



Discrepancy between desired time in bed and desired total sleep time

the DBST index and its relationship with insomnia severity

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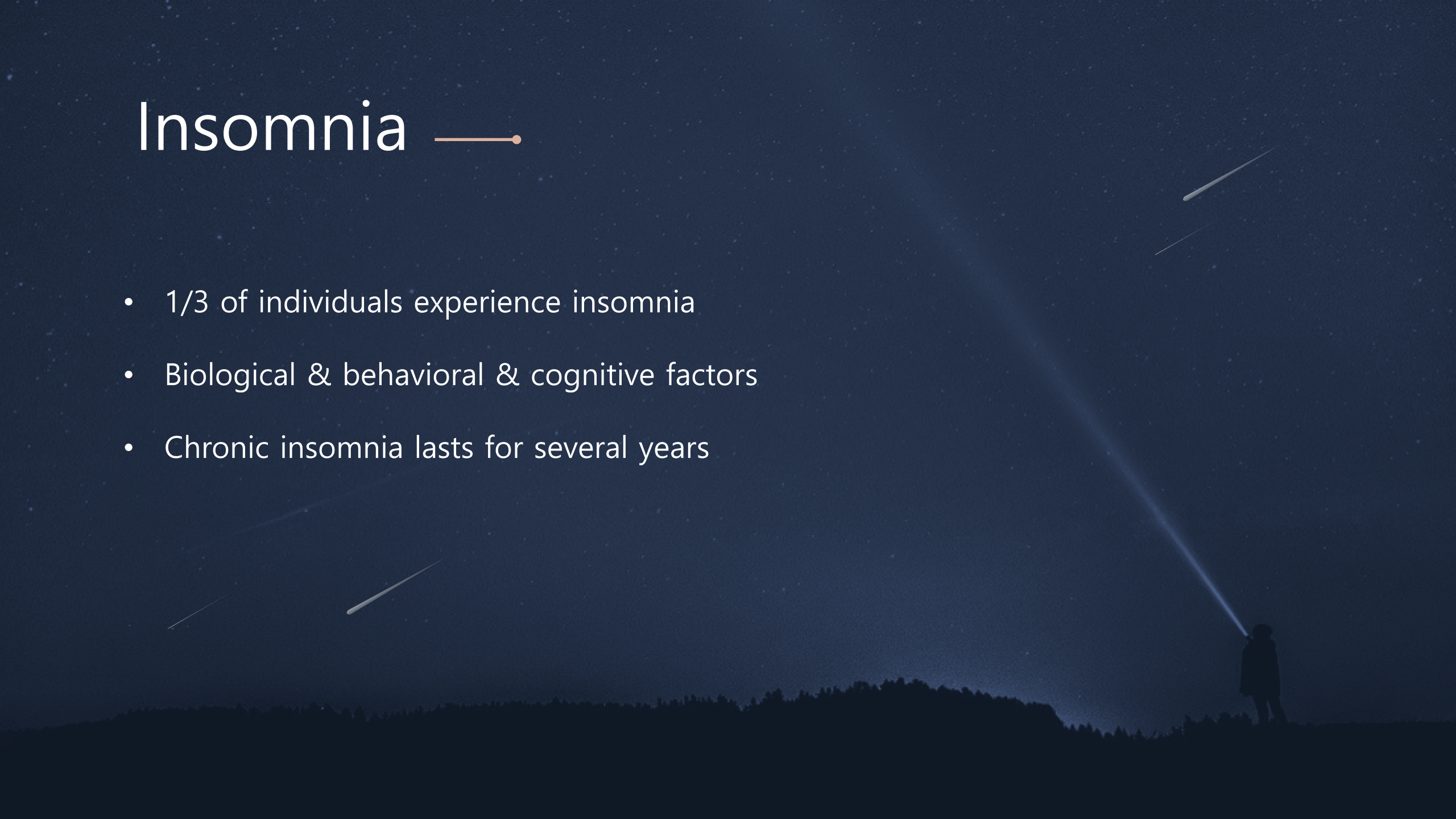
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introduction

Insomnia —

- 1/3 of individuals experience insomnia
- Biological & behavioral & cognitive factors
- Chronic insomnia lasts for several years



