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BSS 17TH ANNUAL SCIENTIFIC PROGRAM 2005

FROM GENOTYPE TO PHENOTYPE - WHAT'S SLEEP GOT TO DO WITH IT?

SUNDAY 25th SEPTEMBER

15:00 - 16:30 Marie Curie Research Fellowship Training Session

This session is being run on the Sociology of Sleep: Principles and Practice. It is organised by the Sociology of Sleep group at the University of Surrey. It is open to all BSS conference delegates to attend, although it is not officially part of the BSS program.

For further information please email: R Meadows [r.meadows@surrey.ac.uk]

16:00 Meet the Exhibitors

16:30 *Tea and Registration*

Special Interest Symposium

‘SLEEP AND PSYCHIATRY THROUGH THE AGES’

Chair: Jonathan Bird, Frenchay Hospital, Bristol, UK

17:00 Herbs, Hormones and Hypnotics in Children

Paul Gringras, Guys & St Thomas' Hospital, London, UK

17:30 Sleep Disorders mistaken for Psychiatric Disorders in Adolescents

Greg Stores, Oxford University, Oxford, UK

18:00 Sleep and Psychiatry in Adults

Chris Hawley, Queen Elizabeth II Hospital, Welwyn Garden City, UK

18:30 Sleep in the Elderly

Avi Dhariwal, Birmingham & Solihull Mental Health Trust, Birmingham, UK

19:00 *Close*

19:30 *Symposium Buffet*

This symposium is supported by unconditional educational grants from



GlaxoSmithKline, for which the BSS is grateful

MONDAY 26th SEPTEMBER

08:00 *Registration Desk Open*

09:00 KEYNOTE SPEAKERS

Chair: Melissa Hack, Royal Gwent Hospital, Newport, UK

09:05 An overview and history of sleep gene research
Simon Archer, University of Surrey, Surrey, UK

10:05 Obesity, the metabolic syndrome and OSA
Patrick Levy, Laboratoire EFCR, Grenoble, France

11:00 *Tea / Coffee*

11:30 THE CLOCK GENE AND SLEEP

Chair: Robert Meadows, University of Surrey, Surrey, UK

11:30 Per3 and diurnal preference
Simon Archer, University of Surrey, Surrey, UK

11:50 Clock genes and sleep disorders
Adrian Williams, Guys & St Thomas', London, UK

12:10 Circadian rhythm sleep disorders in relation to mental health
Katherina Wulff, Imperial College Hospital, London, UK

12:35 Sleep regulation beyond genes: sleep deprivation and energy metabolism
Tarja Porkka-Heiskanen, University of Helsinki, Helsinki, Finland

13:00 *Lunch / exhibitors / Actigraphy special interest lunch*

14:00 SYMPOSIA: METABOLIC INTERACTION AND SLEEP APNOEA

Chair: Renata Riha, Royal Infirmary, Edinburgh, UK

14:00 Diabetes in OSAHS
Sophie West, Oxford Centre for Respiratory Medicine, Oxford, UK

14:30 Cytokines and sleep apnoea
Renata Riha, Royal Infirmary, Edinburgh, UK

15:00 OSAHS, obesity and the metabolic syndrome
Speaker to be confirmed,

15:30 *Tea / Coffee*

16:00 Free Communications

Chair: Kevin Morgan, Loughborough University, Loughborough, UK

16:00 Exploring Potential Associations Of C-Reactive Protein (CRP) With Sleep Duration And Sleep-Disordered Breathing

Taheri, D. Austin, L. Lin, T. Young, E. Mignot

16:15 Serum Angiotensin Converting Enzyme (ACE) Is Correlated With Nocturnal Diastolic Blood Pressure In Patients With The Sleep Apnoea Syndrome (SAS).

Lewis KE, Benjamin A, Ebden P, Bartle I, Giffin D

16:30 Cerebral-Blood Flow Velocity In Snoring Children - A Possible Marker For Abnormal Neural Function

Hill CM, Onugha NN, Harrison D, Kirkham FJ, Datta A., McGrigor V, Hogan AM.

16:45 A Randomised Controlled Trial Of Behavioural Intervention For Sleeplessness In Children With Autism Spectrum Disorders

Wiggs L; and Stores G*

17:00 Sleep Problems, Anxiety And Depression In School-Aged Twins

Gregory, A.M., Rijdsdijk, F., Dahl, R.E., Eley, T. C

17:30 AGM

18:30 *Pre-dinner drinks*

19:00 *Gala Dinner*

The Presentation of the 'Young Sleep Researcher Award' will be made during the Gala Dinner

TUESDAY 27th SEPTEMBER

09:00 **IMPACT OF SOCIAL AND ENVIRONMENT ON EARLY INFANT SLEEP AND BEHAVIOUR**

Chair: Luci Wiggs, Oxford Brookes University, Oxford, UK

09:00 Maternal environment, fetal and infant behaviour

Peter Hepper, Queens University, Belfast

09:30 The antenatal and postnatal factors affecting autonomic function during sleep

Paul Johnson, University of Oxford, Oxford, UK

10:00 Infant social sleep

Helen Ball, University of Durham, Durham, UK

10:30 Facilitated poster viewing - AUTHORS MUST BE BY THEIR POSTERS

Facilitators: Melissa Hack, Paul Reading, Kevin Morgan

11:00 *Tea / Coffee*

11:30 KEYNOTE SPEAKER

Chair: Zenobia Zaiwalla, Park Hospital for Children, Oxford, UK

Sleep and Emotion Regulation in Children and Adolescents

Ron Dahl, University of Pittsburgh Medical Centre, USA

12:30 *Lunch / exhibitors*

12.30 Paediatric special interest lunch

Nocturnal Epilepsy

Kelly Dwyer-St.Pier, Great Ormond Street Hospital

Presentation by:

Jennie Shine, Sebastian Diamond Sleep Lab

UK Paediatric Polysomnography Survey Results

Cathy Hill, Southampton General Hospital

14:00 CASE STUDIES

Chair: Paul Reading, Newcastle General Hospital, Newcastle-upon-Tyne, UK

Speakers will give a case study to illustrate an area of sleep medicine

Sophie West, Renata Riha, Patrick Levy, Ron Dahl

15:00 *Tea - Close*

SLEEP DISORDERS MISTAKEN FOR PSYCHIATRIC DISORDERS IN ADOLESCENTS**Greg Stores, University of Oxford**

There are many sleep disorders in which disturbed behaviour is a major manifestation. Especially when this is not fully appreciated, primary psychiatric conditions may be incorrectly diagnosed. This can happen with sleep disorders at all ages from obstructive sleep apnoea in preschool children to REM sleep behaviour disorder occurring mainly in later life.

The present account is concerned with sleep disorders which are particularly associated with adolescence or early adulthood and which are at special risk of being misconstrued as basically psychiatric problems. This essentially clinical review, with case illustrations, will be concerned with the following examples:

Delayed sleep phase disorder

Narcolepsy

Kleine-Levin syndrome

Sleep paralysis with sleep related hallucinations

Nocturnal frontal lobe epilepsy

Surveys of patient series indicate the range of misdiagnoses that have been made with certain sleep disorders, illustrating the need for a greater awareness of sleep disorders and their manifestations on the part of healthcare professionals in general.

Sources:

Stores G Misdiagnosing sleep disorders as primary psychiatric conditions. *Advances in Psychiatric Treatment*, 2003, 9, 69-77

American Academy of Sleep Medicine ICSD-2, International classification of sleep disorders, 2nd ed: Diagnostic and coding manual. American Academy of Sleep Medicine, 2005.

AN OVERVIEW AND HISTORY OF SLEEP GENE RESEARCH**Simon N Archer**

Centre for Chronobiology, Surrey Sleep Research Centre
School of Biomedical & Molecular Sciences
University of Surrey

It is obvious that our behaviour is divided into regular periods of activity and rest during the 24-hour cycle. Also, we are generally aware that our need for sleep accumulates with prolonged periods of wakefulness, especially when these periods transgress into our usual sleep schedules. Therefore, it is not too surprising to learn that this propensity for sleep is driven by an oscillator or homeostat that counts how much sleep we are getting, compared to how much we require. Our perception of external time could be based on monitoring this sleep drive and it is not necessarily obvious that we have an internal body clock that tracks external daylight and synchronises our biology to the 24-hour cycle. In fact, it is now clear that the sleep homeostat and the circadian clock are independent oscillators whose linkage can be separated experimentally.

The linkage between the two oscillators is very important. The underlying molecular mechanisms of the circadian oscillator are well understood and the major genes and proteins involved have been identified in mammals. Animal studies have demonstrated the effects that mutations in the clock genes can have on sleep parameters. This has led to genetic screening of clock genes in humans with sleep and circadian disorders to identify associated polymorphisms. Further molecular studies have, in some cases, discovered how changes in clock proteins affect their function, in an attempt to relate this to the observed phenotypes.

However, less is known about the underlying molecular mechanisms of the sleep oscillator. While it is clear that there are conditions such as apnea and narcolepsy which have links with genetic factors (e.g. developmental homeobox genes in the former and leukocyte antigen genes in the latter), these are complex traits that are presumably far removed from the homeostat. In fact, it may be that we can discover more about the sleep homeostat by studying how polymorphisms in the clock genes affect sleep phenotypes. In order to do this we need to carefully identify the observed variation in sleep parameters and translate this into well defined phenotypes.

PERIOD GENES AND DIURNAL PREFERENCE**Simon N Archer**

Centre for Chronobiology, Surrey Sleep Research Centre
School of Biomedical & Molecular Sciences
University of Surrey

The circadian body clock synchronises human biology with the external 24-hour cycle. The central circadian oscillator in the hypothalamic suprachiasmatic nuclei is entrained to day-length via the retinohypothalamic tract. This entrainment allows us to anticipate dawn and prepare physiologically for the transition from sleep to wakefulness.

