tool, such as the Japanese Sleep Questionnaire (JSQ) for preschoolers (JSQ-P; Shimizu et al., 2010) and elementary school children (JSQ-ES; Kuwada et al., 2015), which have already been standardized. We now developed the junior high school version of the JSQ (JSQ-JH), which was designed specifically for rating sleep-related problems/symptoms, sleep habits, and life styles at this age.

**Methods:** A set of 3,084 junior high school students and their parents from 18 sites in Japan completed the JSQ-JH. The questionnaire consists of self- and parent-report questionnaires for assessing sleep habits and sleep-related problems such as hypersomnia, circadian rhythm disorder, obstructive sleep apnea (OSA), parasomnias, restless legs syndrome, and others.

**Analysis:** Basic statistics were calculated. Structural equation modeling was applied to analyze the factor structure of each self- and parent-report scale for sleep problems/symptoms.

**Results and Conclusion:** In the Japanese community sample, JSQ-JH for parents and children consisted of 3 (Daytime Behavior/Mood, OSA, and Parasomnias) and 6 (Circadian Rhythm Problems, Tardiness/Absence, Morning Difficulties, Daytime Difficulties, Insomnia/Nightmare, and Restless Legs Syndrome) subscales, respectively. Based on these results, the standardization of the JSQ-JH will be conducted.

## The duration of sleep spindles are correlated with core symptoms in autism spectrum disorder children

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**Background:**Sleep spindles have been reported to play a crucial role in multiple neuronal functions such as learning, cognition and sensory gating. We have found out the frequent sleep spindles with longer duration in children with autism spectrum disorder (ASD), the disorder of the neural connectivity. The aim of this study is to see whether the parameters for sleep spindles correlate with clinical features of ASD.

ADOS scores: the measure of observational assessment for ASD.

**Methods:**Twenty-five children with ASD (mean age 5.8 y; 4 female, 21 male) assessed with Autism Diagnostic Observation Schedule-Generic (ADOS-G) and intellectual quotient or developmental quotient (IQ/DQ) were subject to the study. The parameters for sleep spindles were evaluated using nap EEG study by ten-twenty electrode montage. Spindle index (number/hour), duration of sleep spindles (msec/spindles), and spindle mean amplitude ( $\mu$ V) were calculated from C3 and C4 electrodes using EEG component analysis software (Noru Pro Ltd. Tokyo). Correlations between EEG measures and ADOS-G score and IQ/DQ were tested using Spearman's rank correlation coefficient (SPSS statistics; IBM Japan).

**Result and Conclusion:**There was no correlations between the spindle index and any of ADOS-G scores and IQ/DQ, but there were significantly positive correlations between the duration of sleep spindles at C3 and ADOS-G score pertaining to reciprocalsocial interaction ( $r=0.413$ ,  $p=0.040$ ), stereotyped behaviors and restricted interests ( $r=0.417$ ,  $p=0.043$ ). The duration of sleep spindles at C3 and C4 was also correlated with IQ/DQ. These lines of evidence suggested that the neural circuits responsible for the genesis of sleep spindles may be associated with the neural basis of ASD.

# ***Effects of Ambient Temperature Change on EEG, Sleep Quality and Autonomic Functions in Healthy Subjects: the Mechanism and Representable Indices for Human Comfort during sleep***

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**Background:** Thermal environment affect the sleep quality; however, there lacks the measurements for assessment of thermal environment during sleep. The thermal comfort during sleep still needs other objective parameters. Furthermore, it is also important to provide suitable environmental temperature for different sleep stages. Therefore, we want to investigate the influences of different environmental temperature on sleep-related physiological signals.

**Methods:** This study is divided into three parts. Firstly, to measure the changes of autonomic nerves system (ANS) functions, electroencephalogram (EEG), electrocardiogram (EKG), and subjective feelings among different temperature during awake. Secondly, to explore the effects of different temperature on objective sleep quality. Finally, to explore the relationships between those parameters mentioned above.

**Analysis:** The EEG, EKG data are received by miniature polysomnography, made by K&Y lab, and using FFT to analyze the ANS function and brain activity.

**Result and Conclusion:** As regard to EEG, the beta activity in 24 °C is significant lower than that in 22 °C. The alpha activity in 26 °C is significant lower than 22 °C. As regard to ANS, RR variability in 22, 24 °C is significant higher than in 28 °C, also significant higher in 24 than in 26 °C. The total power in 26, 28 °C is significant lower than in 22 °C. The temperature feeling scale score showed significant differences between each temperature, and the fatigue scale increases with elevated temperature. There is positive correlation between temperature and fatigue level ( $r= 0.552$ ). Thermal comfort level and emotional feeling level showed negative correlation between alpha activity and alpha power % ( $r=-0.616$ ,  $r=-0.519$ ), and thermal comfort level showed positive correlation between delta power % ( $r=0.456$ ). The fatigue level showed negative correlation with beta activity ( $r=-0.389$ ). According to the relationship between brain activity and subject questionnaire, we may build up the assessment of sleep comfort by using EEG.

# **Individualized management of sleep disorders in two Slovenian patients with Smith Magenis syndrome.**

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**Background:** Smith Magenis syndrome (SMS) is a complex developmental disorder with characteristically disturbed sleep patterns.

**Methods:** In a 7-year old girl and a 3-year boy a 17p11.2 deletion was confirmed by FISH analysis and aCGH. They both presented with significant sleep disturbances that were documented from the history, sleep logs and actigraphically. In the girl melatonin production was analysed by RIA of its main metabolite 6-sulfatoxymelatonin (aMT6s). In both patients treatment with melatonin and  $\beta_1$ -adrenergic antagonist metoprolol was introduced.

**Results:** Both patients presented with frequent nocturnal awakenings and decreased sleep time with early morning awakenings. During daytime they both experienced significant EDS with behavioural problems in terms of restlessness, hyperactivity, poor concentration and auto-aggressiveness in the girl. Younger patient had two naps, one in the middle of the morning and one in the late afternoon. In a female patient a reversal of the melatonin rhythm was documented. After behavioural intervention both patients were treated with 1 mg of fast release melatonin in the evening. Melatonin treatment shortened sleep latency and normalised melatonin rhythm. It prolonged night time sleep in a girl for only about an hour, while the boy started to sleep through the night. He omitted morning nap, replacing it with 1-2 hour sleep period in the middle of the day. After adding  $\beta_1$ -adrenergic antagonist metoprolol in the morning EDS and daytime behaviour improved dramatically in both patients. Final introduction of the slow release melatonin in a girl prolonged her night time sleep.

**Conclusion:** Sleep disturbances are important feature of SMS that influence behaviour of the patient and have a great impact on the quality of life of the whole family. They can be successfully treated with a combination of exogenous melatonin and selective  $\beta_1$ -adrenergic antagonist, however the treatment regime should be carefully designed for each patient.

## ***Biological Measurements of Stressful Events***

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**Background:** Sleep deprivation is reported to hinder almost all our cognitive functions including how we perceive and how we react to the stressors in our personal and professional life. While scales and questionnaire are popular to assess stress levels, it has the obvious disadvantage of subjectivity such as raters' bias. Therefore, physiological responses such as pupil dilation, heart rate, muscle contraction, and etc are very desirable candidates for objective measurements. In this study, we test the sensitivity and reliability of three physiological measurements on 6 commonly experienced life events after individuals continuously wake up for 3 hours and for 24 hours.

**Methods:** We measured observers' pupil dilation, heart rates and muscle contraction while displaying six modern stressful events in short movies. All episodes were played first backwards (B) before the normal play in forwards (F). The backwards condition served a baseline to ensure the differences across conditions were not due to low level perceptual differences (e.g. colour, contrast, volume, and etc).

**Analysis:** The biological measurements were extracted from the recorders and the time series are analyzed with Matlab. A two factor within-subject ANOVA was administered with one factor as backward and forward conditions and the other as an individual's arousal response ratio between two sleep conditions (3 and 24 hours).

**Result and Conclusion:** Among all the measurements, heart rates were the most robust readings across all conditions that reliably reflected detectable differences between backward and forward conditions. Pupil dilation was easily saturated at the high intense stimuli and less sensitive at long-awake condition. Our result suggests that biological measurements are potential good candidates for stress related studies in sleep medicine, and one should make the choice based on stimuli properties and participants' sleep states.

## **Eight Years Sleep Education During Elementary School Prevents School Non-Attendance In Junior High School Years.**

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**Background:** Chronic school non-attendance students commonly show the circadian rhythm sleep disorder, especially DSPS and shortage of energy supply with feeling of continuous exhaustion. The condition is main background of difficulty of everyday life and forced to withdraw from school social life. Beginning of the condition is continuous long term sleep deprivation because of habitual night shifted daily life, including TV game, mobile phone, sport club activity, and homework. It resulted in accumulation of sleep deprivation which suddenly induced 10 hours more hypersomnia and prevent normal school social life. Simultaneously, autonomic and brain function is disrupted to pieces. The condition is quite similar to "jet lag" but rather severe, continuous and intractable. Therefore, we claim that the commitment for prevention is important.

**Methods:** Sleep education (min-iku) has been performed at target elementary school in Fukui Japan, since April 2007. Whole grade students were participated in this program with informed consent. Sleep education program consisted with 1) implementation of the "daily life rhythm survey of children" by writing sleep table of 14 days by themselves, 2) sleep table was evaluated in four stages (A ~ D: A:NP~ D: required immediate correction of daily life rhythm), 3) interview (by MD and teacher) to children and parents with rating D, 4) lecture on "the importance of daily life rhythm including sleep-wake" to the parents and to also the children using 50min classwork. And the min-iku gradually spread to local society.

**Results and Conclusion:** Incidence of school non-attendance decreased year-by-year. Finally, no student with school non-attendance was present in 2012. On the other hand, incidence of school non-attendance could not be suppressed completely yet in another trial which intervention was limited to 4<sup>th</sup> – 6<sup>th</sup> grade. Continuous sleep education and lifestyle teaching through whole elementary school grade are essential for preventing school non-attendance.