CBT-I — CBT for insomnia

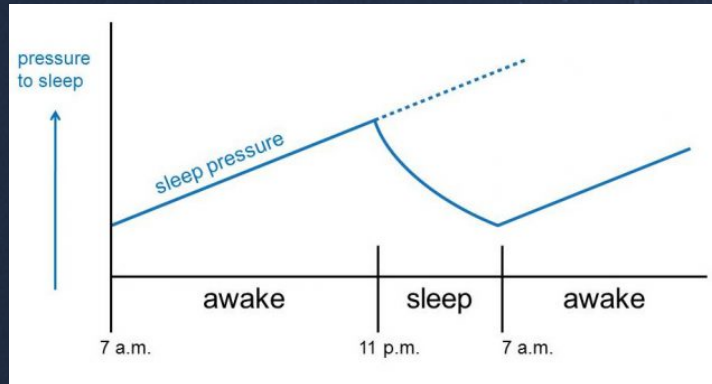
- Effective treatment for chronic insomnia
- USA guideline : moderate evidence in differently aged groups
- Management of illogical cognitive thoughts to insomnia
- Improvement of dysfunctional beliefs regarding sleep
 - Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS)

DBST index

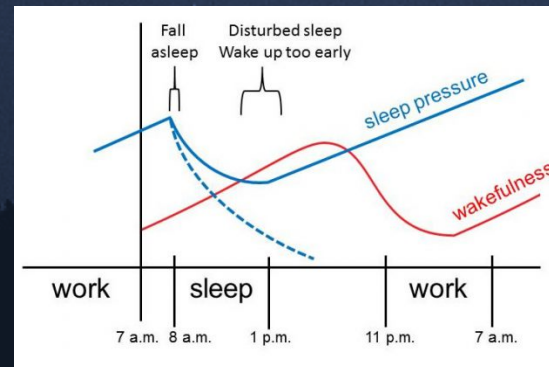
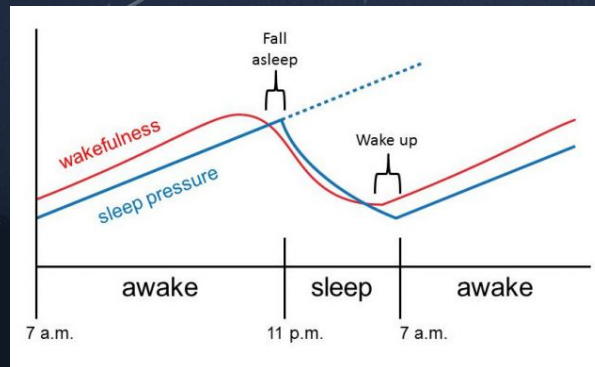
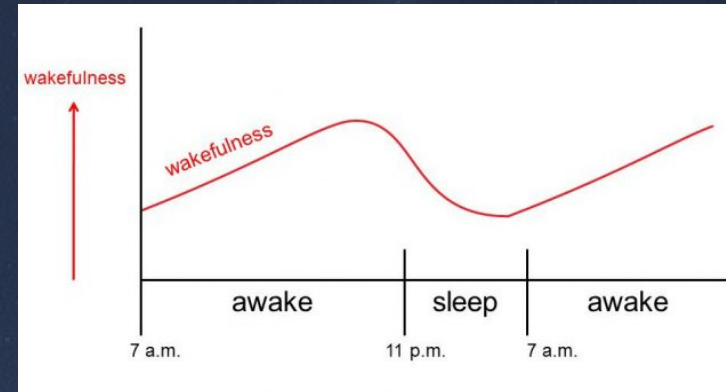


