

# CORSO VIDEO EEG LICE 3° EDIZIONE CATANIA, 24-27 OTTOBRE 2021

La diagnosi differenziale: non solo frontali...

Paola Proserpio

Centro di Medicina del Sonno Neurologia, Dipartimento di Neuroscienze Ospedale Niguarda, Milano

### Non epileptic paroxysmal events out of sleep

Parasomnias Narcolepsy Non-REM arousal disorders Hypnogogic/hypnopompic hallucinations Confusional arousals Sleep paralysis Sleep walking Sleep-related breathing disorders (OSA) Sleep terrors Psychiatric and behavioral disorders Parasomnias associated with REM sleep **PNESs** Nightmares Nocturnal panic attacks REM behavior disorder Isolated "benign" paroxysmal nocturnal events Parasomnia overlap syndrome Sleep starts (hypnic jerks) Other parasomnias Benign sleep myoclonus of infancy Catathrenia (nocturnal groaning) Excessive fragmentary myoclonus Sleep enuresis Propriospinal myoclonus at sleep onset Exploding head syndrome Hypnagogic foot tremor Sleep related hallucinations Alternating leg muscle activation during sleep Sleep-related movement disorders Nonneurological paroxysmal events Periodic limb movements of sleep Gastroesophageal reflux Sleep bruxism Nocturnal leg cramps

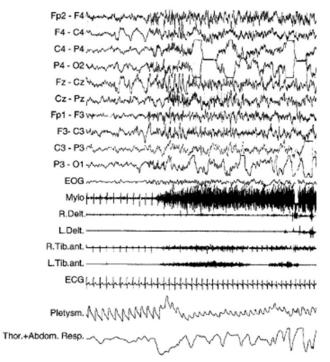
Rhythmic movement disorders

Vendrame et al., 2011

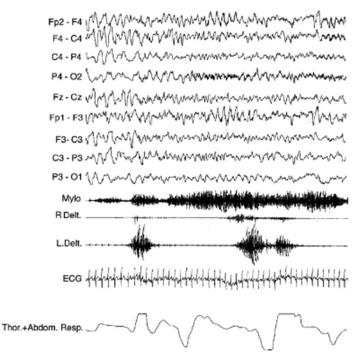
#### Movement disorders in sleep: Guidelines for differentiating epileptic from non-epileptic motor phenomena arising from sleep Sleep Medicine Reviews (2007)

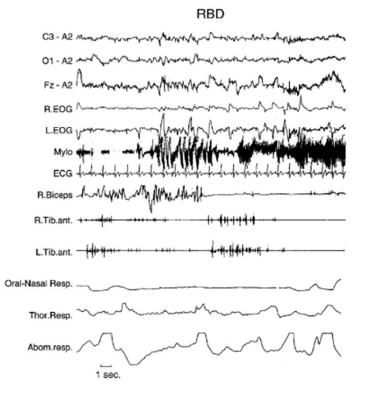
Paolo Tinuper<sup>\*</sup>, Federica Provini, Francesca Bisulli, Luca Vignatelli, Giuseppe Plazzi, Roberto Vetrugno, Pasquale Montagna, Elio Lugaresi

#### NFLS



#### N-REM PARASOMNIA





## Parasomnia

Parasomnias are undesirable physical events or experiences that occur during entry into sleep, within sleep, or during arousal from sleep. Parasomnias may occur during non-rapid eye movement sleep (NREM), rapid eye movement sleep (REM), or during transitions to and from sleep."

.... often they seem to be purposeful and goal directed. They may result in injuries, disturb of sleep (of the patient as well as the sleep of others), and they may cause untoward psychosocial developments.

ICSD3 (American Academy of Sleep Medicine 2014)

# **Classification of Parasomnias**

NREM-related parasomnias		
(disorders of arousal)	REM-related parasomnias	Other parasomnias
Confusional arousals	REM sleep behavior disorder	Exploding head syndrome
Sleepwalking	Recurrent isolated sleep paralysis	Sleep-related hallucinations
Sleep terrors	Nightmare disorder	Sleep enuresis
Sleep-related eating disorder		

Proserpio P and Nobili L, 2017

# Epidemiology

Table 1. Current and lifetime prevalence of the different types of NREM parasomnias.

NREM Parasomnia	Prevalence of Symptoms							
	Childhood	<b>Current Prevalence</b>	Lifetime Prevalence					
Confusional arousals	17% [5]	6.9% [8]	18.5% [8]					
Sleepwalking	14.5% [7]	1.7% [8]	6.9% [9]-22.4% [8]					
SRED	-	2.2% [8] 16.7% [10]	4.5% [8]					
Night terrors Sexsomnia	17.3% [11]–39.8% [7] -	2.7% [8] 2.7% [8]–6% [12]	10.4% [8] 7.1% [8]					

Hrozanova et al., 2019

# **General clinical features of DOA**

General clinical features	
Common in childhood	
Decrease with increasing age	
Episodes in the first third of the night	
A state between sleep and waking during the event, disorientation, and confusion	
Presence of triggering factors	
Long episode duration (minutes)	
Minimal recall of the event	
Strong familial pattern	

Proserpio and Nobili, 2017

## **Constitutional and Precipitating factors**

#### 1. Constitutional or predisposing factors

- Genetic
- Developmental
- Sleep Deprivation
- Chaotic wake/sleep scheduling
- Psychologic

### 2.Precipitating factors

#### A) Endogenous

- Obstructive Sleep Apnea
- Gastroesophageal reflux
- Seizures
- Fever
- Periodic movements during sleep

#### B) Exogenous

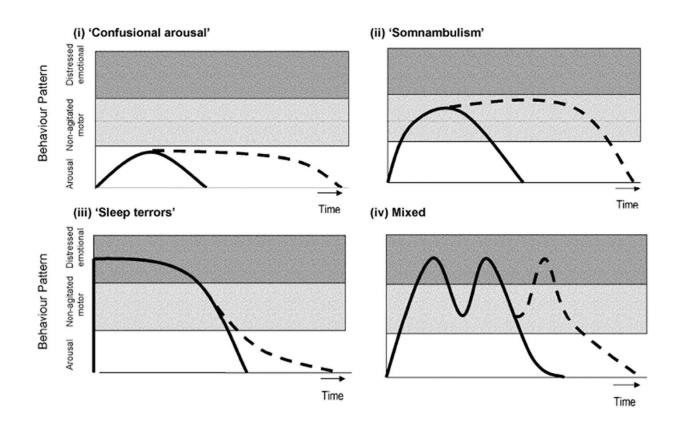
- Drugs
- Stimulation-auditory, tactile, visual

Modified from Ferber and Kryger: Principle and Practice of Sleep Medicine in the Child, 1995

# **General clinical features of DOA**

	Confusional Arousal	Sleepwalking	Sleep terror
Age of onset	2-10 years	4-12 years	18 months – 10 years
Peak time of occurrence	First third of night	First third of night	First third of night
Ictal behaviour	Whimpering, some articulation, sitting up in bed, inconsolable	Walking about the room or house, may be quiet or agitated, unresponsive to verbal commands	Screaming, agitation, flushed face, sweating, inconsolable
Motor activity	Low	Complex	Rarely complex
Autonomic activity	Low	Mild	Intense
Complications	Rare (aggressioness)	Possible (violence)	Occasional (escape)
Typical duration	< 1 minute	1-20 minutes	5-20 minutes

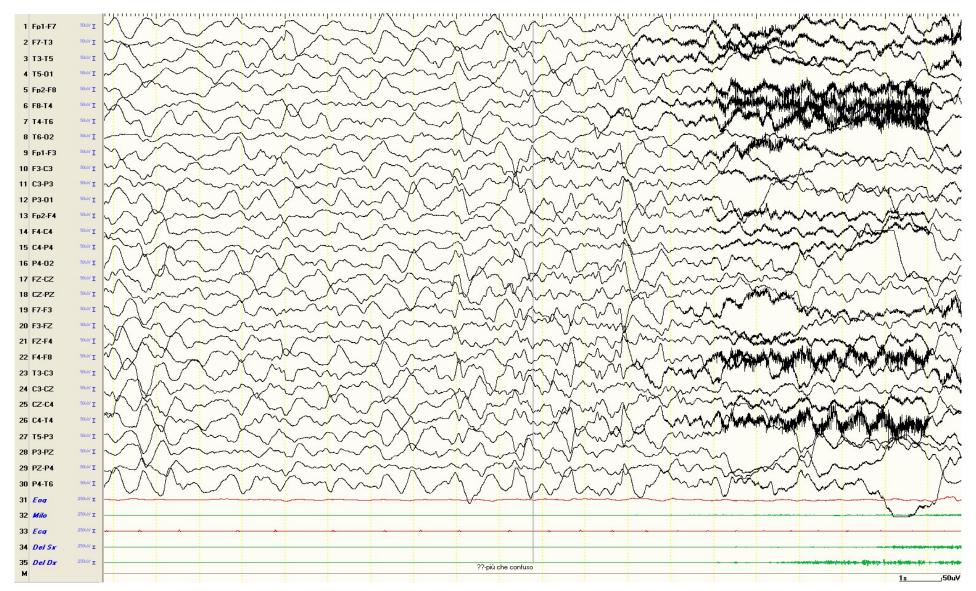
Modified from Proserpio and Nobili, 2017

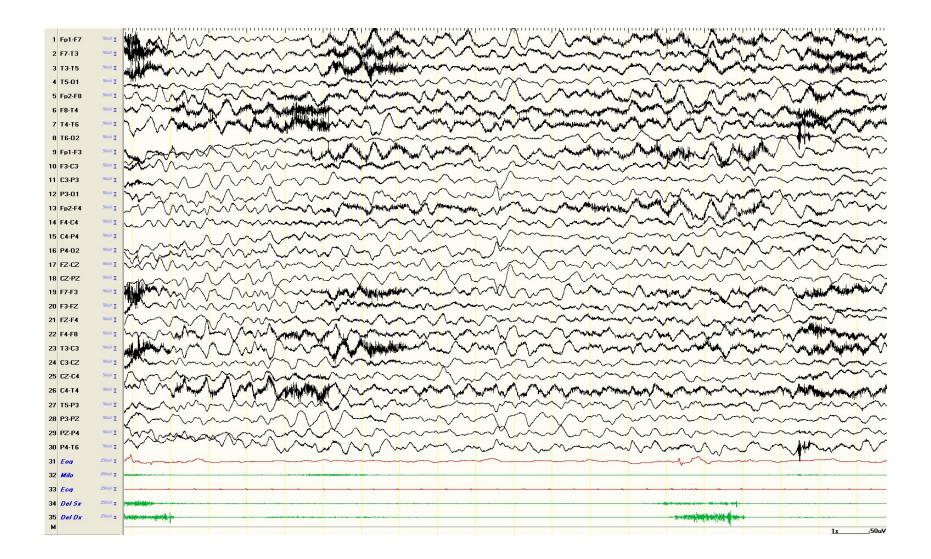


Classifying NREM parasomnias into strict distinct entities is probably an oversimplification; indeed there is a hierarchical continuum between different behavioral patterns of arousal parasomnias