## **REDUCING BEDTIME TANTRUMS: THE BOSS OF MY SLEEP BOOK IN A TODDLER WITH TRAUMA**

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**Background:** Bedtime resistance in toddlers is one of the most frequent presenting complaints in primary care paediatrics. Although most behaviourally based interventions are efficacious, they usually need a trained professional to implement the system are often cry intensive. Use of an internet based system could be efficacious. The online version of The Boss of My Sleep Book (BomS), previously successful in changing bedtime resistance in toddlers but without excessive crying, was evaluated in a three year old boy with a history of trauma and fear of sleeping alone.

**Methods:** A foster parent of a three year old child independently utilised the online version ([www.snoozeforkids.com.au](http://www.snoozeforkids.com.au)) of the BomS, and retrospectively completed a before (7 day) and after (2 day) sleep diary, family history and evaluation in January 2015. Success in choosing and undertaking a bedtime routine, and for waiting until the parent returns was rewarded with prizes, a certificate and the title of “Boss of my Sleep”.

**Analysis:** Intra subject pre post differences in subjective sleep variables (sleep onset latency, total sleep time, wake after sleep onset, sleep refreshment) were undertaken with T-tests accompanied by qualitative evaluations.

**Result and Conclusion:** All sleep variables differed significantly (all  $p=<0.05$ ) immediately post treatment and were sustained 6 months after with positive qualitative feedback. The BomS system enabled even this child with significant fear and trauma, to sleep independently without excessive crying, suggesting an expansion of its utility from typically developing to special needs children. The online version makes this accessible to toddlers worldwide.

# **Influence of parental socioeconomic status on sleep duration of Korean adolescents**

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## **Background**

Sufficient sleep is an important factor affecting physical and mental health. The sleep condition can be affected by social status or socio-cultural background. The purpose of this study was to reveal the relationship of sleep duration in Korean adolescents with socioeconomic status(SES).

## **Methods**

1608 Korean adolescents aged 12 to 18 years were included in this study. Trained interviewers conducted face to face interviews with a structured questionnaire. Participants completed 4 parts of questionnaire composed of a Health Interview Survey, a Health Behavior Survey, a Health Examination Survey including anthropometric measures, biochemical and clinical profiles, and a Nutrition Survey.

## **Result**

Among subjects, the number of females were 860. The subjects' average age was  $15.6 \pm 0.05$  years, and average sleep duration was  $7.04 \pm 0.05$  hours. There was a significant difference between sleep duration and in terms of age, stress, and household income quartiles. Specifically, the higher the age, the shorter was the sleep duration. Similarly, the higher the stress, the shorter was the sleeping duration. Males exhibited a significantly shorter sleep duration based on age as compared to females. Examination of the correlation to SES revealed a strong and direct relationship between sleep duration and family income. There was no difference based on the status of basic livelihood security program or health insurance type.

## **Conclusion**

This study showed the sleep duration of Korean adolescents is inversely proportional to household income and stress. Consequently, there is a need to take deeper interest in adolescents' sleep environment and invest more efforts in improving.

# The impacts of pre-sleep emotion arousal on brain activation and subsequent sleep: preliminary data of an fMRI study

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**Background:** Emotional arousal has been shown to interfere with sleep via the increase of cognitive process. However, the understanding of the neural mechanism between emotion and sleep is limited. The purpose of current study is to investigate the impact of pre-sleep negative emotion on subsequent sleep through the analyses of spontaneous brain activity and functional connectivity using simultaneous EEG/fMRI recordings.

**Methods:** Five young healthy good sleepers (3 women, 2 men; mean age: 23.6 years) participated in the study. They underwent a stressful cognitive task to elicit negative emotion in a MR scanner. Subsequently, they were instructed to try to fall asleep for an hour with simultaneous recordings. We applied a resting state fMRI both before and after stress tasks, as well as after one hour of sleep.

**Analysis:** Low-frequency fluctuation (ALFF) method was used to measure spontaneous brain activity. Functional connectivity between prefrontal cortex and amygdala was also analyzed.

**Result and Conclusion:** Mann-Whitney tests showed that, compared to the pre-task resting state, ALFF in the right amygdala ( $p = 0.043$ ) was higher and connectivities between amygdala and the prefrontal cortex ( $p = 0.043$ ) were lower in the task phase. In the task phase, Spearman's correlations showed that ALFF in bilateral amygdala correlated significantly with the percentage of stage 1 sleep (left:  $\rho = .894$ ,  $p = 0.041$ ; right:  $\rho = .928$ ,  $p = 0.023$ ). During the post-task resting state, there were significant negative correlation between the left amygdala ALFF values and connectivities between amygdala and the prefrontal cortex ( $\rho = -.923$ ,  $p = 0.026$ ). The preliminary results showed that pre-sleep arousal may increase the percentage of light sleep. The anticorrelation between the amygdala activity and the connectivity of amygdala-frontal network may represent an emotion regulation process before sleep. This study might increase the understanding of the neural mechanisms that mediate the effects of emotion on sleep.

## **Behavioral Evaluation by CBCL in Children with Obstructive Sleep Apnea Before and After Treatment**

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**Background and Objective:** Obstructive Sleep Apnea (OSA) may affect daily cognitive function in children. The aims of this study were 1) to examine whether adenotonsillectomy (AT) for treating OSA improved children's behavior and 2) to elucidate the factors that predict post-AT behavioral improvement in children by using polysomnography and the Child Behavior Checklist (CBCL)/4-18 Japanese Edition. This was a short-time retrospective study.

**Methods:** Total 151 children (111 boys and 40 girls; 4-14 years) were recruited from the Pediatric Sleep Clinic at Osaka University Hospital or Ota Memorial Sleep Center between September 2007 and June 2014. All the patients had a chief complaint of chronic snoring and/or apnea during sleep and underwent AT. To clarify behavioral changes due to AT, CBCL scores before and after AT were recorded. CBCL T-scores were compared 1) before and after AT of all participants, 2) those with mild OSA (apnea hypopnea index [AHI] or oxygen desaturation index 3% [ODI3%] < 5) and 3) those with severe OSA (AHI or ODI3% ≥ 15), and 4) those with and without developmental disorders (DD) by a paired-t-test. We also conducted a multiple linear regression analysis of T-scores to detect the predicting factors for behavioral improvement by AT.

**Results:** The mean age of the participants was 6 years 1 month ± 1 year 10 months. After AT, all the T-scores in CBCL were significantly improved ( $p < 0.01$ ). Behavioral improvement was also seen in children with DD. Regarding sex difference, girls showed significantly greater behavior improvement than boys. The improvement by AT in total, internalizing and externalizing scores weren't different between severe and mild OSA.

**Conclusions:** Behavioral problems are likely to be improved after AT in children with OSA, even if the OSA is mild or accompanied by a DD.

( 288/300 words )

## Sustained Attention and Sleep Duration in Children: An Observational Study

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**Background:** Sleep deprivation is common when there are competing events coming up—especially for children and adolescents. This may lead to a detrimental effect on sustained attention, which is an important factor in learning. This study aimed at investigating the association between sleep duration and sustained attention in children and adolescents.

**Methods:** A total of 180 subjects aged 6-18 years (mean=13.80, SD=3.50) were recruited to complete a 7-day sleep diary and undergo the Conners' Continuous Performance Test II subsequently.

**Analysis:** Pearson's Correlation and multiple regression analysis were performed.

**Results:** Commission rate was found to be negatively associated with average sleep duration of in the prior weekdays ( $r=-0.152$ ,  $p=0.042$ ) and the sleep duration of the night prior to testing ( $r=-0.165$ ,  $p=0.027$ ) while hit reaction time was positively correlated with average sleep duration in prior 7 days ( $r=0.188$ ,  $p=0.012$ ) and the sleep duration of the night prior to testing ( $r=0.163$ ,  $p=0.029$ ). These indicated that longer sleep duration was associated with decreased impulsivity. Furthermore, standard error of reaction time by block was also found to be negatively correlated with average sleep duration in the past 7 days prior to testing ( $r=-0.175$ ,  $p=0.019$ ). Multiple regression analysis showed that average sleep duration [ $\beta=-0.167$ ,  $t(178)=-2.201$ ,  $p<0.05$ ] was significantly associated with the change in standard error of reaction time by block even after adjusted for age, gender and body size, suggesting that a longer sleep was independently associated with a higher vigilance.

**Conclusion:** Longer sleep duration of children and adolescents was associated with better sustained attention and reduced impulsivity.

## **Unplanned tubing removal accident and sleep disturbance**

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**Background:** Unplanned tubing removal accidents are the most common adverse event in hospitals, resulting in physical, psychological and financial consequences. It also cause burden to nurse and on call physicians. A practice development project was identified to review risk factors contributing to unplanned tubing removal accident in general ward. .

**Methods:** The study was conducted in a 500-bed teaching hospital at southern Taiwan. Patient data was collected and reviewed from the hospital's standardized patient safety incidents reporting system from January 2015 to December 2015. Associated characteristics, across the departments of internal and surgery, were analyzed. Descriptive statistics and statistical tests: chi were used.

**Analysis:** In one year, there were 194 events of unplanned tubing removal accident. The results revealed that the patient who intended to remove tube caused most unplanned tube displaced or dislodged accident (72% vs.38%). Among the intended group, 34 events (24%) happened while sleeping, 90% of patient claimed of vivid dreaming. Using antipsychotic drug or sleeping pill did not increase incident happening rate. Most of the incidences happened in night shift (74%) but no specific ( $p=0.2$ ). The prevalence in medical and surgical department is equal ( $n=101$  vs.  $n=93$ ,  $p=0.6$ ).

**Result and Conclusion:** Although unplanned tubing removal accident happened mainly at night shift, it does not relate to drug or sleep disturbance.

# **Effect of sleep deprivation on emotional reactivity**

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**Background:**Sleep deprivation (SD) negatively affects various cognitive performances, but sleep loss has been found to have mixed results on the subjective evaluation of emotional stimuli. It is generally assumed that any potentially confounding effects of temporal context are controlled by using a random presentation sequence; however, studies show that temporal-context effects were might revealed in random presentation sequence. In order to evaluate the effect of SD, emotional stimuli selected from the International Affective Picture System (IAPS) and controlled the preceding emotional stimulus.