Two-process model of sleep

- Process S
 - Homeostatic process



- Process C
 - Circadian pacemaker



Previous study about DBST concept

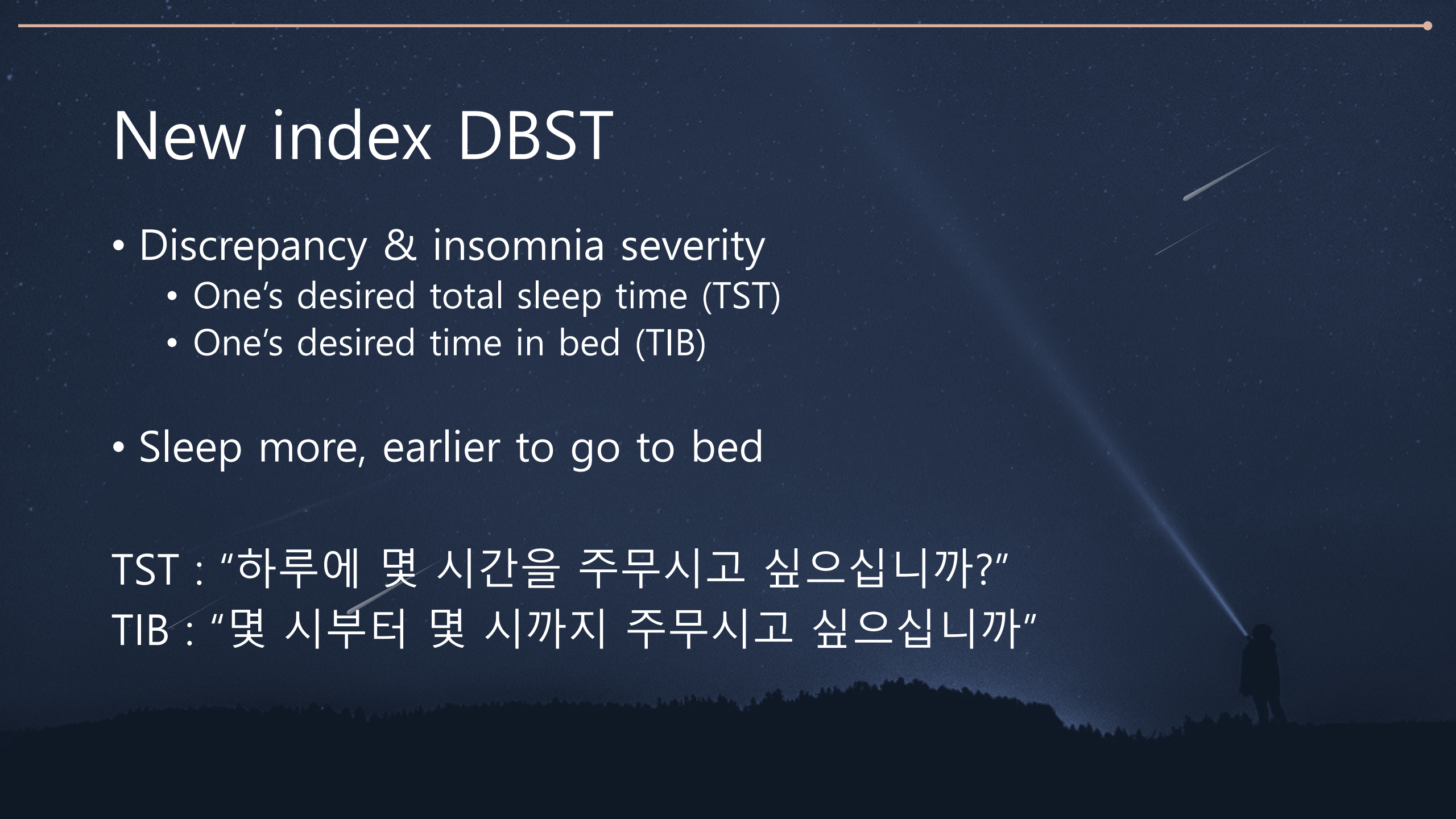
- Process S
 - Sleep-inducing force \uparrow
- Sleep latency $\leq 30\text{min}$
 - Go to bed late
- Wake-up time \sim bed time
 - Sleep latency $\leq 30\text{min}$ \uparrow
- Short sleep latency \propto long duration from wake-up time to bed time
- Pressure to sleep for good sleep
 - Homeostatic drive
- Going to bed early \blacktriangleright time in bed (TIB) \uparrow

New index DBST

- Discrepancy & insomnia severity
 - One's desired total sleep time (TST)
 - One's desired time in bed (TIB)
- Sleep more, earlier to go to bed

TST : "하루에 몇 시간을 주무시고 싶으십니까?"

TIB : "몇 시부터 몇 시까지 주무시고 싶으십니까?"

