Ritmi Biologici & Genere

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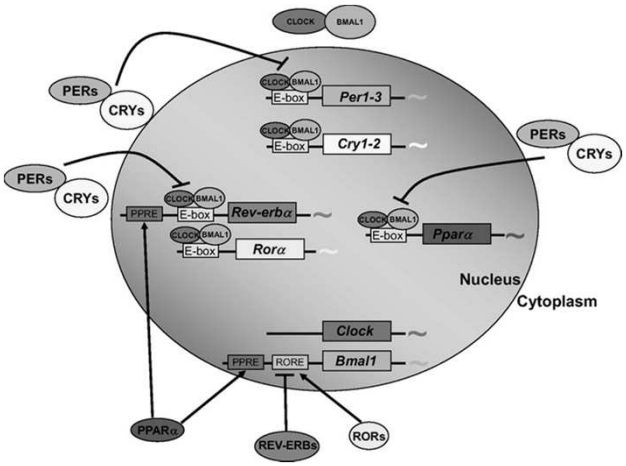
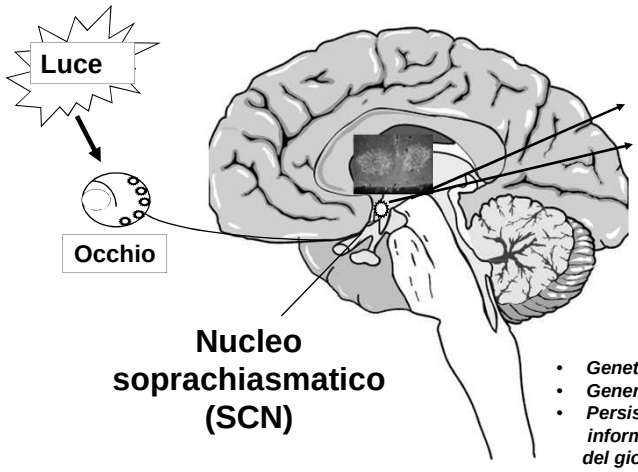
Ritmo circadiano



Froy et al, *Endocr Rev* 2010

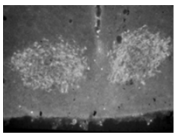
Ritmo circadiano

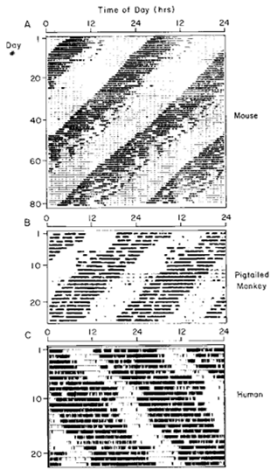


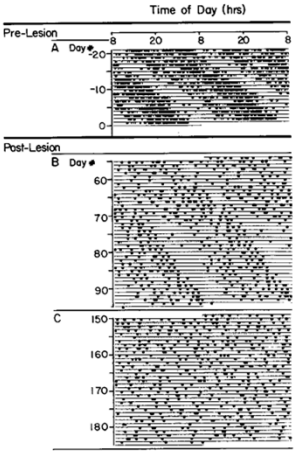
Ritmi di uscita

Aspetti fisiologici, comportamentali, ecc

- ***Geneticamente determinati***
- ***Generati da un orologio interno***
- ***Persistono anche in assenza di informazione su ora o lunghezza del giorno***







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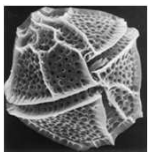
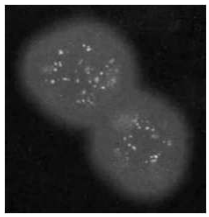
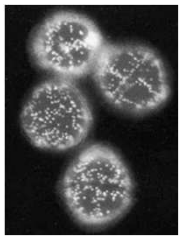


Gonyaulux polyedra
Ordine: protozoi Dinoflagellati planctonici
Eucariote unicellulare
1,8 mld aa

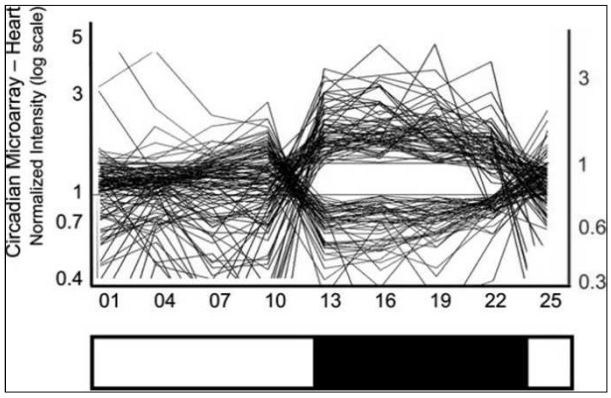




Photosynthesis	**Mid-morning**
Luminescence	**Mid-night**
Cellular division	**Just before dawn**

