JAPAN HIGH PERFORMANCE SPORT CENTER

Heat and Time-Zone Adaptation Strategies: The JISS Approach Toward LA2028

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Risa Iwata

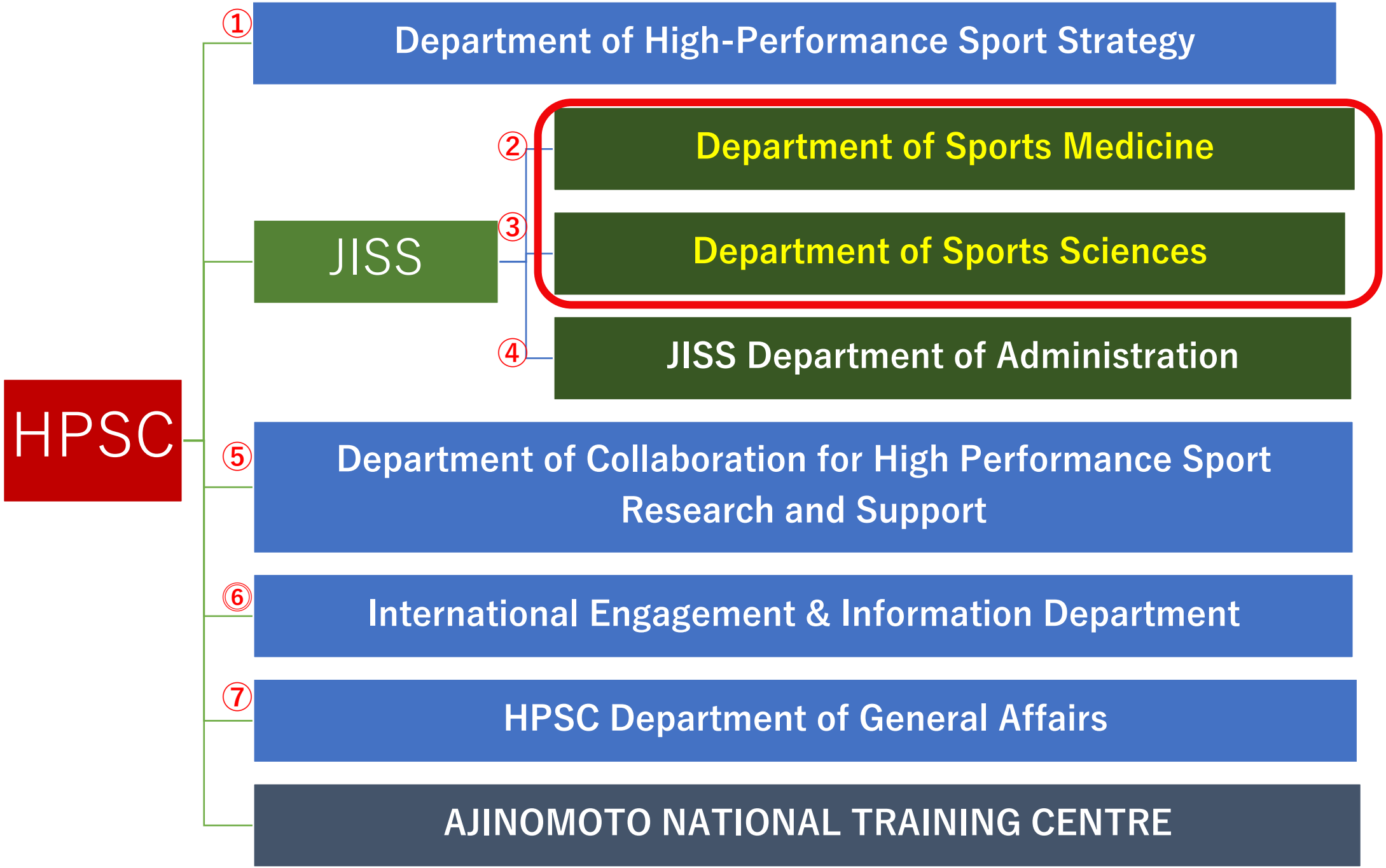
Japan High Performance Sport Center

JAPAN SPORT COUNCIL

Contents

ハイパフォーマンス スポーツの拠点として。

As a hub for high performance excellence


HPSC
JISS
① Department of High-Performance Sport Strategy
② Department of Sports Medicine
③ Department of Sports Sciences
④ JISS Department of Administration
⑤ Department of Collaboration for High Performance Sport Research and Support
⑥ International Engagement & Information Department
⑦ HPSC Department of General Affairs
AJINOMOTO NATIONAL TRAINING CENTRE

Researcher's Affiliation and Areas of Expertise

Department of Sports Medicine

Clinic (Orthopaedic Surgery, Internal Medicine, Dentistry, etc)

Athletic Rehabilitation

Strength & Conditioning

Nutrition

Psychology

Department of Sports Sciences

Fitness Assessment

Training Research

Sports Engineering

Conditioning Research

Sports Biomechanics

Social Sciences

Total conditioning: The key to our works

Total Conditioning for Athletes
Source: Total Conditioning Guidelines for Athletes, p.69, Figure 2, 2023