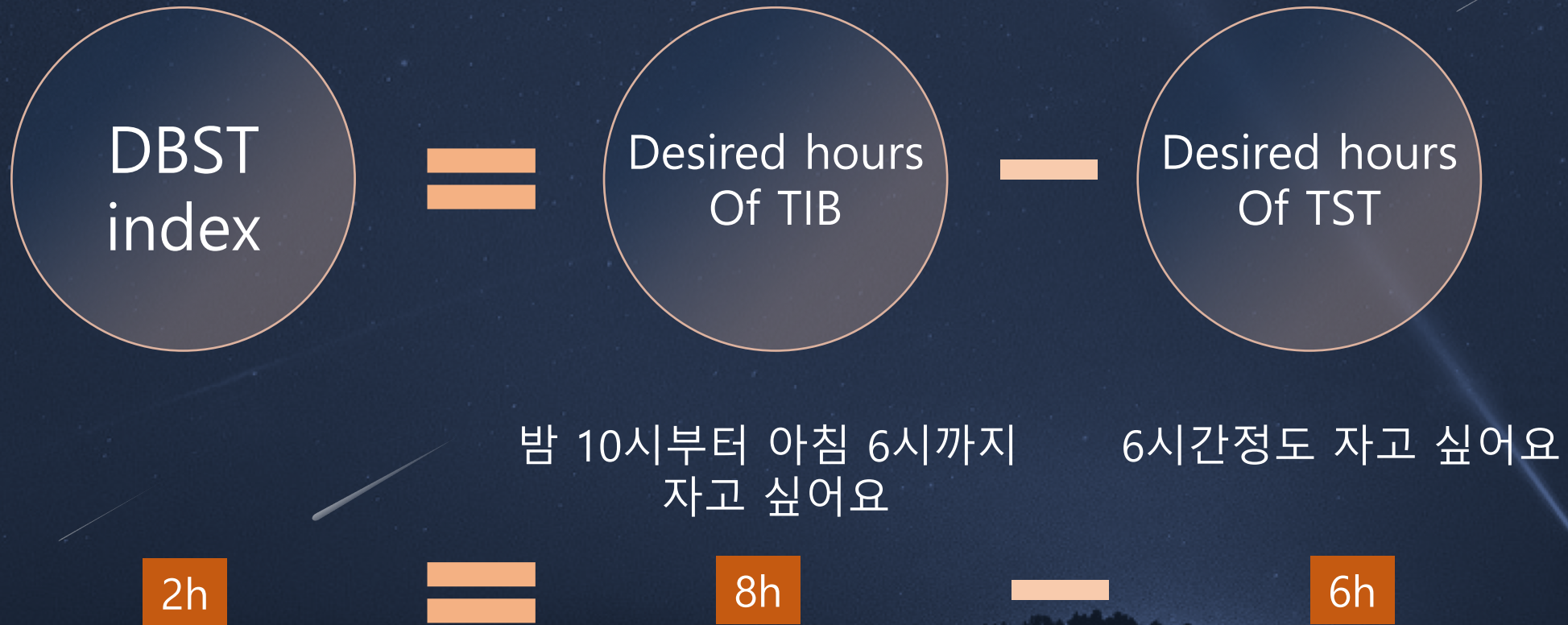


Sleep indices & DBST index

- 하루 몇 시간 주무시고 싶으신가요?
 - 보통 잠자리에 몇 시에 들어가십니까?
 - 보통 몇 시쯤 잠이 드십니까?
 - 보통 몇 시에 마지막으로 깨십니까?
 - 보통 몇 시에 완전히 일어나십니까?
 - 낮에 “누워 있는” 시간이 몇 시간쯤 되십니까?
 - 몇 시에 자서 몇 시에 일어나고 싶으신가요?
- Sleep indices of time variables
 - bedtime, sleep onset time, wake-up time
 - Duration variables
 - Sleep onset latency (SOL)
 - Time in bed (TIB)
 - Duration from wake-up time to bedtime (WTB)
 - DBST index

- $TIB = \text{wake-up time} + 12 - \text{bedtime}$
- $WTB = 24 - TIB$
- TIB/d : reflect physical activity during 24h a day

DBST index calculation



Other variables

- Insomnia severity index (ISI)
- Cancer-related dysfunctional beliefs about sleep (C-DBS)
- Patient health questionnaire-9 items (PHQ-9)
- State subcategory of the state and trait anxiety inventory (STAI-S)
- Short form of the fear of pregression questionnaire (FoP-Q-SF)
- Pain with NRS