Derry et al Sleep 2009

#### **Confusional Arousals**



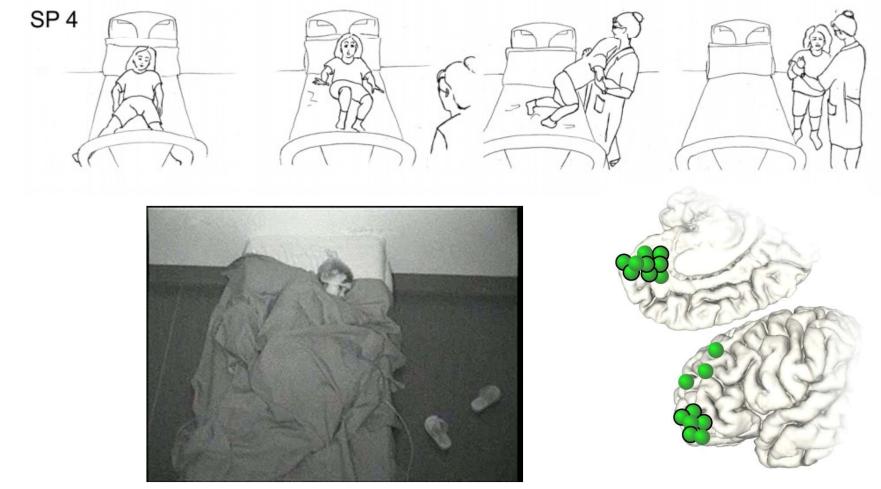


1 Fp1-F7	50uV I	m	N	m	ww	when the second	ma	m		m	mayor	many per	$\sim$	m.	man	with many	. the second of
2 F7-T3	50.JV I	me my	and the second s	~~~~~	www	Winger A	and the second second second	Mar mar	and the second sec	This are a second to the second s		water and the second second	*****	$\sim\sim$		m ~~~~	-
3 T3-T5	50.4V I	mon approved	يعتنيه ويتنافذون بالرن	man and a second and a second	- Andrew and a start	"Managerer and a	the server and the server	Here Marine	and the second second		and a state of the second	with the second second	man in the second	property and the	man	a preserve lagerate	
4 T5-01	50uV I	June	man		m	$\sim$	m	~~~~	m	$\sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		- hardbarry		$\sim$	~~~	-
5 Fp2-F8	50uV I	1mg	m	$\sim \sim$	$\sim$	m		$\sim$		1 Am	mon	~~~~~	min	$\sim \gamma$	- warden ward	and the second	
6 F8-T4	50.JV I	Mary Martin Martin	and a construction of the second	and the second second	and the set of the set	And the second second	Phillippine and the second	a a for the second s	Partition of the second			Warpprocession and	man and the Astronomy	and the second	- Aller	m	~~~~
7 T4-T6	504V I	My water and	and a service and the service of the	المراشمي المعلي المعليه المعريو	" - ANT ALL AND A THE			۲۰۰۰ میلین میل	بالجنوب الإجوار والمتعود والمتعلم	n ar an		and the second and the second	mand for the second	wine warder with	a man	-	Auripean
8 T6-02	50.JV I	form	~~~~		min	-ill-		im						m			monor
9 Fp1-F3	50.JV I	1 mon	mont	$\sim$	$\sim$	$\sim$	m	$\sim$	~~~~	June	mm	man	hand	- A	- Marcan Mar	4 Marine	Aprilia Antonio
10 F3-C3	50uV I	m	m	min	$\sim$	mi		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m		m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~~~
11 C3-P3	50.JV I	min	$\sim$	$\sim$	$\sim$					m			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
12 P3-01	50.JV I	11	miner	$\sim$	mm	$\sim$	m	$\sim$	mm	m	m	~~~~~		and and a	m	man	wh
13 Fp2-F4	50uV I	my	m	$\sim$	$\sim$	~~~~	$\sim$	$\sim\sim\sim$	$\sim$	v	$\sim$	$\sim\sim\sim\sim$	Lun	~~~		m	~~~~
14 F4-C4	50uV I	$\sim$	$\sim$	m				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		$\sim$	m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m		m	m
15 C4-P4	50.JV I	~	$\sim$	m	~~~~	-	~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		m	~~~~~		~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~
16 P4-02	50uV I	man	~~~	mon	$\sim$	$\sim$	man	$\sim\sim\sim$	mont	man	man	m		man		ww	nou
17 FZ-CZ	50.IV I	$\sim$	$\sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$	$\sim\sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$			$\sim$	~~~~	$\sim$	~~~~
18 CZ-PZ	50.JV I	Nu un	m	Ann	man and a second	h	$\sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	min	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m		m	~~~
19 F7-F3	50uv I		man.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Mary all and a way a	hang	mander	$\sim\sim\sim\sim$	mand		Vingelester	$\sim$	m	and a series and	Mar Mar Har	we have been and	and the
20 F3-FZ	50uV I	V.	~~~~	man	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				man	m	~~~~
21 FZ-F4	50uV I		m	$\sim$	m	~~~~	~~~~	$\sim$	m		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		m	~~~~
22 F4-F8	504V I	1.4 1.4	$\sim$	many	m	and a second second	m	m		M	man the second	-v-m	~~~~	my	mm	www.	m
23 T3-C3	50uV I		and the second	marker when	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Mar Marth	m m	in the second	A THE REPORT OF THE PARTY OF TH	Y. Martin and the second second second	www.	mar and the second s	a survey of	her haven		and the
24 C3-CZ	50uV I		m	m		~~~~~	mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~	m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
25 CZ-C4	504V I	v				مىلىكەن بىرىكىيىتىك مەنبارلار بىرىللار بايل					Milliak lake a				~~~~	$\sim$	m
26 C4-T4	50uV I		T <sup>err II</sup> Notice at the left of the	have a second the second s	+- <b>**</b> **********************************			a a la transmission de la construcción de l	w <sup>h</sup> ult <sup>an</sup> th <sup>th</sup> liwith	lander die gestellenden. Nature die gestellenden		and the second second	and an and the second second	maran and a			~~~
27 T5-P3	50uv I		$\sim$		m	m	multi		ma	- Handland	William			happene		$\sim$	m
28 P3-PZ	50uV I				$\sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						~~~~	
29 PZ-P4	50uV I		~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~	min	$\sim$		~~~~~				-	$\sim$	m
30 P4-T6	50uV I		m	and a second and a second and a second	m	$\sim \sim$	man	m	$\sim$	m	man	~~~~~	mythem	m		$\sim\sim$	m
31 <i>Eoq</i>	250uV I									~~~~~	~				÷		
32 Milo	250uV <u>T</u>				· · · · · · · · · · · · · · · · · · ·								-	***			
33 Ecq	250uV <u>T</u>	1.1	~ ^		~ ~ ·		· · · ·				· · · ·	* * *	* * *		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
34 Del Sx	<sup>250uv</sup> I			1													
35 <i>Del Dx</i> M	250uV I																
																<u>1s</u>	_50uV

# **Sleep Terrors**

	2 67-13	
A PARTY AND A PART	3 13-15 4 15-01	
The comment of the second seco	5 Fp2-F8 6 F8-T4 7 T4-T6	
too 1 and the second second	7 14-16 8 16-02 9 Fp1-F3	
	10 F3-C3 11 C3-P3	
	12 P3-01 13 Fp2-F4	- The second state of the
	14 F4-C4 15 C4-P4	
	16 P4-02 17 FZ-CZ	
AND ALL MARKED AND	18 (2-92 19 F7-F3 20 F2-F2	
A REAL PROPERTY AND A REAL	21 FZ-F4 22 F4-F8	
	23 13-63 24 63-62	
	25 CZ-C4 26 C4-T4	
	27 15.P3 28 P3.P2 29 P2.P4	
	28 P2-P4 30 P4-T6 31 <i>E06</i>	
and the second	32 MOLO 33 ECG	
	34 DELT SX 35 DELT DX	a a statistica a
	36 779 5X 37 779 DX	
	40 ADDOMEN PDLSE 43 0%	A :start of the episode 🗍
	1 Fp1-F7 2 F7-T3	
	3 T3-T5 4 T5 01	
	6 FB-T4 7 T4-T6	
	6 FD-T4 7 T4-T6 8 T6-02 9 Fp1-F3	
	6 F8-T4 7 T4-T6 8 T6-02 9 F8-T-F3 10 F3-C3 11 C3-P3 12 P3-01	
	5 FBT4 7 T4T5 8 T642 9 Fp1-F3 10 F3C3 11 C3P3 12 P301 13 Fp2-F4 14 F4C4	
	5 FB14 7 T415 8 T642 9 Fp1F3 10 F3C3 11 C3P3 12 P301 13 Fp2F4 14 F4C4 15 C4P4 16 F402	
	6 FB14 7 T416 8 F642 9 F642 10 F503 11 C3493 12 P301 13 F62F4 14 FF04 15 C4494 16 F9442 16 F9442 17 F2C2 18 C2492	
	6 19914 7 14-16 9 16-62 9 16-62 11 12-89 11 12-89 11 12-89 11 13-65-84 14 14-64 15 64-84 16 14-84 16 16 14-84 16 14-84 1	
	6 1911 7 1416 9 1643 9 1643 1 1630 1 1630 1 2900 1 2900 1 5644 1 6 Mu 1 5644 1 6 Mu 2 1022 2 100 1 222 2 101 2 1224 2 1244 2 2 101 2 2 101 2 2 101	
	5 7914 7 7415 9 7415 9 7415 9 7415 9 7415 9 7415 9 7415 9 742 9 742 74 74 74 74 74 74 74 74 74 74 74 74 74	
	6 /6 /6 /1 7 /1 /1 9 /	
	6 1911 7 1416 7 1416 9 19412 10 1940 10 194	
	0 1944   1 1416   1 1410   3 1410   3 1410   3 1410   1 1410	
	0 10   0 10   0 10   0 10   0 10   10 10   11 10	
	24 GB22 V 25 G224 28 G4-14 27 T549 28 G4-14 29 F2F4 29 F2F4 20 F2F4	C: after 20 minutes