Much of the core molecular components of the circadian oscillator have been identified from extensive animal model studies and the equivalent human genes have been cloned. The oscillator is composed of genes and proteins that interact in coupled positive and negative feedback loops. The positive elements CLOCK and BMAL1 promote the expression of the *Period* (*Per1, 2 & 3*) and *Cryptochrome* (*Cry1 & 2*) genes. PER and CRY proteins form trimers with each other and with casein kinase 1 ϵ and δ (CK1 ϵ/δ), but only when sufficient PER and CRY have accumulated to overcome phosphorylation-dependent proteosomal degradation. The stable trimer translocates to the nucleus, where it binds to and inhibits the promotion by the CLOCK:BMAL1 dimer. The time taken for this feedback to occur is a critical determinant of the circadian period of the clock.

Theoretically, there are many ways in which alterations to these genes or their encoded proteins could affect the timing mechanism of the oscillator. Changes in the gene promoter regions could affect promoter binding and expression, as could changes to the helix-loop-helix DNA-binding motifs in CLOCK and BMAL1. Similarly, changes to the PAS protein binding domains could affect the interaction between the clock proteins in dimer and trimer formation. Alterations to nuclear and cytoplasmic localisation signals could affect nuclear translocation of protein complexes. Mutations that affect kinase activity or substrate recognition sites could change phosphorylation levels, which could affect the degree of protein degradation and the timing of translocation.

In searching for genetic associations, it is important to have well defined phenotypes. Diurnal preference can be reliably measured using the morningness/eveningness Horne-Östberg questionnaire. This is a remarkably robust device that has been shown to reflect intrinsic circadian period. We have used the HO questionnaire to select individuals with extreme diurnal preference and we are screening the clock genes in these people to identify polymorphisms that associate with this phenotype.

DIABETES IN OSAHS

Speaker Dr Sophie West

Oxford Centre for Respiratory Medicine

OSAHS is a condition which is associated with upper body obesity. Type 2 diabetes is also strongly associated with obesity. Obesity causes insulin resistance, in which the normal cellular response to insulin fails, requiring increased insulin to be produced by the pancreas in order to maintain normoglycaemia. Over time, the beta cells of the pancreas may fail, and so hyperglycaemia and diabetes develops. Insulin resistance can hence be regarded as a “pre-diabetic” state, from which approximately 25% of people will go on to develop diabetes. As obesity levels are rising, the prevalence of both type 2 diabetes and OSAHS is increasing, and a considerable overlap between these two conditions would be expected.

In a study of patients attending a sleep clinic, glucose tolerance tests were performed. These showed 20% of patients newly diagnosed with OSA had impaired glucose tolerance and 30% had type 2 diabetes (compared to 14% and 14% of non-apnoeic snorers respectively) ¹. The number of patients with type 2 diabetes who have OSA has not previously been established, although our own work has sought to answer this question.

It has been found that people with OSAHS have higher levels of insulin resistance compared to non-apnoeic snorers and the worse the sleep disordered breathing, the worse the insulin resistance ^{2,3}. Clearly obesity is a confounding factor, but this association persists even after adjustment for obesity. This raises the question of whether sleep disordered breathing itself leads to changes in cellular insulin resistance, perhaps related to recurrent arousals and catecholamine release, due to metabolic changes seen with sleep deprivation or due to hypoxia alone affecting glucose metabolism.

It is also questioned whether CPAP treatment for OSA might improve insulin resistance or improve glycaemic control in type 2 diabetes. There have been a few small uncontrolled studies in this area, some of which have shown an improvement in insulin resistance after CPAP treatment, but the presence of multiple confounding factors, including weight loss and changes in activity, both of which affect insulin resistance, make these results hard to interpret ^{4,5,6}. There is a need for randomised controlled trials, using sham CPAP, to clarify this area.

References

1. Meslier N et al. Impaired glucose-insulin metabolism in males with OSA. *Eur Respir J* 2003;22:156-60
2. Punjabi NM et al. Sleep disordered breathing and insulin resistance in middle aged and overweight men. *Am J Crit Care Med* 2002;165:677-682
3. Ip MS et al. OSA is independently associated with insulin resistance. *Am J Respir Crit Care Med* 2002;165: 670-676
4. Harsh IA et al. CPAP treatment rapidly improves insulin sensitivity in patients with OSA syndrome. *Am J Respir Crit Care Med* 2004;169:156-162
5. Brooks B et al. OSA in obese non-insulin dependent diabetic patients: effect of CPAP treatment on insulin responsiveness. *J Clin Endocrinol and Metabolism* 1994;79:1681-1685
6. Babu AR et al. Type 2 diabetes, glycaemic control and CPAP in OSA. *Arch Int Med* 2005;165:447-452

CYTOKINES, SLEEP AND SLEEP APNOEA/HYPOPNOEA SYNDROME**Renata L Riha**

Department of Sleep Medicine, Royal Infirmary Edinburgh

Sleep is regulated by neuronal and humoral mechanisms that are interdependent.

For NREM sleep, sleep-regulating substances include IL-1, TNF- α , GHRH, PGD₂, adenosine and uridine. In REM sleep, the substances include prolactin and vasoactive intestinal peptide. The mediation of a large number of neurohumoral factors by the cytokines IL-1 and TNF- α appears to be central to the sleep activation pathway and will be discussed in detail.

Cytokine profiles that deviate from the normal circadian pattern may alter the normal expression of sleep-wake behaviour and it is possible that levels of sleep-inducing cytokines are increased during the daytime when they should be low in patients with OSAHS and thus may contribute to excessive daytime sleepiness.

A number of studies have demonstrated hypercytokinaemia in subjects with OSAHS the results of which can be summarised as follows:

1. TNF- α and IL-6 are elevated in OSAHS independently of obesity
2. Body mass index positively correlates with TNF- α and IL-6 levels. Thus, these two cytokines may play a role in daytime sleepiness experienced by the obese in the absence of OSAHS.
3. Subjects with OSAHS are more likely to have a high TNF- α secreting genotype
4. Inflammatory cell infiltration and denervation changes have been demonstrated in the mucosa and upper airway muscles of patients with OSAHS.

Hypercytokinaemia contributes to increased levels of inflammation in the body, thereby increasing the risk of developing cardiovascular disease. IL-6 and TNF- α produce their harmful effects by inducing endothelial dysfunction. TNF- α damages endothelial cells, causes apoptosis of endothelial cells and triggers procoagulant activity and fibrin deposition. TNF- α also enhances the production of reactive oxygen species including inducible nitric oxide (NO) and decreases myocardial contractility in a dose-dependent fashion.

The hypothesis that OSAHS is an inflammatory condition and the implications of this will be discussed.

INFANT SOCIAL SLEEP

Dr Helen L. Ball, Parent-Infant Sleep Lab. Department of Anthropology, University of Durham.

Many infants share a bed with their mothers in the early months of life, particularly for breastfeeding. Although this practice causes controversy, it has been found to be beneficial in several ways: It reduces sleep disruption caused by frequent night-time breastfeeds, promotes milk supply by encouraging frequent suckling, facilitates continued breastfeeding, soothes fractious infants, and promotes sleep for mother and baby (Ball et al 1999; McKenna and Bernshaw 1995; McKenna et al 1997; Ball 2003; Ashmore 1997).

Many hospitals making a commitment to “baby-friendly” practices now have policies regarding “bedding-in” (mother-infant bed-sharing on the postnatal ward). This practice follows naturally from the policy of skin-to-skin contact immediately following birth. There are clear benefits of close contact between mother and infant in the immediate postnatal period and bedding-in serves to prolong this contact for the duration of the hospital stay. There is currently no published research on the effects of bed-sharing on mothers or infants in the immediate postnatal period. There are a number of well-known contraindications (smoking, alcohol consumption, use of drugs that affect sleep) and safety issues (careful use of duvets and pillows, avoidance of soft sleeping surfaces and sofa-sharing) relevant to bed-sharing at home. Other factors come into play on the hospital ward, from simple aspects of the physical environment (e.g., height and width of hospital bed, use of cot sides versus side-car bassinets) to the complexities of how analgesics used during delivery affect both mother and infant, including whether or not such drugs are safe in a social-sleeping context.

Greg Stores, University of Oxford

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SLEEP DISORDERS MISTAKEN FOR PSYCHIATRIC DISORDERS IN ADOLESCENTS

There are many sleep disorders in which disturbed behaviour is a major manifestation. Especially when this is not fully appreciated, primary psychiatric conditions may be incorrectly diagnosed. This can happen with sleep disorders at all ages from obstructive sleep apnoea in preschool children to REM sleep behaviour disorder occurring mainly in later life.

The present account is concerned with sleep disorders which are particularly associated with adolescence or early adulthood and which are at special risk of being misconstrued as basically psychiatric problems. This essentially clinical review, with case illustrations, will be concerned with the following examples:

- Delayed sleep phase disorder
- Narcolepsy
- Kleine-Levin syndrome
- Sleep paralysis with sleep related hallucinations
- Nocturnal frontal lobe epilepsy

Surveys of patient series indicate the range of misdiagnoses that have been made with certain sleep disorders, illustrating the need for a greater awareness of sleep disorders and their manifestations on the part of healthcare professionals in general.

conducted a randomised control study of 3 infant sleep conditions (bedding-in with cot-side; bedding-in with side-car crib; rooming-in) on the postnatal wards of the Royal Victoria Infirmary, Newcastle upon Tyne. Night-time infrared video recording was employed to examine mother and baby behaviour on the first and second postnatal nights for mothers experiencing vaginal deliveries without the use of intramuscular opiate analgesics during labour. Dyads were followed up at home for 16 weeks by means of telephone interviews. Mothers and infants allocated to the bedding-in conditions breastfed more frequently, spent more time in close physical contact, exhibited greater mutual orientation, and were more likely to be both breastfeeding and exclusively breastfeeding at 16 weeks than mothers and infants allocated to rooming-in. 'Risk events' were observed when unanticipated bedding-in occurred. Infant sleep allocation on the post-natal ward was not associated with infant sleep location at home during the subsequent 16 weeks. We conclude that social infant sleep in the immediate post-natal period benefits the establishment of breastfeeding, and that bedding-in with the use of a side-car crib addresses safety concerns. Bedding-in is unlikely to be ideal for every mother and baby, but we hope, as these studies progress, to provide the information upon which informed choices and recommendations can be made.