DBST in
General population



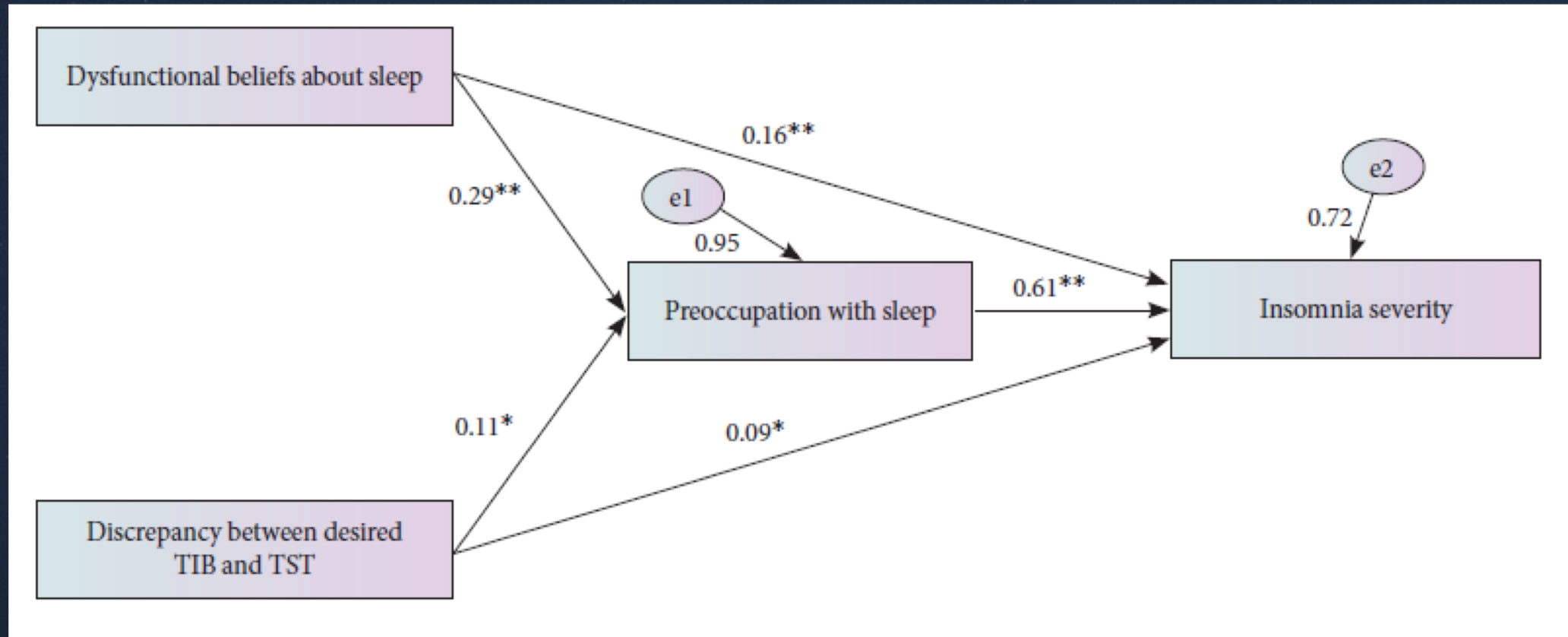
DBST study on general population

Table 2. Spearman correlation coefficients of each variable in all participants (N=387)

Variables	Age	ISI	GSES	DBS-2	PHQ-9	SAVE-6	Desired TST	Desired TIB	DBST
Age	1.000								
ISI	-0.17**	1.000							
GSES	-0.15**	0.68**	1.000						
DBS-2	-0.12*	0.36**	0.31**	1.000					
PHQ-9	-0.23**	0.53**	0.57**	0.29**	1.000				
SAVE-6	-0.02	0.31**	0.30**	0.31**	0.32*	1.000			
Desired TST	-0.25**	-0.05	-0.003	0.10*	0.05	0.06	1.000		
Desired TIB	-0.17**	0.14**	0.13*	0.12*	0.15**	0.16**	0.33**	1.000	
DBST index	0.06	0.17**	0.11*	0.02	0.09	0.10	-0.55**	0.61**	1.000

* $p < 0.05$; ** $p < 0.01$. ISI, insomnia severity index; GSES, Glasgow Sleep Effort Scale; DBS-2, Dysfunctional Beliefs about Sleep-2 items; PHQ-9, Patient Health Questionnaire-9 items; SAVE-6, Stress and Anxiety to Viral Epidemics-6 items; TST, total sleep time; TIB, time in bed; DBST, discrepancy between desired time in bed and desired total sleep time