# Differential diagnosis with SHE



Gibbs et al., Epilepsia 2019

# Sleepwalking

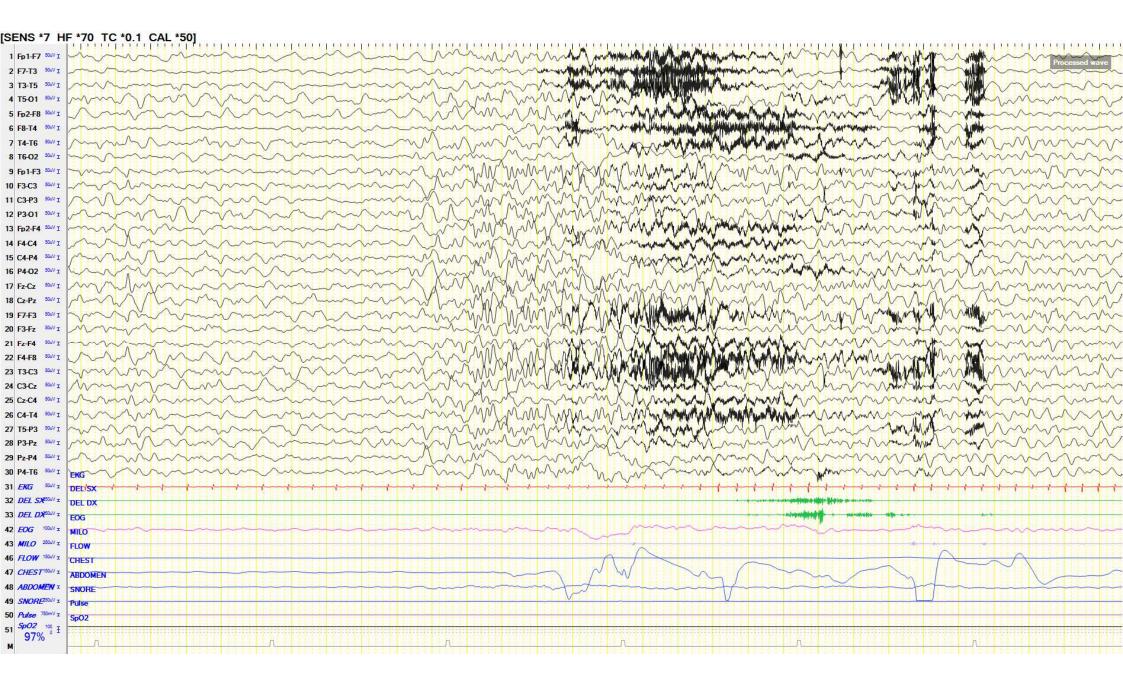
HF	70 TC 0	.1 CA	L 501																												
	hill			111	~~~	111	Lin		2	man and	injum	in		XL	hind	min	2	LAN.	X A	K'A'	N' '	mn	22	1X X	VN/	14	2	22	K'A	12	111
		~	~		~~~~	~ ~				· wvw	min		town	www.	n	Aun		No N	Aun	Nº V					VV	~~~	$\sqrt{\sqrt{2}}$	- martin	W L		Processe
/I (				~ -		~			~ ~	MA	W	When a	mi	1	10.00		~	1	Ant		~	ma	~ ^			NA		- d	And to	~ ~ ~	
				Ľ				~~~~	~~~~	1 VY	r "WW	and the		Umr Cr		WHAT C		JV W	a harden			~~~~	~~~			12	v~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~~~~
<sup>'</sup> -		~~	v v		$\sim$	~~~			~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Man Mary	m	1.100	A N	~~~~	A		Jan Maria	A .A	NA	~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	n~	n n			n A	-	200		
/I _	s many	~~~~~	~~~~~~	~~~			~~~~			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man	- M	m	v vv	0.0	1 min	~~~					n n l		Added	VV	the second	~~~	and w		~~~~~	www
Ĩ		m	~~~	~~~~	~~~	~~~~	www		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	my	MM	ma	- m		VVV	Warn		M. Maria	v.v.v.	v	~~~~	m		V MANNAL,	man -	A A	ay ayoun	and the first	a marine	m	vivi
-			~~~					$\sim$			X.	-	n'	m.	~~~	V~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	/ V m		VV	-vw	nu l	m	A dealer	www.		M. M			m	
I	~~~~		vm								MAN									~~~											$\sim$
I		~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~	~	~~~~		m	North N	MM	NVVV	Now N	N~~~~	N. W	M. M	VWVV	www	1 www	2004	V W V	V	VV	ww.	MW	m	NV	nun		www	vur V
I			~~~~	~	~~~						man																				
I		m									m																				
1	June	m	~~~	-~	w						mh																				
/I ]					~~	~~~		~~~	m.	www	mm	WVW	MANN	wh	win	V	W~1	Ilm	1 ml	-wh	V	ww	VV	Mu	VV	" we !	Mu	~ VIMENA	Mr. M.	mm	m
/I _	~~~~	~~~~	~~~	m	$\sim$	m	m	~~~	m	mul	min	www	m	~~~~	VWV	und h	$\sim$	~~~	m	M	m	www	m	~~~	~m	m	m	M	m	m	VW
/I _	~~~	m	~~	m	~~~	m	~~~	m	m	M	M		mm	M	M	Vin	~~~	m vm	m	m	m	m	N	how	m	m	~~V	~~~	vur.	NW	$\sqrt{\gamma}$
II U	m	m	m					Ś			W.A	WW	ww	VW	www	Mm	n l	YW	ww	VN	NM	MI	Jun	W W	M	v	wh	NW	m	m	~~
/I 0	mm	mm	my	m	m	$\sim$	m	m	my	my	MAN IN	NMJ	un IV	V	6/10	MM	W/M	ANNI	MM	111	Imr	MM	11/1	M	5112	WI	1210	m	mil	non	VVII
11		m	~~	m	~~	m	m	wh	m	m	/ W	1 m	m	m	m	J.	m	mm	ham	1 mm	m	vm	w	~~~~	Vn	Nh	VV	S	m	m	vh
/ I	m	mm	m	~~~~	$\sim$	m	~~~	m	mm	www	MMM	WNW	VVVV V	17 M	ww.	WW	MM	Www	MAN	NW	V	WV	VV	WW	VVY	m	m	m	WW	mm	NW
I		m	m	m	S	mm	~~~	m	ww	m	mm	WYYY	my	ww	m	mm	wh	Jww	ww	Vvv	-v~	ww	2	211	2 m	$\sim$	w.	~~~	mm	m	~~~
/I -	m	mm	~~~~	m	m						Myn																			m	
'I _	mm	m		mm	~~~		$\sim$	~~~~	m	my	WW	WW	mm	V YN	VWW	1 may	NV	Mary	hm	MM	hun	MWY	M	NYN	M	Why	when	www	ranna	min	my
/ I ]	m	~~	~~~	$\sim$	m	m	$\sim$	m	mm	m	milin	NW	NNN	15h	mm	www	hug	mm	WW	wh	Vww	MM	VV	WW	m	m	hom	m	vorm	m	m
11 -	mm	m	$\sim$	~~	V	m	m	m	mp	~~~	Jun	www.	m	~~~	m	VN	m	MW	ww	n	w	m	-1/1	m	~~	2	S	$\sim$	$\sim$	m	202
11 1	m	m	m	n	h	~~~~	m	m	~~~~	m	MM	VW	In	m	MM	m	N	m	m	m	M	m	VV	m	m	m	$\sim$	m	n	him	M
'I	m	m		m	$\sim$	~~~~	~~~~	~~~	m	m	WW	WW	my	Vin	NWW	mm	M	m	hm	why	m	M	In	Marin	Nm	ww	M	m	mm	m	m
'I	m	l	~~	~	~~	~~~	~~~	~~~	m	m	mjm	why	nni	M	run	m	Win	m	m	m	Vw	hh	m	m	m	m	s	m	han	m	m
/I -	m	m	m				m	m	m	yrh	m	La	$\sim$	~~	m	vh	m	M	m	m	n	m	m	m	wh	$\sim$	$\langle \mathcal{M} \rangle$	ha	$\sim$	$\sim$	$\sim$
/ <b>I</b> ^	m	m	m	A	$\sim$	m	him	m	~~~	m	MM	JV V	AAAA	MA	nm	M	~ ~ ~	An	NA	MM	MA	mand	MAL	12m	AN	m	AA.	MA	no	2m	YM.
/I	EOG Sx	m	m	~	m		~~~	~~	m	M	M	100 V Y	mm	M	my	non	N	ww	Lin	ml	n	m	Am	m	ni	w	m	m	m	m	X
/± [	EOG Dx	111				1111					~~~~	~~~~	~																		
1= -	MILO											~~~~																			
4	EKG	141	1.1.1.1	14.1.1	414	2223	314		111	1 4 1 4	1 1 1 2	1 1 2	11.11	11-1	1111	111-1		1111	1111	1111	1211	1 8 4 4	414	1 2 1 1	1 11		111	111	111	1411	11.24
-		111			111	111	111		111			111		111	-			*****	HH	1111	1111	111		1111						n-m-	
-							111												Λ	1111										Λ	

[SENS 7 HI	F 70 TC 0.1 CA	AL 50]	166666		nnnnn			annan			399 <b>9</b> 98		88888	188888
1 Fp1-F7 504V I	mm	- water theman	m	mound	man	m	m	Lamanto	minum	mannen	mann	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$	Processed wave
	mono													~~~~~~
3 T3-T5 50.1V I	manu	the have a second and the second and	mymmy	have the second	not a som allogun nybretteret a ansa astr	un and the formation and	mappinenter	many Moount	ited the activited and an all for the	White mount	man	m		~~~~~
4 T5-01 504V I	mound	how he proposition and a second	montan	the Marshannan	way was all and the second and an	anar malantanah man	map and and a second	/ June 1	water monthly and the second of the second o	Normal Martin and the second s	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~
5 Fp2-F8 50.V I	man	Man	m	min		~~~~~~	m	m	a management and	programment		~~~~~~		~~~~~~
6 F8-T4 504V I	10th an mark the part	mapminim	immen your	mppham	man	minimum			performants property and			m		~~~~~
7 T4-T6 504V I	an man	mm	mon		manpara	mm	mm				m	m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	v
8 T6-O2 SOLV I		min	******	mything	man	m		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	warden and when the	www.ham		harring		~~~~~~
9 Fp1-F3 504V I	mm	when york of the second and the second and	moun	more	manhan	m	mm	mon.	war and an and a state of the second	water the stand of the	momentary		~~~~~	~~~~~
10 F3-C3 504V I	mm	mon	~~~~~	mjim	~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	,	n	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~
	mon						m			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~
12 P3-01 50.1V I	www	Munn	m	mohn	maham	m	mmm	Jum	man market	1 mm	m	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
13 Fp2-F4 504V I	m	- Carthan	m	mpun	m	~~~~~wr	the work of the second		numerous and a starting	domment the		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~	~~~~~
14 F4-C4 50.V I	mm	min	~~~~~	mprim	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		mund	Lam		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	~~~~~
15 C4-P4 504V I	mywy	m	www	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	~~~~~~	~~~~~	m	( more	~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~
	Mm						m	my	month	part	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mm	$\sim\sim\sim\sim$
	Winn					m		hann	h		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~~~~~~
18 Cz-Pz Souv I	V V			m		~~~~		m	mm		- norm		s menter and a second s	
19 F7-F3 50.V I	mm	Managemen	mar	mon		m	may	h	minim	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	~~~~~~
20 F3-Fz 500V I	Mann	-Virman V		$\sim$			m	<u> </u>		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
and the second	mm			mhinn	~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~		man	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		m	
	Munn			mur			Man and a start and		the internet of the state of th	have been a set of the	~~~~~			
23 T3-C3 504V I	mmm	man man	man ha	- A Mar		www.	manning	1	r wanter hange	ward all war war	meren ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	~~~~~	
	Mana					minin	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~	hand				
	mm						~~~~			Juston		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
	Minner									although		and a second	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
27 15-P3 501	m			an Mu Wu ma	A Mar Married and Additional	Mar Manual	margaren and	A subsection of the section of the s	ante-con-ender im. Althou	- The state	~ ~~~			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
	Ann												~^~~	~ ~ ~ ~ ~
	N T		A						a subs day MM					
30 P4-16 Sul 1 31 EOG Sx <sup>2504/</sup> ±	EOG Sa	VVVVVV	~~~~~	- Marcel 1111 An					Amerikan Amerika					V. V. W. V
31 EOG Dx <sup>250</sup> ····································	EOG Dx					HTHE								
32 EOG DA <sup>TAL</sup> 2 33 <i>MILO</i> 375V ±	MILO													
34 <i>EKG</i> <sup>250</sup> √ <sup>1</sup>				nim							~			
м	h					A							N	

## Epileptic nocturnal wandering

1 Fp1-F7	MM	mmmmmm	Manh	man (males manage	www.www.mannewall	Mander	WWW.WWWWWWWWWWW		MALAN