**Methods:**Thirty-five participants were randomly assigned to the normal sleep(n=19) or sleep deprivation group, and rated their valence and arousal responses to pleasant, neutral and unpleasant pictures during the day following normal sleep(7-9 hrs/day) or one night total sleep deprivation. Participants were asked to judge their emotional reactions while viewing pictures by means of the Self-Assessment Manikin. To create an emotional context, a pleasant, neutral and unpleasant picture was preceded by three types of pictures, i.e., pleasant, neutral and unpleasant pictures, resulting in nine pairings.

**Analysis:**Repeated-measures ANOVA was used to examine the effect of valence and arousal ratings on the picture in the sleep deprivation and normal sleep groups.

**Result and Conclusion:**The results indicated that whatever emotional context, SD subjects perceived the unpleasant pictures more negatively and pleasant picture more positively compared to non-deprived subjects. On the contrary, no significant effect of SD was observed on the evaluation of neutral stimuli. Our findings suggest that sleep is involved in regulating emotional evaluation. Sleep deprivation could impact reactivity to emotional stimuli through automated attentional and self-regulatory processes.

# **Sleep problems predict mood disturbance and risky behaviors among adolescents with ADHD**

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**Background:** Sleep alterations are common in youth with attention-deficit/hyperactivity disorder (ADHD). In addition, adolescents with ADHD are at a higher risk for mood disorders and risky behaviors. Therefore, this study aimed to investigate the possible predictive role of sleep problems among adolescents with ADHD for their subsequent mood disturbance and risky behaviors.

**Methods:** In the first year, adolescents (mean age 16.0) from a Taiwanese senior high school ( $N = 1,947$ ) completed the Adult ADHD Self-report Scale (ASRS) and Pittsburgh Sleep Quality Inventory (PSQI). In the second year, Beck's Depression Inventory, Beck's Anxiety Inventory, Mood Disorder Questionnaire and a set of questions about risky behaviors were applied for the measurement of their emotional symptoms and experience of risk taking.

**Analysis:** The subjects were classified into ADHD with sleep problems group (ASRS subscale  $\geq 17$ , PSQI  $\geq 5$ ), ADHD only group (ASRS subscale  $\geq 17$ , PSQI  $< 5$ ) and control group (ASRS subscale  $< 17$ ). One-way analyses of variance were used to assess differences among the three groups in emotional symptoms one year later. Univariate logistic regression analyses were conducted to explore whether risky behaviors could be predicted by sleep problems.

**Result and Conclusion:** Adolescents with ADHD and sleep problems exhibited more severe emotional symptoms ( $p < 0.001$ ) and significant odds ratio for risky behaviors ( $p < 0.05$ ) compared to those with ADHD only and controls in the next year. Our results suggested that sleep problems among adolescents with ADHD are indicative of a greater risk for development of mood disorders and contribute to higher propensity for risky behaviors.

# **Are There Bi-directional Relationships between Sleep Problems and Depression in Youth?**

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**Background:** We conducted a longitudinal study to investigate bi-directional relationships between different dimensions of sleep problems and depression in youth. Possible confounders (neuroticism, personality and stress) and mediators (3C usage) are also examined.

**Methods:** We enrolled 1,628 students of age 9-13 years in Taiwan. Depression and sleep problems were assessed at baseline and one-year follow-up by the Center for Epidemiologic Studies Depression Scale, and Pittsburgh Sleep Quality Index. Perceive stress scale and Junior Eysenck Personality Questionnaire were used to assess stress and neuroticism. Information on 3C usage was also collected.

**Analysis:** Multiple logistic regression models were used for association testing between depression and sleep problems after adjusted for region, gender, grade and potential confounders.

**Result and Conclusion:** There were 17% and 31% of students reported to have depression and insomnia, respectively. Most sleep problems at baseline, except sleep duration and sleep efficiency, were significantly associated with new onset of depression at follow-up ( $OR=2.05-3.52$ ). After adjusted for neuroticism, only daytime dysfunction was significantly associated with depression. On the other hand, most of the sleep dimensions remain significant after adjusted for stress. The reverse associations from depression to sleep dimensions were found ( $OR=1.67-3.92$ ). After adjusted for neuroticism, only sleep quality remains significant, whereas no sleep dimension remains significant after adjusted for stress. Moreover, 3C usage mediated the relationship between depression and sleep problems. In conclusion, sleep problems and depression have reciprocal effects to each other, while stress is a confounder for the association between depression and sleep problems.

# EVALUATING EFFECT OF SLEEP PROBLEMS ON SUICIDALITY IN YOUTH: IS EMOTION REGULATION A MODERATOR?

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**Background:** Sleep problems are salient indicators of many psychiatric issues. Previous studies reported associations between sleep problems (e.g., insomnia, nightmares, etc.) and suicidality, while some factors may moderate this relationship. The current study examined effects of sleep problems on suicidal behaviors, and evaluated potential moderating effect through emotion regulation in youth.

**Methods:** We enrolled 1899 students of age 8-16 in Taiwan. All participants completed the Pittsburgh Sleep Quality Index (PSQI), the Inventory of Adolescent Resilience (IAR), and three suicidality questions (ideation, plan, and attempt). Emotional regulation was assessed by IAR.

**Analysis:** Multivariate logistic regressions were applied for association testing while adjusted for grade.

**Result and Conclusion:** There were 342 (18.0%), 99 (5.2%), and 86 (4.5%) students reported to have suicidal ideation, plan, and attempt, respectively. Sleep disturbance, nightmares, daytime dysfunction, overall sleep quality and PSQI total score significantly predicted all suicidal behaviors. The moderating effect of emotion regulation was found in the relationship between sleep disturbance and suicidal attempt ( $OR=1.17, p=.047$ ), and between overall sleep quality and suicidal attempt ( $OR=1.11, p=.023$ ).

Our results suggest that sleep problems predict all suicidal behaviors in youth. Emotion regulation further moderates this association, especially for sleep disturbance and overall sleep quality. Although the mechanisms behind sleep problems and suicidal risk are yet clear, designing strategies to improve sleep quality is recommended for the prevention of suicidal behaviors in children and adolescents.

# Pediatric Sleep Apnea and Risk of Depressive disorders: A nationwide 15-year follow-up cohort study

**Running title:** pediatric sleep apnea and depressive disorder

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**Contributor's Statement:**

Chun-Hung Chang conceptualized and designed the study, drafted the initial manuscript, and approved the final submitted manuscript.

Shaw-Ji Chen, and Chieh-Yu Liu conducted the initial analysis, reviewed and revised the manuscript, and approved the final submitted manuscript.

Chieh-Yu Liu coordinatedand supervised data collection, critically reviewed the manuscript, and approved the final submitted manuscript.

## **Abstract**

**Background & Aims:** Previous studies have shown a trend in the development of mood disorders following a diagnosis of sleep apnea. However, the long-term relationship between sleep apnea and subsequent depressive disorders among children (<18 year-old) remains unclear.

**Methods:** Using a nationwide database, the Taiwan National Health Insurance Research Database, children with sleep apnea and age-, sex-, and index-year matched control children who did not have sleep apnea were enrolled between 1996 and 2013. Patients with a prior diagnosis of depressive disorders before enrollment were excluded. The 2 cohorts were observed until December 31, 2013. The primary endpoint was occurrence of newly diagnosed depressive disorders.

**Results:** A total of 510 sleep apnea children and 5,100 control children were enrolled. The cumulative incidence of depressive disorders in the sleep apnea group was higher than that of the comparison group (5.7% vs 4.2%;  $p<0.001$ ) during a mean follow-up period of 14.74 years. The Kaplan-Meier analysis revealed a predisposition of children with sleep apnea to develop depressive disorders (log-rank test,  $p<.001$ ). After multivariate adjustment, the adjusted hazard ratio (aHR) for subsequent depressive disorders among the sleep apnea children was 2.701 (95% confidence interval, 1.129 to 6.461;  $p<.001$ ). Moreover, boys with sleep apnea have higher risk than those without sleep apnea (aHR, 3.632; 95% CI, 1.192-11.063).

**Conclusions:** Our study indicated a subsequent risk of depressive disorders in children with sleep apnea, and the risk increased for those with male gender. Psychological evaluation and support are two critical issues in these sleep apneachildren.

Keywords: pediatric sleep apnea and depressive disorder.

# **Relationship between Sleep Pattern and Internet Addiction / Overuse in Adolescents**

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**Background:** Addiction to the internet among adolescents becomes a serious problem, and may cause school refusal and mental health problems. Students who spend more time using game and internet might have less sleeping time and feel higher levels of tiredness. The aim of this study was to examine the association of Internet addiction with sleep and mental state in adolescents.

**Methods:** All junior high school students at a local city of Japan (n=853, male/female: 425/428) were involved and screened for Internet addiction, sleep habits, sleep problems and behavioral/emotional problems using the self-reported version of Young's Internet Addiction Test (IAT), the Child and Adolescent Sleep Checklist (CASC) and the Strengths and Difficulties Questionnaires (SDQ).

**Analysis:** Addicted, Possibly-addicted and non-addicted groups were determined according to the cut-off values of IAT. Sleep and behavioral parameters were compared among the three groups with nonparametric multiple comparison.

**Result and Conclusion:** Based on the total IAT score, 2.0% and 21.7% of adolescents were classified as Addicted and Possibly-addicted, respectively. Total sleep duration were significantly shorter, and the bed time and the rise time on weekends were significantly delayed in Addicted group. The total scores of sleep problems measured by CASC were significantly higher in Addicted group. The total score of SDQ was significantly higher in Addicted group ( $20.3 \pm 5.7$ ) and in Possibly-addicted group ( $13.6 \pm 5.1$ ) than in Non-addicted group ( $9.8 \pm 4.9$ ). Internet addiction is strongly associated with sleep disturbances and also mental states. Poor psychiatric condition was observed not only in Addicted group but also in Possibly-addicted group. Internet addiction/overuse should be considered in examining adolescent lifestyle and mental states.

# **Sleep Pattern in Newly Diagnosed & Medication Treated Attention Deficit Hyperactive Disorder Children**

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**Background:** There is high incidence of sleep disorders in children with Attention Deficit Hyperactivity Disorder (ADHD) which impact on their quality of life and exacerbation of ADHD symptoms. The medication that is used for ADHD in Taiwan, Methylphenidate, is known to have a side effect of insomnia and sleep disturbance. We would like to know how the medication changed the children's daytime activity amount and the night time sleep pattern.