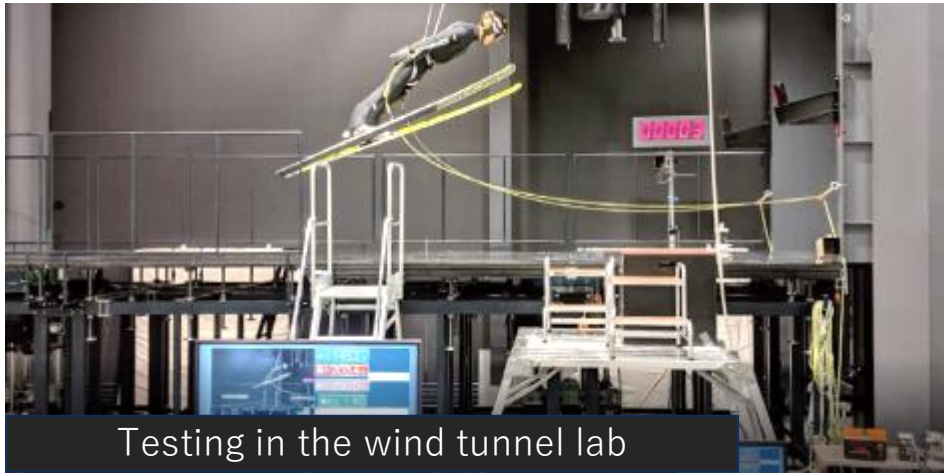
S&C
PT
PT

Meetings

S&C
Nutritionist
Psychologist
Doctor


Sports Medicine / Science Support Programs
Sports Medicine / Science Research Programs
Sports Clinic Programs

Sports Medicine / Science Research Programs



Testing in the wind tunnel lab

Purpose

Creating new knowledge that will contribute to enhancing international competitiveness.

Motion Analysis

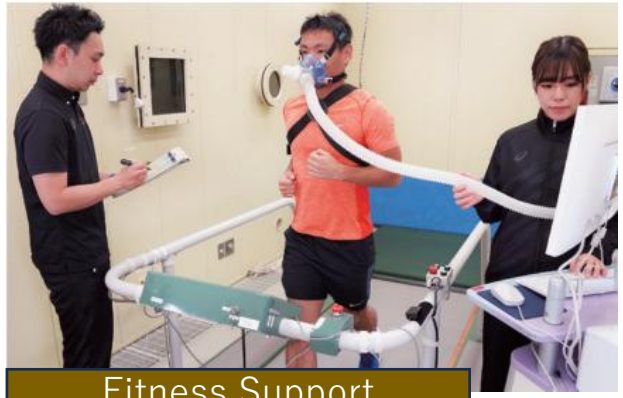
Analysis using AI

Biochemical Analysis

Sports Medicine / Science Support Programs

Purpose

Providing solutions for performance enhancement



Fitness Support

Psychological Support

Motion Analysis

Physical Training

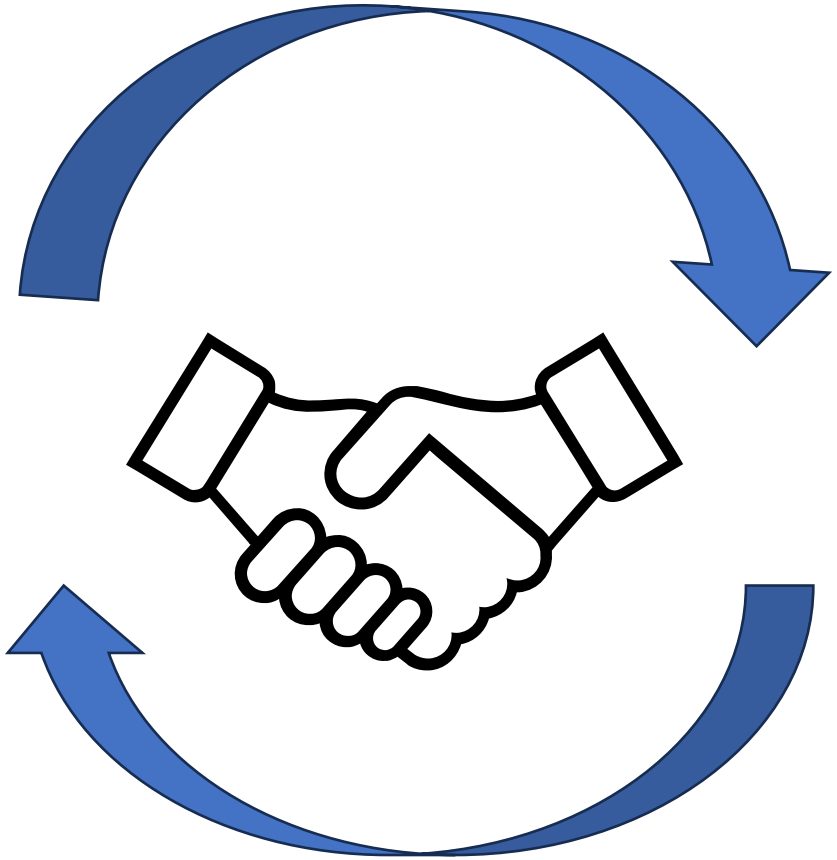
Nutritional Support

Race / Game Analysis

Video / Informaation Technology Support

Apply research findings

Research programs



Support programs

Address issues identfied during support process through our Research programs.

Sports Medicine / Science Research Programs

Six pillars of research

0) Research directly related to comprehensive support

1) Development of support procedures based on structure mo

2) Implementation of digital technology and sports equipmen enhancement

Heat and Time-Zone Adaptation Strategies

3) Implementation of specific environmental measures according to the competition venues