2 F7-T3		and a support of the second of the second				monorand Ma	www.Addad Wallatada.c. au		han him
3 T3-T5					หมาะหน่างหมายหมายการการการการการการการการการการการการการก	my marker (		UZ NI MINI MANNH	Maryhand
4 T5-01	minh	mm	mm	mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm		- porta la			A MANA
5 Fp2-F8	monument to	montantingumant	manum	my my hand when	when a when the second a secon	Martune VA	1 MI MAN R HIMMAN IN MAN		
6 F8-T4	non principal for him	the plan and the part the setting of	where the particular and the second	them and when a fur when you way	and with the theory of the providence of the test and the second stands	mantheman and work the glass			
7 14-16	minum	a providence and a second	mannonman	marinaman	nametranan perinterana anton	en man man man and a start of the second of the second second second second second second second second second			LIM MAN
8 T6-02	manda	man			mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm	mannennennen	Chamil 4		
9 Fp1-F3	mar	mmmmm			nserved experiment a provide a strate with a served of the	mounterman	mary throw the may	MAR MINING AND	
10 F3-C3	6	mon				with mining (			
11 C3-P3			() · · · · · · · · · · · · · · · · · · ·		hadraharalpeanership threader a start loss was held	my working /	AMARY AND A DECK		9 AN A
12 P3-01	mm	mm	minim		momente	howwww.			M. MAR
13 Fp2-F4	mann	montermeter	mound my man	warman harman hard hard hard hard hard hard hard hard	him manual manager and the second and	My Manny Mus	XMM		
14 F4-C4					ever and the second a				
15 C4-P4	Manutally	mannon	m Mon Mon	annam an yran war	land haran many and sound when the	halaway Mool Alana 199	Anademication and Additional		
16 P4-02	min	mmmmm	mmmmm	mmmmmmm	mannin	m. m	mound Of her		i him k
17 FZ-CZ	mmMp	man	mannon	maran yaran ar	๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛	www.www.www.	Martin and Martin		
18 CZ-PZ	mont	www.www.	mummum	mmunuman	๛๛ๅ๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛	marked and the start of the	$\vee$	We when a start of the start of	
19 F7-F3					and and all and the second and the second		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		WAY HIM HAY IN
20 F3-FZ	mount				werner and more and a second with		an man many human	WAY WANT AND AND AND AND AND AND AND	M. alt Hollins
21 FZ-F4	mmm	munomono	munimum	momenterspreases	Development - Mindertan Destanding	mayne hyper year	where the second state of the second state of the	and a with a with a with a with a with	N. ANK MAL
22 F4-F8	when when the way to	were to one when the second	white here when the second	www.www.www.www.www.	www.www.www.www.www.www.www.www.	any mound with a front		Thursday was not been and	all de la ma
23 T3-C3					กลางผู้ <mark>ประส</mark> ุกระสุขณะที่ <sub>ยา</sub> กลางระบุประการสาวการการการการการกา				<b>TANKE WE</b>
24 C3-CZ	munn	monorman	mmumm	www.www.youtherst	alimbra hanna Manna alima an ann an a	My rother.			u Million
25 CZ-C4	WWWWWWWWWW	www.Www.www.	mallown	when a reason with the work when the test of the second second second second second second second second second	Winawaly manager and a strategy and the second strategy and	www.weblance.com	Martin Sull Ana City II		
26 C4-T4	-whom when	in him white and the second second	webrieve and a property and a second	an and the property and the second states an	allenter Analasian produced for all produces	were person where the particular and the particular	- And the second s		III MUMPY
27 T5-P3	mm	mm	mummum	m	mension was an	man man have	form in providing	where the second of the strategic the	A Martin Kumberrow
28 P3-PZ	my	mon	m from more than the second se		non man and a second and a second second	man man and	ΥXX /	"Man and the second of the Association	A VA
29 PZ-P4	mon				un man man	manner why	m / " \ Am		
30 P4-T6					www.www.www.	man and the second	someway June		M WAL
33 <i>ECG</i>	-hh-			har and have been a second har		hh	Muniply	- Ananolist Manual and	Mundalla
34 DELSx									Kindrallinask-alleka-ma
35 DEL Dx									No-wind by the first
M									

# Minor episodes



# Minor episodes

HF *70 TC *0.1 CAL *50]	innaqaannnaqaa		111111				ngangana	
		- Jurger an aller	Mitthe approximents		in the second	an and a state of the state of the state of the	WARD IN THE REAL PROPERTY AND INCOMENTS	The state
	and a second a second a second a	Mar Mar was supported by	man and a second	man and a second and	Weight a when when a start when	All a half of the second s	Anna ( Mana Mana and Andrew and An	and the second
mun man man	and a mark and a surrow and	man southernally	warman war	have monophist the man and a second	Malan when with and the second the second	water with a property and the second second second	alter particular and the Man and man we have	and have a
		- PMMMMMM	Am country of	he at with the set of	a reason when the make a set all the Mill bead	ally all the set was an and an and a	and whether all the sheet and the second	h h H h h
			Min and a share the share	the advertised and a destand and a second				is, that were
		m www.www.www.ww	shirting a station to a second	and the second second second second second second second		Lind he thanking a make tide, a state of a called by the surface	And the second	A stabut the state
		in all a	LIAL ALL AND	And the second in the second second second	Marine Ma	Mills Milli Bellin a a Ballin malana a la ballana	A LAND RADAL MARY & LAND AND AND AND AND AND AND AND AND AND	- marine
a management	mumming me	WWWWW	man	Mun addition of much my way	in the same the start while the	here and the sale of the second and the second	- requiremention of the manualistic motion	in ustime
	man man man	mmmm	the Xh X M	A manufacture in the second		the provide and the second sec	Convertine the attendent was	No Matria
	man manun	mmmmmm	in	L'anna ann	and the mark of the second	and and a second and	and the man way was and the second of the second	man
mummin	min month man	monound	N. mit	Van man Maria	which	man mar manna	mannaman	ham
mannaman	mannen mannen	man Milliaman m	ma mathen	Muy May Multimer marine in	" Manus Min Minimum	would share amenable hande	anound and and have an	10 m march
mannin	man mound	minint	man	1 million manun	Manneman	musicanon	un manus manus	man
mannon		minin	mont	M. Marina Marina marina	month and a service and the services of the se	warment have a server where the server w	mon man and man and and the second	warm
mann	man many many many	montan	mont	Mundamman war	man man	mahamman	mannowhith	Munut
momment	man man man man	mm Minm	mmm m	(mannaman)	monton	mannam	man	m
mannohim	month month	mmmmmm	harmon	for my month for the second	mon many the solo	part man man	mun million	min
monum	many ming Minun	my why why his	MAN	/ have a set the property of the set of the set of the set	With A MAN IN A SHALL AND		New Pills New Constitution and States and States and States	
man	man man man man	monor	mannin	many man man man man	Www.maning	and the formal the second of the former that the second of the	war war war war war war war war	matypywer
munition	man man and a second se	man	mmm	time manual mon	min Jun Multin	approxide and an and a source of the	worker washingthe work and	myum
man	mon month	man Juman W	mm	L. Marine Ma Marine Marine Marin	M. Award Marker Marker Marker	And the state of t	www.weinerstellingenetitienerstellingenetitiener	MAN WHIT
mmmmmm	mund man and	man manner	Mither Marine	and more thank the second	Hall a share and we wind the states	in the head of a starting many a state as a start and a start and	אינייני אינט אילי אינט איני איני איני איני איני איני אינ	philippine
man	man man man man	mm Manman	mount	man man man	man Mathan	were showed and an and water and a second and	man war	monorm
harmon	and the second s	- many	munu	have with the state of the second	man man war war and we had so and	man how have men and how how have how	monthe manager and a second manager and	d your