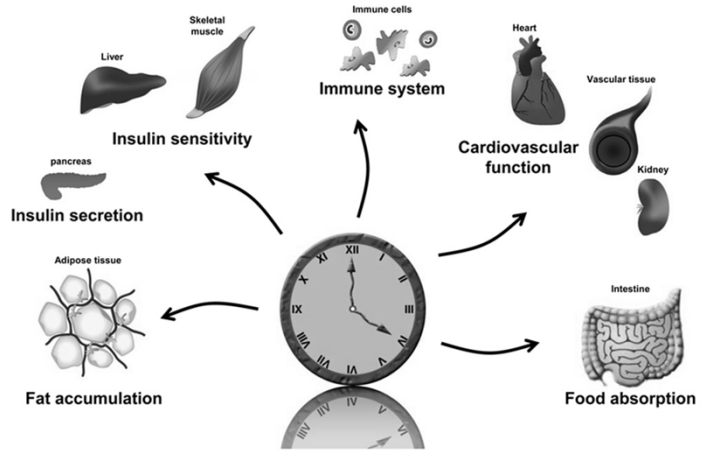
Ritmo circadiano

Almeno il 10-15% di tutti i geni è circadiano- dipendente



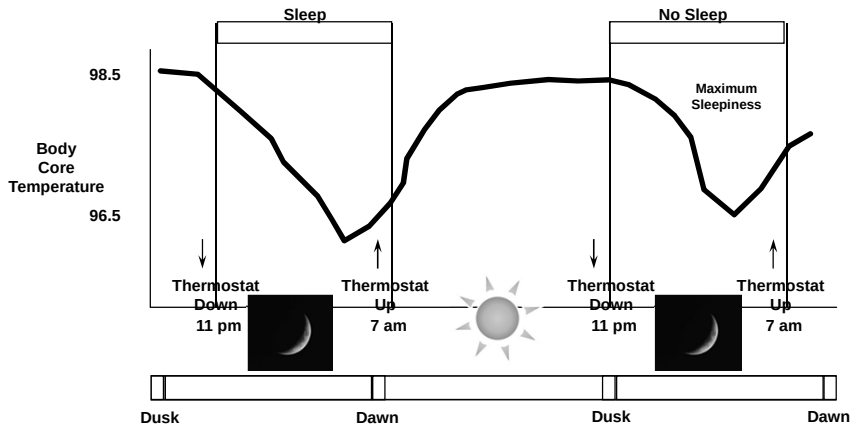
Martino et al, *J Mol Med* 2004

Orologi biologici e regolazione delle funzioni dell'organismo



Maury et al, *Circ Res* 2010

Ritmo circadiano



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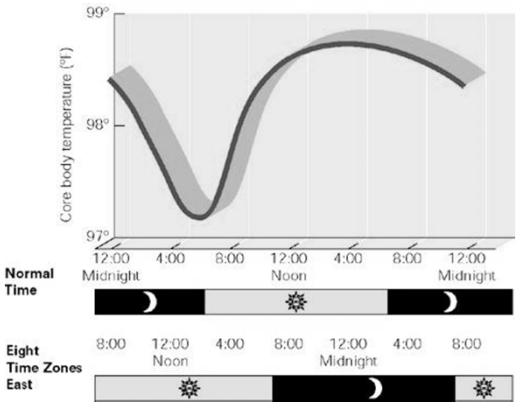

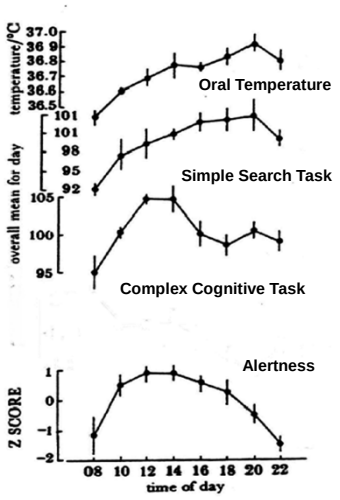

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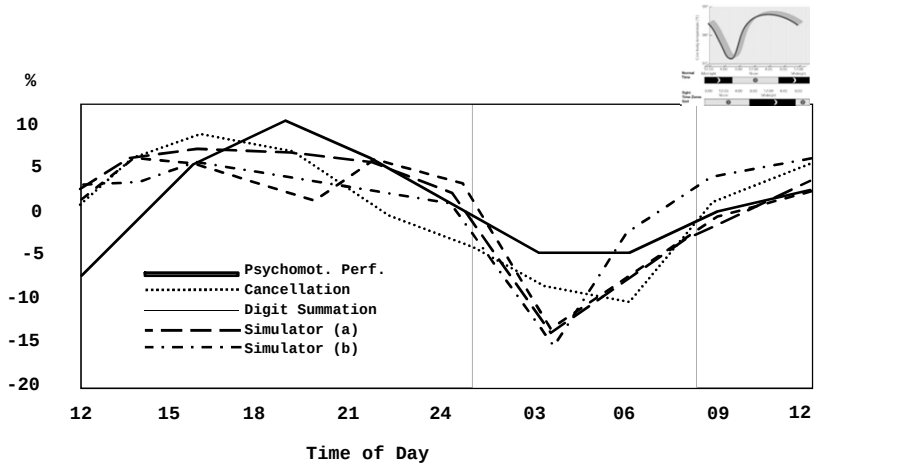

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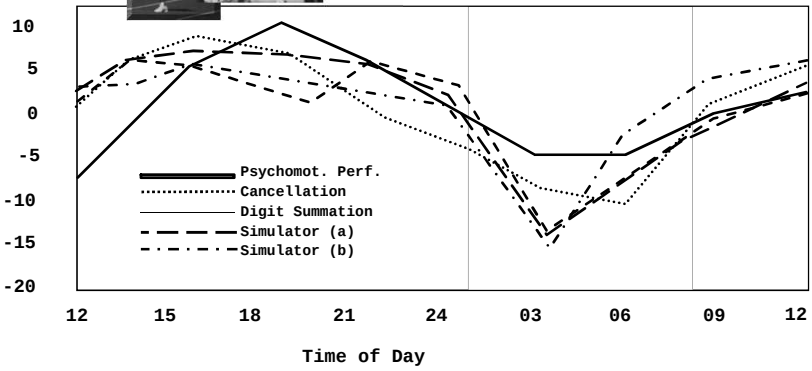

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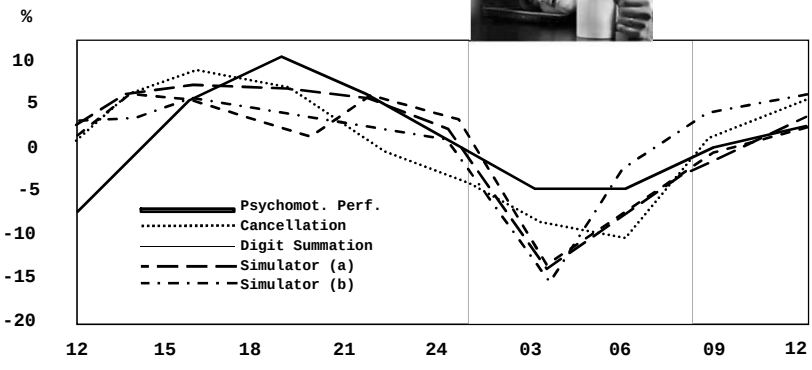
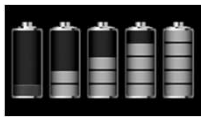