12 EXPLORING POTENTIAL ASSOCIATIONS OF C-REACTIVE PROTEIN (CRP) WITH SLEEP DURATION AND SLEEP-DISORDERED BREATHING

Taheri S¹, Austin D², Lin L³, Young T², Mignot E³

¹University of Bristol

²University of Wisconsin

³Stanford University

Introduction:

Increasing evidence suggests that alterations in sleep duration are associated with obesity, insulin resistance, cardiovascular disease (CVD) and mortality. Additionally, sleep disordered breathing (SDB), which is associated with disturbed nighttime sleep and hypoxemia, may be an independent risk factor for CVD. C-reactive protein (CRP) is an inflammatory marker that is an important predictor of CVD. We investigated potential associations between circulating CRP, and sleep duration and SDB in the Wisconsin Sleep Cohort Study (WSCS), an ongoing longitudinal study of sleep in the general population.

Methods:

A cross-sectional study of 907 adults from the WSCS was carried out using multiple observations (for greater efficiency). After overnight polysomnography, CRP was measured in duplicate using a highly sensitive enzyme-linked immunoassay. The relationships between CRP and sleep parameters were evaluated using multiple linear regression before and after control for age, sex, and BMI.

Results:

CRP showed a significant positive association with smoking, self-reported exercise, the metabolic syndrome, waist-hip ratio (WHR), body fat, LDL, triglycerides, leptin, insulin, and homeostatic model assessment (HOMA), independent of age, sex and body mass index (BMI). Significant independent negative associations were observed with HDL, quantitative insulin sensitivity check index (QUICKI), and hours of exercise. CRP levels showed significant associations with the apnea-hypopnea index (AHI; the measure of SDB) and snoring. These associations, however, were not significant after adjustment for age, sex and BMI. No significant association between CRP levels and measures of sleep duration (polysomnographic and self-reported) were found.

Discussion:

There was no significant association between CRP levels and SDB when correction for age, sex and BMI was made. There was no significant association between CRP levels and measures of sleep duration. Any previously reported relationship between SDB and CRP is likely to be primarily driven by its association with excess body weight, and in particular, visceral obesity.

11 SERUM ANGIOTENSIN CONVERTING ENZYME (ACE) IS CORRELATED WITH NOCTURNAL DIASTOLIC BLOOD PRESSURE IN PATIENTS WITH THE SLEEP APNOEA SYNDROME (SAS).

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INTRODUCTION:

Measurements of serum ACE in the SAS have been variable. Single or even mean 24-hour BP readings may not be sensitive enough to disclose subtle relationships between serum ACE, AHI and BP. We correlated daytime serum ACE and nocturnal BP in patients with and without SAS.

METHODS:

22 consecutive attendees at a sleep disordered breathing clinic had (afternoon) serum ACE and 24-hour BP recorded prior to sleep studies. None were taking anti-hypertensives or had granulomatous disease. 14 patients had SAS (daytime sleepiness and AHI >10 events per hour). 8 patients had daytime sleepiness and an AHI <10 events per hour, but were otherwise similar (see Table):

	SAS	Non-SAS	p-value
Median Age (years)	55	48	0.27
Median BMI (kg/m ²)	33	32	0.60
Median Epworth Score	11	12	0.53
Median AHI	36	4.5	<0.001

RESULTS:

Median serum ACE in the SAS group was 44 u/L compared to 22 u/L in the non-SAS Group (p=0.08). All measures of BP (mean daytime and nocturnal diastolic and systolic) were higher by 2-3 mmHg in the SAS group but these did not reach statistical significance.

Pearsons correlation between serum ACE and mean nocturnal diastolic BP in the SAS group was +0.51, p=0.06 and in the non-SAS group was -0.24, p=0.56.

There were no other statistically significant correlations between serum ACE and other BP readings.

CONCLUSIONS:

Daytime serum ACE may be an important positive predictor of nocturnal diastolic BP in patients with SAS. Larger group sizes may detect differences in serum ACE between SAS and controls. Measuring nocturnal serum ACE and recording the effects of CPAP on serum ACE in SAS, are ongoing.

3 CEREBRAL-BLOOD FLOW VELOCITY IN SNORING CHILDREN - A POSSIBLE MARKER FOR ABNORMAL NEURAL FUNCTION.

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Introduction:

Childhood obstructive sleep related breathing disorders (oSRBD) are associated with adverse neurobehavioural sequelae. The causative pathway to neural dysfunction remains speculative. There is little known about cerebrovascular function in these children, despite evidence of systemic blood pressure dysregulation and of cerebrovascular disease in adult OSA.

Methods:

Polysomnography was undertaken in 30/31 otherwise healthy snoring children aged 3-7 years; awaiting tonsillectomy. 23 patients (Apnoea Hypopnea index -AHI >1) were classified as oSRBD, and 7 with AHI < 1 as 'Primary Snorers' (PS). Non-snoring controls (n=17, age 3-7 years) were recruited. Parents of all children completed a sleep related breathing disorder questionnaire (SRBQ) and the Behaviour Rating Inventory of Executive Function (BRIEF). Transcranial Doppler (TCD) was performed when awake. Cerebral blood flow velocity (CBFV) was recorded bilaterally for the middle cerebral artery, and the maximum value reported.

Results:

All controls had SRBQ scores below, and all snorers had scores above the clinical threshold. Snorers had significantly increased levels of abnormal behaviour, (BRIEF Global Executive Composite - GEC - T Score), compared to controls (p=.001); PS and oSRBD groups were affected equally. CBFV, obtained in 25 snorers and all controls, was significantly increased in snorers (mean 116cm/sec, SD 17.5) compared to controls (84.8cm/s, SD 9.1) (p<.001), again PS and oSRBD groups were affected equally.

Across groups, higher CBFV correlated positively with GEC despite most children having AHI < 4. There were no significant correlations between CBFV or BRIEF scores and PSG measures of AHI, mean O₂, O₂ nadir or arousal index.

Discussion:

Increased CBFV may be a marker of brain vulnerability in childhood oSRBD. The implications of these findings will be discussed.

8 A RANDOMISED CONTROLLED TRIAL OF BEHAVIOURAL INTERVENTION FOR SLEEP LESSNESS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS**Wiggs L*, Stores G***

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Introduction:

Severe sleeplessness difficulties affect about 50-90% of children and adolescents with autism spectrum disorders (ASD) but empirical investigation of the efficacy of interventions for such sleep problems is lacking. This study aimed to assess the effect of behavioural intervention (BI) for sleeplessness in children with ASD on the children's sleep and daytime behaviour and their mothers' mental health.

Methods:

The parents of 36 children with an ASD aged between 3 and 16 years (34 males, mean age 8.3 years, sd 4.1) took part in a randomised controlled trial with a wait-list control group. BI was discussed in one therapist session and supported by weekly telephone contact for six weeks. Baseline and six weeks later (post-treatment for intervention group) a composite sleep disturbance score (CSDS) was derived from parent-completed sleep diaries (range 0-12), actigraphs were worn by the children for at least 5 nights and parents completed the Developmental Behaviour Checklist to assess child behaviour and the General Health Questionnaire to measure their own mental state.

Results:

CSDSs were significantly reduced to sub-clinical levels in the intervention group (baseline mean 8.4 (sd 3.3); six-weeks mean 2.6 (sd 1.6); $p < 0.001$) and remained unchanged in the control group (baseline mean 8.2 (sd 3.3); six-weeks mean 7.9 (sd 2.9); $p > 0.05$) until intervention was implemented (mean score 1.9 (sd 1.6)). Despite the improvements reported by parents there were no significant changes in the children's objective sleep patterns associated with successful intervention. Treatment was associated with widespread improvements in reported child behaviour but effects on maternal mental health were limited to reduced anxiety.

Conclusions:

BI for sleeplessness may have benefits for children with ASD and their mothers but the mechanism underlying the change is not improved objective child sleep. Questions remain about whether the children's objective sleep disturbance requires treatment and how this might be achieved.

25 TITLE: SLEEP PROBLEMS, ANXIETY AND DEPRESSION IN SCHOOL-AGED TWINS**Gregory AM, Rijdsdijk F, Dahl RE, Eley T C**

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Aetiologies of sleep problems and associations with internalising difficulties are complex. Previous research suggests bidirectional relationships between sleep and anxiety/depression, and has highlighted the importance of age in these associations. Behavioural genetic research has also shed light upon these associations although this research is sparse and limited to pre-school aged children. The aim of this study was to investigate genetic and environmental influences on sleep difficulties and associations with internalising problems in a relatively neglected age group (8 year olds).

600 twins completed questionnaires about their sleep (Sleep Self Report; Owens et al., 2000), anxiety (Screen for Childhood Anxiety Related Emotional Disorders; Birmaher et al., 1997) and depression (Child Depression Inventory, Kovacs, 1981). Parents also completed the Child Sleep Habits Questionnaire (Owens et al., 2000).