DBST study on general population



DBST in
Age over 60

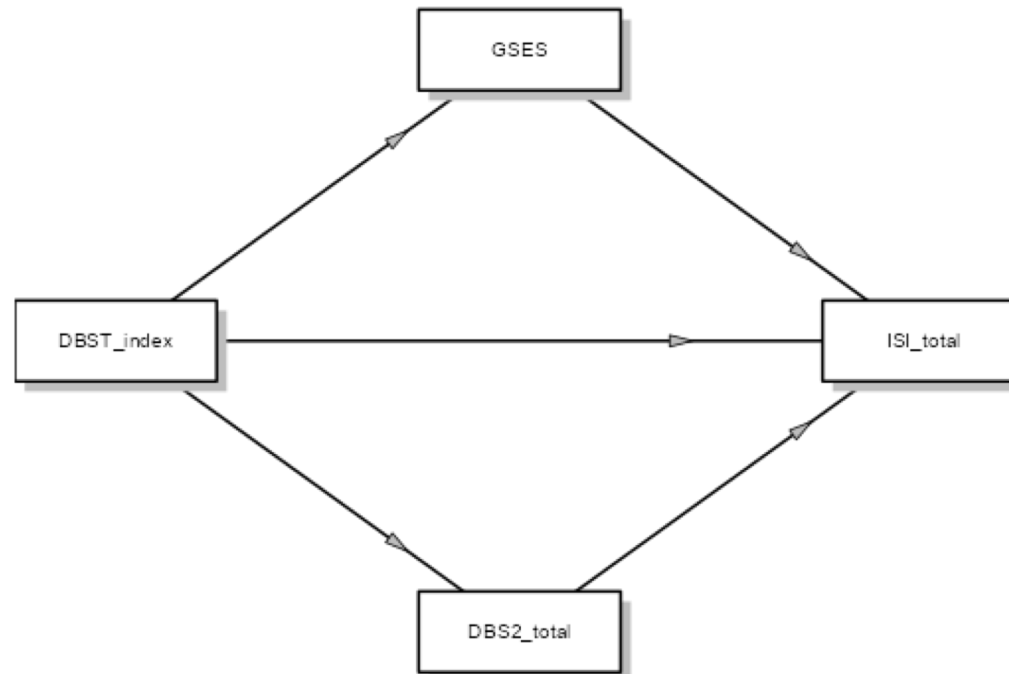


DBST study on older group

	Age	Desired_TST	Desired_BT	Desired_WT	Desired TIB	DBST index	ISI_total	DBS2_total	GSES	SOL	TIB	WTB	TIB/d
Age													
Desired TST	-.007												
Desired BT	-.005	.073											
Desired WT	-.151	.229*	.433**										
Desired TIB	-.126	.125	-.625**	.434**									
DBST_index	-.087	-.689**	-.513**	.138	.632**								
ISI total	-.177	-.060	.000	.308**	.267**	.241*							
DBS2 total	.024	.160	-.163	.160	.301**	.095	.407**						
GSES	-.134	.064	-.017	.161	.157	.064	.623**	.338**					
SOL	.172	-.071	-.248*	-.034	.222*	.222*	.000	-.052	-.042				
TIB	-.021	.133	-.262*	.169	.411**	.202	-.109	.052	-.062	.113			
WTB	.021	-.133	.262*	-.169	-.411**	-.202	.109	-.052	.062	-.113	-1.000**		
TIB/d	.257*	.130	-.016	.101	.103	-.028	.042	.043	.087	.110	.283**	-.283**	

*p<0.05; **p<0.01. ISI, insomnia severity index; GSES, Glasgow Sleep Effort Scale; DBS-2, Dysfunctional Beliefs about Sleep-2 items; PHQ-9, Patient Health Questionnaire-9 items; SAVE-6, Stress and Anxiety to Viral Epidemics-6 items; TST, total sleep time; TIB, time in bed; DBST, discrepancy between desired time in bed and desired total sleep time

DBST study on older group



DBST in Cancer patients



Insomnia in cancer patients

- 74% of patients' experience insomnia for a period of at least 1 year
- 46% report insomnia over a period of 3 years
- cancer + treatment process + psychological status
- more sensitive in dysfunctional beliefs for insomnia
- Hypothesis
 - DBST index association with insomnia severity in cancer patients
 - DBST index association with sleep onset latency

Results

Sleep indices of the study subjects (n=146)	
Variable	Mean \pm SD
Time variables	
Bedtime	10:42 \pm 1:12 PM
Sleep onset time	11:59 \pm 1:18 PM
Wake-up time	6:36 \pm 1:24 AM
Duration variables	
Sleep onset latency (min)	90.0 \pm 60.0
Time in bed (h)	7.9 \pm 1.5
Duration from wake-up time to bedtime (h)	16.1 \pm 1.5
Time in bed during 24 hours (h)	10.2 \pm 3.6
DBST	
Desired time in bed	7.4 \pm 1.0
Desired total sleep time	6.6 \pm 1.2
DBST index	0.8 \pm 1.0 (-1.0 ~ 4.5)

Results

Correlation coefficients of rating scale scored and the DBST index among cancer patients (N=146)

Variables	Age	ISI	PHQ-9	STAI-S	FoP	C-DBS2
ISI	0.26**					
PHQ-9	0.13	0.37**				
STAI-S	-0.03	0.12	0.45**			
FoP	-0.16**	0.10	0.64**	0.45**		
C-DBS	-0.03	0.24**	0.28**	0.16	0.41**	
DBST index	0.14	0.19*	-0.04	-0.03	-0.14	-0.08

ISI, Insomnia Severity Index; PHQ-9, Patient Health Questionnaire-9 items; STAI-S, State category of State and Trait Anxiety Inventory; FoP, Fear of Progression; C-DBS, Cancer-related Dysfunctional Beliefs about Sleep; DBST, Discrepancy between desired time in Bed and desired total Sleep Time

* $p < 0.05$, ** $p < 0.01$

Results

Correlation coefficients of the DBST index, time and duration variables among cancer patients (N=146)

Variables	Age	SOL	TIB	TIB/d	WTB	Bedtime	Sleep onset time	Wake-up time	the DBST index	Desired TIB
SOL	-0.06									
TIB	-0.16	0.35**								
TIB/d	0.09	0.23**	0.43**							
WTB	0.16	-0.35**	-1.00**	-0.43**						
Bedtime	-0.18*	-0.32**	-0.48**	-0.25**	0.48**					
Sleep onset time	-0.20*	0.54**	-0.14	-0.04	0.14	0.63**				
Wake-up time	-0.32**	0.10	0.66**	0.24**	-0.66**	0.34**	0.38**			
DBST index	0.14	0.23**	0.06	-0.08	-0.06	-0.13	0.07	-0.05		
Desired TIB	-0.03	0.24	0.28**	0.14	-0.28**	-0.15	-0.11	0.17*	0.29**	
Desired TST	-0.14	-0.17*	0.19*	0.18*	-0.19*	-0.16	-0.16	0.19*	-0.59**	0.60**