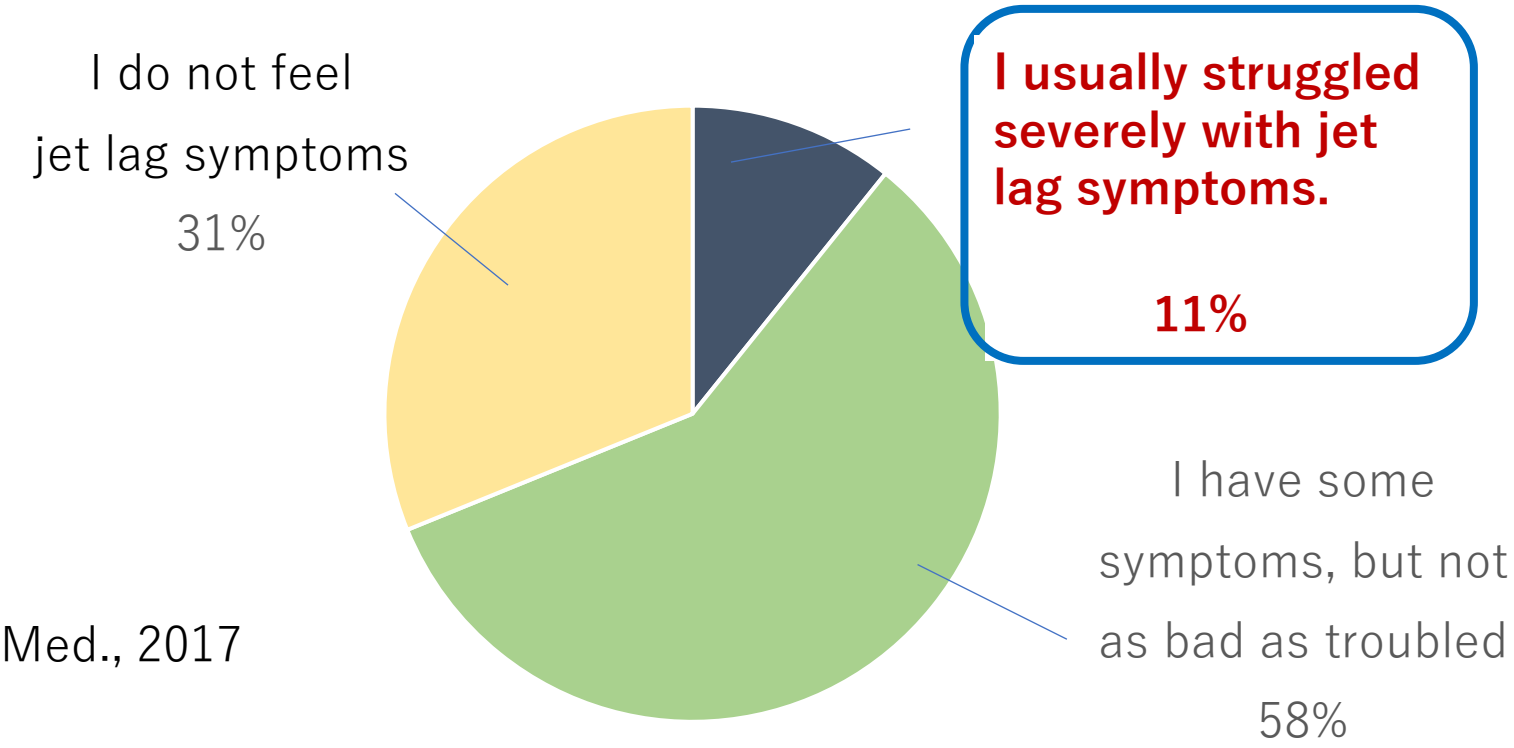
4) Enhancement of epidemiological approaches to sports medicine

5) Promotion of sports science, medicine, and information support in light of changing social contexts

Time-Zone Adaptation Strategies: The JISS Approach Toward LA2028

What percentage of athletes are severely struggling with jet lag symptoms?

- A Questionnaire study (Elite Japanese Athletes, n= 687)



Hoshikawa et al.,
Jpn J Clin Sports Med., 2017

Physical condition of athletes after international flights

Jet Lag + Fatigue

- Mismatch between circadian rhythm and the social 24-h rhythm at the destination area
- Fatigue during travel and after arriving at destination area

Sports Medicine (2021) 51:2029–2050
https://doi.org/10.1007/s40279-021-01502-0

CONSENSUS STATEMENT

Managing Travel Fatigue and Jet Lag in Athletes: A Review and Consensus Statement

Dina C. Janse van Rensburg[1,2] · Audrey Jansen van Rensburg[1] · Peter M. Fowler[3] · Amy M. Bender[4] · David Stevens[5,6] · Kieran O. Sullivan[7,8] · Hugh H. K. Fullagar[9] · Juan-Manuel Alonso[10] · Michelle Biggins[7] · Amanda Claassen-Smithers[11] · Rob Collins[12,13] · Michiko Dohi[14] · Matthew W. Driller[15] · Ian C. Dunican[16] · Luke Gupta[17] · Shona L. Halson[18] · Michele Lastella[19] · Kathleen H. Miles[20] · Mathieu Nedelec[21] · Tony Page[22] · Greg Roach[19] · Charli Sargent[19] · Meeta Singh[23] · Grace E. Vincent[19] · Jacopo A. Vitale[24] · Tanita Botha[25]

Athletes and coaches often need some arrangements･･･

Research

Support (Intervention, monitoring, and advice)

Workshop

Consultation (making a recommended schedule, lending devices, etc.)