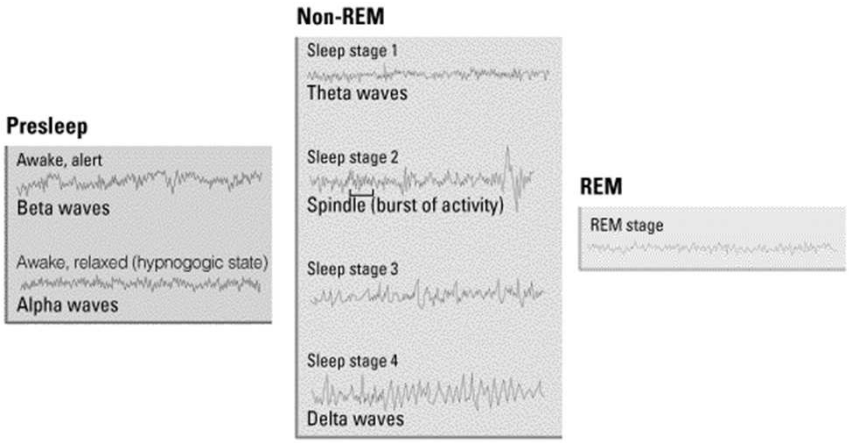
- Restoration Theory
  - 'Recharging Battery' per le richieste di tipo cognitivo, fisico ed emotivo
- Evolutionary Theory
  - Conservazione dell'energia, minimizzazione dell'esposizione ai predatori

('di notte è meno agevole la ricerca del cibo e più agevole la protezione nei confronti dei predatori notturni')

Normale architettura del sonno

- Sonno Non-REM (NREM) - Stadi I-IV cervello 'inattivo', corpo mobile
- Sonno REM (Rapid Eyes Movements) – Corpo 'paralizzato' cervello 'attivo' (dal punto di vista metabolico, ancora più attivo che durante la veglia)

Stadi del sonno



Stadio 1 – Periodo di Transizione

- Normalmente 10 minuti
- La maggior parte delle persone risvegliate durante lo Stadio 1 dichiarano (giurano!) che ‘non stavano affatto dormendo’
- “Micro-Sleeps”

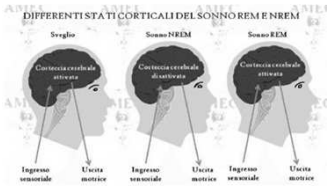
Stadio 2 – Più profondo, movimenti oculari ridotti

- Bassa qualità ristorativa del sonno
- Circa il 50% del sonno dell'adulto ricade in Stadio 2
- Occorrono circa 20 min. prima di passare allo stadio successivo

Stadi 3/4 – Slow Wave Sleep (SWS) (delta sleep)

- Il più ristorativo e riposante; vitale per il recupero fisico
- Difficile svegliarsi dal SWS
- La deprivazione di SWS causa 'fatigue' e dolori muscolari

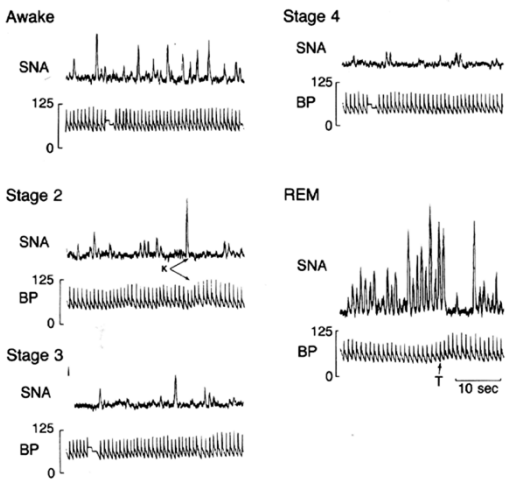
Sonno REM



- '*brain on, body off*'
- Vitale per il benessere psicologico;
- In caso di deprivazione isolata di sonno REM -> irritabilità -> psicosi -> morte
- EEG simile a quello di stato di veglia
- Sogni, polso e respiro irregolari, aumento della PA, perdita di tono muscolare, riflessi spinali assenti

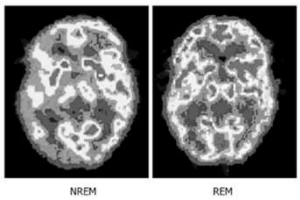
Attivazione del sistema nervoso autonomo e fasi del sonno

SNA
sympathetic-nerve activity



Somers et al, N Engl J Med 1993

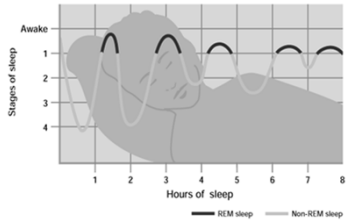
Sonno REM



- Il primo episodio avviene dopo 90-120 minuti di sonno NREM
- Ricorre in cicli di circa 90 minuti, che diventano più frequenti man mano che ci si avvicina al risveglio
- I periodi REM si fanno più lunghi nel corso della notte

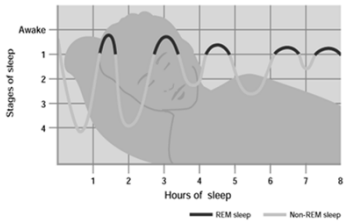
'CORE' sleep

- Horne: I primi tre cicli di SWS con rispettive fasi REM
- "optional sleep" il resto della notte: più REM, meno SWS
- Core sleep: circa 5 ore per la maggior parte delle persone