mannen	mun hanne	mun many many many	Wywell Mary Mary Mary Mary	and monorital property and a second second and a second second second second second second second second second	to and an an a second the second s	her be all and the second s	and in the function of the state of the second states and the second stat	"He way a share
mann	man man man	munun	my month	man man man man man	month and when the source	an man have been and the second	monorman	mm
	man white the second se	man Marian	mmmm	- manun manun manun m	mun hour	man		nm
mannen	a manufacture and a second sec	mont	mmmm	myrowwwww	mummum	www.www.	mount	mm
ECG	man when the second	······	minim	Anna warman	men management	mm with many		min
EOG	- V		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	and a marked and a second	and the and the second and the second and the second	and an an and the second and the		-v
MILO								
DELSX				alaterian en angliteran <del>ana a sama ana ana ana ana ana ana ana ana ana </del>	a distributed and a distributed and an application and		• • ••₩•₩•	
DELDX								
FLOW								
CHEST								2
ABDOMEN								
SNORE								
TIB SX			- March	decembric surger from the grader of the second	a state and the second s			
TIB DX								
		*****						
	Α		A Charles and A Charles			A	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	

### Atypical parasomnia



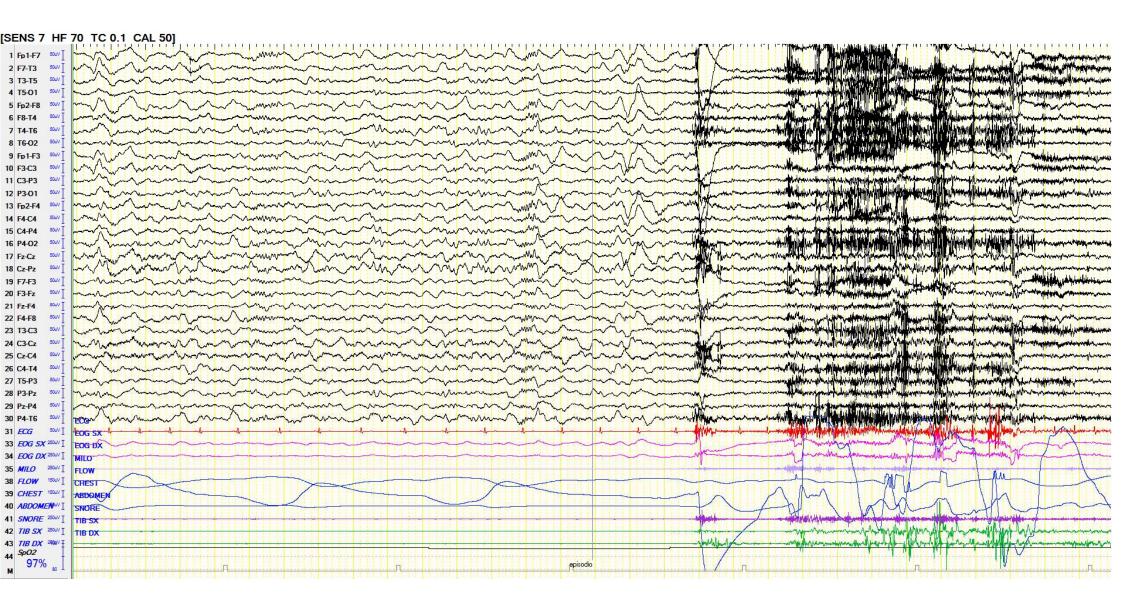






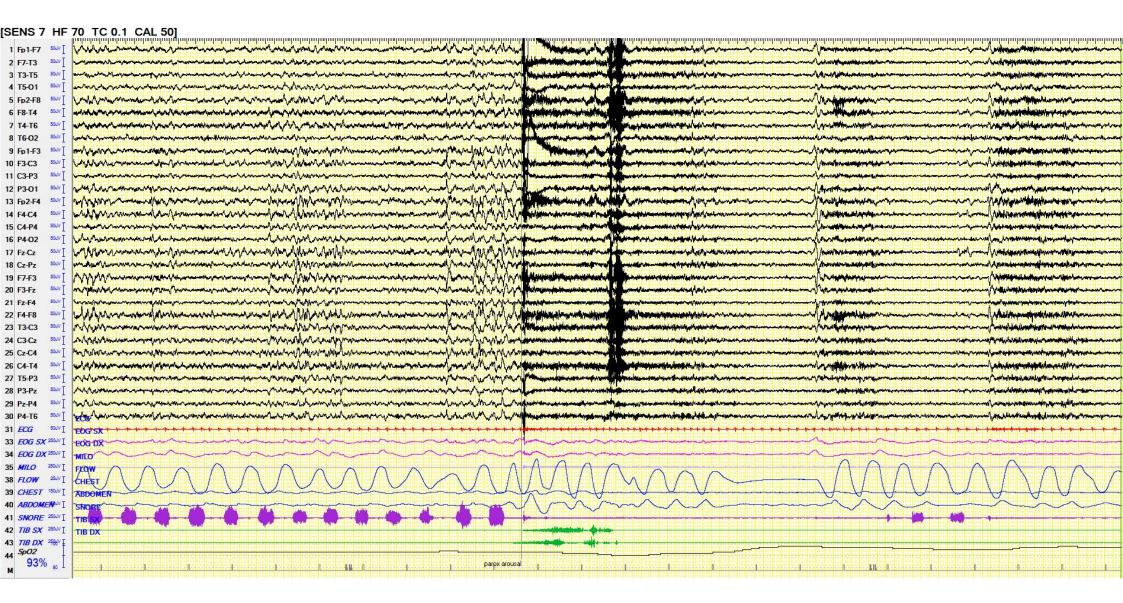


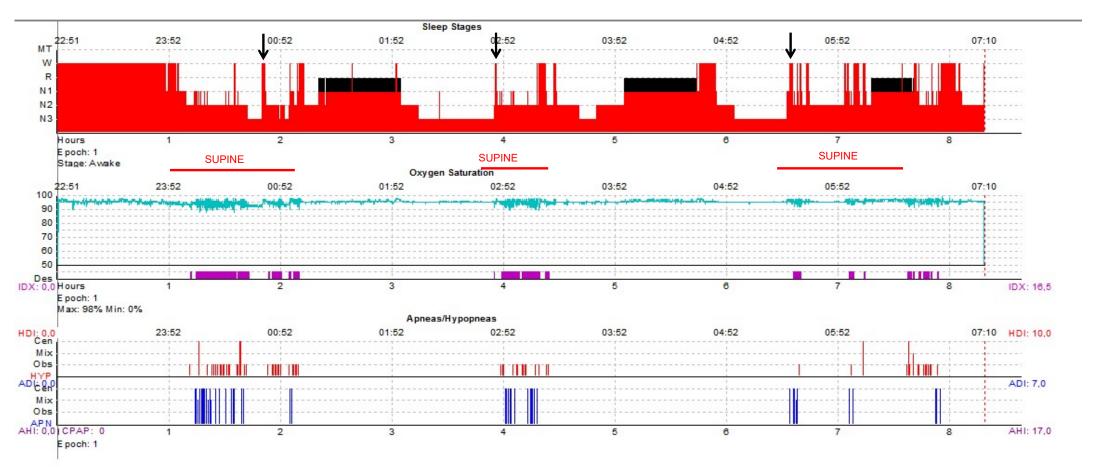




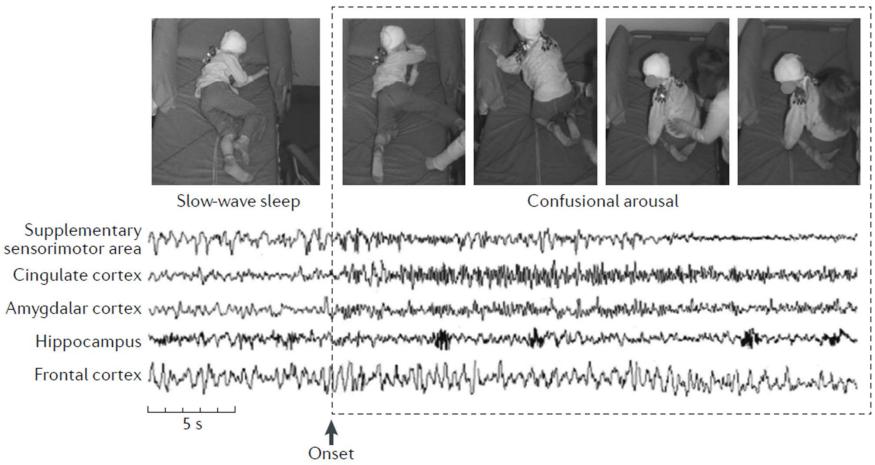
#### [SENS 7 HF 70 TC 0.1 CAL 50]

		10.10				1.11
1 Fp1-F7	50uV I	HAL HAMAN AND MAN	the Array with the states	A second and the seco	****	mr.
2 F7-T3	50uv ]		W Tringeter Billingeter		and all and the states	man and
3 T3-T5	50uv I	Windshipping	Wigned and the still of a law so the			-ar
4 T5-01	50uv I		" The second sec			m
5 Fp2-F8	50uv I	mining	W Water war war with the	and the second and th	man	$\sim$
6 F8-T4	souv I	maniture				Sm
7 T4-T6	SOUV ]	-			when how and	~
8 T6-O2	50uV	muinerminer			mann	~~~
9 Fp1-F3	50uV	Hard barder the star	I w have a superior	Manuscher Marine Ma	at when the service of the service o	m l
10 F3-C3	50UV	monthered	Manun manun and			w
11 C3-P3	SOUV I	mound	An address of the second secon			~~
12 P3-01	SOUV I	and water and a fait	Contraction of the local distribution of the		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~
13 Fp2-F4	SOUV	many	munun			
14 F4-C4	SOUV I	- and	Construction and the second se			1
15 C4-P4	SOLV I	a den and		have been and the second and the sec		
16 P4-02	SOUV T	Strate Strate Strate				
17 Fz-Cz	50UV T		Addition of the second			N.
18 Cz-Pz 19 F7-F3	SOLA I					Ύ]
20 F3-Fz	50UV T					
20 F3-F2 21 Fz-F4	50UV T					$\mathbf{M}$
22 F4-F8	50UV T	minut	Nothing when we		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$
23 T3-C3	50UV	البر والمنغطا فعنهد	A STATE OF THE REAL PROPERTY OF THE REAL PROPERTY OF		an pranting	-
24 C3-Cz	50UV	manyment	Current marine		and a strange and a series	in
25 Cz-C4	50UV	monun	mannengener		mar hand and the second	m
26 C4-T4	SOUV T	manner	No. Hubble was a published		mp mar mar mar	m
27 T5-P3	50UV	morrowsper	Walter where the property in		minimum	m
28 P3-Pz	50UV	moning	programmer with manner while	where a second where the second of the secon	manne	m
29 Pz-P4	SOUV T	manner	water water water water the state of the sta		monorman	w
30 P4-T6	50UV [	-	Nontron Analyny, way when the		many many	m
31 ECG	50uV I	tog skor	perphasement	in from the same the second of	h	-4-
33 EOG S	250uV I	EOG DX-	manener and the second way	and the state of t		
34 EOG D2	(250JV ]	MILO	with the second s	min to the second of the secon		
35 <i>MILO</i>	250uV I	FLOW	***			111
38 FLOW	150UV I	CHEST	10mm			
39 CHEST	150UV I	ABDOMEN	$\sim / \uparrow \uparrow$			
40 ABDOM	EN I	SNORE	X	talt i 1 and the manager of the		111
41 SNORE		THB SX				
42 TIB SX	250JV I	TIBOX	sint marken bur			1.1
43 TIB DX 44 SpO2	2989V T	and share we	mp man			
44 979	5		110000000000			
м 979	80 1	1111				tit



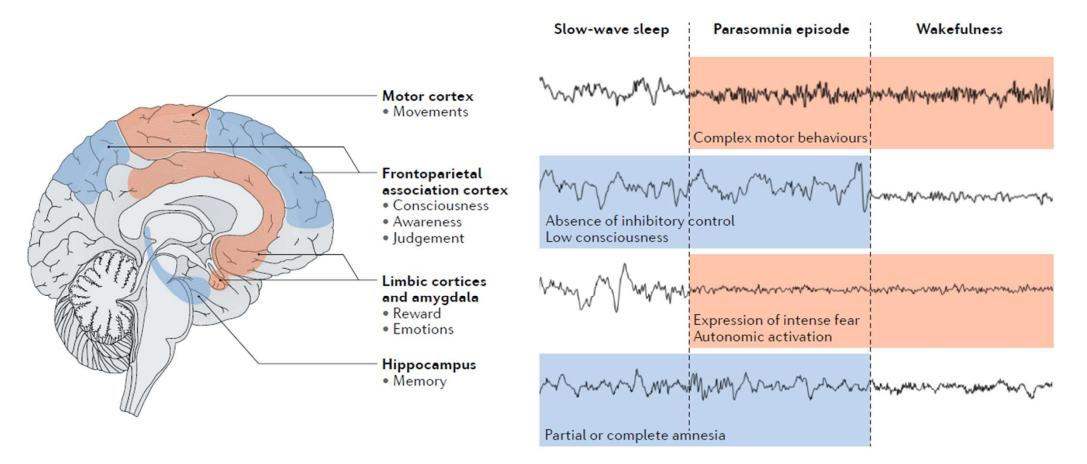


### **Stereo-EEG recordings**



Castelnovo et al., Nature 2020

### Sleep-wake dissociation in DOA



Castelnovo et al., Nature 2020

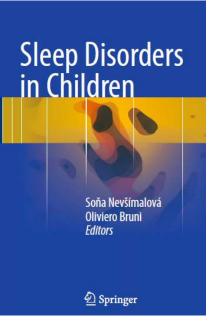
## **Differential Diagnosis between DOA and SHE**

320

P. Proserpio and L. Nobili

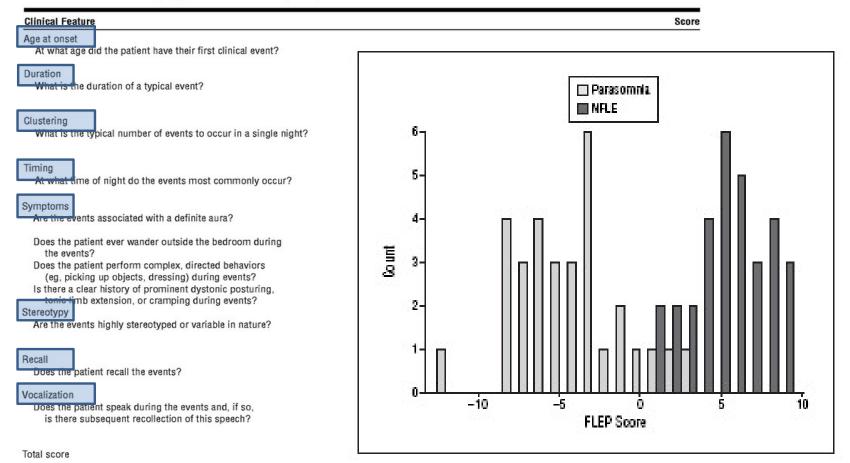
	NREM parasomnia	NFLE
Age at onset	3-8 years	Any age (peak in childhood)
Familial history	Frequently present	Possible
Peak time of occurrence	Usually during the first third	Any time
Sleep-stage onset of episodes	NREM sleep (usually N3)	NREM sleep (usually N2)
Frequency during one night	Usually one episode/night	Several episodes/night
Frequency	Sporadic	Almost every night
Duration	1–10 min	Seconds to 3 min
Evolution	Tend to disappear	Stable, increased frequency, rare remission
Predisposing factors	Frequent (sleep deprivation, febrile illness)	Rare
Stereotypic motor pattern	No	Yes
Consciousness	Usually impaired	Usually preserved
Amnesia	Frequent	Unconstant

Table 14.6 Differential diagnosis between NREM parasomnia and nocturnal frontal lobe epilepsy



### The Frontal Lobe Epilepsy and Parasomnias (FLEP) Scale

#### Table. The Frontal Lobe Epilepsy and Parasomnias (FLEP) Scale



Derry et al Arch Neurol 2006

Epilepsia, 49(9):1581-1585, 2008 doi: 10.1111/j.1528-1167.2008.01602.x

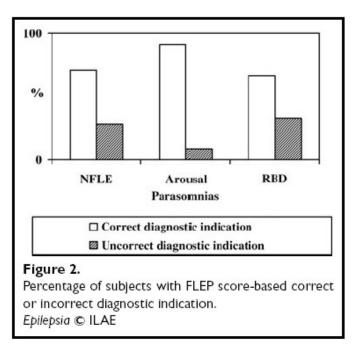
#### FULL-LENGTH ORIGINAL RESEARCH

#### The FLEP scale in diagnosing nocturnal frontal lobe epilepsy, NREM and REM parasomnias: Data from a tertiary sleep and epilepsy unit

Raffaele Manni, Michele Terzaghi, and Alessandra Repetto

Unit of Sleep Medicine and Epilepsy, Institute of Neurology "C. Mondino Foundation," Pavia, Italy

The FLEP scale gave an incorrect diagnosis in 4/71 (5.6%) of the cases, namely NFLE patients with episodes of nocturnal wanderings and uncertain diagnostic indications in 22/71 subjects (30.9%)



PRACTICE PARAMETERS FOR PSG AND MSLT TESTING FOR CHILDREN

http://dx.doi.org/10.5665/sleep.2190

Practice Parameters for the Non-Respiratory Indications for Polysomnography and Multiple Sleep Latency Testing for Children

R. Nisha Aurora, MD<sup>1</sup>; Carin I. Lamm, MD<sup>2</sup>; Rochelle S. Zak, MD<sup>3</sup>; David A. Kristo, MD<sup>4</sup>; Sabin R. Bista, MD<sup>5</sup>; James A. Rowley, MD<sup>6</sup>; Kenneth R. Casey, MD, MPH<sup>7</sup>

SLEEP, Vol. 35, No. 11, 2012

The polysomnogram using an expanded EEG montage is indicated in children **to confirm the diagnosis of an atypical or potentially** *injurious parasomnia or differentiate a parasomnia from sleeprelated epilepsy* when the initial clinical evaluation and standard EEG are inconclusive.

### Limits of Video-PSG recording:

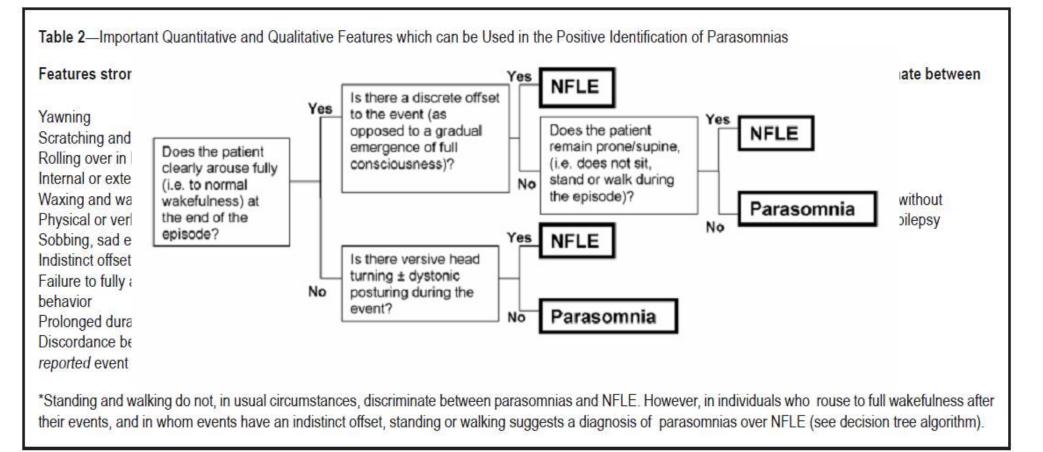
- ✓ Not always capture the event in a single-night recording
- ✓ Absence of epileptiform abnormalities in a substantial percentage of SHE patients
- ✓ interictal epileptiform abnormalities may occur in some DOA patients

#### NREM AROUSAL PARASOMNIAS AND FRONTAL LOBE EPILEPSY

NREM Arousal Parasomnias and Their Distinction from Nocturnal Frontal Lobe Epilepsy: A Video EEG Analysis *Sleep 2009* 

Christopher P. Derry, PhD<sup>1,3</sup>; A. Simon Harvey, MD<sup>1,2</sup>; Matthew C. Walker, PhD<sup>3</sup>; John S. Duncan, MD<sup>3</sup>; Samuel F. Berkovic, FRS<sup>1</sup>

<sup>1</sup>Epilepsy Research Centre, Department of Medicine, University of Melbourne, Victoria, Australia; <sup>3</sup>Department of Neurology, Royal Children's Hospital, Melbourne, Australia; <sup>3</sup>Department of Clinical and Experimental Epilepsy, Institute of Neurology UCL, Queen Square, London, UK



#### NREM AROUSAL PARASOMNIAS AND FRONTAL LOBE EPILEPSY

NREM Arousal Parasomnias and Their Distinction from Nocturnal Frontal Lobe Epilepsy: A Video EEG Analysis *Sleep 2009* 

Christopher P. Derry, PhD<sup>1,3</sup>; A. Simon Harvey, MD<sup>1,2</sup>; Matthew C. Walker, PhD<sup>3</sup>; John S. Duncan, MD<sup>3</sup>; Samuel F. Berkovic, FRS<sup>1</sup>