-3 year

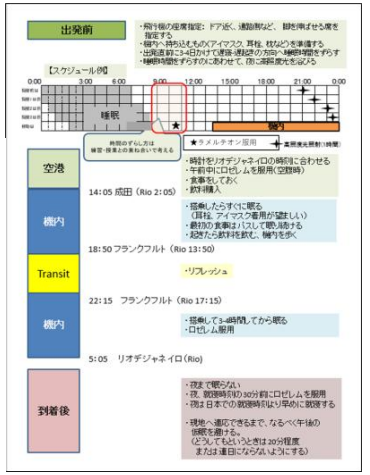
-2 year

-1 year

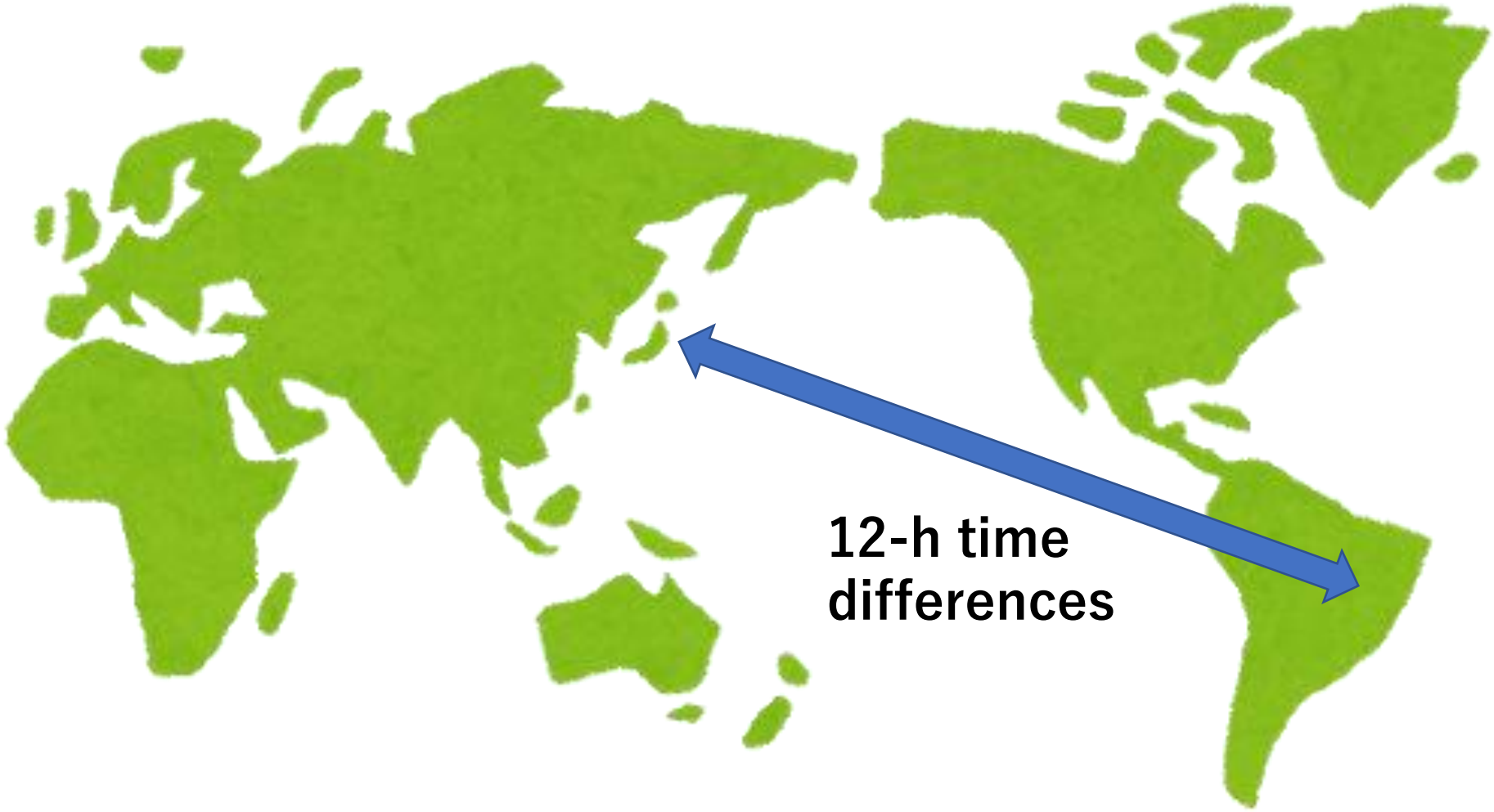
Trials

The Game

Experiment /
Field study



Rio 2016



-3 year

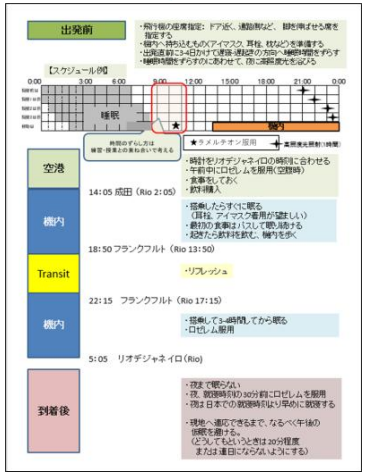
-2 year

-1 year

Trials

The Game

Experiment / Field study



Research Note

the Journal of Strength and Conditioning Research™

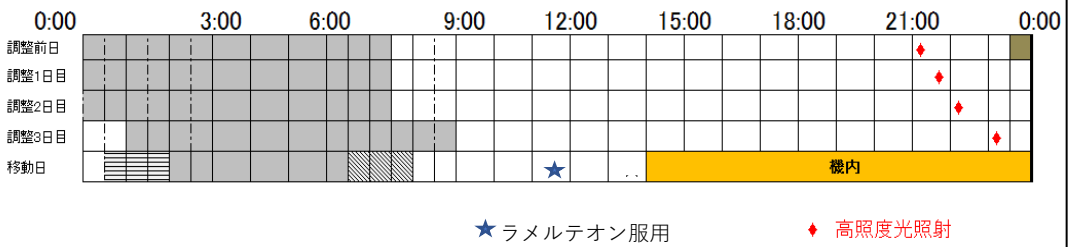
Intervention for Reducing Sleep Disturbances After a 12-Time Zone Transition

Masako Hoshikawa,[1] Sunao Uchida,[2] and Michiko Dohi[3]

Hoshikawa et al., J Strength Cond Res, 2020

At home (for 4 days before the departure)