**Methods:** The actigraphy is an objective method for recording motor activity and sleep parameters that has been used in many studies. Thirty Patients diagnosed as ADHD were requested to wear actigraphy 24 hours a day for one week before the implementation of any kind of medication treatment. One or two more weeks of actigraphic measurements were followed from the time they started the medication and reach the clinical responsiveness (decreased of ADHD symptoms for more than 30% on SNAP-IV rating scale).

**Analysis:** The post-treatment and baseline actigraphic items will be compared by the day and night time differences. The primary outcome measures were "sleep duration" and daytime "activity mean". The secondary outcome measures were "sleep onset latency", "sleep efficiency" and "wake after sleep onset".

**Result and Conclusion:** We hypothesize that the medication will decrease the daytime activity mean and the sleep duration. There will be prolonged sleep onset latency but better sleep efficiency and less wake after sleep onset. The result and conclusion will be presented when we finished all the thirty subjects.

# **Validation of the French version of the Severity Hierarchy Score (SHS) for Paediatric Sleep Apnoea**

X. L. Nguyêñ, P. Lévy, N. Beydon, D. Gozal, B. Fleury

## **ABSTRACT**

**Background** Paediatric obstructive sleep apnoea syndrome (OSAS) is a highly prevalent condition which predisposes to impaired cognitive performance and adverse cardiovascular events. The reference examination is full-night polysomnography (PSG), but limited access to PSG leads to massive under-diagnosis of this condition. The use of a validated and simple diagnostic tool to predict OSAS could prioritise night sleep recordings in children at high risk of OSAS and help in clinical decision making, particularly regarding adenotonsillectomy.

**Objective** The aim of this prospective study was to assess and validate the performance of the French version of the Severity Hierarchy Score (SHS) in paediatric OSAS. This score consists of a discriminative subset of six respiratory items and has already been validated in English for screening OSAS in the general paediatric population.

**Methods** A total of 96 children (mean age  $7.1 \pm 2.4$  years; BMI Z-score:  $-0.03 \pm 1.50$ ) who were referred to two academic sleep centres in France for the diagnosis of sleep disordered-breathing were recruited. The SHS questionnaire was filled in by the parents prior to PSG. Sensitivity and specificity of the SHS for detecting at least moderate OSAS, defined by an apnoea hypopnoea index (AHI) of  $\geq 5$ , were assessed and a ROC analysis was performed.

**Results** A value of  $>2.75$  for the SHS had an 82% sensitivity, 81% specificity and 92% negative predictive value for detecting an AHI of  $\geq 5$  in our sample.

**Conclusion** The French version of the SHS is suitable for the screening for OSAS in children.

**Keywords:** diagnosis; French; paediatric obstructive sleep apnoea syndrome; polysomnography; severity hierarchy score; screening; validation

# **Intravenous immunoglobulin therapy in two children with type 1 narcolepsy administered early after disease onset**

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**Background:** Type 1 narcolepsy is a disabling sleep disorder mainly characterized by excessive daytime sleepiness (EDS) and cataplexy, an emotion-triggered sudden loss of muscle tone. Patients have a selective degeneration of hypocretin-producing neurons with growing evidence for an underlying immune-mediated process. Only few case studies have been reported with intravenous immunoglobulin therapy (IVIg) suggesting efficacy of IVIg when administered early after disease onset. This study aimed to evaluate IVIg in two children with early onset typical type 1 narcolepsy based on clinical and polysomnographic follow-up.

**Methods:** Patients were treated with IVIg at a dose of 1g/kg/dose, administered over 1 day and IVIg cycles were repeated three times at 4-weeks intervals. Overnight PSGs and MSLTs were performed two weeks after each IVIg cycle to objectively evaluate treatment efficacy.

**Analysis:** Clinical scores and PSG/MSLT evaluations were analyzed for statistical significance using a Bayesian paradigm.

**Results:** IVIg cycles were initiated in a ten-year-old girl and in a seven-year-old boy within two and four months after cataplexy onset. The girl reported less frequent but more regular and prolonged daytime naps, whereas cataplectic attacks continued to worsen. The boy had clinically ameliorated EDS, a better sleep hygiene and frequency of cataplectic attacks diminished after initial fluctuations. PSG data showed no amelioration of overnight sleep, sleep latencies at MSLT or SOREM. Both children had transient headache, one had a flu-like syndrome and the other child a viral gastro-enteritis.

**Conclusion:**

Outcome of type 1 narcolepsy using IVIg therapy did not show significant amelioration.

## **Cardiorespiratory Monitoring by An On-Mattress Piezoelectric Sensor during High Frequency Oscillatory Ventilation**

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**Background:** High frequency oscillatory ventilation (HFOV) will be selected in the case of failure of conventional ventilation in the preterm infant with severe infant respiratory distress syndrome, pulmonary interstitial emphysema or pulmonary hypoplasia. Cardiorespiratory monitoring during HFOV is important to find the improvement in ventilation. However, ECG electrodes for the monitoring often cause skin damage and dislodging in premature infants and therefore, we assessed the feasibility of a noninvasive on-mattress piezoelectric (OMP) sensor for cardiorespiratory monitoring during HFOV.

**Methods:** We performed cardiorespiratory monitoring using the OMP sensor in 15 neonates in the Akita University Hospital in accordance with a protocol approved by Human Ethics Committee of Akita University School of Medicine. The OMP sensor was fixed with an adhesive plaster to a towel-covered foam mattress in an incubator and covered with a folded face towel, on which the neonate was placed. Adhesive ECG electrodes and other tubes and sensors were also attached as usual in the NICU. ECG and the OMP-sensor signals were recorded for 3 to 10 d and stored into a computer.

**Analysis:** Among the 15 neonates, ECG and the OMP-sensor signals of 2 infants who underwent HFOV were analyzed by using signal-analysis software Clampex (Molecular Devices) and Excel.

**Result and Conclusion:** In one infant, the OMP-sensor signal that was contaminated largely with HFOV noise showed a fluctuation synchronized with heartbeats during the beginning of HFOV treatment but not at the end. High-pass filtering was partly effective for heart sound observation. Spontaneous respiratory activity, which appeared during HFOV treatment, was easily observable in the both infants. Although the number of data analyzed is insufficient and we need further study, the results demonstrated that the OMP sensor may be a helpful tool to monitor respiratory activity and the response of preterm infants to HFOV.

# **Use of iButton Sensors to Measure Children's Skin Temperature During Sleep in the Home Setting**

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**Background:** Distal and proximal skin temperature (Tsk) and distal-proximal gradient (DPG) are important in sleep onset and maintenance. ThermochroniButton sensors (Maxim/Dallas Semiconductor Corp, USA) have been used to measure Tsk during sleep in adults and infants in clinical settings. The purpose of this study was to ascertain the practical application and reliability of iButtons to measure children's Tsk during sleep in their home settings.

**Methods:** Distal and proximal Tsk were measured in 23 children (aged 6-12 y) over four consecutive nights. iButtons were set to record at 5 minute intervals. They were secured with surgical tape on distal (L and R feet) and proximal (L and R thigh and subclavicular areas, abdomen) sites one hour before bedtime. No restrictions were made to usual routines and activities. Diaries and Actigraphs were used to record activities prior to bedtime, and sleep onset and maintenance.

**Analysis:** Mean skin temperatures were analysed hourly before bedtime (BB), at reported bedtime (RB), at sleep onset (SO) and for 9 hours after bedtime (AB). They were also analysed in 10-minute intervals before RB and SO and for 180 minutes AB. Reliability of data between nights was calculated using two-way analysis of variance, typical error (TE), intra-class correlation (ICC) and coefficient of variation (CV).

**Result and Conclusion:** All children tolerated the use of iButtons. Distal Tsk was lower, had greater rate of change than proximal Tsk at BB, RB, SO and for two hours AB. Reliability was good ( $CV < 0.9\%$ ) for distal and proximal Tsk measures during sleep. However, such measures were less reliable ( $CV > 1.4\%$ ) at reported bedtime, possibly due to inconsistencies in pre-sleep activity and environmental factors. Such findings have implications in the reliable assessment of children's skin temperature in home settings.

# The Correlations of Different Domains of Work Stress to Emotion and Insomnia

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**Background:** Previous studies have shown that work stress is associated with both emotion and sleep disturbances. However, work stress is a multi-dimensional construct with different domains. Previous studies paid less attention to the influences of different domains of work stress on emotion and insomnia. Hence, this study aims to explore the influence of different domains of work stress on emotion and insomnia.

**Methods:** Participants included 300 full-time employees from technology industry companies in Taiwan. They completed a set of questionnaires including, Job Stress Questionnaire (JSQ), Insomnia Severity Inventory (ISI), Beck Anxiety Inventory (BAI) and Beck Depression Inventory-II (BDI-II). A total of 284 valid questionnaires (157 males and 127 females from age 23 to 54) were obtained.

**Analysis:** Pearson's correlations were conducted to analyze the associations in work stress, emotion and sleep.

**Result:** Pearson's correlations show that total score of JSQ correlates significantly with BAI ( $r=0.387, p<0.01$ ), BDI ( $r=0.335, p<0.01$ ) and ISI ( $r=0.285, p<0.01$ ). In term of four domains of work stress, work-role-confusion shows medium correlation with BDI ( $r=0.363, p<0.01$ ) and BAI ( $r=0.315, p<0.01$ ) and small correlation with ISI ( $r=0.217, p<0.01$ ); skill-under-usage has medium correlation with BDI ( $r=0.410, p<0.01$ ) and small correlation with BAI ( $r=0.217, p<0.01$ ) and ISI ( $r=0.168, p<0.01$ ); work-overload shows small correlation with BDI ( $r=0.175, p<0.01$ ), BAI ( $r=0.206, p<0.01$ ) and ISI ( $r=0.198, p<0.01$ ); work-role-conflicts also have small correlation with BDI ( $r=0.180, p<0.01$ ), BAI ( $r=0.171, p<0.01$ ) and ISI ( $r=0.178, p<0.01$ ).