‘Sleepiness’

- 2 componenti: core vs. optional
- Una perdita di *core sleep* (versante fisiologico) – desincronizza e sbilancia i sistemi fisiologici
- Una perdita di *optional sleep* (versante psicologico) – specialmente effetti sul versante psicologico e dell’umore



SCIENTIFIC AMERICAN™

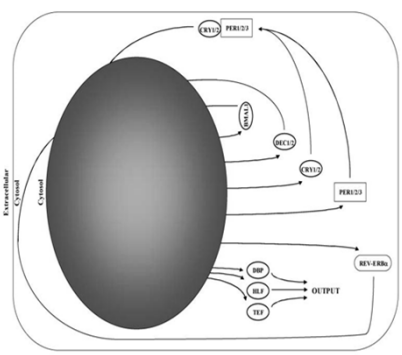
Health

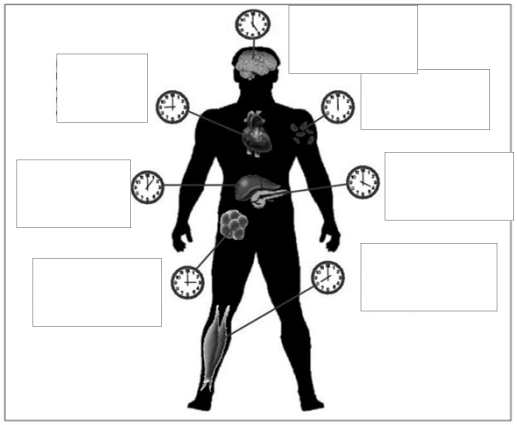
How Slight Sleep Deprivation Could Add Extra Pounds

New analysis shows that metabolic effects caused by even a couple nights with less than six hours of shut-eye may feed obesity

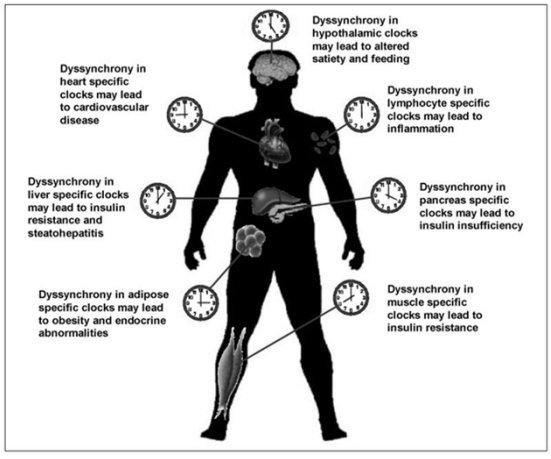
By Katherine Harmon on October 24, 2012

Ritmo circadiano





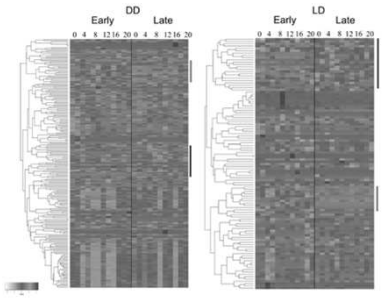
Desincronizzazione (*out-of-synch*) degli orologi biologici e patologie umane



Young et al, *Sleep Med* 2007

Cronotipo

Larks & Owls



Pegoraro et al, *Front Neurol* 2015

Larks & Owls

Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ)

n°	Domanda	Risposta	Punti
1	Se tu fossi del tutto libero/a di programmare la tua giornata, a che ora circa ti alzeresti?	5:00 – 6:30 6:30 – 7:45 7:45 – 9:45 9:45 – 11:00 11:00 – 12:00	5 4 3 2 1
2	Se tu fossi del tutto libero/a di programmare la tua serata, a che ora circa andresti a letto?	20:00 – 21:00 21:00 – 22:15 22:15 – 00:30 1:30 – 1:45 1:45 – 3:00	5 4 3 2 1
3	Se ti alzi abitualmente la mattina ad una certa ora, quanto sei dipendente dal suono della sveglia?	Per nulla Molto poco Abbastanza Molto	4 3 2 1

Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ)

n°	Domanda	Risposta	Punti
4	Quanto ti è facile alzarti la mattina (se non sei stato svegliato/a improvvisamente)?	Molto difficile Piuttosto difficile Abbastanza facile Molto facile	1 2 3 4
5	Quanto ti senti sveglio/a nella prima mezz'ora dopo che ti sei alzato/a al mattino?	Per niente Lievemente Un poco Del tutto	1 2 3 4
6	Quanto ti senti affamato/a nella prima mezz'ora dopo che ti sei alzato/a al mattino?	Per niente Leggermente Un poco Molto	1 2 3 4
7	Come ti senti durante la prima mezz'ora dopo che ti sei alzato al mattino?	Molto stanco/a Abbastanza stanco/a Abbastanza riposato/a Molto riposato/a	1 2 3 4

Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ)

n°	Domanda	Risposta	Punti
8	Se il giorno dopo non hai particolari impegni, a che ora vai a letto rispetto al tuo solito?	Circa uguale ma non più tardi Meno di 1 ora dopo 1 – 2 ore dopo Oltre 2 ore dopo	4 3 2 1
9	Hai deciso di fare esercizio fisico e un tuo amico ti ha consigliato di farlo per 1 h 2v/sett. e che per lui l'ora migliore è fra le 7:00 e le 8:00. Senza sapere niente del tuo orologio biologico, come pensi di riuscire?	Bene Abbastanza bene Difficile Molto difficile (la vedo male)	4 3 2 1
10	A che ora circa, la sera, ti senti stanco/a, e quindi bisognoso/a di sonno?	20:00 – 21:00 21:00 – 22:15 22:15 – 00:45 00:45 – 2:00 2:00 – 3:00	5 4 3 2 1

Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ)

n°	Domanda	Risposta	Punti
11	Devi sostenere un test mentalmente molto stancante, della durata di 2h, nel quale però devi assolutamente essere al tuo 'top' di performance. Se tu fossi libero/a di decidere l'orario in cui eseguirlo, sceglieresti:	8:00 – 10:00 11:00 – 13:00 15:00 – 17:00 19:00 – 21:00	6 4 2 0
12	Se vai a letto alle 23, quanto stanco ti senti?	Per niente Un poco Abbastanza Molto	0 2 3 5
13	Per una qualsiasi ragione, devi andare a letto alcune ore più tardi del solito, ma la mattina dopo non hai alcun obbligo particolare di alzarti. A che ora è più probabile che tu lo faccia?	Alla stessa ora, senza più riuscire ad addormentarti Alla stessa ora, ma poi sonnecchi Alla stessa ora, ma ti riaddormenti con facilità Più tardi del solito	4 3 2 1

Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ)

n°	Domanda	Risposta	Punti
14	Visto che il giorno dopo sei completamente libero/a, ti sei preso l'impegno di accompagnare un amico/a all'aeroporto, partendo da casa, alle 4 del mattino. Come ti comporti:	Sto alzato fino all'ora di andare Faccio un pisolino prima e poi dormo al ritorno Faccio una bella dormita prima e poi un pisolino al ritorno Faccio una bella dormita solo prima di partire	1 2 3 4
15	Devi fare due ore di duro lavoro fisico, ma sei del tutto libero/a di organizzare la tua giornata. In quale orario pensi di scegliere di farlo?	8:00 – 10:00 11:00 – 13:00 15:00 – 17:00 19:00 – 21:00	4 3 2 1
16	Hai deciso di fare esercizio fisico e un tuo amico/a ti ha consigliato di farlo per 1h 2v/sett e che l'ora migliore è fra le 22:00 e le 23:00. Senza sapere niente del tuo orologio biologico, come penseresti di riuscire?	Bene Abbastanza bene Difficile Molto difficile (la vedo male)	1 2 3 4

Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ)

n°	Domanda	Risposta	Punti
17	Supponi di potere scegliere il tuo orario di lavoro. Fai conto di dovere lavorare 5 ore al giorno (un lavoro che ti interessa) ma di essere pagato sulla base del risultato. A che ora all'incirca sceglieresti di iniziare?	Fra le 4:00 e le 8:00 Fra le 8:00 e le 9:00 Fra le 9:00 e le 14:00 Fra le 14:00 e le 17:00 Fra le 17 e le 4	5 4 3 2 1
18	A che ora del giorno circa ti senti di essere 'al massimo'?	5:00 – 8:00 8:00 – 10:00 10:00 – 17:00 17:00 – 22:00 22:00 – 5:00	5 4 3 2 1
19	Hai sentito parlare di soggetti 'mattutini' (*allodole*) e soggetti '*serotini*' (gufi). A quale di questi due gruppi ti senti di appartenere?	Sicuramente *allodola* Più *allodola* che *gufo* Più *gufo* che *allodola* Sicuramente *gufo*	6 4 2 1

Horne-Ostberg Morningness-Eveningness Questionnaire (MEQ)

Punteggio	Risultato
70 – 86	Sicuramente *allodola*
59 – 69	Moderatamente *allodola*
42 – 58	Intermedio
50 - 58	Intermedio con propensione *allodola*
42 - 49	Intermedio con propensione *gufo*
31 – 41	Moderatamente *gufo*
16 – 30	Sicuramente *gufo*

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ORIGINAL ARTICLE

Chronotype, gender and general health

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Fabbian et al, *Chronobiol Int* 2016

Table 1. General and cardiovascular health: Main available evidence.

Topic	Sample	Gender notes	Chronotype notes	Author
General health	*n* = 4493 general population	No	E-type: ↓fish and fruits, ↑chocolate and soft drinks, ↑alcohol and sucrose, ↓carbohydrates, protein, fiber, folic acid, ↑fat	Kanerva et al., 2012
General health	*n* = 2565 high school-students	No	I- and M-type: ↓smoking, ↓smoke nondaily, ↓smoke daily, ↓alcohol use, ↓physical inactivity	Urban et al., 2011
Lifestyle	*n* = 115 adolescents	No	E-types: fewer fruits and vegetables, ↑soda, ↓physical activity, ↑daytime naps.	Malone et al., 2016
Metabolic disorders	*n* = 1620 adults	M: E-type associated with diabetes (OR 2.98) W: E-type associated with metabolic syndrome (OR 2.22)	E-type: independently associated with diabetes and metabolic syndrome	Yu et al., 2015
Metabolic disorders	*n* = 126 obese and short-sleepers	No difference	E-type: eating later, larger portions, ↑calories; ↑24 h urinary epinephrine, ↑ morning plasma ACTH, ↑morning resting HR	Lucassen et al., 2013
Physical activity	*n* = 4904 general population	No	E-type: ↑odds for none to very low and low PA; ↑odds for more time spent sitting	Wenman et al., 2015

M = men; W = women; E-type = Evening-type; PA = physical activity; HR = heart rate.

Fabbian et al, *Chronobiol Int* 2016

Table 2. Psychological and psychopathological issues: Main available evidence.