時差調整方法



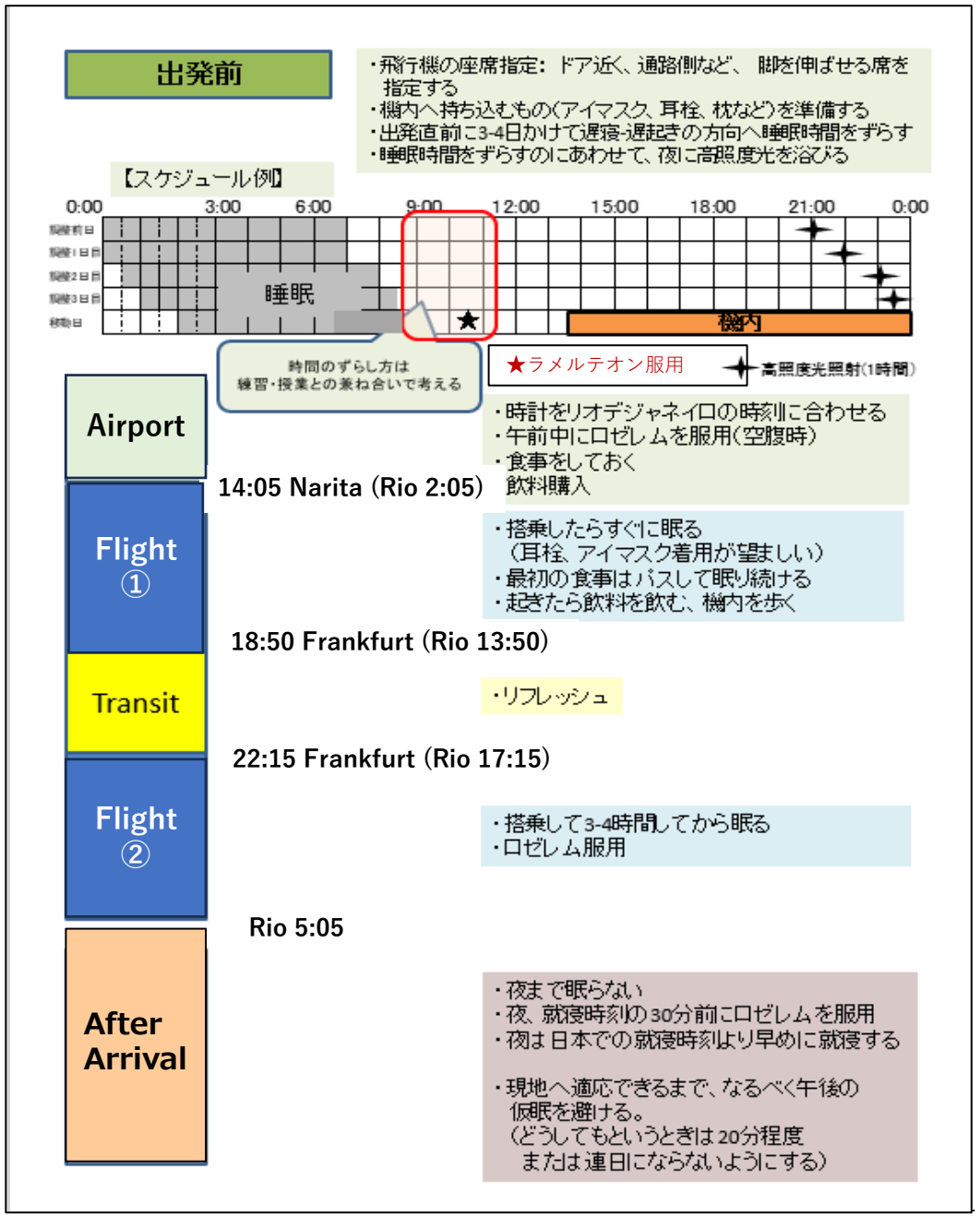
5月11日(初日)　21時から光　1時間　→　23時30分就寝　→　8時30分頃起床
5月12日(2日目)　21時30分から光　1時間　→　24時00分就寝　→　8時30分頃起床
5月13日(3日目)　22時から光　1時間　→　24時00～24時30分就寝　→　8時30分頃起床
5月14日(4日目)　23時から光1時間　→　2時に就寝　→可能な範囲で朝寝坊

※夜更かしする分には、上記の時間でなくても構いません。
※起床時刻は、練習に間に合う時間で大丈夫です。

※These were written considering each athlete's training, flight schedules and preferences.