SOL, Sleep Onset Latency; TIB, Time In Bed; TIB/d, Time In Bed during 24 hours; WTB, duration from Wake-up time To Bedtime; DBST, Discrepancy between desired time in Bed and desired total Sleep Time; TST, Total Sleep Time

* p < 0.05, ** p < 0.01

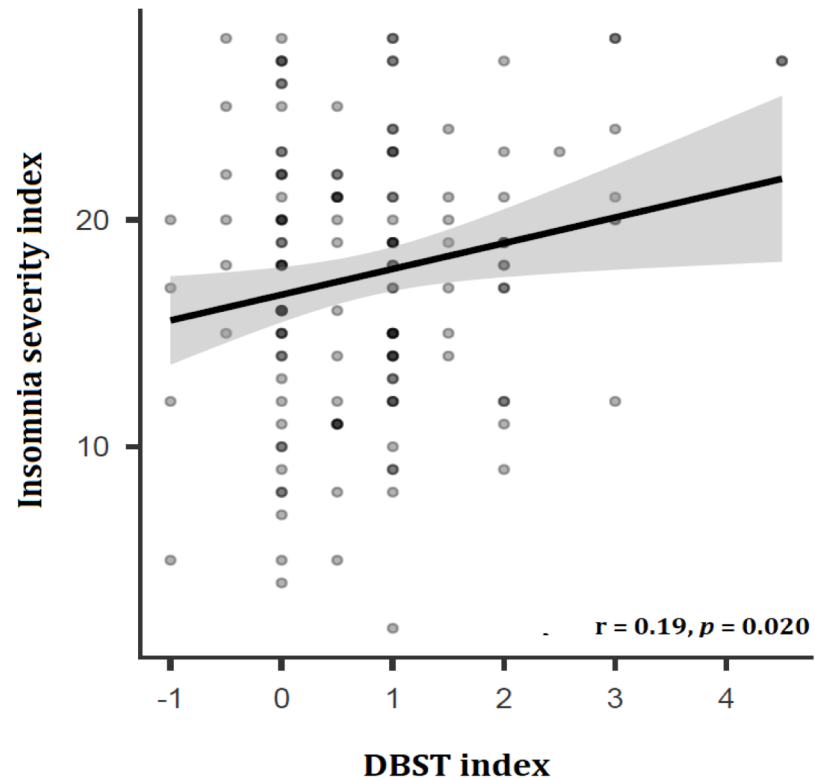
Results

Correlation between the DBST Index and Sleep Indices.

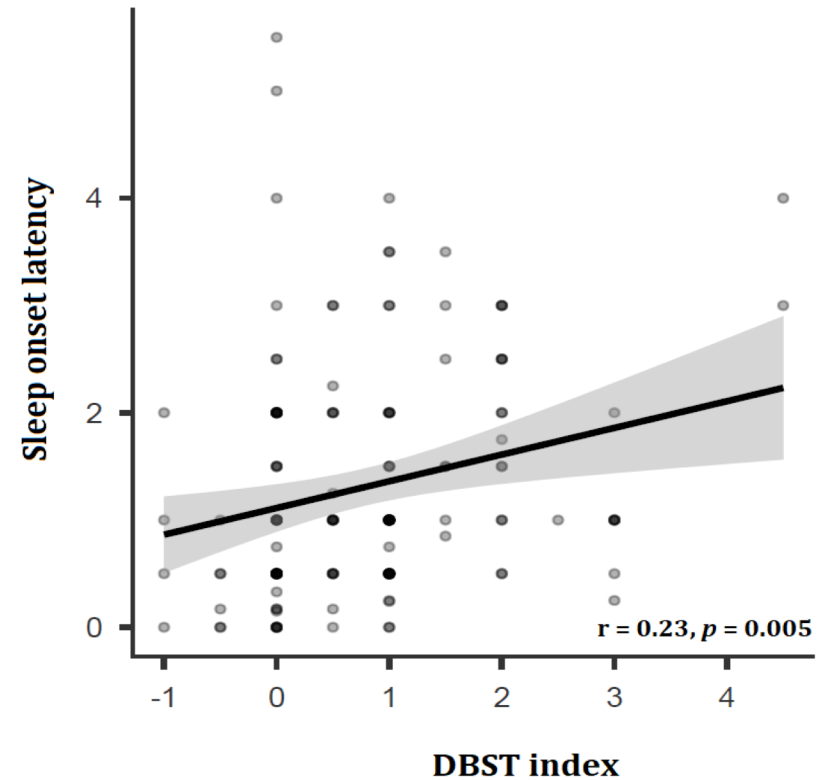
(A) Correlation between the Insomnia Severity Index and DBST index