There was a tendency for child report to highlight greater sleep problems than parent report; and twin correlations for sleep problems were higher in parent report ($r=.09-.81$) than in self report ($r=-.01-.37$). Parent reported data suggest that genes play a substantial role in individual differences in a range of sleep difficulties (accounting for between 32%-79% of the variance) but that environmental influences also play a role. Self-report data suggest more modest genetic influence (1%-27%) with larger environmental influence. Parent rated sleep problems showed small correlations with child rated anxiety ($r=.12$) and slightly larger correlations with depression ($r=.20$). The latter association was mainly explained by genes and there was substantial overlap between genes influencing sleep problems and those influencing depression ($r=.64$).

This study highlights the importance of reporter in examining childhood sleep problems. It also suggests that genes play a role in a range of sleep difficulties and associations with depression although environmental influences are as important. Future work needs to specify these influences and examine ways in which genes and the environment interact.

1 A RETROSPECTIVE AND PROSPECTIVE STUDY OF DELAYED SLEEP-PHASE SHIFT IN PATIENTS WITH SEVERE, CHRONIC OBSESSIVE-COMPULSIVE DISORDER (OCD)

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Objectives:

Bobdey et al (2001) described a group of non-depressed OCD patients who subjectively reported phase shifted sleep patterns.

We performed a retrospective case note and a prospective study of sleep patterns of all OCD patients admitted to a specialist Unit.

Method:

Retrospective Study:

Case notes of consecutive admissions for 5 years were examined. The nurses' record of sleep was examined. Age, gender, duration, severity of illness, history of substance misuse and prescribed medication were noted.

Prospective Study:

Consecutive admissions to an IP unit with OCD were asked to participate.

Patients' sleep patterns were recorded by nurses for 5 nights. Measures of OCD, depression, sleep and demographic data were recorded.

Results:

Retrospective:

123 files were evaluated and nursing sleep reports were found in all (100%). 21 patients (17.1%) demonstrated delayed sleep-phase shift, 28 (22.8%) other sleep disturbance and 51 (41.4%) no abnormalities of sleep.

Patients with delayed sleep were younger and more likely to be male.

Prospective:

20 of 23 consecutive admissions consented. Half of these showed delayed sleep. 8 of the 10 patients with delayed sleep were male (equal sex ratio for others). Patients with delayed sleep had significantly more severe OCD symptomatology.

Conclusions:

In a specialist OCD inpatient unit, a retrospective study identified 17.1% and the prospective study, 50% of patients having delayed sleep. This is much higher than in the general population (0.17%-0.72%; Schrader et al., 1993).

The affected patients were likely to be male, younger, earlier onset and more severe OCD symptoms.

We suggest these patients form a small but clinically important sub-group of OCD. Further studies may yield insight into aetiology.

References:

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- Bobdey, M., Fineberg, N., Gale, T., Patel, A., & Davies, H. A. (2001). Reported sleep patterns in obsessive compulsive disorder. *International Journal of Psychiatry in Clinical Practice*,6,15-21.

2 THE RELATIONSHIP BETWEEN SLEEP STAGES AND DECLARATIVE AND PROCEDURAL LEARNING DIFFICULTIES IN OBSTRUCTIVE SLEEP APNOEA

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Obstructive sleep apnoea (OSA) has been associated with cognitive deficiencies with varied results. Different sleep stages (stage2 and REM) have been associated with the mastering of particular cognitive tasks (declarative and procedural, respectively). The aim of this study was to consider the performance of OSA patients on learning tasks with respect to their sleeping habits.

The learning of one declarative (paired associates) and one cognitive procedural (mirror trace) task were assessed in 15 participants; five controls, ten with OSA, five on continuous positive airway pressure (NCPAP). Independent variables included an Epworth sleepiness score and a sleep log. The OSA group had marked and sometimes-significant deficits on the cognitive procedural task especially on initial learning ($p = .002$). Procedural learning was correlated significantly with sleep quality ($p = .007$; $.072$) and daytime somnolence ($p = .062$). The NCPAP group showed the greatest improvement ($p = .016$). The relationship between OSA and declarative learning was non-significant. Learning ability is in concordance with past research concerning both OSA and sleep stage deprivation on cognitive functioning. The findings provide an initial framework for future detailed analysis of how sleep architecture correlates with OSA and learning. Future findings may contribute towards models concerning sleep stagers and learning as well as those regarding the effects of OSA and hypoxia on cognition.

4 TITLE: EFFECT OF LORAZEPAM ON ACTIVITY, ACTIGRAPHIC SLEEP, COGNITIVE AND PSYCHOMOTOR PERFORMANCE

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Introduction:

Historically actigraphy has been developed as a non-invasive tool for assessing sleep-wake patterns, however, there are little data on whether the technology is sensitive to the sedating effects of medication. The aim of this study was to evaluate the effect of a single dose of the sedating benzodiazepine, lorazepam (LZP) (2.5mg), compared with placebo, on activity, actigraphic sleep parameters, cognitive and psychomotor performance.

Methods:

Healthy male and female volunteers (n=24, aged 19-37 yrs) were randomised to a double blind, placebo-controlled, cross-over study with a 6-day wash out period. After dosing at 18:00 hrs psychomotor and cognitive tests were conducted at 1, 2, 3, 4 and 14 hrs post dose. The volunteers were required to wear actigraphs (Actiwatch) for the duration of each test period.

Results:

All results were analysed using repeated measures ANOVA.

Activity levels after LZP were significantly reduced ($p < 0.02$) between 1.5-2.0, 2.5-3.0, 4.5-5.0, 13.0-13.5 and 13.5-14.0 hrs post dose. In addition, various actigraphic sleep parameters showed a significant change following LZP: increased Actual Sleep Percent ($p=0.01$); reduced Mean Activity Score ($p=0.03$) and reduced number of Wake Bouts ($p=0.02$).

Reaction time following LZP administration was significantly impaired ($p < 0.05$) compared with placebo for both the Choice Reaction Time (CRT) and Continuous Tracking Task (CTT) at 2, 3, 4 and 14 hrs, respectively. Tracking accuracy was also significantly impaired ($p < 0.02$) at 2, 3, 4 and 14 hrs. Subjects felt more sedated (Line Analogue Rating Scale LARS) at 4 ($p=0.01$) hrs post dose.

Discussion:

This study has demonstrated the ability of actigraphy to measure the sedative effect post dose, sedative effect during sleep and hangover effects of medication after sleep.

General activity and sleep, as monitored by actigraphy, was correlated with changes in cognitive function and psychomotor performance following dosing with lorazepam.

Actigraphy may therefore prove to be a useful tool to measure the acute effects of sedative medication as well any hangover residual effect.

Key words:

actigraphy, hangover effect, sedation, psychomotor performance

**5 STATISTICAL COMPARISONS OF CIRCADIAN VARIABLES IN
MOUSE MUTANT LINES**

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Circadian rhythms control a range of daily biological cycles. In understanding foundational mechanisms of circadian function, the mouse has come to the fore as a model organism.

Over recent years, we have used progeny of N-ethyl-N-nitrosourea mutagenised mice in a forward genetics screen for dominant circadian mutations, where wheel-running activity is measured as a component of circadian output pathways. Two main parameters have been studied: 1) free-running in constant darkness and 2) phase shift in response to a light pulse at Circadian Time 16.

From approximately 2000 F1 mice screened up to now, all the outliers (3 standard deviations above/below the mean of F1 cohort) were selected for inheritance testing. Overall, we have established that 1% of all F1 mice screened represent robustly inherited mutants.

Of the 68 lines selected, 19% show a robust inheritance, 23% are inherited with low penetrance, 36% show no significant inheritance and 20% are currently under testing.

Of the mutant lines we have analysed, the majority represent mutations at novel genetic loci as identified by completing genome scans for BALB/c/C3H heterozygosity in backcross progeny. Here we present statistical comparisons for structure detection within the population, in order to examine the underlying relationships between the circadian variables and within our mouse lines. Principal Component Analysis explained the variability within the population according to the following circadian phenotypes: entrainment (delayed and advanced), free-running period (shorter and longer) and phase shifting (reduced or absent), but also activity profile (low activity). Recent evidence implicates an association between polymorphisms in circadian genes and behavioural traits in humans. Thus further characterization of our mutant lines will be instrumental in delineating functional properties in CNS processes related to a number of neurological and psychiatric diseases, including sleep disorders.

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6 PREDICTORS OF POOR TITRATION AND OUTCOME IN PATIENTS WITH OBSTRUCTIVE SLEEP APNOEA/HYPOPNOEA SYNDROME (OSAHS) AFTER HOME OR HOSPITAL AUTOMATED CPAP TITRATION

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Introduction:

A randomized controlled study of patients with obstructive sleep apnoea/hypopnoea syndrome (OSAHS) found equivalent outcomes from automated CPAP titration conducted at home or in hospital. A secondary aim was to evaluate predictors of poor titration and treatment outcome at 3 month follow up.

Method:

188 patients (19 female) with OSAHS, averaging $50 \pm \text{SD } 11$ yrs, with body mass index (BMI) 35 ± 8 kg/m², apnoea/hypopnoea index 44 ± 25 per hr and Epworth score 15 ± 3 were randomised to automated CPAP titration (Spirit[®], ResMed), for one night in-lab or three nights at home. Titration success was defined by median mask leak <0.40 cmH₂O, and by nurse-practitioners acceptance of 95th centile pressure for fixed pressure treatment. Treatment success at 3 month follow-up was defined by average CPAP use >3 hrs/night and Epworth score <10 .

Results:

159 of 188 titrations (85%) were successful, with no patient requiring repeat titration. At 3 months, 78 of 157 patients (50%) were treatment successes. Patients with poor titration were assigned lower fixed CPAP pressure (9.9 vs 10.6 cmH₂O), but poor titration was not associated with lower 95th centile pressure, titration setting (home vs hospital), sex, age >60 yrs, or physical disability (SF-36 physical function score <40). Treatment success was associated with a higher diagnostic AHI, age <60 , higher fixed CPAP pressure, worse titration mask leak, and diagnosis by home sleep study. Treatment successers also had better improvements in OSLEP, FOSQ and SF-36 scores at 3 months.