Topic	Sample	Gender notes	Chronotype notes	Author
Common mental disorders	$n = 2538$ college students	No	E-type: relative ↑odds of CMDs	Rose et al., 2015
Common mental disorders	$n = 2645$ college students	W: ↑prevalence of CMD	Daytime sleepiness and poor sleep quality associated with ↑odds of CMD	Byrd et al., 2014
Common mental disorders	$n = 963$ college students	W: ↑daytime sleepiness and poor sleep quality	Daytime sleepiness and poor sleep quality associated with ↑odds of CMD	Concepcion et al., 2014
Common mental disorders	$n = 2970$ college students	No	E-type, poor sleep quality and excessive daytime sleepiness associated with ↑odds of CMD	Haregu et al., 2015
Depression	$n = 351$ students	Young girls, E-type: ↑depression symptoms	Young girls, E-type: ↑depression symptoms	de Souza & Hidalgo, 2015
Depression	$n = 2502$ young adults	M: daytime sleepiness and difficulty in initiating sleep associated with depression, W: association between depression and delayed sleep-wake schedule, daytime sleepiness, difficulty in initiating sleep	No	Morita et al., 2015
Depression	$n = 264$ adolescent girls	E-types: ↑depressive symptoms in both normal-weight and overweight females, especially in overweight	E-types: ↑depressive symptoms and trait anxiety	Pabst et al., 2009
Depression	$n = 4051$ adults	prevalence of depressive symptoms ↑>50 years in both sexes, W ↑scores than M	Group 31–40 years: subjects with mild-severe scores were E-types and with ↑ SJL	Levandovski et al., 2011
Depression	$n = 10\,503$ adults	No	E-type: ↑odds for depressive disorder, antidepressant medication, depressive symptoms	Merikanto et al., 2015
Depression	$n = 6071$ adults	No	Indicators of depression ↑ for E-types and I-types	Merikanto et al., 2013a
Depression	$n = 2325$ adults	No	↓morning alertness and ↑preference for evening hours related to ↑depressive symptoms and emotional eating	Konttinen et al., 2014
Depression	$n = 1944$ healthy and ill adults	No	Depressive and/or anxiety disorders associated with E-type	Antypa et al., 2016
Depression	$n = 756$ adults	Regardless of the effects of gender, age, circadian misalignment, sleep complaints	Eveningness-preference: independent risk factor for ↑negative emotionality	Simor et al., 2015
Nightmares	$n = 3978$ general population	W: strong association between nightmares and eveningness	E-types: most severe nightmares, younger age	Nielsen, 2010
Nightmares	$n = 1403$ university students		High-risk group exhibited later chronotype	Sheaves et al., 2016
Risk-taking	$n = 172$ young adults	No sex differences	E-type: ↑general risk-taking	Ponzi et al., 2014
Risk-taking	$n = 212$		M-types less likely than E-types to engage in financially risky behaviors	Wang et al., 2015
Self-control	$n = 308$ students		Eveningness: ↓self-control	Digdon & Howell, 2008
Sense of humor	$n = 197$ university students	E-type: sense of humor scores in W	E-types:↑sense of humor than M-types	Randler, 2008

M = men; W = women; CMD = common mental disorder; E-type = Evening-type; M-type = Morning-type; SJL = social jet lag.

Fabbian et al, *Chronobiol Int* 2016

Table 3. Sleep and sleep-related issues: Main available evidence.

Topic	Sample	Gender notes	Chronotype notes	Author
Bedtime and wake-up time	$n = 6631$ high school students	No	Eveningness: later bedtime and wake-up, shorter time in bed during the week, longer WE time in bed, irregular sleep-wake schedule, subjective poor sleep	Giannotti et al., 2002
Bedtime and wake-up time	$n = 568$ secondary school students	No	Eveningness: later bedtime, waking time, shorter sleep duration	Arrona-Palacios et al., 2015
Bedtime and wake-up time	$n = 356$ university students	DLMO phase earlier in W; phase angle wider in W	No	Van Reen et al., 2013
Bedtime and wake-up time	$n = 384\,076$ secondary school students	No	Later the bedtime, the lower the school performance and their motivation	Merikanto et al., 2013b
Sleep quality	$n = 34$ university students	M: eveningness more often than W; W: greater morningness	M-types: ↑sleep efficiency than E-types	Lehnkering et al., 2007
Sleep quality	$n = 50$ college students	No	E-types: ↓sleep quality and quantity compared with M- and N-types during weekdays, but recover on WE	Vitale et al., 2015
Sleep quality	$n = 540$ university students	No	Eveningness: ↑number of cigarettes, poor sleep	Kabrita et al., 2014

M = men; W = women; DLMO = dim light melatonin onset; E-type = Evening-type; M-type = Morning-type; WE = weekend; N-type = Neither-type.

Fabbian et al, *Chronobiol Int* 2016

Table 4. School and school-related issues: Main available evidence.

Topic	Sample	Gender notes	Chronotype notes	Author
Attention	n = 669 adolescents	Boys: ↑ attention than girls; E-type boys: ↑ attention than E-type girls	No differences between chronotypes	Escribano and Díaz-Morales, 2014, 2014
Mood	n = 655 high school students	No	M-types = better mood; E-types = lowest mood; E-types = lower sleep	Díaz-Morales et al., 2015
Academic achievements	n = 796 adolescents	SJL more detrimental to girls' performance, negatively related to cognitive abilities and GPA	M–E: related positively to academic achievement, negatively to inductive reasoning	Díaz-Morales & Escribano, 2015
Academic achievements	n = 158 high school students	F: ↑ grades and test anxiety; ↓ test anxiety predicted higher GPA in W but not in M	Positive correlation between consciousness and GPA and morningness. Significant association between gender and GPA for E-types and I-types	Rahafar et al., 2016
Academic achievements	n = 272 high school students	No differences	E-type = negative predictor of overall, math-science and language GPA	Preckel et al., 2013
Academic achievements	n = 1020 high school students	W and older students had earlier chronotypes. Students going to school earlier: ↑ school success	M-type students starting school earlier, but with no significant difference in daytime sleepiness versus those starting school later	Milić et al., 2014
Academic achievements	n = 4734 high school students	No	Lowest grades for students definite E-type or slept very short on schooldays (<7 h)	van der Vinne et al., 2015
Academic achievement	n = 838 college students	W: ↑ morning preference than M, and seniors had ↑ morning preference than freshmen	E-type: ↑ levels of fatigue, alcohol and caffeine use, worse academic performance	Taylor et al., 2011
Academic achievements	n = 134 university students	W significantly outperformed M in each measured academic assessment criteria. Compared to M, W: significantly ↑ mean score on hardiness commitment	No	Sheard, 2009
Academic achievements	n = 147 university students		Morning exam: M-type ↑ scores than E-type or I-type	Beşoluk et al., 2011
Academic achievements	n = 120 university students	No differences	SN-TSD associated with later bedtime, evening preference, ↓ GPA	Thacher et al., 2008
Academic achievements	n = 1109 university students	Significant ↓ in performance of E-type relative to M-type in M, M: only near-trend significant correlation of performance with sleep-onset time	Significant ↓ in performance of E-type relative to M-type in M, M: only near-trend significant correlation of performance with sleep-onset time	Smarr et al., 2015