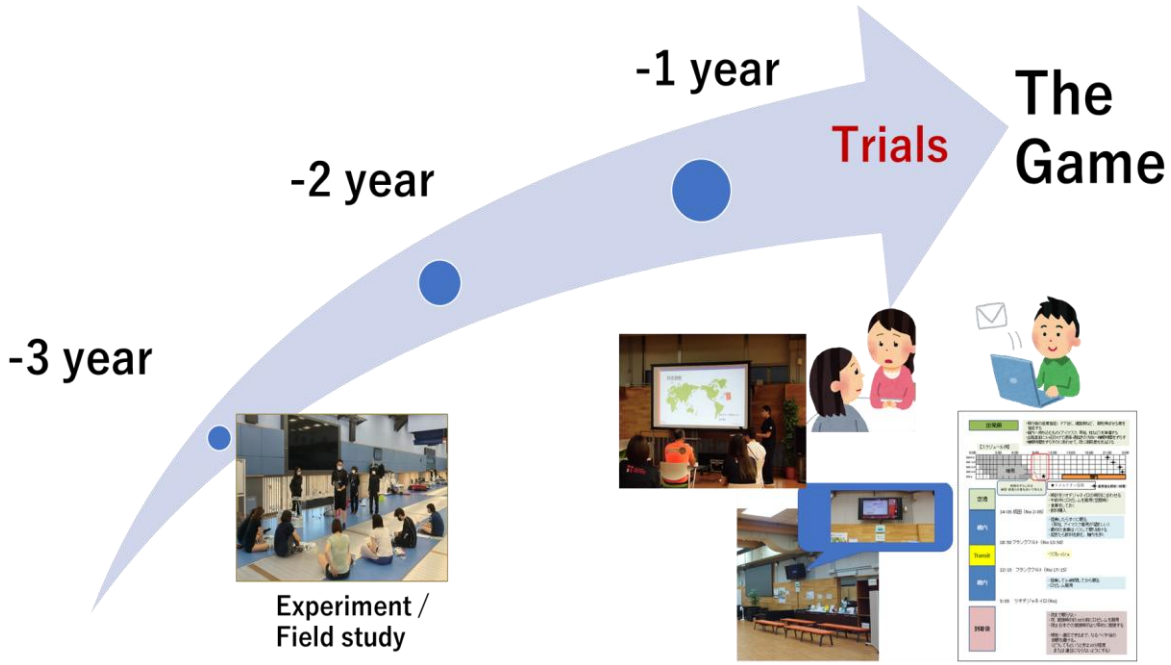
During trip

After arrival



PARIS 2024

7-h time differences



At home

During trip

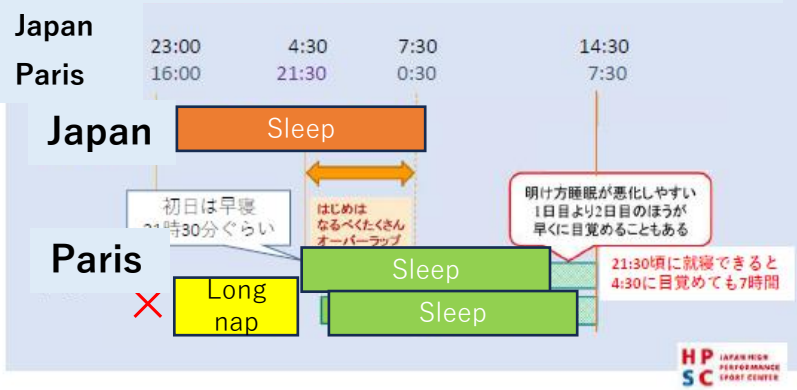
After arriving

- From Japan to Paris -

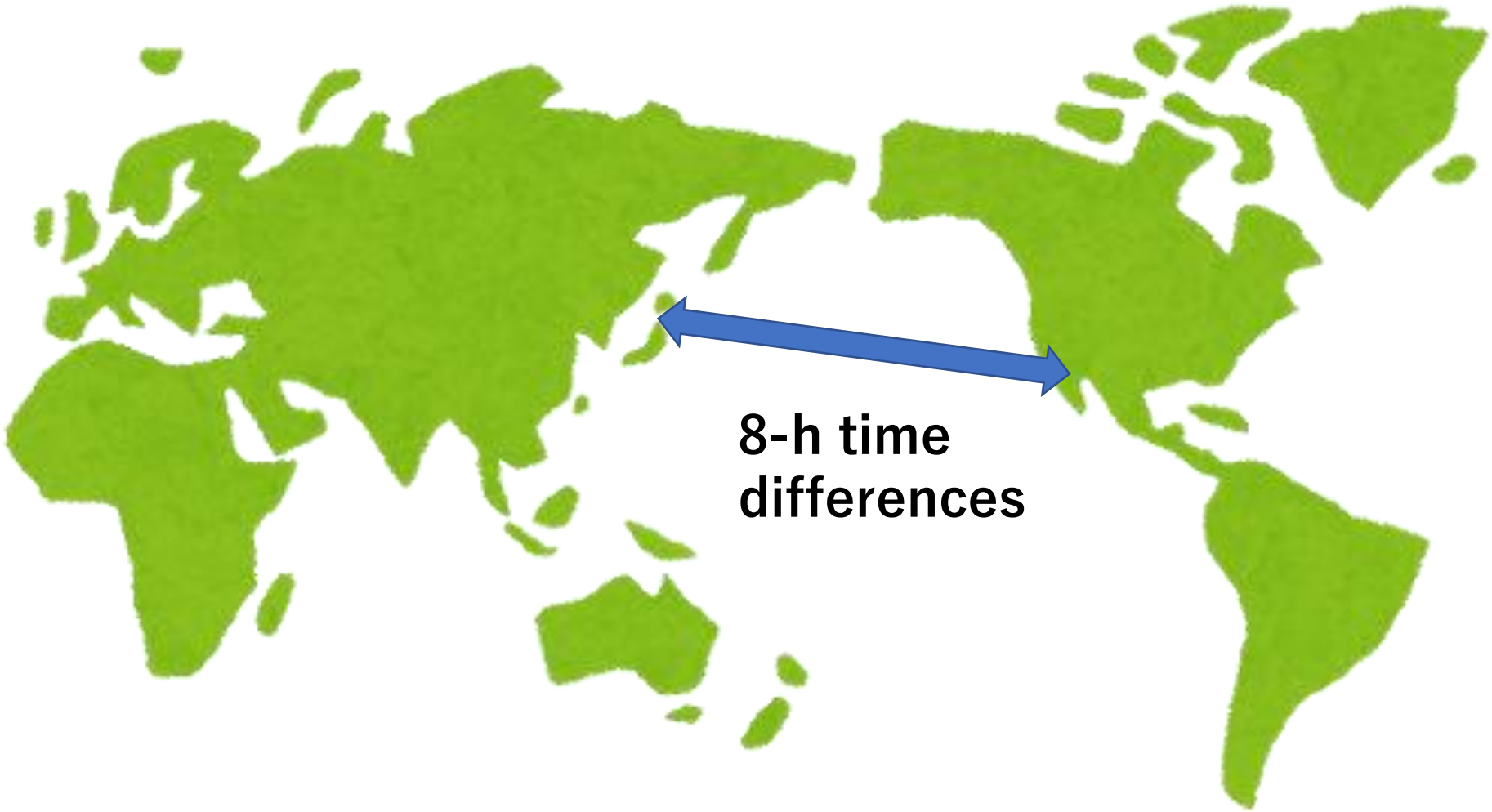
- ✓ Sleep longer than usual
- ✓ Wake up as late as you can
- ✓ Stay out of the sun until after 9:00 AM (e.g., don't go outside, wear sunglasses)