Conclusion:

No patient subgroup could be identified as unsuitable for automated or home titration.

7 THE ACTIVE TONGUE PROTRUSION MANOEUVRE (ATPM): AN OUTPATIENT ENDOSCOPIC PREDICTOR OF JAW ADVANCEMENT BENEFIT IN PATIENTS WITH SLEEP DISORDERED BREATHING.

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Introduction:

The selection of patients suffering from snoring or obstructive sleep apnoea (sleep disordered breathing) who may be suitable for mandibular advancement devices (MAD) has traditionally been somewhat empirical. The introduction of sleep nasendoscopy as a means of clarifying the anatomical site of obstruction or vibration (snoring) has become an increasingly useful technique in the management of such cases. This does however require inpatient admission and sedation anaesthesia. Mandibular advancement devices are often used to correct restriction resulting from tongue base regression.

Method:

The authors present a modification of an outpatient endoscopic assessment of the upper airway, the active tongue protrusion manoeuvre (ATPM). This involves holding the protruded tongue between clenched teeth whilst endoscopically observing the effect of forced nasal and oral inspiration upon the oropharyngeal airway. Patients underwent ATPM manoeuvre followed sleep nasendoscopy. Findings of ATPM to those elicited by sleep nasendoscopy was made to illustrate the potential clinical application of ATPM.

Results:

50 patients were included in the present study. A good comparison between the findings of ATPM and sleep nasendoscopy as regards to tongue base regression in patients with OSA was observed. Based on the above findings, the authors propose a management plan for patients of OSA with tongue base collapse.

Discussion:

Mandibular advancement devices (MAD) have become a common treatment for patients of OSA with tongue base collapse as the primary site. However the compliance rate still remains low. Mandibular advancement devices should be carefully fabricated and chosen for the individual after careful identification of the site of obstruction. This involves sleep nasendoscopy which requires inpatient admission. The present study showed a good correlation between the findings of sleep nasendoscopy & ATPM as regards to tongue base collapse, thereby confirming that this technique has a positive role to play in the assessment of patients of OSA due to tongue base regression.

Key Words:

Sleep Nasendoscopy; Active tongue protrusion manoeuvre (ATPM)

**9 SNORING & SEXUAL RELATIONSHIPS.
DON'T BE A SNORE BORE -
STOP SNORING AND IMPROVE YOUR SEXUAL HEALTH.**

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Snoring is one of the few complaints that directly affects the health of another; normally the bed partner. Sharing a bed with a snorer can have deleterious effects on sleep, health and quality of life and often causes friction within the relationship, not least creating a negative effect on a couple's sexual well being.

This study extended the line of thinking of previous research by examining the negative emotions that snoring causes and the consequences of an increased sleep debt. Being irritable, shouting, arguing with their partner and making mistakes at work were cited as the most common problems associated with sleep loss. Women complained of sleep deprivation more than men. Research confirms that wives are more emotionally reactive than husbands and are more likely to initiate conflict. They see their husbands as the cause of the problem whereas, husbands view the problem as mutual. This conflict can be detrimental to a relationship resulting in high levels of negative emotion such as anger, hate and resentment by the partner and anger, rejection, and isolation experienced by the snorer.

Marital conflict is more acute in unhappy marriages. Results indicate that the quality of a relationship in a snoring couple can be undermined by frequent arguments that tend to become more severe. This leads to hostility and alienation and is often an excuse for couples sleeping separately. Snoring is cited as being the ultimate cause of marital breakdown and subsequent divorce.

Without doubt snoring affects a couple's sexual relationship. Previous research found that heavy snorers have reduced sexual drive and over 50% of them also experience erectile dysfunction. Over half of the respondents to this present study make love less than once per week or hardly ever.

A key finding from this study was that the sexual well being of snoring couples is adversely affected and they want help.

10 CHANGES IN HUMAN WAKING EEG AND SLEEP PATTERNS AFTER A 30-MINUTE EXPOSURE TO VARYING MOBILE PHONE SIGNALS

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Available human laboratory studies have recognized electromagnetic fields (EMFs) have non-thermal effects on the brain physiology. Consistent effects include increased electroencephalogram (EEG) power in the alpha frequency range during waking, and in the spindle frequency range during non-rapid eye movement (NREM) sleep. Moreover, the findings that the enhanced left dorsolateral prefrontal waking cerebral blood flow (rCBF) was only evident with EMF pulsing at low frequency (8 Hz) suggested a mechanism for these changes. The current research was motivated by this 8-Hz pulsed EMFs and aimed to compare their effects with those generated by the other hitherto ignored EMFs pulsing at an even lower-frequency (2 Hz). Both are common mobile-phone signals radiated when the user is talking (8-Hz modulation) or listening (2-Hz modulation). Six right-handed, healthy males (mean age: 22 years) participated in three (*talk-*, *listen-* and *sham-*) EMF experiments. These were conducted single-blind, in a randomized order and separated each by one week. The EMFs were sent, frequency-modulated, from a base station to a GSM 900 MHz handset located beside the right-ear with a cradle. Each participant underwent a 30-minute EMF exposure, followed by a 3-minute eye-open and eye-close session, and then by a 90-minute sleep opportunity. Results from post-exposure waking EEG power spectra showed that the *talk*-EMF, compared to the *listen*-EMF, induced higher hemispheric EEG power asymmetry (left lateralized) in the frontal regions (derivations: F3-C3, F4-C4) in the theta (4-6, 7-8 Hz) and alpha (9-11, 12-13 Hz) bands. Subsequent sleep patterns compared with sham exposure also remarked differentiation: the *listen*-EMF “advanced” the onset time of slow-wave sleep and REM sleep but the *talk*-EMF “delayed” them. To conclude, current results support previous waking rCBF findings that the low-frequency modulation effect might have frontal origins. It is noteworthy that mobile phone usage might implicitly alternate the circadian control for the subsequent sleep process.

13 A COGNITIVE-BEHAVIOURAL GROUP INTERVENTION FOR PEOPLE WITH CHRONIC INSOMNIA: AN INITIAL EVALUATION

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Introduction:

A group intervention for people with chronic insomnia, led by sleep specialists and occupational therapists is described. A consistent format has evolved which involves seven weekly sessions of 1 1/2 hours for a group of approximately 8 patients; it includes education about sleep, relaxation, CBT and encouragement and help to follow specific behavioural strategies such as sleep restriction. An evaluation of outcome data from nine groups was carried out in order to measure the success of the group.

Method:

Sleep diaries completed at the start and at the end of courses (n=43), and at follow-up (n=25) were examined. Estimated sleep onset latency (SOL), total sleep time (TST) and sleep quality (SQ) were calculated and compared. Qualitative data from feedback questionnaires (n=56) were examined and allocated to major themes.

Findings:

Improvements after 6 weeks are modest but encouraging:

61% of patients show improvement in SOL (20% by >30 minutes)

62% of patients show improvement in TST (48% by >30 minutes)

67% of patients report improvement in sleep quality.

At follow-up, improvement in SOL was shown by 58% (3% improved by >30 minutes) while TST improved for 60% (36% improved by >30 minutes); sleep quality improved for 88% of patients.

Feedback data indicate that it was particularly important for patients to meet other people with the same condition and to share ideas with them. While many patients said that their sleep had not changed a substantial minority reported being less worried about their sleep.

Discussion and conclusions:

Although numbers are small and self-report measures such as sleep diaries may be unreliable, the TST figures compare well with other available data (Espie et al 2001). Our findings suggest that most patients welcome the intervention and substantial numbers make and maintain improvements in their sleep. Patients' more positive attitudes reflect reported improvement in sleep quality. Further evaluation of data is necessary to elucidate the particular course components which contributed to improvements in sleep.

14 MELATONIN RHYTHMS AND LIGHT-INDUCED MELATONIN SUPPRESSION AS PREDICTORS OF SLEEP PROBLEMS?

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Introduction:

The age-related reduction in melatonin production and changes within the circadian system have been linked to the decline in sleep quality with age. To test this, two studies were performed. Endogenous melatonin rhythms and sleep quality were assessed in women with sleep problems in a field study (study 1). The effectiveness of different wavelengths of light to suppress nocturnal plasma melatonin in women with or without sleep problems were determined in a laboratory study (study 2).

Methods:

Study 1: Postmenopausal women complaining of poor sleep quality (n=11, 59 ±6.2 yrs, PSQI 9.5 (2.7, mean ± SD) completed an 8 week study. Sequential urine samples were collected for 48 h each week to determine 6-sulphatoxymelatonin (aMT6s) timing and production. Sleep was assessed by daily sleep and nap diaries. The relationship between sleep and nap parameters and aMT6s timing and production were assessed.

Study 2: Postmenopausal women without sleep problems (n=16, 56 ±1 yrs, PSQI 3.5 ±0.4) and with sleep problems (n=5, 60 ±3 yrs, PSQI 11.8 (1) were exposed to 30 mins of monochromatic light at two different wavelengths and irradiances (λ_{\max} 456 nm: 3.8 and 9.8 $\mu\text{W}/\text{cm}^2$; λ_{\max} 548 nm: 28 and 62 $\mu\text{W}/\text{cm}^2$). Melatonin suppression was compared across light treatments and between the two groups.

Results:

Study 1: There was no significant correlation between aMT6s (acrophase and production) and any of the subjective sleep measures.

Study 2: No significant difference in melatonin suppression was found in two groups of postmenopausal women ($F_{(1,17)} = 0.31$, $p = 0.6$).

Discussion:

Endogenous melatonin rhythms and its response to light are not predictors of self-reported sleep problems in postmenopausal women.

Keywords:

melatonin, light, sleep, ageing

Supported by an EU grant (QLK6-CT-2000-00499).