<sup>1</sup>Epilepsy Research Centre, Department of Medicine, University of Melbourne, Victoria, Australia; <sup>2</sup>Department of Neurology, Royal Children's Hospital, Melbourne, Australia; <sup>3</sup>Department of Clinical and Experimental Epilepsy, Institute of Neurology UCL, Queen Square, London, UK

## Features which do *not* discriminate between parasomnias and NFLE

Brevity

Sitting

Standing or walking\*

Preceding 'normal' arousal

Brief arousals (up to 10 seconds) without definite semiological features of epilepsy

Fearful emotional behaviour

DOA





Definition and diagnostic criteria of sleep-related hypermotor epilepsy Tinuper et al Neurology 2016

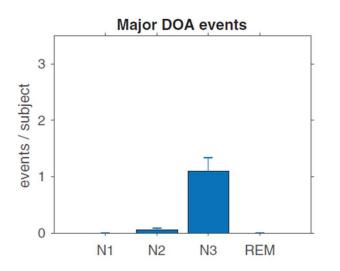
'If the captured episodes are minor motor events or paroxysmal arousals, and if few episodes are captured, the clinical diagnosis may be unreliable'

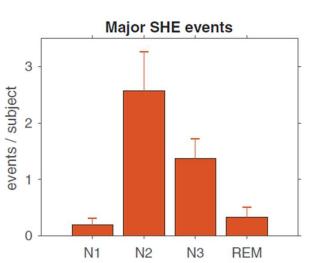
# Polysomnographic features differentiating disorder of arousals from sleep-related hypermotor epilepsy

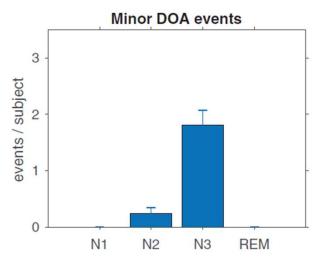
Paola Proserpio<sup>1</sup>, Giuseppe Loddo<sup>2,0</sup>, Frederic Zubler<sup>3</sup>, Luigi Ferini-Strambi<sup>4</sup>, Laura Licchetta<sup>2,5</sup>, Francesca Bisulli<sup>2,5</sup>, Paolo Tinuper<sup>2,5</sup>, Elio Clemente Agostoni<sup>1</sup>, Claudio Bassetti<sup>3</sup>, Laura Tassi<sup>1</sup>, Veronica Menghi<sup>2</sup>, Federica Provini<sup>2,5</sup> and Lino Nobili<sup>1,6,7,\*</sup> **SLEEPJ, 2019**,

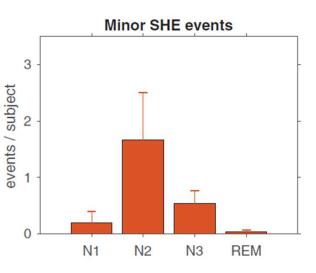
### Table 1. Classifier performance

9) (N = 30)	
%) 14 (47%)	0.7
10.1 30.4 ± 14.4	0.81
2.4 6.9 ± 8.2	0.03
1.30 4.47 ± 5.20	1.25E-06
2.27 2.43 ± 5.81	0.07
2.21 1.90 ± 2.41	0.0036
0.83 5.00 ± 7.43	8.56E-11
1.26 1.37 ± 1.96	0.91
0.22 3.10 ± 4.89	2.19E-13
1.94 0.53 ± 1.25	4.62E-05
0.82 1.90 ± 4.71	0.0023
0.66 0.14 ± 0.71	0.0119
$0.77^{a}$ -0.01 ± 0.78	0.0026
0.67 0.25 ± 0.52	0.2015
0.24 0.17 ± 0.37	0.0048
	10.1 $30.4 \pm 14.4$ $6.9 \pm 8.2$ $1.30$ $4.47 \pm 5.20$ $2.27$ $2.43 \pm 5.81$ $2.21$ $1.90 \pm 2.41$ $0.83$ $5.00 \pm 7.43$ $1.26$ $1.37 \pm 1.96$ $0.22$ $3.10 \pm 4.89$ $1.94$ $0.53 \pm 1.25$ $0.82$ $1.90 \pm 4.71$ $0.66$ $0.14 \pm 0.71$ $0.77^a$ $-0.01 \pm 0.78$ $0.67$ $0.25 \pm 0.52$

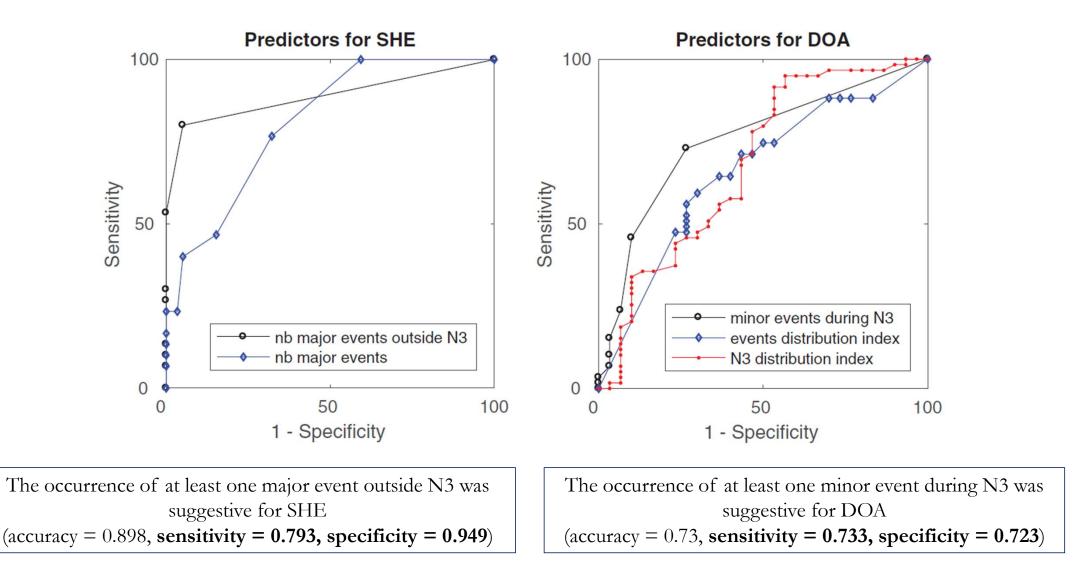








### **Performance of predictors**



### Seizures with paroxysmal arousals in sleep-related hypermotor epilepsy (SHE): Dissecting epilepsy from NREM parasomnias

Giuseppe Loddo<sup>1</sup> | Lorenzo Baldassarri<sup>1</sup> | Corrado Zenesini<sup>2</sup> | Laura Licchetta<sup>1,2</sup> Francesca Bisulli<sup>1,2</sup> | Fabio Cirignotta<sup>3</sup> | Susanna Mondini<sup>3</sup> | Paolo Tinuper<sup>1,2</sup> | Federica Provini<sup>1,2</sup>

	SPAs (SHE)	SAMs (DOA)	Episodes resembling SAMs (Healthy Controls)	Р
Total number of recorded episodes	121	140	11	<.001
Median duration, sec (IQR)	5 (4-8)	12 (8-16)	16 (15-17)	<.001
Sleep stage at onset, n (%)				
1 NREM	33 (27)	0 (0)	2 (18)	<.001
2 NREM	77 (63)	37 (26)	5 (46)	
3 NREM	9 (8)	103 (74)	3 (27)	
REM	2 (2)	0 (0)	1 (9)	
Body spatial distribution at onset, n (%	)			
Focal	0 (0)	20 (14)	2 (18)	<.001
Segmental	4 (3)	11 (8)	2 (18)	
Multifocal	31 (26)	52 (38)	5 (46)	
Generalized	86 (71)	57 (40)	2 (18)	
Episodes with motor arrest, n (%)	0 (0)	61 (43)	1 (9)	<.001
Movement progression, n (%)				
Waning	0 (0)	75 (54)	1 (9)	<.001
Waxing	0 (0)	8 (5)	0 (0)	
Waxing-waning	0 (0)	10 (8)	0 (0)	
Waning-waxing	0 (0)	8 (5)	0 (0)	
Constant	121 (100)	39 (28)	10 (91)	

Epilepsia. 2020;61:2194-2202.

#### COMMENTARY

### Can Homemade Video Recording Become More Than a Screening Tool?

A commentary on Derry et al. NREM Arousal Parasomnias and their distinction from nocturnal frontal lobe epilepsy: a video EEG analysis SLEEP 2009;32:1637-1644.

Lino Nobili, MD, PhD

Centre of Epilepsy Surgery "C. Munari" and Centre of Sleep Medicine, Department of Neuroscience, Niguarda Hospital, Milan, Italy

### Sleep-Related Hypermotor Epilepsy vs Disorders of Arousal in Adults A Step-Wise Approach to Diagnosis

Check for updates

Chest 2021

Angelica Montini, MD; Giuseppe Loddo, MD, PhD; Luca Baldelli, MD; Rosalia Cilea; and Federica Provini, MD, PhD

### **Three-level diagnostic algorithm**

### SHE

#### **Clinical Interview**

- Confusional Arousals: sloppy movements with puzzled expression
- Sleep Terrors: alarming vocalizations, agitated motor behaviors and autonomic activation

· Audio video recording of multiple events, even major

• Sleepwalking: ambulation around or outside the bedroom

Homemade video

events, thanks to the familiar environment and long-term

Neither stereotyped, hyperkinetic or ballistic movements,

#### **Clinical Interview**

- Bizarre and unnatural postures and/or repetitive, rhythmic movements
- High frequency of episodes

#### Homemade video

Audio video recording of highly stereotyped motor patterns including:

- Tonic or dystonic postures
- Hyperkinetic automatisms
- Ballistic movements

#### Video-PSG core features

• EEG: onset from stage 3 NREM sleep

nor tonic/dystonic postures

 Video: typically the patient with eyes opened raises the head, with or without limb and/or trunk movements, sits up, gets out of bed and walks around

#### Video-PSG core features

- EEG: onset at any time during the night, with interictal and/or ictal epileptiform abnormalities
- Video: hypermotor behaviors or asymmetric tonic/dystonic postures

### DOA

monitoring

# **REM** sleep



# **REM** sleep behavior disorder

### **Diagnostic Criteria**

### Criteria A-D must be met

- A. Repeated episodes of sleep related vocalization and/or complex motor behaviors.<sup>1,2</sup>
- B. These behaviors are documented by polysomnography to occur during REM sleep or, based on clinical history of dream enactment, are presumed to occur during REM sleep.
- C. Polysomnographic recording demonstrates REM sleep without atonia (RWA)<sup>3</sup>
- D. The disturbance is not better explained by another sleep disorder, mental disorder, medication, or substance use.

### Notes

- This criterion can be fulfilled by observation of repetitive episodes during a single night of video polysomnography.
- The observed vocalizations or behaviors often correlate with simultaneously occurring dream mentation, leading to the frequent report of "acting out one's dreams."





Figure 1—A patient with chronic RBD demonstrates his homemade restraint apparatus that he used every night for five years to prevent himself from leaving the bed and injuring himself during dream-enacting episodes.

REM Sleep Behavlor Disorder-Schenck et

Chronic behavioral disorders of human REM sleep: a new category of parasomnia. Schenck CH, Bundlie SR, Ettinger MG, Mahowald MW. Sleep 1986

	т	
1 Fp1-F7	50uV	The second
2 F7-T3	50UV	Manufacture and the second
3 T3-T5	50uV	as a second as the
4 T5-01	50.W	the second se
5 Fp2-F8	50uv	
6 F8-T4 7 T4-T6	50.JV	we w
8 T6-02	50.JV	
9 Fp1-F3	50uV	and the second and the
10 F3-C3	50.IV	Commences and the second of th
11 C3-P3	50uV	A for a second way and the second an
12 P3-01	50uV	and the second
13 Fp2-F4	50.JV	The shall be and the share when the share we wanted the
14 F4-C4	50uV	The second from the second of
15 C4-P4	50uV	and a second and a
16 P4-02	50.JV	and and a second and a proper and a second and the second a
17 FZ-CZ	50uV	menter and the second have a second and the second
18 CZ-PZ	50.JV	and the second of the second o
19 F7-F3	50.JV	
20 F3-FZ	50uV	
21 FZ-F4	50uV	
22 F4-F8	50uV	The second s
23 T3-C3	50uV	
24 C3-CZ	SOUV	
25 CZ-C4	50.0/	an and a manufacture of the second of the se
26 C4-T4 27 T5-P3	50.0	and the second of the second
27 13-P3 28 P3-PZ	50.JV	man and the second an
29 PZ-P4	50.JV	
30 P4-T6	50uV	anone and a second
31 <i>Eoq</i>	50.IV	have a second and the second of the second o
32 Milo	50u/v	
33 <i>Ecq</i>	50.JV	
34 Del Sx	50uV	
35 Del Dx	50.JV	
36 <i>Tib Sx</i>	50.JV I	
37 <i>Tib Dx</i>	50.JV I	
м		

# **RBD** and Sleep Apnea

	*70 TC *0.1 CAL *50]		որորորորորորորոր