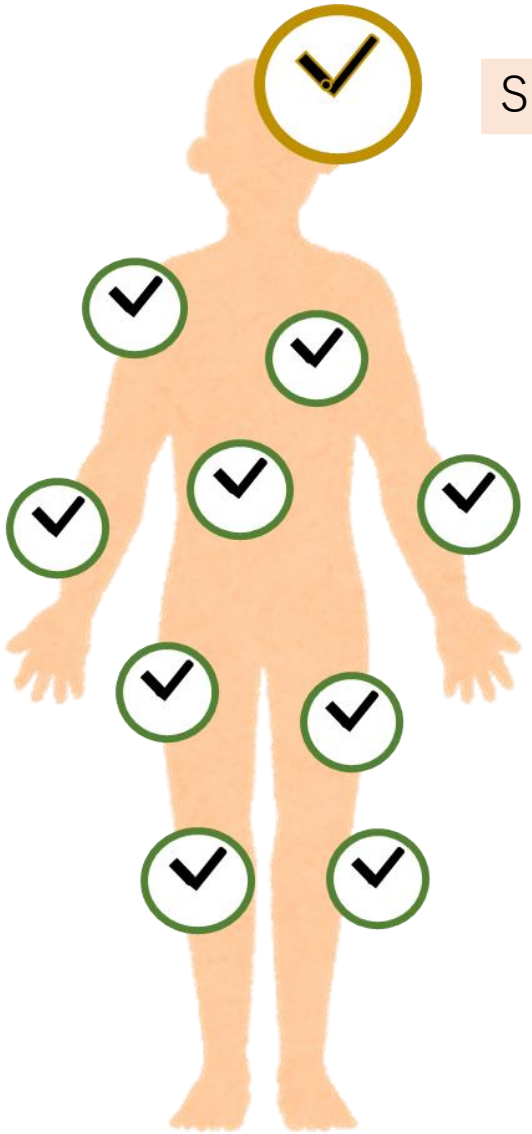
- ✓ Set your watch to time at the destination
- ✓ You can sleep easier during nighttime at home
- ✓ Recline your seat when you sleep
- ✓ Use items that help you sleep better

- ✓ Go to sleep by 9:30 PM on the day of arrival.
- ✓ Go to bed early for 2-3 days.
- ✓ Naps should be within 30 minutes and taken before 3:00 PM for the first three days.