15 VALIDATION OF A TRANSLATIONAL MODEL OF INSOMNIA IN RATS AND HUMAN VOLUNTEERS

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Introduction:

Caffeine can produce symptoms of insomnia in humans that are sensitive to the benzodiazepine hypnotics. It was hypothesised that caffeine could be used to disrupt sleep, which could then be restored by hypnotic medication. The aim of this study was therefore to validate a caffeine-induced model of insomnia in rats and humans in order to produce a translational paradigm in which to study novel hypnotics.

Methodology:

Rat study: Radiotelemetry transmitters with EEG and EMG electrodes were implanted into male rats. Following recovery, animals were dosed with caffeine alone (10mg/kg) or in combination with zolpidem (10mg/kg) or trazodone (20mg/kg) or vehicle, in cross-over experiments with 7 day washout periods. Automated sleep scoring was performed for each 12s epoch. Healthy volunteer study: randomised, placebo-controlled 4 week crossover design in 12 male volunteers. Subjects were given placebo, caffeine (150mg) or caffeine in combination with zolpidem (10mg) or trazodone (100mg). Polysomnography was performed at home (Embla), and measures of sleep derived from visual scoring according to R&K criteria (Somnologica).

Results and Discussion:

In rats and human volunteers, caffeine disrupted a number of measures of sleep and in particular, caused significant increases in sleep onset latency, which was attenuated by both zolpidem and trazodone (see table). Values are Mean \pm S.D. *P<0.05.

SOL (min)	Placebo	Caffeine	Caff+Zolpidem	Caff+Trazodone
Human volunteers (n=12)	18.3 (9.7)	32.4 (25.6*	13.5 (5.1	22.6 (14.6
Rats (n=6)	21.3 (8.7	55.0 (36.3*	12.2 (5.9	-
Rats (n=7)	27.6 \pm 10.8	72.7 \pm 45.5*	-	44.6 \pm 36.2

Therefore, two successful hypnotics with different treatment profiles can significantly attenuate the disruptive effects of caffeine on sleep. This suggests that a caffeine-induced model of insomnia is a promising paradigm with which to study prospective drugs for the treatment of sleep disorders.

This work was funded by Merck Sharp and Dohme

16 GENDER AND AGE-RELATED DIFFERENCES IN HUMAN DIURNAL PREFERENCE AND SLEEP/WAKE ACTIVITY

Kay Jones, Derk-Jan Dijk, Debra Skene, Malcolm von Schantz, Simon Archer

Introduction.

Diurnal preference is a measure of preferred timing of activity and sleep and can be assessed using the Horne-Östberg (HÖ) questionnaire, which categorises people as morning, evening or intermediate types. There is some evidence that diurnal preference shows gender and age-related differences in the normal population. In this study, we have examined these inter-individual differences in a population of 1106 individuals.

Methods.

The study was conducted as a Live Science Project at the London Science Museum where visitors completed a computer-based HÖ questionnaire, a sleep assessment questionnaire and provided a buccal swab for genetic analysis. Subsets of participants with extreme morning or evening preference scores (n=16 males; n=16 females) were selected for a 16-day follow-on study where sleep/wake activity was measured with activity monitors (Actiwatch) and daily subjective sleep diaries.

Results and Discussion.

Comparisons of HÖ distribution as a function of age for each gender confirmed that there is an increasing trend towards morningness with age. The female distribution of HÖ scores was more skewed towards morningness. Individual HÖ question mean scores showed less standard deviation for the morning types than the other groups. Follow-on analysis of activity and subjective sleep data in selected extreme types also revealed significant differences in sleep-timing preference, although there were no significant differences between groups in terms of sleep efficiency, latency, fragmentation and duration or percentage time awake, which suggests that sleep timing accounts for the difference between groups. 154 extreme types (77 morning and evening) were selected for genotyping and the results have been analysed together with a previous study which showed an association between a variable number tandem repeat polymorphism in the *PER3* gene and diurnal preference. Factor analysis of the HÖ questionnaire revealed a subset of questions relating to morningness that may be particularly sensitive to differences between groups.

Support:

Wellcome Trust

Collaboration: London Science Museum

17 IDENTIFICATION OF NATURAL SHORT AND LONG SLEEPERS

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Introduction:

Sleep duration varies among individuals and epidemiological studies have shown that both short and long sleep durations are associated with more frequent sleep problems and increased mortality. In these studies no distinction was made between natural short and long sleepers and people who have extreme sleep patterns because of social and other factors.

Aim:

To identify and characterise natural short and long sleepers. They were defined as having consistent (i.e. during the week and weekend) long sleep (>8.5h) or short sleep (<6.5h); being satisfied with their sleep quality and sleep duration; having no sleep or health problems.

Methods:

The study consisted of a stepwise recruitment and data collection protocol: 1. Development of selection methods and criteria. 2. Recruitment. 3. Analysis of selection data. 4. Field study protocol: 2.5 week sleep diary and actigraphy plus 2 nights of polysomnography (PSG) home recording. 5. Data analysis: Actual sleep timed averaged across all field study nights, PSG data was staged and spectral analysis performed.

Results:

544 potential subjects were screened (males n=174, females n=537, under 25yrs n=64, 25-35yrs n=414, over 35yrs n=60). 2 short, 7 average and 7 long sleepers were selected. Objective sleep measurement confirmed self-reported sleep duration from the selection data. Actual sleep duration showed significant differences in the long, short and average sleep groups.

Conclusion:

Natural short and long sleepers exist in the population and short sleepers are more difficult to identify than long sleepers.

18 SLEEP ON OIL RIGS

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Introduction:

Offshore shift workers working a 2 week 1800-0600h night shift are able to adapt fully to night work (Barnes et al., 1998). However little objective sleep data exists for this population.

Methods:

Nine healthy subjects were studied in the summer months for the last 7 days of a 2 or 3 week night shift on two offshore installations (61°N and 58°N). The first group: five men, aged 49 ± 11.5 years ($X \pm SD$), body mass index (BMI) 27.8 ± 4.2 kg/m², worked 19.00-07.00h for 2 or 3 weeks. The second group: 4 men, aged 50 ± 6.2 years, BMI 27.5 ± 4.4 kg/m², worked 18.00-06.00h for 2 weeks. Each subject wore an Actiwatch-L (Cambridge Neurotechnology Ltd) during the study period to monitor light and activity and completed individual sleep diaries. Sleep parameters derived from the actigraphy (manufacturer's software) included sleep onset/offset, sleep latency, fragmentation index, and sleep duration.

Results:

Sleep duration showed significant differences $p=0.034$ (RM-ANOVA) between the 2 shift schedules with mean sleep duration, 19.00-07.00h: 4.94 ± 0.7 h, and 18.00-06.00h: 6.33 ± 0.99 h ($X \pm SD$, decimal hours). Other parameters were not significant, but those working 18.00-06.00h, along with a higher sleep duration, had a lower sleep latency (13 mins), fragmentation index (33.1) and a higher sleep efficiency (85.4%) compared to 22 mins, 38.1 and 77% for those working 19.00-07.00h.

Conclusions:

The sleep duration of both groups was shorter than normal sleep duration data 7.02 ± 1.55 h reported by Groeger et al., 2004. To make robust comparisons between the 2 shift schedules greater number of subjects are required.

Barnes RG, Deacon SJ, Forbes MJ, Arendt. Adaptation of the 6-sulphatoxymelatonin rhythms in shiftworkers on offshore oil installations during a 2-week 12-h night shift. *Neuroscience Letters* 1998; 241 9-2.

Groeger JA, Zijlstra FRH, Dijk DJ. Sleep quantity; sleep difficulties and their perceived consequences in a representative sample of some 2000 adults. *Journal of Sleep Research* 2004; 13 359-371.

19 THE IMPACT OF DAILY AND NOCTURNAL SLEEP DURATION ON BODY MASS INDEX (BMI) AND BODY FAT

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Introduction:

Several population studies have shown that short habitual sleep duration is associated with elevated body mass index (BMI; weight/(height)²) across all age groups and ethnic origins. In this study, we investigated possible associations between nocturnal and 24hr (daily) sleep duration, and BMI and body fat.

Methods:

A cross-sectional study of randomly-selected 44 healthy Greek adults, of which 32 were females, aged 30-60 years old, was carried out. Nocturnal and daily sleep duration were determined by a 7-day diary and questionnaire. Measurements of height, weight and four skinfolds (triceps, biceps, subscapular and suprailiac) were conducted, using standard techniques.

Results:

The characteristics of the sample were: Mean age (45.43±9.79 years), height (1.64±0.09 m), weight (70.14±11.00 kg), BMI (25.94±3.33 kg/m²), triceps (21.94±7.01 mm), biceps (9.95±4.82 mm), subscapular (17.07±4.86 mm) and suprailiac (14.03±5.70 mm) skinfolds, estimated body fat (31.59±6.94%), sum of skinfolds (62.99±18.97 mm) and nocturnal and 24hr sleep duration (6.49±0.93 hours, 7.03±0.88 hours, respectively). Nocturnal sleep duration was negatively associated with BMI ($r=-0.299$, $p=0.049$), biceps ($r=-0.467$, $p=0.001$), subscapular ($r=-0.319$, $p=0.035$), suprailiac ($r=-0.500$, $p=0.001$) and the sum of skinfolds ($r=-0.405$, $p=0.006$). 24hr sleep duration was also negatively associated with biceps ($r=-0.498$, $p=0.001$), subscapular ($r=-0.418$, $p=0.005$), suprailiac ($r=-0.468$, $p=0.001$), and the sum of skinfolds ($r=-0.459$, $p=0.002$) and with BMI, a trend was shown ($r=-0.279$, $p=0.067$). Body fat was negatively associated with 24hr sleep duration ($r=-0.315$, $p=0.037$), and with nocturnal sleep duration, a trend was shown ($r=-0.271$, $p=0.076$).