(B) Correlation between sleep onset latency duration and the DBST index

A)



B)

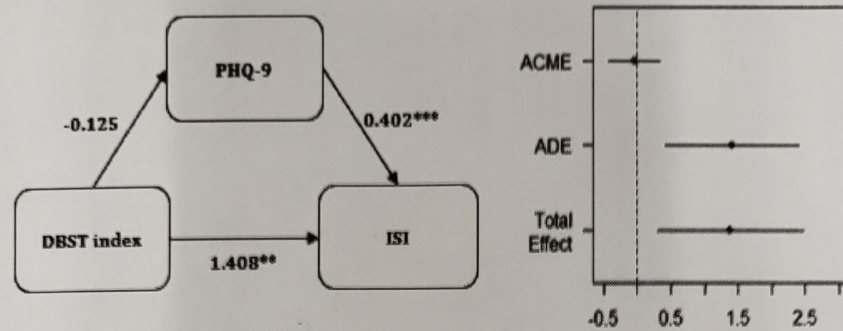


DBST in
Insomnia patients
At the clinic

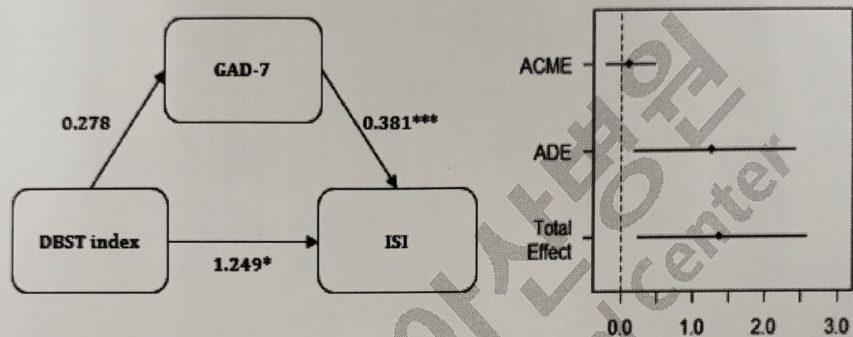


Results

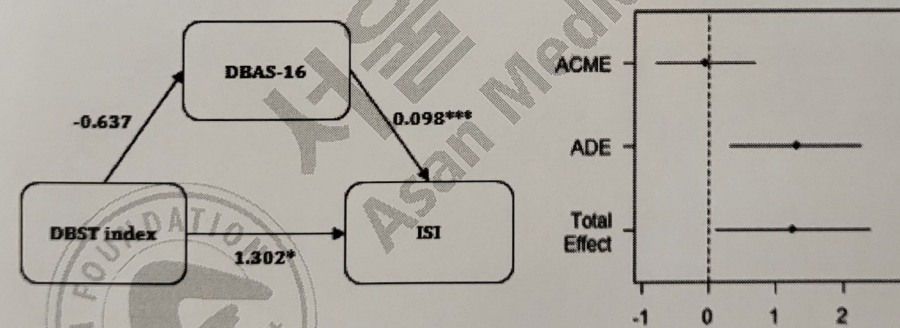
A) Mediator: depression



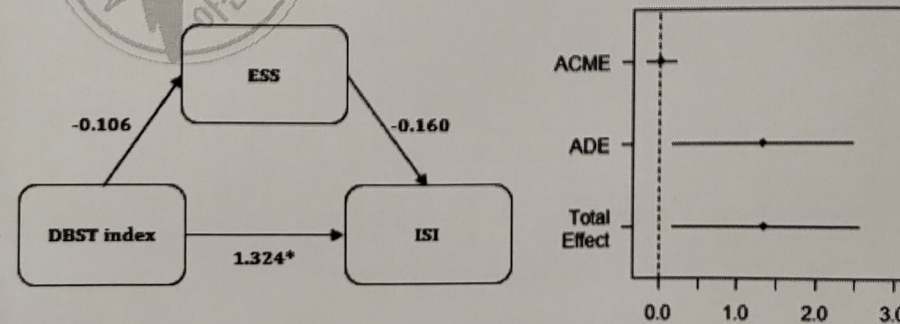
B) Mediator: anxiety



C) Mediator: dysfunctional beliefs about sleep



D) Mediator: daytime sleepiness



Discussion

- High DBST index, late sleep onset time, short WTB → long SOL
- DBST could be used for assessing cancer patients' insomnia
- Short sleep latency ----- long WTB
- WTB index : explore sleep-wake patterns
- Long SOL \propto short WTB, early bedtime, long TIB/d
 - Low homeostatic drive (long TIB/d , short WTB) / Early circadian timing (early bedtime)
 - Not good for shorten SOL



Thank you