	and the second s	Contraction to a second a second and a second a second and a second a s	Whenton and an and
101 CONTRACTOR 1	++++++++++++++++++++++++++++++++++++++		1. 24-20-10/10-10 ( 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
	which has been and the state of the second second and the second se		and a second second second
4 T5-01			p
5 Fp2-F8	who are a set and a strange of the set of th	Construction of the second	Whaterprise and the second second
6 F8-T4	www.abs. www.and. and and and and and and and and and a state of the s		all the second
7 T4-T6	and the second and the second second and the second s		for a second property and a second
8 T6-O2	and and the second second and the second s		produced to be approximation of a state
Fp1-F3			hay the second and a second
F3-C3	a to the second s		
C3-P3			888/10
P3-01	annon an fair ann an an ann an ann an ann an an an an		energy and the second and the second and the second s
Fp2-F4	where the second provide the second		WANNER MARINE MARINE AND
F4-C4			<b>Male of the second of the sec</b>
C4-P4	<sup>1</sup> งงหาราชอาญรูลที่สี่งสาขพระป <sub>อ</sub> ต์ชุลสีของวินาสสุดที่สาขสาขคายเหลือสามสาว <sub>ส</sub> ามสาวาสสุดได้ประสาขสาชิมสีประบาดบาลสมส 		
P4-02	ansanaansi familaasaan aheen ahaa ayaa haraa aheen aheen aheen aheen aheen aheen aheen ahaa ahaa		for the stand of the second second second
Fz-Cz	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		and the legal and in a surplus and its man
Cz-Pz	and the second statement of the second statement of the second second second second second second second second		i gli e alli e delle di la di la di integra i e der antipo i di anti i di
F7-F3 F3-Fz			**#****###############################
			₩₩₽₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩
Fz-F4 F4-F8	ֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈֈ		
-4-F8 F3-C3	LLU I. A bar a higher thank and a second sec		A Part of Part of the state of
3-C3 3-Cz			and an
3-C2 z-C4			
-C4  -T4	and the second		wanten ihren An Leichen auf dern eihere
-14 -P3			and a second
-Pz			the second second second
-P4			
-T4 -T6			man management
2G			We had a freeh for the bad
EOG			
EOG SX	man man in the second s		as many and the second
EOG DX		a faith the second s	v
MILO			Martin .
FLOW			
CHEST	- ACTINA	VI Very and the state of the st	
ABDOMEN	- A A		min
SNORE			
TIB SX			meterine it is in the
TIB DX			- the second
SpO2			
<u>тів DX</u> <i>SpO2</i> 98%	A		
<u> </u>	in a second we had we had an a second we had a		

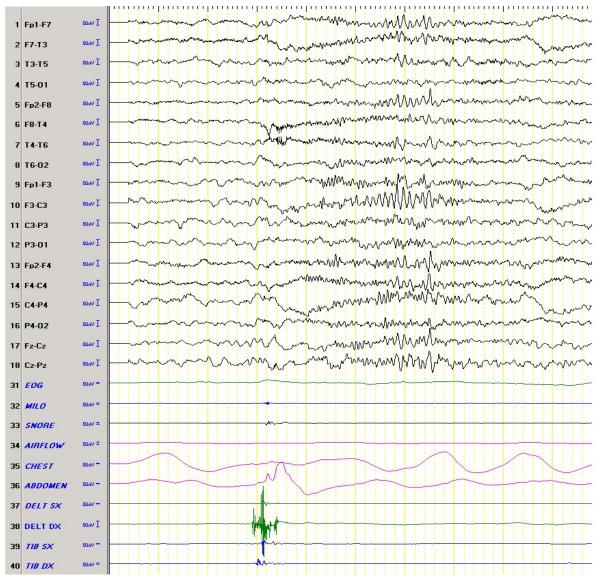
## **RBD** and Sleep Apnea

#### [SENS \*7 HF \*70 TC \*0.1 CAL \*50] 1 Fp1-F7 2 F7-T3 3 T3-T5 4 T5-01 5 Fp2-F8 6 F8-T4 7 T4-T6 8 T6-O2 9 Fp1-F3 1. . . A . 10 F3-C3 11 C3-P3 12 P3-01 13 Fp2-F4 14 F4-C4 15 C4-P4 16 P4-02 17 Fz-Cz 18 Cz-Pz 19 F7-F3 20 F3-Fz 21 Fz-F4 22 F4-F8 23 T3-C3 24 C3-Cz 25 Cz-C4 26 C4-T4 27 T5-P3 28 P3-Pz 29 Pz-P4 30 P4-T6 31 ECG 32 EOG mit han my 33 EOG SX 34 EOG DX and have more a Mondiation 35 MILO 38 FLOW 39 CHEST 40 ABDOMEN 41 SNORE ++ 42 TIB SX 43 TIB DX 44 *SpO2* M urla e piange

	RBD	NFLS
	After 50	Apy 200
Age at onset (yrs) Gender		Any age
	Male predominance	Male predominance
Family history of	—	+
parasomnias	_	· · · · · · · · · · · · · · · · · · ·
Spontaneous evolution	Rare spontaneous	Increased
	remission	frequency?
Episodes/month	Almost every night	Almost every night
Occurrence during the	At least 90 min	Any time
night	after sleep onset	
Sleep stage onset of	REM sleep	NREM (mainly st. 2)
episodes		
Triggering factors	_	±
Episodes/night	From one to several	Several
Episodes duration	1–2 min	sec to 3 min
Stereotypic motor pattern	-	+
Autonomic discharge	_	++(+)
Consciousness if awakened	Normal	Normal
Recall of the episode if	Yes	Inconstant
awakened		

Tinuper P et al., 2007

# Sleep Starts (Hypnic Jerks)



Physiologic manifestations

# Sleep Related Rhythmic Movement Disorder

### Alternate Names

Body rocking, head banging, head rolling, body rolling, jactatio capitis nocturna, jactatio corporis nocturna, rhythmie du sommeil.

### **Diagnostic Criteria**

Criteria A-D must be met

- A. The patient exhibits repetitive, stereotyped, and rhythmic motor behaviors involving large muscle groups.
- B. The movements are predominantly sleep related, occurring near nap or bedtime, or when the individual appears drowsy or asleep.
- C. The behaviors result in a significant complaint as manifest by at least one of the following:<sup>1</sup>
  - 1. Interference with normal sleep.
  - 2. Significant impairment in daytime function.
  - 3. Self-inflicted bodily injury or likelihood of injury if preventive measures are not used.
- D. The rhythmic movements are not better explained by another movement disorder or epilepsy.

### Notes

 When there are no clinical consequences of the rhythmic movements, the rhythmic movements are simply noted but the term rhythmic movement disorder is not employed.

ICSD 3

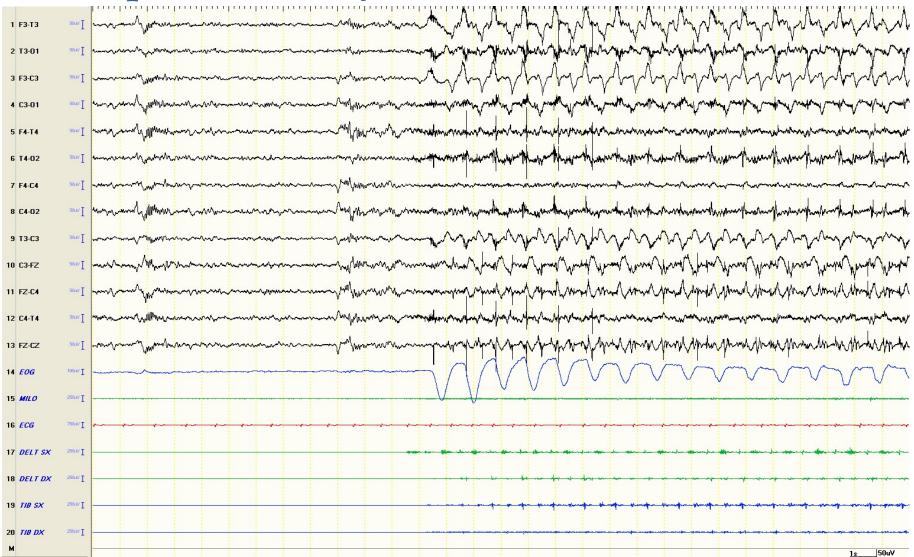




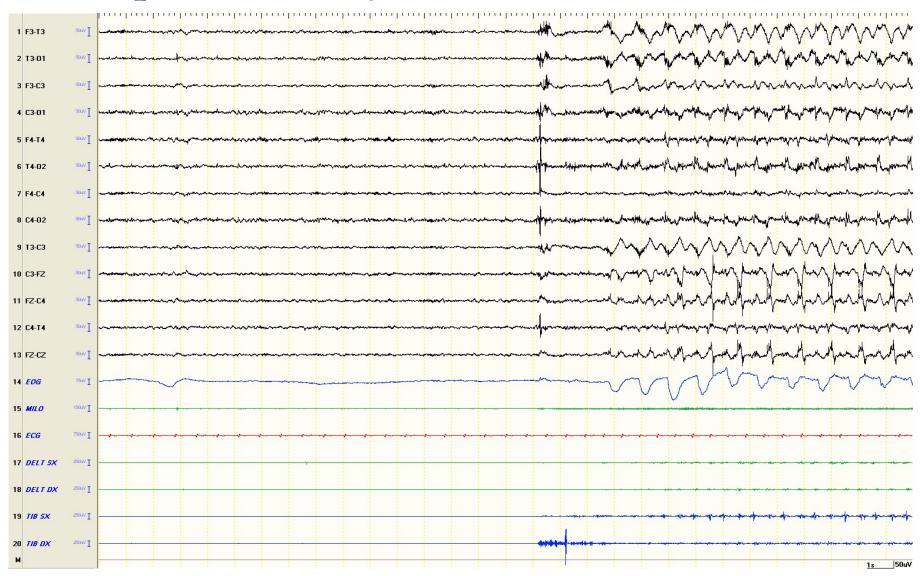
# Sleep Related Rhythmic Movement Disorder

1 F3-T3	50 W T	
2 T3-01	50uv ]	
3 F3-C3	50uv I	
4 C3-01	50uv I	and the second s
5 F4-T4	50.JV I	and the second s
6 T4-02	50uv I	
7 F4-C4	50uv I	
8 C4-02	50uv I	Manual Manuary
9 T3-C3	50uv I	
10 C3-FZ	50.JV I	
11 FZ-C4	50.JV I	
12 C4-T4	50uv I	
13 FZ-CZ	50uv I	
14 <i>EOG</i>	100.JV I	
15 <i>MILO</i>	250uv I	
16 <i>ECG</i>	750uv I	
17 <i>DELT SX</i>	250.JV I	
18 <i>DELT DX</i>	250.JV I	
19 <i>TIB SX</i>	250uv I	
20 <i>TIB DX</i>	250.JV <b>T</b>	
м	-	

# **Sleep Related Rhythmic Movement Disorder**



# Sleep Related Rhythmic Movement Disorder



## Benign Sleep Myoclonus of Infancy



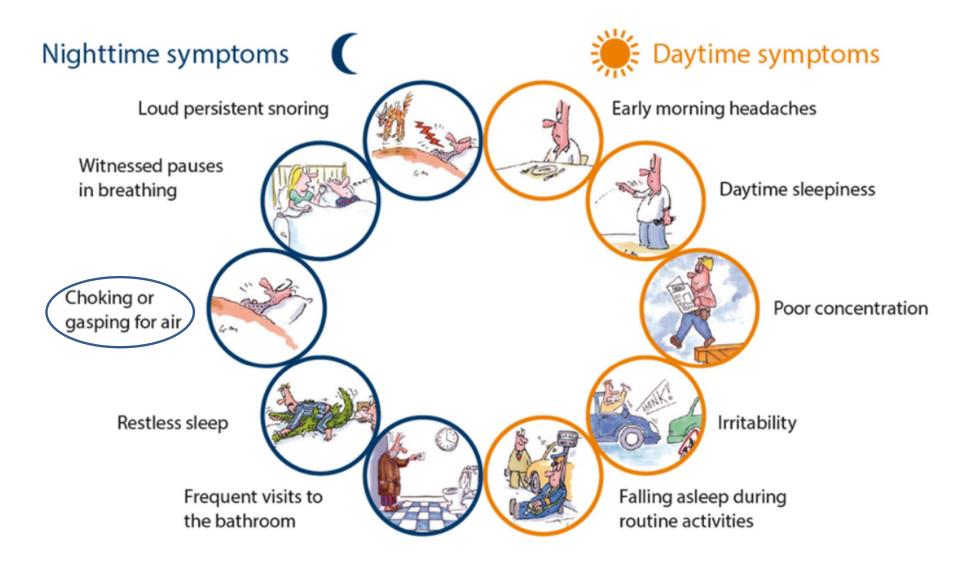
### **Diagnostic Criteria**

Criteria A-E must be met

- A. Observation of repetitive myoclonic jerks that involve the limbs, trunk, or whole body.
- B. The movements occur in early infancy, typically from birth to six months of age.
- C. The movements occur only during sleep.
- D. The movements stop abruptly and consistently when the infant is aroused.
- E. The disorder is not better explained by another sleep disorder, medical or neurological disorder, or medication use.

ICSD3

# Sleep Apnea



# **Risk factors for Sleep Apnea**

Structural risk factors	Non-structural risk factors
Innate anatomic variations (facial elongation, posterior facial	Obesity
compression)	Central fat distribution
Retrognathia and micrognathia	Male sex
Mandibular hypoplasia	Age
Brachycephalic head form (associated with an increased AHI in	Postmenopausal state
whites but not in African Americans)	Alcohol use
Inferior displacement of the hyoid	Sedative use
Adenotonsillar hypertrophy, particularly in children and young	Smoking
adults	Habitual snoring with daytime somnolence
Pierre Robin, Down, Marfan, and Prader-Willi Syndromes	Supine sleep position
High, arched palate (particularly in women)	Rapid eye movement (REM) sleep

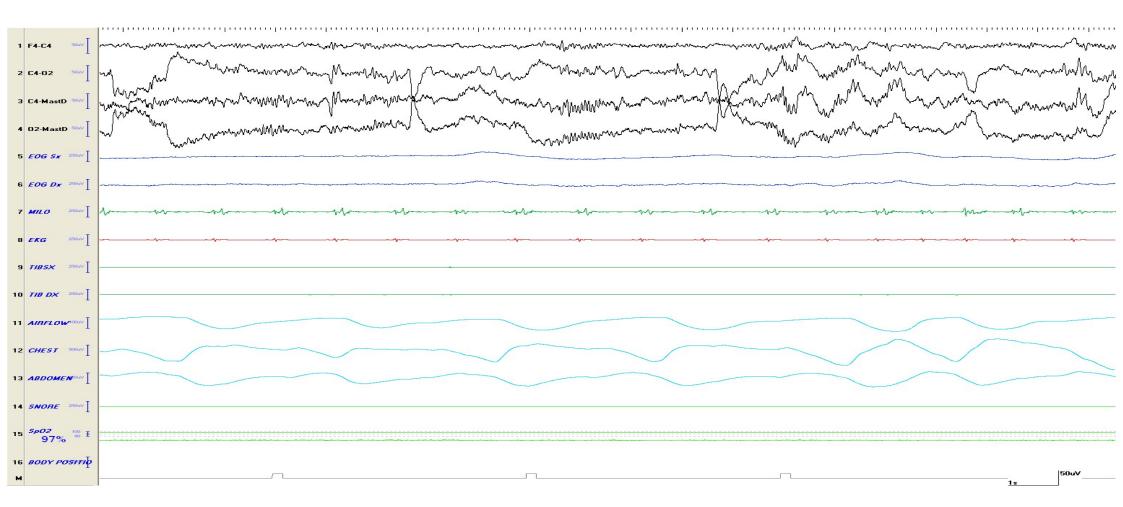
Buchanan et al., 2016



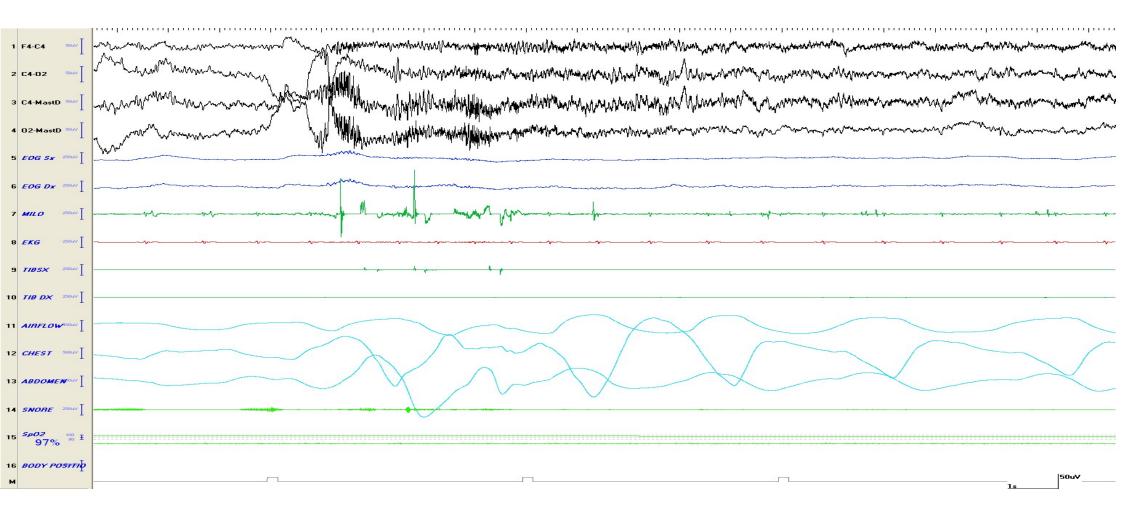
The patient was sent to our lab for a nocturnal Video-PSG. The patient reported the recent occurrence of very frequent awakenings characterized by breathing difficulties and often accompanied by agitation. He also complained of somnolence during the day. ESS:18

A previous cardio-respiratory monitoring did not revealed significative apneas.

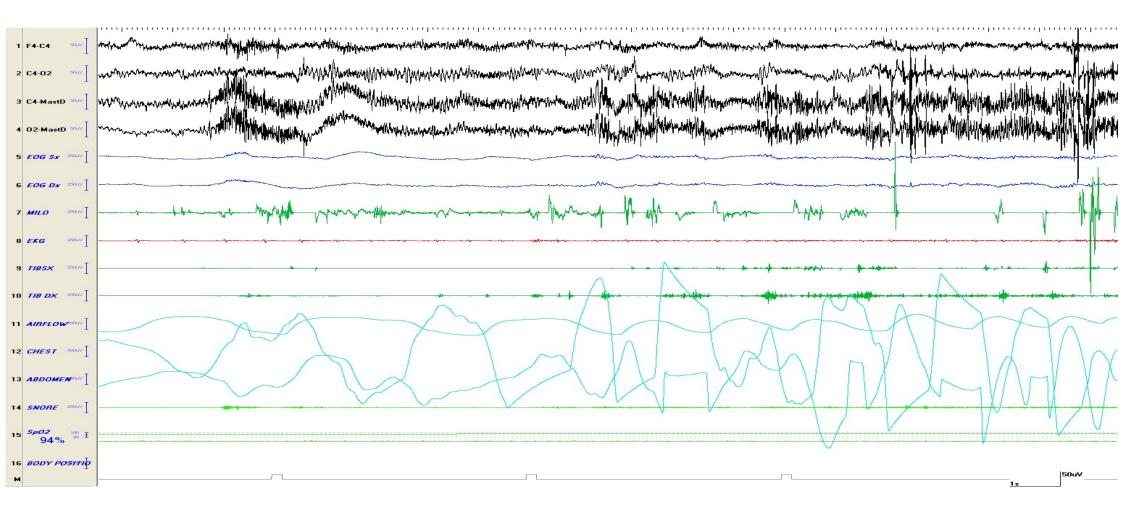
### Episodio 1 (00.29.50)



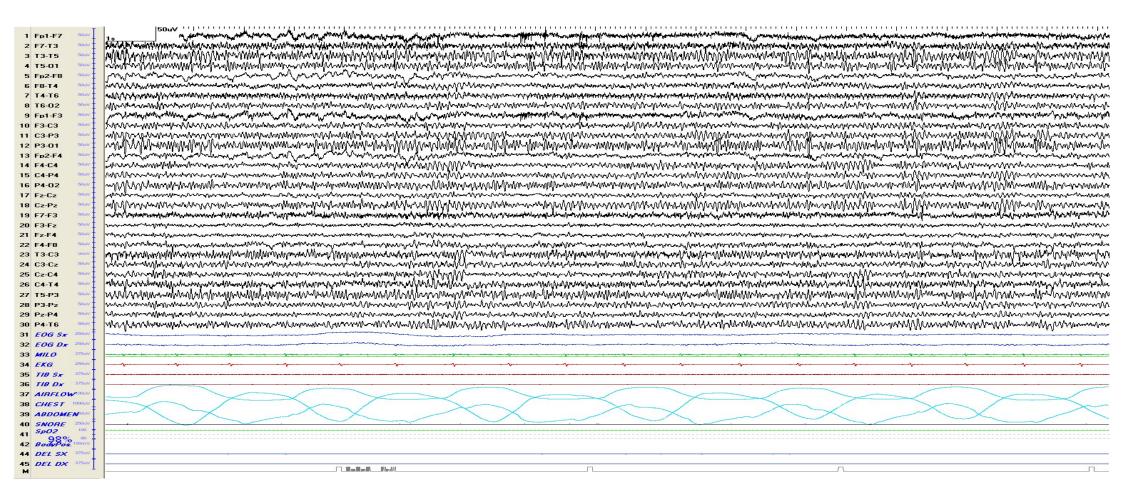
### Episodio 1 (00.30.50)



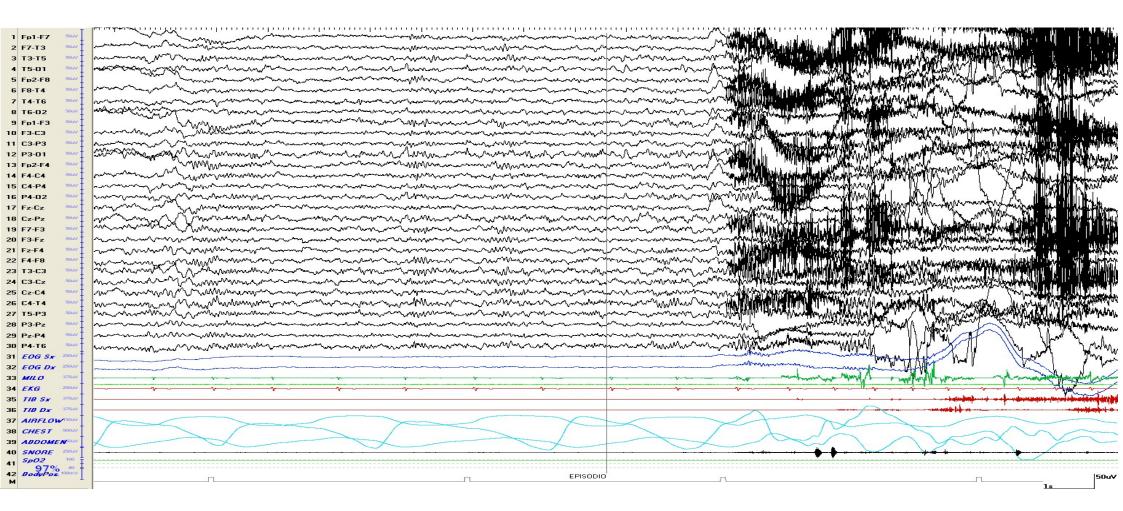
## Episodio 1 (00.31.10)



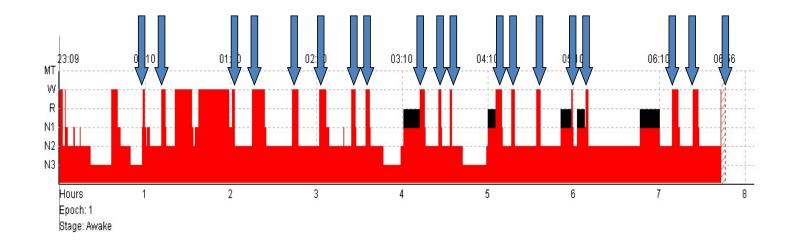
### Montaggio 10-20 completo



## Episodio 2 (01.25.02)



# Ipnogramma



**EPISODI** 1 in MSLT 4 in REM 15 in NREM Original Article

Choking during sleep: can it be expression of arousal disorder? Mathilde Flamand<sup>a</sup>, Bastien Herlin<sup>a</sup>, Smaranda Leu-Semenescu<sup>ab</sup>, Valérie Attali<sup>acd</sup>, Claire Launois<sup>acd</sup>, Isabelle Arnulf<sup>abe</sup>

Sleep Medicine 🔳 (2015) 💵-