Discussion:

Data of the present study show the significant negative association of nocturnal and daily sleep duration on BMI and measures of body fat, indicating a strong impact of sleep duration on body composition.

Acknowledgement:

*Dr Shahrhad Taheri, University of Bristol.

20 CELON RADIOFREQUENCY THERMO-THERAPY TO THE TONGUE BASE IN PATIENTS WHO SNORE: A PILOT STUDY.

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None of the authors has any commercial affiliation with the manufacturers of the products used in the study.

Introduction:

Snoring and obstructive sleep apnoea can cause personal distress and social disharmony. Where the upper airway collapse is primarily at the tongue base and hypo-pharyngeal levels, mandibular advancement devices work well. However, not all patients are suitable for such therapy, yet surgical management is largely unsatisfactory. A successful, minimally invasive surgical approach, with low morbidity would be highly desirable.

Method:

This prospective, non-randomized study investigated the effects of Celon radio-frequency, thermo-ablative therapy in non-apnoeic snorers and patients with mild / moderate obstructive sleep apnoea (OSA). Following a diagnostic sleep study and sleep nasendoscopy, 15 patients in whom the tongue base alone was responsible for the impaired breathing and snoring, were recruited. Each patient had two Celon treatments under general anaesthetic. On each occasion, eight interstitial applications of the Celon probe were made to the tongue base. Simple analgesics and prophylactic antibiotics were prescribed post-operatively. Outcome measures comprised sleep studies and visual analogue scales (VAS) to record snoring, day time somnolence and quality of sleep. Post-operative pain, speech and difficulty in swallowing were also recorded.

Results:

Statistically significant subjective improvements in snoring, daytime somnolence and quality of sleep were reported. Patients had no permanent complications of the treatment and no significant side effects. The procedures were well tolerated, with minimal analgesic requirement. Speech and swallowing were unaffected.

Discussion:

Celon radiofrequency application to the tongue base is a promising treatment for snoring and mild OSA. It is minimally invasive, has insignificant post operative morbidity and is well tolerated. It would seem to provide an alternative treatment for patients who are unsuitable for mandibular advancement devices.

A larger sample of patients is required for further evaluation.

21 THE EFFICACY OF MANDIBULAR ADVANCEMENT SPLINT THERAPY IN SLEEP-RELATED BREATHING DISORDERS

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None of the authors has any commercial interest in any of the products used in the study.

Introduction:

Mandibular advancement splints (MAS) have an accepted role in the management of patients with sleep related breathing disorders (SBD). Precise indications for their use are unclear and controlled studies, comparing the efficacy of MAS with no intervention, are lacking.

Method:

This prospective, non-randomised, controlled, clinical trial compared the efficacy of MAS therapy with no intervention, using both subjective and objective outcome measures. Two hundred and fifteen subjects with a diagnosis of SBD confirmed by polysomnography, were recruited. The test group (n = 120) demonstrated favourable sleep nasendoscopy findings and received a custom-made Herbst MAS. Subjects with OSA underwent a follow-up sleep study after a minimum period of four months. Subjects in the control group (n = 95) remained untreated for four months. Questionnaires were completed at baseline (T1) and follow-up (T2). These assessed daytime sleepiness, snoring and quality of sleep. Apnoea/hypopnoea index (AHI) and minimum oxygen saturation (Min O₂) were evaluated at T1 and T2 for OSA subjects.

Results:

The groups were comparable at baseline for all parameters measured. Eighty-three (87%) control and 107 (89%) test subjects completed the study. Statistically significant differences in all subjective outcome measures were detected between the two groups at T2 ($P < 0.001$), with very low odds ratios (range 0.02 to 0.17). Subjects with mild OSA showed the greatest success rate (AHI < 10), followed by the moderate and severe individuals (86.2%, 77.8% and 58.3%, respectively). Eighty-six (96.7%) OSA subjects showed increased Min O₂ levels at T2 ($P < 0.001$). MAS therapy was significantly more effective at improving sleep outcomes ($P < 0.001$) compared with no treatment.

Discussion:

The study showed clear benefits of MAS wear when compared with no intervention. Success rates were relatively favourable and this may have been due to the use of sleep nasendoscopy to select the study group.

**22 CONSTRUCTING AND EVALUATING AN ACTIGRAPHIC METHOD FOR
INVESTIGATING COUPLES' SLEEP:
THE PARTNER IMPACT ON SLEEP WAKE ANALYSIS (PISWA)**

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Introduction:

Despite the measurement of activity being used in human sleep research since 1959, actigraphy has rarely been employed to investigate couples' sleep. This is partly because of the fact that the problems associated with actigraphic methods are particularly salient when attempting to directly compare and contrast two individuals' records. This paper attempts to construct an actigraphic method for the investigation of couples' sleep which circumvents these difficulties.

Methods:

40 heterosexual couples (aged 20-59) wore Cambridge Neurotechnology actiwatches for one week. Data were downloaded using Sleepwatch software and programs were run directly on the ".awd" files. The success of any given algorithm was judged against a set of criteria which included whether or not it deals with absolute values or patterns, whether or not it can identify states associated with sleep and wake, and whether or not it can identify onset and duration of movement. In addition to these criteria, audio sleep diary data were used to assess the validity.

Results/Discussion:

In order to meet the criteria we developed the *Partner Impact on Sleep Wake Analysis (PISWA)*. Using Lotjonen et al's sleep/wake algorithm, calculated relatively and developed specifically for the CNT watch, PISWA firstly identifies whether an epoch should be scored as sleep or wake and then plots the actigraphy level for each minute; colour coding each line according to sleep/wake. This enables the identification of periods of movements during sleep, periods of non-movements during sleep, periods of movements while awake in bed and also periods of non-movements while awake in bed. By tagging episodes of "wake" following an episode of "non-wake" in one person, these onsets were then compared with the preceding state the bed partner was in. As well as fulfilling the required criteria, the accuracy of the algorithm was supported by audio diary information.

23 A SINGLE-NUCLEOTIDE POLYMORPHISM IN THE 5'-UNTRANSLATED REGION OF THE *hPER2* GENE IS ASSOCIATED WITH DIURNAL PREFERENCE.

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Introduction:

The PERIOD2 (PER2) gene is a key component of the molecular mechanism that generates circadian rhythms in mammals. We have investigated three single-nucleotide polymorphisms (SNPs) in the *hPER2* gene, one upstream of the transcription start site (C-1228T), one in exon 2 in the 5'-untranslated region (5'-UTR) (C111G), and one missense mutation (G3853A) causing a glycine to glutamine substitution.

Methods:

From a group of 484 volunteers, subjects for extreme morning or evening preference, or intermediate diurnal preference (n = 35 for each group) were genotyped with regard to the three polymorphisms.

Results:

Whereas allele frequencies for the C-1228T and G3853A polymorphisms did not differ significantly between any of the groups, the 111G allele frequency was significantly higher in subjects with extreme morning preference (0.14) than in subjects with extreme evening preference (0.03) (Fisher's exact test, P = 0.031, odds ratio = 5.67). No significant difference in 111G allele frequency was observed between either of these groups and subjects with intermediate diurnal preference. Computer prediction indicated that the C111G polymorphism might alter the secondary structure of the transcript. However, a reporter assay to test this hypothesis indicated no significant difference in mRNA translatability.

Discussion:

The *hPER2* 111G allele associates with extreme morning preference and is a potential candidate allele for ASPS.

JDC supported by a MRC studentship

24 GENETIC AND SOCIO-CULTURAL INFLUENCES IN DIURNAL PREFERENCE

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Introduction:

Most existing research on diurnal preference focuses on physiological influences on the circadian system. Recently a polymorphism in the *PERIOD 3 (PER3)* gene has been found to be associated with extreme diurnal preference. The sociological study of sleep can further contribute to the study of diurnal preference by examining the influence of social roles, responsibilities and relationships present in everyday life, and how they are negotiated with an individual's diurnal preference. These negotiations are put into critical relief in examining the negotiation of sleep timing between couples with differences in individual diurnal preference.

Methods:

40 heterosexual couples, aged 20-59 participated in in-depth qualitative interviews about their sleep and kept audio sleep diaries for one week. Qualitative data was analysed using NVivo software and a grounded theory approach. Participants completed the Horne Ostberg Morning-Eveningness questionnaire, and provided buccal swabs from which their *PER3* genotype was determined by polymerase chain reaction.

Results/Discussion:

Differences in diurnal preference between partners may result in potential conflict in the negotiation of sleep timing between partners in discordant couples. Sociological analysis can be helpful in developing an understanding of how couples manage physiological differences in diurnal preference, in this study highlighting the interaction of the individual's perceived diurnal preference with the normative expectations of the couple relationship. The influence of structural factors such as work schedules, moral discourse surrounding sleep and related strategies are also examined.

26 ATTENTION AND MEMORY IN PATIENTS WITH OBSTRUCTIVE SLEEP APNOEA

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London & MRC Cognition & Brain Sciences Unit, Cambridge

Background:

The presence and type of cognitive deficits in patients with obstructive sleep apnoea (OSA) is a subject of debate (Sateia, MJ, Clin Chest Med, 2003; 24:249-59). Some have found that patients with OSA may have specific problems with memory and attention, although it is unclear whether this is the result of intermittent hypoxia or daytime somnolence. The aim of this study is to explore the relationship between cognitive dysfunction, daytime somnolence and severity of OSA; preliminary findings are presented in this abstract.

Methods:

21 sleep clinic patients (4 females; mean (sd) age 50 (6) years) were recruited. Patients completed 20 cognitive tests designed to assess specific aspects of memory and attention, prior to undergoing full polysomnography. Sleepiness was assessed with the EES and a single OSLEP test. OSA patients were classified as having mild, moderate and severe disease using AHI. Comparisons were made using Mann Whitney U; significance $p < 0.05$.