**Conclusion:** In general, work stress correlate with emotion and insomnia. Regarding different domains of work stress, work-overload and work-role-conflicts, which are more related to demands from the job, both showed only small association with both emotion and insomnia. However, skill-under-usage and work-role-confusion have higher correlation with depression, which are more related to unfulfilled self-expectation or self-responsibility, may increase the sense of worthlessness and hopelessness that are essential for depression.

# The Effects of Jacobson Muscle Relaxation in a Supportive Group for Patients Suffering from Insomnia

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**Background:** The study aims to explore the effectiveness of Jacobson muscle relaxation in a supportive group.

**Methods:** Eight participants suffered from insomnia for at least three weeks. The supportive group contained six sessions; each session included 15-minitute Jacobson muscle relaxation and 40-minitute group discussion in knowledge and strategies regarding dealing with insomnia. Data were collected through group records and a self-reported satisfaction questionnaire (five-point Likert scale).

**Analysis:** (1) In the cognitive aspect, the participants discovered myths regarding sleep or insomnia, and reconstruct correct knowledge. (2) In the affective aspect, they could feel comfort and relieve negative emotions after experiencing the process of being tensed and relaxed. (3) In the skill aspect, the participants could correctly perform Jacobson muscle relaxation and practice it in the daily life. (4) Their satisfaction level regarding sleep quality was improved from 38% to 56%. They were able to continuously sleep six to eight hours. (5) Their satisfaction level regarding group participation was 96%.

**Result and Conclusion:** Jacobson muscle relaxation in a supportive group is effective to help people suffering from insomnia to learn how to relax, accompany with cognitive therapy in understanding the causes and types of insomnia and analyzing the relationships of daily events and insomnia. The combination interventions help (1) reframe events' meanings, (2) examine life patterns, emotions, and worries after suffering from insomnia, and (3) modify thoughts and behaviors. The interventions are effective in decreasing anxiety induced by insomnia, promoting self-confidence in falling sleep, and experiencing a good sleep. The interventions also enhance the quality of nursing care.

# **Segmental maxillomandibular rotational advancement in obstructive sleep apnea: long-term follow-up**

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**Background:** Maxillo-mandibular advancement (MMA) is a safe and highly effective treatment for obstructive sleep apnea (OSA). MMA is one type of orthognathic surgery planned to maximize the forward movement of the maxillo-mandibular complex (MMC) and expand pharyngeal airway in OSA patients. Therefore, MMA may cause excessive maxillo-mandibular protrusion, especially on patients with thinner facial soft tissue. To prevent unfavorable facial aesthetics after MMA while maintaining the maximal advancement of MMC, the authors perform segmental maxillo-mandibular rotational advancement (SMMRA) as the modification technique of the MMA. SMMRA is combination with (1) Le Fort I osteotomy, (2) maxillary anterior segmental osteotomy (Wassmund procedure) to provide additive advancement of posterior maxilla using extracted premolar space and (3) bilateral sagittal split osteotomy. MMC is undergoing counterclockwise rotation.

**Case report:** A 33 years old male patient suffered from sleep disorder was referred to our hospital. He had body mass index of 23 Kg/m<sup>2</sup> and mandibular retrognathism. Cephalometric X-ray showed mandibular retrusion and narrow pharyngeal airway. Polysomnography (PSG) indicated moderate OSA (AHI = 23 /h; Lowest SaO<sub>2</sub> = 80%). SMMRA combination with trapezoid mortised genioplasty was performed. Postoperative cephalometric X-ray showed that ANB improved 13° to 3°. Pogonion was advanced by 20 mm. Middle and lower pharyngeal airway were increased by 8 mm and 10 mm, respectively. Postoperative PSG indicated drastic improvements (AHI = 1.7 /h; Lowest SaO<sub>2</sub> = 89%). Six-year follow-up will be presented.

**Conclusion:** The patient's sleep condition, occlusion and aesthetic were stable 6 years after SMMRA. However further follow-up and management is recommended.

## ***The role of paradoxical intention to the process of falling asleep among the individuals with sleep-onset insomnia***

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**Background:** This study aims to explore whether the psychological factors affect the autonomic nervous system (ANS) and brain waves activities during the process of falling asleep. We hypothesized that an abnormal ANS function and the lower activities of sleep-related brain waves will be found when patients with primary insomnia (PI) intended to asleep, compared with good sleepers (GS). However, there will be no difference between groups when lying on bed without intention of sleep.

**Methods:** All participants were divided into PI and GS group by sleep quality questionnaires. The polysomnography was performed to measure subjects' sleep structure and physiological activities. An ANS analyzer was also be used to evaluated their ANS function under three experimental conditions as "lie with open eyes" (OA), "lie with closed eyes but stay awake" (CA), and "lie and try to fall asleep" (CS).

**Analysis:** To test the difference under three conditions within groups and between groups, Wilcoxon sign-rank test and Mann-Whitney U test were used.

**Results and Conclusion:** A significantly decreased normalized low frequency percentages (LF%) of heart rate variability (HRV) was found in GS during CS, but no difference in PI. However, PI showed a decreased LF% during CA that measured by the ANS analyzer. Furthermore, we found that theta power of EEGs, LF and R-R interval of HRV were significantly differences during CS from OA in GS; however, there's a trend indicated a decreased delta power of EEGs among PI. Moreover, no differences between OA and CA in GS, but a trend that indicated a decreased LF% was observed in PI.

Our results showed that PI failed to down regulate sympathetic activity while CS, but showed a decreased sympathetic modulation during CA. These findings suggest that LF% changing may be a useful marker to evaluate psychological effort of intention to sleep among PI.

# **Effects of classical music on cerebral rhythms, and autonomic nervous system in self-reported insomniacs**

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**Background:** It has been known that listening to music can alter the autonomic activities, cerebral rhythms and other physiological activities. This study aims to explore the effects of classical music on cardiovascular functions in self-reported insomniacs.

**Methods:** A group of the individuals with insomnia, and a control group of good sleepers (GS) were both recruited into the study. The baseline recordings were taken for five minutes and followed by six tracks in randomized order: (I) “Va pensiero”; (II) “Libiam Nei Lieti Calici”; (III) “Goldberg Variations”; (IV) “Surprise”; (V) “Air on the G String”; and (VI) 5-minute white noise. The physiological evaluation during the music listening were recorded by polysomnography, and a finapres for continuous blood pressure evaluation.

**Analysis:** A Friedman two-way repeated measures analysis of variance (ANOVA) was used. If the repeated measures ANOVA detected a significant effect ( $p < .05$ ), then the Wilcoxon signed-rank test and Mann-Whitney U test were employed to assess the changes within each group and the group differences, respectively.

**Result and Conclusion:** We found that a significantly increased in alpha and theta power of EEG, and a reduction in beta activity when GS listen to the track I during the daytime rest. However, there was no significant difference in alpha EEG was found but significant increased beta power and theta power of EEG and a decreased heart rate were both observed. Moreover, a greater beta power of EEG among the insomnia group was found under all conditions compared with control group. Our results demonstrate that insomniacs have greater beta activity during the daytime rest. The efficacy of classic music on the regulation of cardiovascular functions is more effective than on the alternation of brain waves activities when listening to relaxation music among insomniacs. These findings provide the evidence of music therapy for patients with insomnia.

# **Comparison of An Innovative Smartphone-based Sleep Log and Traditional Two Week Sleep Diary**

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**Background:** Information collected in daily sleep diary can provide doctors a more comprehensive picture of patient's recent sleep patterns and make a better arrangement. We wanted to evaluate the smartphone-based sleep log APP and traditional two week sleep diary as a test for screening sleeping problems in the adult male patients.

**Methods:**A total of 10 participants were recruited. All patients completed smartphone-based sleep log APP test and traditional two week sleep diary at the same time for 14 nights. The smartphone has an accelerometer sensor build-in and it could receive a record of body movement overnight. Besides, the smartphone has a build-in microphone sound receiver and it could record significant noises during sleep including, sleep talking, cough and snoring.

**Analysis:**Three sleep specialists, doctor A, B and C, reviewed the smartphone-based sleep log's clinical data and made a first comment. Three sleep specialists reviewed the two week sleep diary and made a second comment. The agreement was defined as the concurrence between the first comments and second comments.

**Result and Conclusion:**Laboratory-based polysomnography is the most commonly used test in the diagnosis of sleep disorder syndrome. Unfortunately, growing interest in this diagnosis has resulted in increased waiting times for polysomnography, as well as a delay in diagnosis and treatment. Three sleep specialists A, B and C were enrolled to read the report of smartphone-based sleep log and two week sleep diary. When compared to the first comments, which was made via a smartphone-based sleep log APP and the second comments, which was made via two week sleep diary, the three sleep specialists obtained diagnostic agreement of 100%, 100% and 100%, respectively. The results of the study showed that the smartphone-based sleep log APP is a reasonable screening tool.

# Sleep Apnea Event Identification Algorithm Using Thoracic-abdominal Motion and Blood Oxygen Saturation

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**Background:** To construct an algorithm that can determine the sleep apnea and hypopnea events by using thoracic (THO) , abdominal (ABD) motion signal and the blood oxygen saturation (SpO<sub>2</sub>) measured by Polysomnography (PSG) .

**Methods:** There are two sections in the proposed algorithm. Section I classifies Apnea and Normal cases and section II classifies Hypopnea and Normal cases. Section I considers the counter-phase of THO and ABD signals while an obstructive sleep apnea (OSA) event occurs. The correlation calculation is performed to detect whether the phase of THO and ABD signals are in-phase or counter-phase. The THO and ABD become weak in-phase vibration signals as a central sleep apnea (CSA) event occurs. Chirp z-transform (CZT) analyzes the frequencies of THO and ABD and a threshold is set to distinguish normal and CSA event. The THO and ABD signals become weaker as a hypopnea event occurs. Thus, Section II uses the low SpO<sub>2</sub> value (3% desaturation) to distinguish the hypopnea from normal. The identification algorithm was applied to 8 sleep apnea syndrome patients.

**Analysis:** There are two methods used in the experiment. Method I only uses THO and ABD signals to identify events in both Section I and Section II. Method II uses THO, ABD in section I and SpO<sub>2</sub> in Section II. The identified events were compared with the events classified by medical experts. The average accuracy of Apnea, Normal and Hypopnea events are 81.1%, 81.1%, and 10.1%, respectively, in Method I, and the average accuracy are 81.1%, 82.5%, 75.5%, respectively, in Method II.