M = men; W = women; M–E = Morningness–Eveningness; SJL = social jet lag; GPA = grade point average; SNTSD = single night total sleep deprivation; E-type = Evening-type.

Fabbian et al, *Chronobiol Int* 2016

Tendency Toward Eveningness Is Associated With Unhealthy Dietary Habits

Noora Kanerva,[1] Erkki Kronholm,[1] Timo Partonen,[2] Marja-Leena Ovaskainen,[3] Niina E. Kaartinen,[1] Hanna Konttinen,[4] Ulla Broms,[2,5] and Satu Männistö[1]

TABLE 2. Food consumption by ME score quintiles

	ME score quintiles*†						
	1 (n = 826, 18%)	2 (n = 946, 21%)	3 (n = 665, 15%)	4 (n = 1061, 24%)	5 (n = 995, 22%)	p trend[‡¶]	p[†§]
Whole grain, g/d	225 (5)	231 (3)	238 (3)	245 (3)	251 (4)	.012	<.001
Wheat, g/d	77 (1)	77 (1)	76 (1)	76 (1)	76 (1)	.08	.08
Rye, g/d	61 (1)	63 (1)	66 (1)	68 (1)	71 (1)	<.001	<.001
Potatoes, g/d	136 (3)	138 (2)	142 (1)	145 (2)	147 (3)	.021	<.001
Fried potatoes, g/d	9.9 (.4)	9.5 (.3)	9.0 (.2)	8.6 (.2)	8.2 (.3)	.008	.08
→ Vegetables/roots, g/d	266 (5)	271 (4)	277 (3)	282 (3)	287 (5)	.006	.002
→ Fruits, g/d	265 (6)	268 (4)	271 (3)	274 (4)	277 (6)	.17	.025
Butter g/d	7.6 (.2)	7.7 (.2)	7.8 (.1)	7.9 (.2)	8.0 (.2)	.74	.41
Margarine, g/d	13.3 (.3)	13.3 (.2)	13.2 (.2)	13.2 (.2)	13.1 (.3)	.34	.45
Oil, g/d	10.7 (.2)	10.5 (.1)	10.3 (.1)	10.2 (.1)	10.0 (.2)	.12	.65
Red meat/meat products, g/d	136 (2)	137 (2)	138 (1)	139 (2)	141 (2)	.35	.08
→ Fish, g/d	43 (1)	44 (1)	45 (1)	46 (1)	47 (1)	.10	<.001
Milk, g/d	359 (8)	361 (6)	363 (5)	366 (5)	368 (8)	.82	.27
Fruit juices, g/d	128 (4)	124 (3)	120 (2)	117 (3)	113 (4)	.17	.47
Softdrinks, g/d	98 (6)	79 (5)	69 (6)	87 (5)	73 (5)	.50	.015
Beer, g/d	113 (7)	105 (4)	98 (3)	90 (4)	82 (6)	.06	.51
→ Wine, g/d	26 (1)	23 (1)	20 (1)	17 (1)	14 (1)	<.001	<.001
→ Spirits, g/d	3.6 (.3)	3.0 (.2)	3.2 (.2)	3.0 (.2)	2.9 (.3)	.037	.99
Sweets, g/d	10.2 (.5)	10.2 (.3)	10.1 (.3)	10.1 (.3)	10.0 (.5)	.96	.001
→ Chocolate, g/d	10.2 (.4)	9.7 (.3)	9.1(.2)	8.6 (.3)	8.1 (.4)	.02	<.001

*Lowest ME score quintile represents strong tendency toward eveningness and highest quintile represents strong tendency

Kanerva et al, *Chronobiol Int* 2012

Tendency Toward Eveningness Is Associated With Unhealthy Dietary Habits

Noora Kanerva,[1] Erkki Kronholm,[1] Timo Partonen,[2] Marja-Leena Ovaskainen,[3] Niina E. Kaartinen,[1] Hanna Konttinen,[4] Ulla Broms,[2,5] and Satu Männistö[1]

TABLE 1. Mean (± SEM) or % of lifestyle, health, and sleep-related factors, and anthropometric measures by ME score quintiles

	ME score quintiles*					
	1 (n = 826, 18%)	2 (n = 946, 21%)	3 (n = 665, 15%)	4 (n = 1061, 24%)	5 (n = 995, 22%)	*p* trend†,‡
ME score, range	5–14	15–17	18–19	20–22	23–27	
Male sex, %	38	42	45	49	51	<.001
Age,† yrs	47 (.5)	50 (.4)	52 (.5)	54 (.4)	56 (.4)	<.001
Highly educated Subjects, %	46	42	35	33	27	<.001
→ Physically inactive	27	21	15	14	13	<.001
→ Current smokers, %	21	16	12	15	16	.003
Working evenings or night shift, %	3	1	<1	<1	1	<.001
BMI,† kg/m^2	27.0 (.2)	26.7 (.2)	26.5 (.2)	26.7 (.1)	27.2 (.2)	.35
Sleep <7 h/d,† %	13	8	9	9	12	.38
Sleep >8 h/d,† %	17	16	14	14	13	.008
Insomnia,†¶ %	67	61	58	54	46	<.001
Experienced insufficient sleep,†§ %	25	15	11	8	6	<.001
→ Good self-rated Health,† %	49	60	62	65	69	<.001
→ Good self-rated physical fitness,† %	37	45	48	54	59	<.001

*Lowest ME score quintile represents strong tendency toward eveningness and highest quintile strong tendency toward morningness.