Results:

Patients with severe OSA showed significant impairment on 3 tests of attention compared to those with mild / moderate disease; patients with mild / moderate disease did not differ significantly from one another. Daytime sleepiness was not significant between groups.

Table: Group mean (sd)	Mild (n=7) (AHI<15)	Moderate (n=3) (AHI=15-30)	Severe (n=11) (AHI>30)
AHI (events/hour)	7.8 (5.2)	21.6 (5.3)	72.4 (15.9)
Phonemic Fluency (F) (No of words)	17.1 (4.0)	17.5 (1.9)	11.3 (4.6)
Trails A (Time to complete in s)	34.7 (6.9)	37.8 (3.0)	45.0 (9.2)
Trails B (Time to complete in s)	64.4 (9.9)	83.1 (21.1)	108.0 (39.8)
Epworth Sleepiness Scale (ESS)	8 (5.7)	13 (2.1)	15 (4.6)
Single OSLEP - 09:00 (mins)	33 (10.9)	27 (11.0)	33 (11.3)

Conclusions:

Preliminary findings suggest that OSA is associated with deficits in cognitive function; specifically in attention, with disease severity being an important contributory factor. Daytime somnolence does not appear to contribute to performance on these tests.

Funding:

Wellcome Trust, GT is supported by an NHLI studentship.

27 COMPARISON OF HOME SNORING MEASUREMENT USING SIMULTANEOUS EMBLETTA AND SNOROMETER RECORDINGS

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Introduction:

The estimation of snoring severity in subjects presenting with problematic snoring is important in the selection of treatment options. Overnight home cardio-respiratory and snoring recordings are currently undertaken using the Embletta system (Flaga Inc). Accurate acoustic measurement of snoring is now possible using the Snorometer (Stowood Scientific). The aim of this study was to compare Embletta measured snoring with Snorometer recordings.

Method:

50 subjects (41M, 9F), referred for problematic snoring, underwent single overnight cardio-respiratory study (Embletta) and simultaneous independent snoring recording (Snorometer) in their own home.

Results:

Subject mean age was 45 yrs (range 21-57) and mean BMI was 32 (20-49). Mean AHI was 21 (2-63) and mean Embletta scored snore time was 49 min (0-286). Embletta recordings do not quantify snoring intensity. Snorometer measured mean snore time was 129 min (34-321), mean snore index was 248 snores/hr (64-583), and mean intensity (99 percentile) was 69dBSPL (59-87).

No correlation was found between snore index and AHI or snore intensity and AHI. In all but one subject, Embletta recordings underestimated snore time. Average Embletta scored snore time was 33% of Snorometer snore time, with a maximum underestimation of 213 minutes.

Discussion:

Overnight Snorometer recording enables accurate identification of snoring in the home. Embletta recordings significantly underestimate actual snoring.

28 STAYING UP AND SLEEPING IN: TEENAGERS IN THE HOUSEHOLD

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Introduction:

As teenagers move towards increased independence their sleep needs and requirements often contrast with that of their parents and other members of the household. For example, it is very common to hear parents lamenting the change in their children's sleep patterns as they move from pre-teens who go to bed before their parents and wake up early in the morning to teenagers who are still awake at 2 am, and unable to be roused from sleep to get to school or college in the morning. The impact of teenager's sleep schedules on health and academic performance is well researched and documented, with excessive daytime sleepiness, moodiness and, more seriously, consequences for driving, being reported for this group of young people. Indeed such research has even led to the delay in school start times in one State in the US. However little research has been undertaken on how the sleep/wake patterns of young people affect other members of the household.

Methods:

This paper is based on data obtained from a pilot study of young people aged 13-17 in the UK. The data were obtained using a multi-method approach and comprise focus groups, data from audio sleep diaries, paper diaries, email diaries and a sleep web blog (n=20). Respondents were also asked to provide photographic and written data about their sleeping environment.

Results and Discussion:

Focusing on the methodological issues arising from data collection from and by young people, as well as presenting some early findings from sleep diary data, this paper will suggest that by offering alternative and innovative methods of data collection to young people, important and diverse information about the negotiation of sleep in households with teenagers can be obtained.

Keywords:

Sleep, teenagers, household.

29 NOCTURNAL DIAPHRAGM FAILURE IN OBESITY HYPOVENTILATION SYNDROME (OHS)

Cormican L, Higgins S, Nijhawan N, Davidson C, Williams A (London, United Kingdom)

Eur Respir J 2004; 24: Suppl. 48, 115s

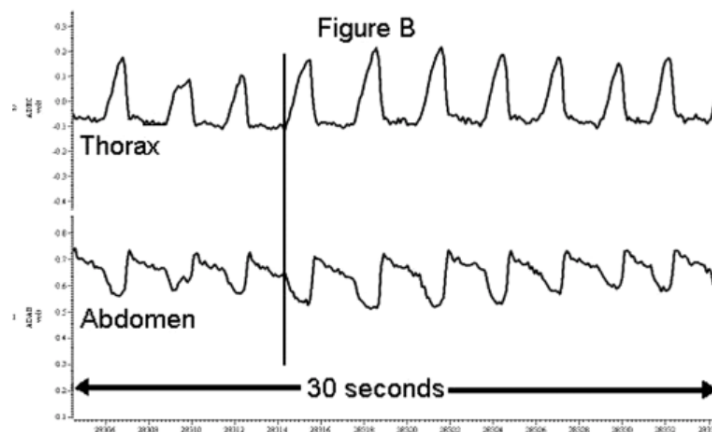
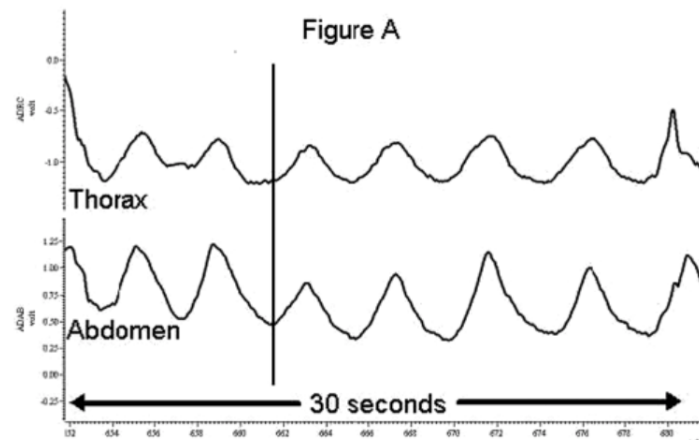
Introduction:

Obesity is an independent risk factor for chronic alveolar hypoventilation (OHS). The cause of obesity hypoventilation syndrome is poorly understood and its severity does not correlate with measures of obesity.

We describe, for the first time, the occurrence of nocturnal intermittent abdominal wall paradoxical movement (AWPM) during spontaneous ventilation which appears to be unrelated to central respiratory drive.

Patient Population, Methods, & Results.

6 patients (M: F 5:1) of mean age 58.6 years with OHS were identified prospectively (mean BMI 67.7 Kg/m²), mean daytime resting arterial pCO₂ 7.58 Kpa) by diagnostic overnight respiratory inductance plethysmography during spontaneous ventilation. All had a normal respiratory pattern while awake (Fig A). 2 had evidence of Obstructive Sleep Apnoea, but all 6 had distinct periods during sleep of abdominal wall paradox (Figure B) indicative of diaphragm failure.



Conclusion:

Sleep associated AWPM was seen in OHS suggesting that nocturnal diaphragmatic failure may be of aetiological significance.

**30 AN AUDIT OF THE DIAGNOSIS AND TREATMENT OF OBSTRUCTIVE SLEEP APNOEA AT TWO DIFFERENT HEALTH SERVICE CLINICS IN CENTRAL LONDON
(1) SLEEP DISORDERS CENTRE, ST THOMAS' HOSPITAL, LONDON
(2) ENT SURGERY, ROYAL NATIONAL THROAT, NOSE AND EAR HOSPITAL**

Sutherland C., Athar M., Williams A., Kotecha B.

INTRODUCTION:

The aim was to show differences in management of Obstructive Sleep Apnoea (OSA) in two sleep centres and compare these with the Scottish Intercollegiate Guidelines (SIGN) for the diagnosis and management of OSAHS.

Methods:

A surgically-run (RNTNE) and a physician-run (STH) sleep centre were selected for this audit. A retrospective analysis of clinical information from hospital notes was made. The notes analysed were those of all patients referred with suspected OSA who had first attended clinics at either hospital between Feb 1st 2003 and April 30th 2003.

Results:

89 notes were analysed at STH and 34 at the RNTNE. The population demographics of sex, age and BMI were similar for both groups. AHI was higher in the STH group. Most RNTNE patients were referred from General Practitioners (GP) whereas at STH most were referred from ENT surgeons. Waiting time was doubled at both sites if the GP referred to a non-sleep specialist first who then referred on to the sleep clinic. More home cardiorespiratory studies and full polysomnography were done at the RNTNE and more home simple oximetry at STH. 24% of patients attending the RNTNE had surgery as treatment compared to 4% at STH. 47% of RNTNE patients underwent Sleep Nasendoscopy (SNE) compared to less than 2% of STH patients. 21% of patients were prescribed CPAP at the RNTNE as compared to 42% at STH. This showed that anaesthetic and surgical intervention was higher in patients referred to the surgically run service and CPAP was more common in the medically run service.

Conclusions:

Neither centre followed SIGN guidelines. Despite the small numbers of patients to infer from, it is likely that an individual's treatment was affected by where they were referred to. Further work should be done towards creating UK national guidelines for the diagnosis and management of OSA.

CASE STUDY

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Rhythmic rocking movement disorder rarely persists into adulthood. We describe a case in an adult female and discuss the sleep stages, patterns of movement and treatment options as well as an overview of the medical literature.