**Result and Conclusion:** Experimental results show that the accuracy of hypopnea detection in method II is much higher than that of method I. This study proves that the inclusion of SpO<sub>2</sub> can significantly improve the detection accuracy of the hypopnea events.

# **Combination of Intranasal Corticosteroid and Oral Montelukast**

## **Therapy for Mild Pediatric OSA**

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**Background:** Pediatric obstructive sleep apnea (OSA) is usually initially treated by adenotonsillectomy. However, children with mild OSA may not be recommended for adenotonsillectomy, frequently exhibit neurocognitive and behavioral morbidity, and may benefit from alternative therapeutic interventions. Anti-inflammatory approaches as a nonsurgical alternative for mild OSA have emerged recently, but their efficacy has not been extensively assessed.

**M ethods:** Twenty-four children with mild OSA were treated with a combination of intranasal corticosteroid and oral montelukast for 8 weeks. All the subjects underwent a full-night PSG before and after the intervention.

**R esults:** Sleep quality was significantly improved after 8 weeks treatment. The AHI and arousal index were changed from  $6.13 \pm 1.38$  to  $2.44 \pm 0.97$  ( $P < 0.05$ ),  $9.76 \pm 1.59$  to  $2.01 \pm 1.14$  ( $P < 0.01$ ) respectively. The nocturnal lowest oxygen saturation and sleep structure were also improved although no statistic significances were found. For all subjects, 20/24(83.33%) showed improvement in PSG study, while 4/24(16.67%) showed either no improvement or worsening of their OSA.

**C onclusions:** A combination of intranasal corticosteroid and oral montelukast as initial treatment of mild OSA appears to provide an effective alternative to adenotonsillectomy. These results support implementation of multicenter randomized trials to more definitively establish the role of anti-inflammatory treatment in pediatric OSA.

## Nocturnal Oxygenation and Sleep Quality in Patient with Chronic Obstructive Pulmonary Disease

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**Background:** COPD has been associated with poor sleep quality found mostly in subjective self-reported studies. Sleep disorders, exercise intolerance both are major complaints in COPD patients. However, little is known about the association between both in COPD. Hypoxemia is a recognized cause of increased mortality in COPD, whether the presence of nocturnal hypoxemia could be predicted from daytime exercise capacity is still unclear. The difference in sleep characteristics and quality between COPD and controls will be objectively evaluated. We will also survey possible daytime pulmonary function and exercise capacity as predictive factor for nocturnal hypoxemia in COPD.

**Methods:** We prospectively enrolled moderate to severe COPD non-OSA patients and normal controls confirmed by spirometry and standard polysomnography from chest outpatient clinic. Besides, subjects were also assessed with diffusion lung capacity (DLCO), 6 minute walk distance (6MWD), COPD Assessment Test (CAT), Modified Medical Research Council dyspnea scale (mMRC) and Epworth Sleepiness Scale (ESS).

**Analysis:** Sleep characteristics between COPD and normal controls were compared. Correlation between quality of sleep and functional exercise capacity were analyzed statistically.

**Result and Conclusion:** Totally 33 COPD non-OSA patients and 12 normal control males were recruited. Shorter total sleep time, lower sleep efficiency and longer sleep onset latency were found in COPD patients than normal controls, also, COPD patient showed increased shallow sleep (stage 1) and more periodic limb movements compared with normal controls. SaO<sub>2</sub> in the end of exercise in 6MWD (End SaO<sub>2</sub>), FEV1/FVC, DLCO and mMRC separately showed significant correlations with mean SaO<sub>2</sub> during sleep. Multiple stepwise regression analysis revealed that End SaO<sub>2</sub> and DLCO both were independent predictors of mean SaO<sub>2</sub> during sleep in COPD. In conclusion, COPD have poorer sleep quality and worse nocturnal oxygenation than controls. SaO<sub>2</sub> in the end of exercise and DLCO both independently predict sleep oxygenation status in COPD.

# **Increased Formyl Peptide Receptor 1 expressions on blood immune cells in patients with obstructive sleep apnea**

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**Background:** Formyl peptide receptors (FPRs) mediate leukocyte responses during inflammation, and encompass three subtypes: FPR1, FPR2 (LAX or LXA4 receptor), and FPR3. FPR1/FPR2 heterodimerization triggers pro-inflammatory responses, while FPR2/FPR2 homodimerization triggers anti-inflammatory responses. The roles of FPRs expressions in chronic intermittent hypoxia-induced endothelial dysfunction and clinical phenotypes of obstructive sleep apnea (OSA) have not yet been determined.

**Methods:** Cell surface FPR1/2 and intracellular FPR3 protein expressions (mean fluorescence intensity) of blood CD14<sup>+</sup>CD209<sup>-</sup>M1 monocyte, CD14<sup>+</sup>CD209<sup>+</sup>M2b monocyte, CD16<sup>+</sup> neutrophil, CD3<sup>+</sup>CD56<sup>+</sup> natural killer (NK) T cell, CD3<sup>+</sup>CD8<sup>+</sup> cytotoxic T cell, and CD3<sup>+</sup>CD4<sup>+</sup> helper T cell were measured by flowcytometry method in 78 adult patients with sleep-disordered breathing (SDB), classified into 4 groups: 14 primary snoring (PA), 22 mild to moderate OSA (MMO), 28 severe OSA (SO), and 14 severe OSA with long-term CPAP treatment (SOC).

**Analysis:** ANOVA test followed by post hoc analysis with Bonferroni test was used for comparing mean values of more than two experimental groups, and Student t test was used for comparing mean values of two independent group.

**Result and Conclusion:** FPR1 expression on neutrophil was increased in MMO, SO, and SOC groups as compared with that in PS group (all p values < 0.05), while FPR2 expression on neutrophil was decreased in SOC group as compared with that in OS group (p<0.01). Subgroup analyses showed that FPR3 expression in helper T cell was increased in SO group versus PS group. SDB patients with gastroesophageal reflux disease had increased FPR1/2 expression on cytotoxic T cell, and increased FPR3 expression in helper T / NK T cell. SDB patients with excessive daytime sleepiness (Epworth Sleepiness Scale >10) had increased FPR1/2 expression on neutrophil, and decreased FPR3 expression in M2 monocyte. In conclusion, FPR1 and 3 may play a pivotal role in mediating disease severity and clinical phenotypes in OSA.

# Evaluating endothelial dysfunction in patients with obstructive sleep apnea with a novel method: Arterial waveforms measured at the wrist

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**Objective:** There have been very few easy-performing procedures measuring endothelial dysfunction, a prelude of cardiovascular diseases. We had developed a novel method, i.e. air pressure sensing system (APSS), detecting endothelial dysfunction. We applied this modality on patients with obstructive sleep apnea (OSA) to detect their endothelial dysfunctions since there is a close correlation of OSA and cardiovascular diseases.

**Methods:** A total 113 (7 female) patients with sleep-disordered breathing participated in this study, and 75 (3 female) of them were patients with severe OSA (apnea-hypopnea index, AHI > 30/h). After an overnight sleep study diagnosing OSA, dilatation index (DI) was obtained by APSS while lying quietly and awake. DI and the variables obtained from sleep study were analyzed.

**Results:** A higher DI represents a better endothelial function. The average DI of severe OSA patients is lower than that of the other patients with sleep-disordered breathing ( $1.14 \pm 0.38$  vs  $1.34 \pm 0.33$ ,  $p = 0.001$ ). Meanwhile, the DI level is inversely correlated with AHI ( $r = -0.387$ ,  $p < 0.001$ ).

**Conclusions:** DI measured by APSS, a novel and easy-performing method detecting endothelial dysfunction, could be easily applied to patients with OSA. The more severity in OSA is associated with a lower DI. It may help patients with OSA to be aware of their endothelial status and then treat their OSA to prevent the occurrence of cardiovascular diseases.

# Multiscale entropic assessment of autonomic dysfunction in patients with obstructive sleep apnea and therapeutic impact of CPAP treatment

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**Objective:** Obstructive sleep apnea (OSA) is an independent risk factor for cardiovascular disease because of autonomic nervous and vascular regulatory dysfunctions.

**Methods:** Totally 147 subjects were divided into four groups according to apnea hypopnea index (AHI) from polysomnography (PSG): Snoring without OSA ( $5 > AHI$ , n=31), mild ( $5 \leq AHI < 15$ , n=31), moderate ( $15 \leq AHI < 30$ , n=41), and severe ( $AHI \geq 30$ , n=44) OSA. Forty-one OSA patients under continuous positive airway pressure (CPAP) treatment were included for comparison. For each subject, two segments of electrocardiographic (ECG) signals (both at stage N2) were used for R-R interval (RRI) analysis, including a 10-minute recording 10 minutes after sleep (i.e., early phase) and another 10-minute segment at three hours (i.e., late phase). Heart rate variability as reflected in changes in RRI between the two segments was assessed with small-scale multiscale entropy index (MEI<sub>SS</sub>, sum of sample entropy from time scale 1-5) and large-scale multiscale entropy index (MEI<sub>LS</sub>, scale 6-10).

**Results:** Increase in MEI<sub>LS</sub> in late phase of sleep was noted in normal snoring and CPAP groups ( $p < 0.01$ ). While moderate OSA group exhibited MEI<sub>SS</sub> drop in the late phase ( $p < 0.02$ ), both MEI<sub>SS</sub> and MEI<sub>LS</sub> decreased in late phase in severe OSA group ( $p < 0.001$ ,  $p < 0.02$ ). However, no differences were noted in mild OSA subjects in both parameters.

**Conclusion:** The results demonstrated significant severity-dependent deterioration in autonomic and vascular regulatory function in patients with OSA as reflected in the reductions in MEI<sub>SS</sub> and MEI<sub>LS</sub>, respectively, and notable improvement after CPAP treatment. MEI obtainable through PSG may indicate not only OSA severity and

physiological status but also therapeutic outcome for OSA patients.