Kanerva et al, *Chronobiol Int* 2012

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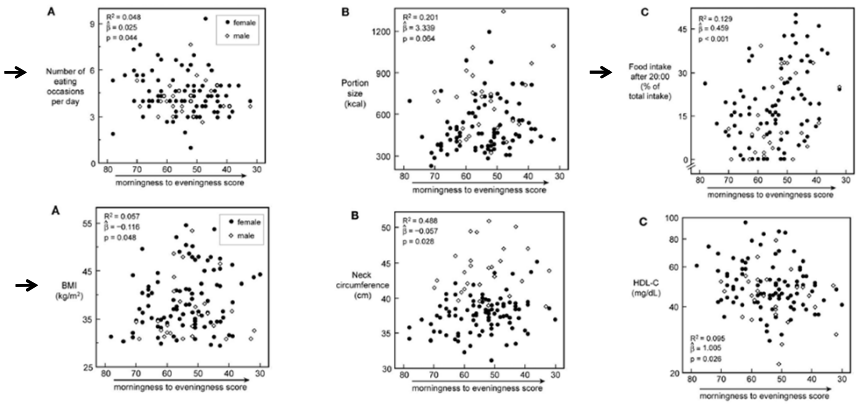
Evening Chronotype Is Associated with Changes in Eating Behavior, More Sleep Apnea, and Increased Stress Hormones in Short Sleeping Obese Individuals

Eliane A. Lucassen[1], Xiongce Zhao[2], Kristina I. Rother[3], Megan S. Mattingly[4], Amber B. Courville[1], Lilian de Jonge[4], Gyorgy Csako[5], Giovanni Cizza[4]*, for the Sleep Extension Study Group



Lucassen et al, *PLoS One* 2013

Associations of Chronotype and Sleep With Cardiovascular Diseases and Type 2 Diabetes

Ilona Merikanto,[1,2] Tuuli Lahti,[1,3] Hannu Puolijoki,[4] Mauno Vanhala,[5,6] Markku Peltonen,[7] Tiina Laatikainen,[6,7,8] Erkki Vartiainen,[7] Veikko Salomaa,[7] Erkki Kronholm[7] and Timo Partonen[1]

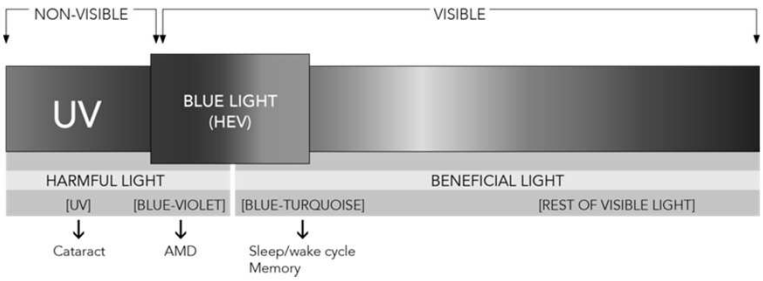
TABLE 3. Cardiovascular disease-related morbidity or procedures and type 2 diabetes predicted by chronotype and sleep duration[a]

	Odds ratio (95% confidence interval)			
	Chronotype		Sleep duration	
	Intermediate	Evening	≤6 h	≥9 h
→ Hypertension (Total: N = 4516) (No: N = 3407, Yes: N = 1109)	1.0 (.9–1.2)	1.3 (1.0–1.8)*	1.4 (1.2–1.7)****	1.3 (1.0–1.7)*
Angina pectoris (Total: N = 4522) (No: N = 4398, Yes: N = 124)	1.4 (1.0–2.1)	1.8 (1.0–3.5)	1.3 (.9–2.0)	.8 (.4–1.7)
Myocardial infarction (Total: N = 4513) (No: N = 4422, Yes: N = 91)	.9 (.6–1.5)	.8 (.3–2.1)	1.5 (.9–2.4)	1.0 (.4–2.3)
Stroke (Total: N = 4511) (No: N = 4405, Yes: N = 106)	1.1 (.7–1.7)	1.4 (.7–2.8)	1.9 (1.2–2.9)**	1.7 (.9–3.2)
→ Type 2 diabetes (Total: N = 4501) (No: N = 4342, Yes: N = 159)	1.3 (.9–1.8)	2.6 (1.5–4.4)****	1.6 (1.1–2.3)*	1.6 (.9–2.7)
Coronary artery bypass (Total: N = 4522) (No: N = 4464, Yes: N = 58)	1.3 (.7–2.3)	.9 (.3–3.0)	1.7 (.9–3.2)	2.3 (1.0–5.0)
Coronary artery angioplasty (Total: N = 4524) (No: N = 4470, Yes: N = 54)	.8 (.4–1.4)	1.0 (.4–3.0)	1.3 (.7–2.5)	.9 (.3–2.7)

[a]Morning-type and sleep of 7 to 8 h per night as the reference, respectively; adjusted for sex, age, education level, and civil status.
*$p < .05$; **$p < .01$; ***$p < .001$; ****$p < .0001$.

E-types had a 2.6-fold association with type 2 diabetes ($p < .0001$) and a 1.3-fold association with a diagnosis of hypertension ($p < .05$), as compared with M-types

Merikanto et al, *Chronobiol Int* 2013



Sources of blue light include the sun, digital screens (TVs, computers, laptops, smart phones and tablets), electronic devices, and fluorescent and LED lighting.

Blue light has a dark side. Light at night is bad for your health, and exposure to blue light emitted by electronics and energy-efficient lightbulbs may be especially so.

***Harv Health Lett* 2012**