#### Choking at Night: A Case of Opercular Nocturnal Frontal Lobe Epilepsy

Case Reports in Pediatrics

Geetanjali Rathore,<sup>1</sup> Paul Larsen,<sup>2</sup> Manish Parakh,<sup>3</sup> and Cristina Fernandez<sup>4</sup>

Acta Neurol Scand 1998: 98: 67-71 Printed in UK - all rights reserved

Copyright © Munksgaard 1998 ACTA NEUROLOGICA SCANDINAVICA ISSN 0001-6314

### Short communication

### Nocturnal frontal lobe epilepsy misdiagnosed as sleep apnea syndrome

Oldani A, Zucconi M, Castronovo C, Ferini-Strambi L. Nocturnal frontal lobe epilepsy misdiagnosed as sleep apnea syndrome. Acta Neurol Scand 1998: 98: 67–71. © Munksgaard 1998. A. Oldani, M. Zucconi, C. Castronovo, L. Ferini-Strambi Sleep Disorders Center, University of Milano, School of Medicine, Istituto Scientifico, H San Raffaele,

of Medicine, Istituto Scientifico, H San Raffaele Milano, Italy

### Choking, asphyxiation and the insular seizure

Nimeshan Geevasinga<sup>a</sup>, John Stephen Archer<sup>b</sup>, Karl Ng<sup>a,\*</sup>

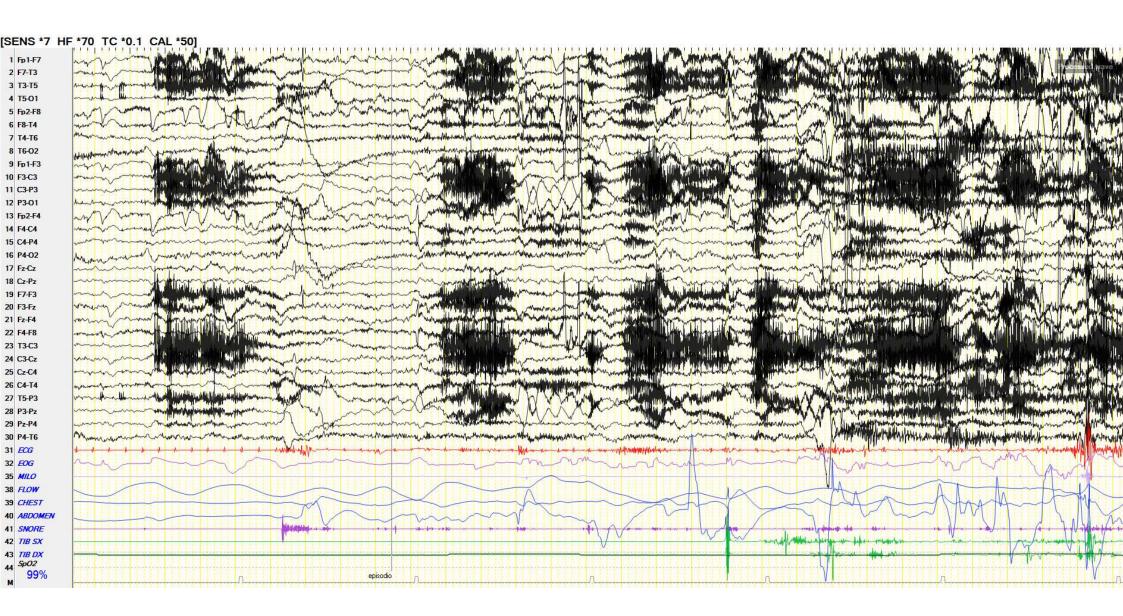
<sup>a</sup> Department of Neurology, Royal North Shore Hospital and University of Sydney, Sydney, Australia <sup>b</sup> Department of Neurology, Austin Health and University of Melbourne, Melbourne, VIC, Australia Case Reports/Journal of Clinical Neuroscience 21 (2014)

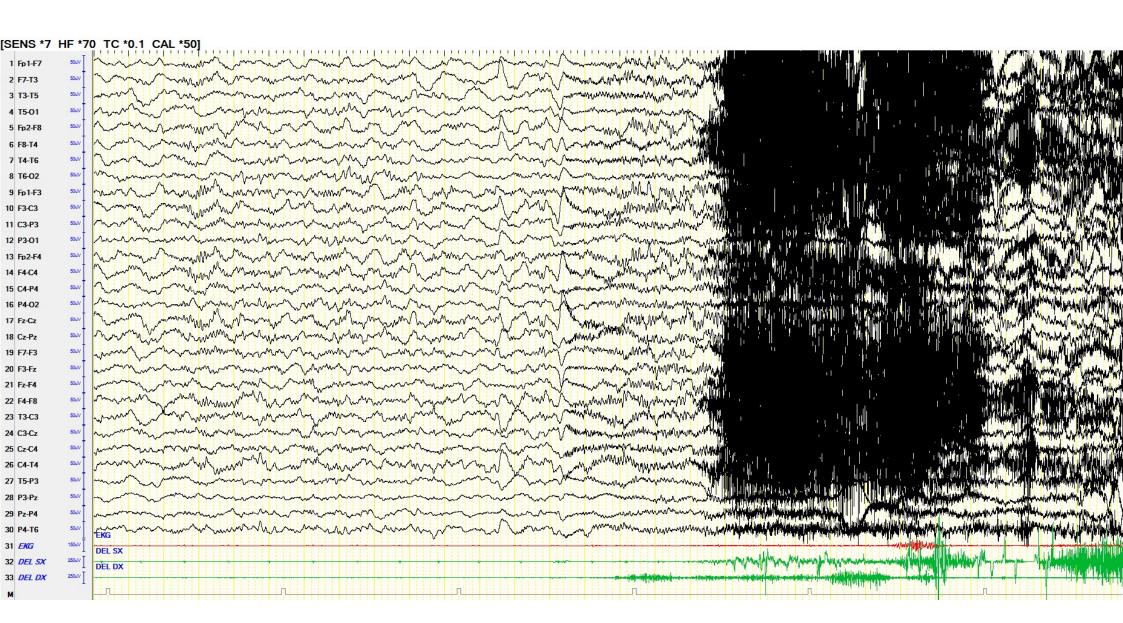
## Psychogenic non-epileptic seizures during sleep



## Psychogenic non-epileptic seizures during sleep

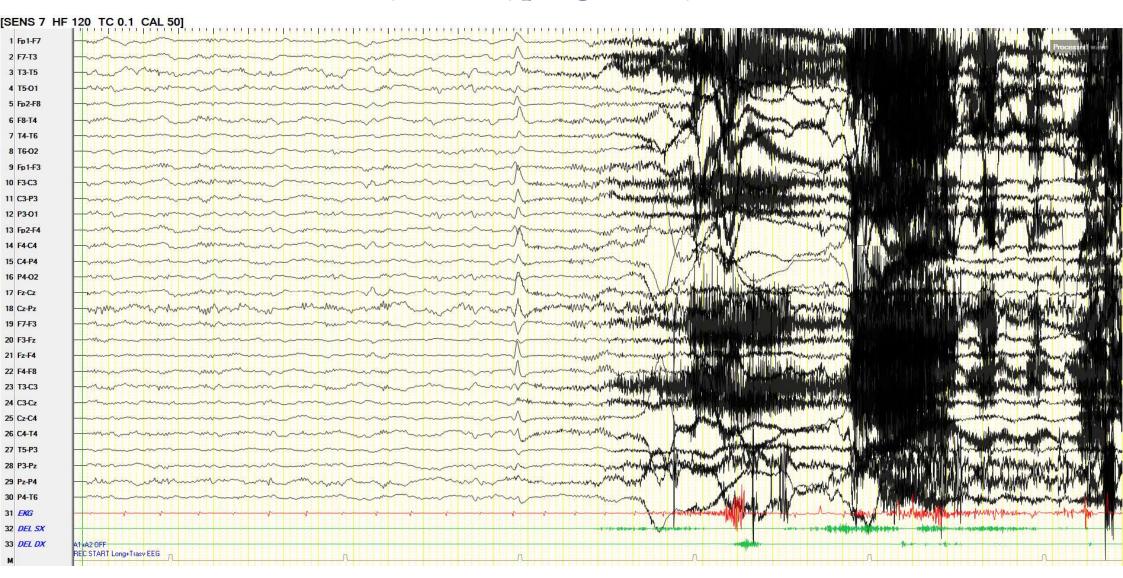
	an and and a second					-V-v-	~~~~		~~~~	~~~~	<u>~~</u>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	·~~~	min	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	minin
venn	man man and a second	mann	manna	monthing a	mynn	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man	man han	mane	many more	min	minin	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	minden	winner w	mmm	mmm	mm	man	min	mymm	mannan	man man
		man more my	1 mm	manna	man man	ay party part	Mar An Mindle Ma		mushing	mmm	mmm	ant	mand	mont	many part of	and and and a second	may may me	- Anthermore	- mar way of the	way my	Juse Marine	man	wy my my
	and the second second	and manual and	And States and	and when the second second		wellow my own	www.www.www.	-man por son and		aparamana ana ana	Lagran restlements	har an an and a second	American States 100 Ach	wannes	monorman	page the man	an all an an all and	- warman warman	winner where is	maning	rmaxway mana	and a gradient and and a second	enverenent
	the second and the second	Wattenport all street all the	uterespersively an	mon man	vermentering	in the second second	whenever	www.www.ww	Mayanaharaha	mar and a second and a second	Whomenum	and an and the set	warner war	white	experience where	white		montherm	manifus	nonenternetisce	an which which and	n Madaa marth	manner
non	mmmmm	monomist	mmut	manna	mount	manning	man	mmm	moning	homeson	in m	mon	manna	man	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mohtem	mond		www.	monor	mound	mound	manness
mon	mmmm	mun	m	m	~~~~	VV	man		m	ww	m	m	mm	som	~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~	m	min	~~~~	Jum-	~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
with		mont	m	m	m	min	nonomi	m	m	$\sim\sim\sim$	m	m	mon	m		m	m	m	min	m	num	~~~~	man
www		mohim	mm	mum	mm	mm	mm	mmm	mm	minin	min	m	mint	min		mm	min	mon	moun	min	mm	min	mumme
	monorman	man man	ming million	mon man	montration	mann	minun	mount was	Mont	man and share	Mulmon	Mariante	marker ways	m	mono	Momm	umm	man	mummu	montan	wwwww	mun	mannahaham
	www.weighthistly.or.alth		more a	Marian	morningation	M	my war your	have been and the second	mount	- WWW	www	~ ~ ~	mound	v v	W 4	~ (MW)Yh	YY	a margarena	man	MM M	mann	My Mar	Munut
	toonlaplater Water water do		have been and the second of th	hay a thread a name	the granter by the start and	and many and the state of the s	and With American	has we have the second second	And and the second second	-manufathanian	Water were south	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	diversity burringed	Contraction of the second		W/Alexhinehiner-three	And an and all	Mugala Anthe and	hele war and he was a feature of the	aster aller and the sequence	Man with Walkson	the destroy of the second prover	ward hand the second with
100000000000000000000000000000000000000	man here and the second	Andrew Martin Barrens Deter and	and the second	ward all warmed	\$1.4.84148-6AU	hat an approved by the	WA MAN WAY AND AN	MANU CAMUN	Al-and alevenad	when a share and is	A weeks and a second	and the second second	*********	A CANAN PARAMAN	non-many and the same	MAAA	A The party by the	www.www.	C. Martine Martine P.	Maper Marine	an and the way	And and and and	an and a second
and the second second	monologia Maria	Nation and a construction of the second s	And a start of the				man	Man	www.www.ww	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Marra	man	mann a	Annower		Mar WOUVer	-	- Anna - Marine	manual th	Mr man	- A	A www.	which and a state
mm					~~~~	~~~~~				~~~~~	~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~~~~			make		m	. A. Mars . A.		
1.0.00		min a		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		- marken				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			- <u></u>	Mahaaaa	······	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			- me m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	manne
munorth		Anna Anna Anna Anna Anna Anna Anna Anna	A Anna	man			A ALA MALA	main			man	- Anno - A	manning		m	mergense		min	a men	- Come	a non Maria	Anna	money
	-wayoutawal allower of	www.Washerners of	matheman	may with the dam	when when when when when when when when	manan	Muna Ma Martin	mannen	- Marine	marken Marking	manutan	Adman Maker -	Multimeter ages	n wannen	mentionent	whether	min	manna	a man many		moun	man	monte
			alles water alles	and and the second states	Muse wather at the	AL SALAN LAN	-	weeker with the second	winter		warmen and a speed	- Mary Mary	manyman	and the second second	and an and an and and	all the start	Windowshinking	Managen Marine Marine	home-manternal m.A.	month and and	an an an an an	- Unitran wager	
manna	managemen	mm	m	min	minin	m	man	m	mm	m	mm	min	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mm	min	mm	mm	m	man		minum	mm	mann
marin	momm	mmmm	mm	mm	mmm	mm	manin	mm		min	mm	m	mon	when	mon	mon	mm	minn	mmm	m	mm	mm	monor
hermant	manulpinnet shows	water and many and	mars the march when	understand marked m	www.wernewishin	and some approved	no may here any car	manning			moundary	anyoundar	Amphantor	mannen	agender man	whenen	symmetry	mon Manara	monorman	-	mannen	-	annon programme
	THE ALL AND ALL	water stand and the series	-				anator spenticity ana	an and the law of the		man and and any of			grand the work	at all the the second		www. www.	www.www.	nter muse transmost	-	ment has within the	an all a share and	New Therese States a states of	white march where a shift
	minum	mont	manual	monthing	man	man	mm	mpyhin	mm	man	Mumm	man	mont	mm	mmm	manny	mon	mouri	min	mont	man	mon	mmumm
mm		mann	mm	mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	www	mmm	mm		min	m	mmm	wm	m	mmm	min	m	min	mmm	minun	mm	mm
mon	monum	mmm	www.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	nam	vienne	man	mm	mm	mon	m	man	m	m	m	mon	m	mmm	mm	man	mym	mm	mmm
mm	manantan	Wethown on the second	under growth	maningsom	mountain	how when a show when	mman	mun	manone	monument	Munam	warm	numme	monorm	umonorm	moment	monte	monterio	month	minum	monthemation	ninmore	month
	n n n	***						n	-		n a	<u>~</u> ~		n n		-1	-		n n	* *			
							1																
					1 2 20	101 101	1.1.1													10000	101 101 10		4
		hard	-	>				~		->>	A	/	7		/		>			hand	/	2	
12	S-N	~~~	~~	~		$\sim$	$\sim$	~		~	-	$\sim$		_ ~	~~~	$\sim$			~		~~		$\sim$
-												2											~~
				1111	1 11 11	1111	1111			1111						1111		1111	1111			11111	
1.1.1				1 1 1 1 1 1		1111		1414	1111	11111	1111				1111	1.1						11111	man







## Paroxysmal Hypnogenic Dyskinesia









Thank you!