# Melatonin Secretion Abnormalities in Children and Adolescents with Fetal Alcohol Spectrum Disorders

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**Background:** Fetal Alcohol Spectrum Disorders (FASD) is the most common form of toxic prenatal brain damage. FASD is associated with somatic, cognitive and behavioural problems that pose extreme treatment challenges. According to parent/foster parent reports sleep problems affect approximately 85% of children with FASD; however objective data of sleep disturbances in this population is almost completely lacking. Circadian problems and melatonin secretion abnormalities are common in neurodevelopmental disorders in general. Although objective data concerning melatonin secretion in FASD is not available, rodent models have shown that prenatal alcohol exposure damages the suprachiasmatic nucleus and induces a chronic disruption of circadian rhythms. The aim of this study was to detect the features of melatonin secretion in children and adolescents with FASD in order to obtain preliminary, objective data of the biological underpinning of sleep disturbances in this population.

**Methods:** Twenty four children and adolescents with FASD (age  $M = 10.0$ ,  $SD = 3.2$ , range 6-18; 55.6% females) participated in Dim Light Melatonin Onset Tests(DLMO). Partial melatonin phase response curves were recorded.

**Result and Conclusion:** Seventy nine percent of the sample had abnormal melatonin secretion curves. The abnormal melatonin secretion profiles were classified into three main categories: delayed sleep phase syndrome (17%), advanced sleep phase syndrome (8%), or other melatonin abnormality (54%). Abnormal melatonin profiles were common in this sample. Melatonin has been efficacious in managing sleep problems in other neurodevelopmental disorders and could be a promising treatment option for children and adolescents with FASD. The effective treatment of both sleep and circadian problems could optimize the development and everyday functioning of these children and ease the burden of their caregivers.

# **Abstract of Lunch Seminar**

## **Nocturnal hypoventilation in children and its treatment**

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### **Abstract**

Breathing is the resultant of the balance between the load imposed on the respiratory muscles and the capacity of these muscles, which are driven by the bulbar respiratory centers. Hypoventilation, defined by hypercapnia and hypoxemia, occurs when the load imposed on the respiratory muscles is too high with regard to the capacity of the respiratory muscles, or in case of a dysfunction of the bulbar respiratory centers. Diseases that may cause alveolar hypoventilation are either 1) diseases causing an increase in the work of breathing such as upper or lower airway obstruction, cystic fibrosis and viral bronchiolitis, 2) diseases associated with a weakness of the respiratory muscles such as neuromuscular disorders, and more rarely 3) disorders characterised by an abnormal central drive such as the congenital central hypoventilation syndrome (CCHS) or acquired disorders such as brain injury (trauma, infection or tumor) which may depress neural ventilatory drive.

As there is no validated level of nocturnal hypoventilation with regard to end-organ damage in children, the most clinically relevant definition of nocturnal hypoventilation in children is still a matter of debate. Indeed, it is possible that the age of the patient, with regard to windows of increased susceptibility, but also the duration and level of nocturnal hypoventilation may affect the consequent or associated end-organ damage. The underlying disease may also affect the prevalence of nocturnal hypoventilation. Patients with isolated restrictive lung disease will have proportionally higher levels of oxygenation for similar levels of carbon dioxide ( $\text{CO}_2$ ) compared to patients with other lung disease, such as patients with chronic obstructive pulmonary disease. Different definitions of nocturnal hypercapnia and/or hypoventilation are used. The American Academy of Sleep Medicine (AASM) defines alveolar hypoventilation in children as a carbon dioxide pressure ( $\text{PCO}_2$ )  $> 50 \text{ mmHg}$  for at least 25% of total sleep time. This definition is surprisingly less restrictive than for adults, in whom alveolar hypoventilation is defined as an "arterial  $\text{PCO}_2$  (or surrogate)  $> 55 \text{ mmHg}$  for  $\geq 10 \text{ minutes}$  or when there is an increase in  $\text{PCO}_2$  (or surrogate)  $\geq 10 \text{ mmHg}$  (in comparison to an awake supine value) to a value exceeding  $50 \text{ mmHg}$  for  $\geq 10 \text{ minutes}$ . Other authors have used a more restrictive definition of hypercapnia. The lack of consensus on the definition of alveolar hypoventilation may have practical (and deleterious) consequences such as the indication to start home mechanical ventilation in neuromuscular patients.

Noninvasive respiratory support represents the first line treatment of alveolar hypoventilation by restoring the normal respiratory balance. The optimal type of noninvasive respiratory support depends on the pathophysiological underlying mechanism: the aim of noninvasive respiratory support will be to "unload" the respiratory muscles in case of upper airway obstruction, cystic fibrosis and acute viral bronchiolitis, and to "assist" or "replace" the respiratory muscles in neuromuscular disorders. In case of dysfunction of central drive, the patient will need controlled ventilation which will "replace" the respiratory command during sleep. In any case, children with alveolar hypoventilation should be evaluated and followed by pediatric multidisciplinary teams, having an expertise in pediatric sleep and noninvasive ventilation.

## **Introduction of Somnics and Speakers of Today!**

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**Somnics, Inc.**: Founded in 2011 in Hsin-Chu, Taiwan, Somnics, Inc., (or “Somnics”) is a research-based and product-driven medical device company engaging in the development of innovative treatment for sleep-disordered breathing. Somnics has a wholly-owned Germany subsidiary and has been conducting clinical trials and related registrations in Taiwan, China, Germany and United States.

**Tien-Jen Liu, M.D.**: Director of Otorhinolaryngology Head & Neck surgery and director of Ambulatory Management Centre of MacKay Memorial Hospital, Hsinchu Branch; as well as an adjunct assistant professor of the Institute of Management of Technology of National Chiao-Tung University. Dr. Liu has also been a fellow at Stanford University Medical Centre from Oct 2010 to Sep 2011.

**Fang Han, M.D.**: Director and professor of Sleep Centre in the Medical Science Centre of Beijing University; as well as the president of Chinese Sleep Research Society. Dr. Han also serves as an associate editor of Sleep and Breathing and has published over 150 research papers in peer-reviewed journals. Major research interest includes, the respiratory control, the genetic study of narcolepsy and non-invasive ventilation.

## Somnics

### Treatment Outcomes of the iNAP Sleep Therapy System for the OSA Patient with Different Severity in China

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**Background:** The objective of this study was to evaluate the feasibility of the iNAP® Sleep Therapy System (iNAP®) in treating adults with different severity of obstructive sleep apnea (OSA).

**Methods:** An open-label, prospective, non-comparative, single-center feasibility study was designed to evaluate the safety and efficacy of the iNAP® sleep therapy system, a novel tongue and soft palate retaining intraoral device using negative pressure, in adults with different severity of obstructive sleep apnea (OSA) during sleep. The iNAP® sleep therapy system was designed to decrease airway obstruction by pulling the tongue and the soft palate forward by forming negative pressure within the confined space in the oral cavity thereby allowing the patency of the upper airway around pharynx to increase and prevent sleep-disordered breathing for obstructive sleep apnea (OSA) patients. There were three main components in the iNAP® Sleep Therapy System: an iNAP® console, an oral interface (OI02-02) and a saliva container. Clinical Success Defined as Apnea-hypopnea Index (AHI) Reduction of >50% and Treated AHI<20.

**Results:** An feasibility clinical testing has been conducted in Beijing University People's Hospital, China. Seventeen (17) patients were enrolled to this study. Fifteen (15) evaluable patients with an average body-mass index (BMI) and age of  $26.7 \pm 3.4 \text{ kg/m}^2$  and  $47.5 \pm 13.4$  years, respectively, were analyzed. The apnea-hypopnea index (AHI) ranged from 12.1 to 70 in these patients before treatment intervention. The median of AHI was 34.55 (12.1, 43.4) before treatment which was decreased to 25.35 (1.6, 32.55) when treated by the iNAP®. The median change of AHI was -41.23% (-89.94, -4.74). The treatment success rate to iNAP® in general was 40% with a median decrease in the oxygen desaturation index (ODI) by -21.71% (-96.71, 14.67). Both of the AHI and ODI were statistically reduced by the treatment of the iNAP®.

**Conclusion:** The iNAP® Sleep Therapy System could reach clinical success from mild, moderate to severe OSA patients. More excitingly, this excellent treatment success rate was reached in a much better comfort way. No SAE occurred during the entire study period. This investigational product seems to be well tolerated and highly effective for an alternative treatment for adults with obstructive sleep apnea.

## Somnics

### Imaging and Treatment Outcomes of the iNAP Sleep Therapy System in the Feasibility Study in Taiwan

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**Background:** The objective of this study was to evaluate the feasibility of the iNAP<sup>®</sup> Sleep Therapy System (iNAP<sup>®</sup>) in treating adults with snoring or obstructive sleep apnea (OSA) and to collect patients' safety information when treated by the iNAP<sup>®</sup>.

**Methods:** An open-label, prospective, non-comparative, single-center feasibility study was designed to evaluate the safety and efficacy of the iNAP<sup>®</sup> sleep therapy system, a novel tongue and soft palate retaining intraoral device using negative pressure, in adults with snoring or obstructive sleep apnea (OSA) during sleep. The iNAP<sup>®</sup> sleep therapy system was designed to decrease airway obstruction by pulling the tongue and the soft palate forward by forming negative pressure within the confined space in the oral cavity thereby allowing the patency of the upper airway around pharynx to increase and prevent sleep-disordered breathing for snoring and obstructive sleep apnea (OSA) patients. There were three main components in the iNAP<sup>®</sup> Sleep Therapy System: an iNAP<sup>®</sup> console, an oral interface (OI02-02) and a saliva container.

**Results:** Somnics, Inc. has conducted feasibility clinical testing in MMH (MacKay Memorial Hospital, Hsinchu City, Taiwan). Thirty-seven (37) evaluable patients with an average body-mass index (BMI) and age of  $26.41 \pm 4.16 \text{ kg/m}^2$  and  $41.15 \pm 11.71$  years, respectively, were analyzed. The apnea-hypopnea index (AHI) ranged from 1.9 to 107.9 in these patients before treatment intervention, and the treatment success rate to iNAP<sup>®</sup> in general was 32.43% with a median decrease in the AHI by -8.50 (-13.90, -0.40). The median of oxygen desaturation index (ODI) was 28.30 (19.80, 57.60) before treatment which was decreased to 15.50 (7.80, 50.40) when treated by the iNAP<sup>®</sup>. The median change of ODI was -8.30 (-13.30, -0.50). Both of the AHI and ODI were statistically reduced by the treatment of the iNAP<sup>®</sup>. The adverse event rate and types of AEs were similar to the predicate device and there was no serious adverse event occurred during this study.

**Conclusion:** The iNAP<sup>®</sup> Sleep Therapy System treated patients could reach a much higher treatment success rate at 78.57% than the predicate device within the new defining target group (AHI: 15~50 and BMI<28kg/m<sup>2</sup>). More excitingly, this excellent treatment

success rate was reached in a much better comfort way. No SAE occurred during the entire study period. This investigational product seems to be well tolerated and highly effective for an alternative treatment for adults with obstructive sleep apnea.

## **Transcutaneous carbon dioxide recording during sleep**

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### **Abstract**

Monitoring of oxygen and carbon dioxide ( $\text{CO}_2$ ) is of crucial importance during sleep-disordered breathing in order to assess the consequences of respiratory events on gas exchange. Pulse oximetry ( $\text{SpO}_2$ ) is a simple and cheap method that is used routinely for the recording of oxygen levels and the diagnosis of hypoxemia.  $\text{CO}_2$  recording is necessary for the diagnosis of alveolar hypoventilation and can be performed by means of the end-tidal ( $\text{PETCO}_2$ ) or transcutaneous  $\text{CO}_2$  ( $\text{PtcCO}_2$ ). However, the monitoring of  $\text{CO}_2$  is not performed on a routine basis due to the lack of simple, cheap and reliable  $\text{CO}_2$  monitors.

Nocturnal hypercapnia occurs in a large number of children referred for sleep-disordered breathing. Indeed, data reported in 543 healthy children aged 3 to 7 years showed that 2.2% spent more than 50% of total sleep time (TST) at 50 mmHg or greater  $\text{PtcCO}_2$ . In another study, in which the aim was to look for the agreement between  $\text{PETCO}_2$  and  $\text{PtcCO}_2$ , mean  $\text{PtcCO}_2$  was greater than 50 mmHg in 11.9% of the 318 patients who had an apnoea-hypopnoea index (AHI) <5 events/hour. A recent study compared the prevalence of nocturnal hypoventilation according to different definitions; 1) the 2012 definition of the AASM, 2) a 95 percentile of  $\text{PtcCO}_2 > 50$  mmHg ( $\text{PtcCO}_2 > 50[>95\text{p}]\$ ), 3) a percentage of  $\text{PtcCO}_2 > 50$  mmHg >2% of nighttime ( $\text{PtcCO}_2 > 50[>2\%]\$ ), and 4) a  $\text{PtcCO}_2 > 10$  mmHg above waking baseline level ( $\text{PtcCO}_2 > 50[>10\text{mmHg}]\$ ). PSGs from 221 children referred to a tertiary hospital sleep laboratory for the clinical suspicion of obstructive sleep apnoea (72%), neuromuscular diseases (21%) and lung diseases (7%) were analyzed. The prevalence of hypoventilation according to  $\text{PCO}_2 > 50$  [ $>25\%$ ],  $\text{PtcCO}_2 > 50$  [ $>95\text{p}\%$ ],  $\text{PtcCO}_2 > 50$  [ $>2\%\text{}$ ], and  $\text{PtcCO}_2 > 50$  [ $>10\text{mmHg}\text{}$ ] were 16, 27, 31 and 52%, respectively, and did not differ between the three diagnostic groups. Thus, nocturnal hypoventilation occurs in a large number of children referred for sleep-disordered breathing, independently of the underlying disease, especially when more stringent criteria than those of the AASM are used.

As there is no validated level of nocturnal hypoventilation with regard to end-organ damage in children, the most clinically relevant definition of nocturnal hypoventilation in children is still a matter of debate. Indeed, it is possible that the age of the patient, with regard to windows of increased susceptibility, but also the duration and level of nocturnal hypoventilation may affect the consequent or associated end-organ damage.

In conclusion, in the absence of any validated level of nocturnal hypoventilation with regard to end-organ damage in children, a systematic and continuous overnight  $\text{CO}_2$  recording is strongly recommended during sleep study in children, taking in account more restrictive definitions of nocturnal alveolar hypoventilation.

**Transcutaneous carbon dioxide recording during noninvasive ventilation in children**

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**Abstract**

Long term noninvasive ventilation (NIV) involves the delivery of ventilatory assistance through a noninvasive interface, as opposed to invasive ventilation via an endotracheal tube or a tracheostomy. The number of children treated at home with NIV is expanding exponentially around the world despite the lack of validated initiation criteria and proven benefits.

There are no validated guidelines on the monitoring or long term follow up of children with NIV. The timing of the follow up visits depends on the age and the medical condition of the child. A sleep study one month after the initiation, and then every 2 to 6 months, with at least 2 check-ups per year including one full sleep study with the NIV per year seems a minimum. Pulse oximetry ( $\text{SpO}_2$ ) with transcutaneous carbon dioxide ( $\text{PtcCO}_2$ ) recording is recommended at each visit as numerous asymptomatic patients remain hypercapnic during NIV despite a normal overnight  $\text{SpO}_2$  and normal daytime blood gases. This residual hypercapnia can be easily corrected by simple measures such as changing an interface or the ventilator settings.

In conclusion, systematic  $\text{PtcCO}_2$  monitoring is mandatory during the follow up of children treated with long term NIV.

## **Tailored therapies for Sleep-disordered breathing, H. Woehrle**

The most recognized form of sleep-disordered breathing (SDB) is obstructive sleep apnea (OSA) in overweight, middle-aged, male patients. When linked with daytime sleepiness, OSA has been referred to as obstructive sleep apnea syndrome (OSAS) and has been successfully treated with CPAP (continuous positive airway pressure) therapy for more than 35 years. However, recent research shows that overweight, middle-aged males with daytime sleepiness only make up a small proportion of the SDB population. Thus, OSA is much more common than OSAS and is not only a disease of middle-age in overweight males. Although both age and obesity are major drivers of OSA risk, a significant number of patients with OSA are lean and/or female. This means that there are a wide variety of OSA phenotypes.

There are pronounced differences in symptoms between these different OSA phenotypes, e.g. sleepy phenotype, phenotype with disturbed sleep, and an asymptomatic phenotype. Also, there are important differences in the symptoms of OSA between genders.

Recognition of and differentiation between phenotypes is also important in another type of SDB, central sleep apnea (CSA). CSA can often be caused by drugs, heart disease or neurological conditions, but can also suddenly occur in patients with OSA treated with CPAP (known as treatment-emergent CSA, or complex sleep apnea).

Phenotypic differences between SDB patient groups can also be seen on respiratory recordings during sleep. OSA patients might show mostly flow limitation and hypopnea, or a REM-sleep dominance, or classical obstructive apnea. In CSA, recordings also show inter-patient variations in apnea and hypopnea patterns, such as periodic breathing patterns, classical central apnea, or sometimes more ataxic breathing.

Given the differences in physiology and presentation, it is important to discuss the different requirements for positive airway pressure (PAP) therapies in patients with different SDB phenotypes, as well as the possibility of non-PAP therapies. As a result, treatment strategies for SDB patients can be better tailored to suit each individual, thus facilitating improved therapy effectiveness, compliance and outcomes. Important developments in this field of personalizing SDB treatment include specific PAP algorithms for female patients and new patient selection criteria for patients to be treated with adaptive servo-ventilation.

Individualization of the approaches to overnight diagnosis and symptoms assessment, as well as tailored treatments and the ability to predict treatment effects, combine to create a new initiative called precision medicine. The aim of this approach is to treat a person as an individual rather than as part of a group, enabling us to provide them with individualized, personalized and precise care. An important component of this initiative is the active participation of a patient in his or her therapy. This has become possible with the recent introduction of telehealth strategies into respiratory sleep medicine.

## **Latest Development in Surgical Intervention for Obstructive Sleep Apnea Syndrome**

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The construction of an optimal treatment for obstructive sleep apnea syndrome (OSAS) needs to respect evidence and culture. Between them, evidence-based outcome should be the first priority to be concerned. However, individual culture plays a significant role and needs to be fully respected.

The supreme principle of surgical treatment for adult OSAS is not to jeopardize the use of continuous positive airway pressure (CPAP). Additionally, salvage treatment always needs to be premeditated before any surgical intervention.

It is crucial to understand the purpose of the operation for adult OSAS: to cure the disease, to improve the clinical symptoms, to improve survival rate, or to facilitate the sequential treatment such as CPAP or oral appliance. Surgeons need to make it very clear and discuss the treatment process and outcomes to patients to avoid unrealistic expectation.

All patients suggestive of OSAS need comprehensive physical examination, drug-induced sleep endoscopy (DISE), rhinomanometry, image study, and polysomnography to identify disease severity obstruction levels of the upper airway. OSAS patients with pathological obesity, neuromuscular dysfunction, and coronary artery disease require CPAP therapy; Surgeries are not recommended in these patients.

The purpose to cure OSAS may need multi-level surgery from the nose to the larynx.

The procedures involve a functional septomeatoplasty in the nose, palatal procedures involving lateral pharyngeal wall in the palatopharynx, endoscopic glossectomy in the tongue, and supraglottoplasty in the larynx: Transoral robotic surgery (TORS) is particularly helpful in treating obstruction from hypertrophic lingual tonsils. Hypoglossal nerve stimulation for OSAS is on the horizon and attracts a lot of interest. Maxillofacial surgery is another option with evidence to cure OSAS. Bariatric surgery is suggested in pathologically obese OSAS patients. Multi-modality treatment (such as nasal surgery plus CPAP or UPPP plus oral appliance) is tailor-made for individual patients. Otherwise, minimal invasive surgeries (radiofrequency, pillar implant) are usually helpful to improve the clinical symptoms but not the disease entity. We can consider soft tissue surgery, skeletal surgery, and bariatric surgery as local, regional and systemic treatment for OSAS. Further, an integrated treatment needs to include perioperative myofunctional training to improve surgical outcomes in short and long term.

In summary, the surgical treatment for adult OSAS needs to take evidence-based outcome into account, fully understand the purpose of surgery, and tailor made treatment to maximize patients' welfare.



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