LA2028





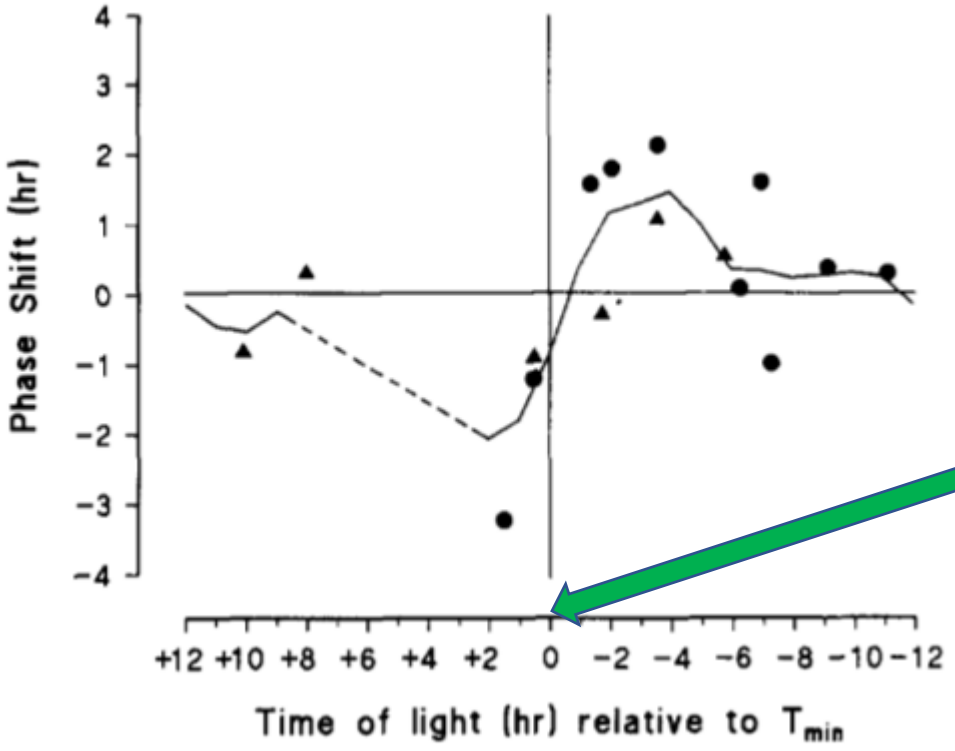
Suprachiasmatic nucleus

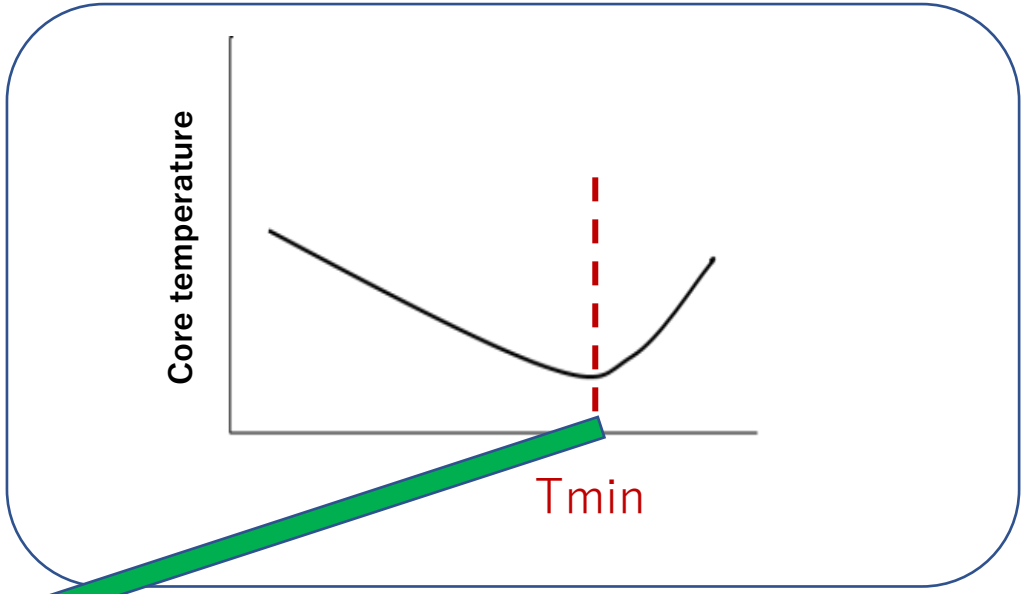
Master Clock

Light

Melatonin

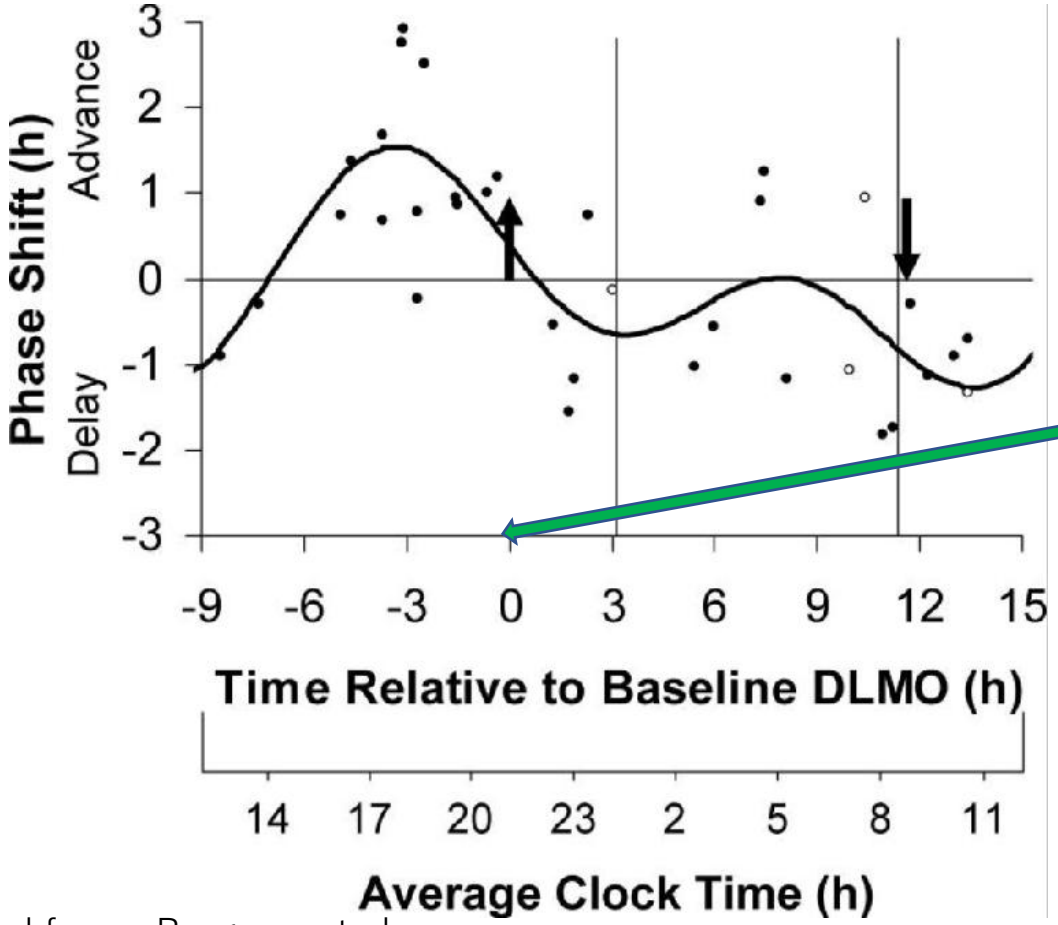
Phase Response Curve to light

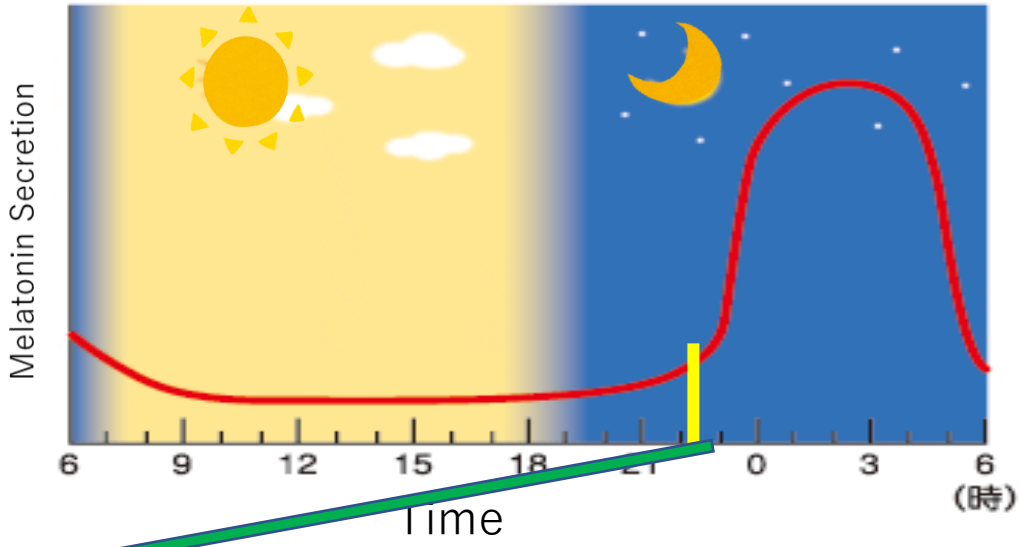




Modified from: Minors DS, et al.,
Neuroscience Letters, 133: 36-40, 1991

Phase Response Curve to melatonin

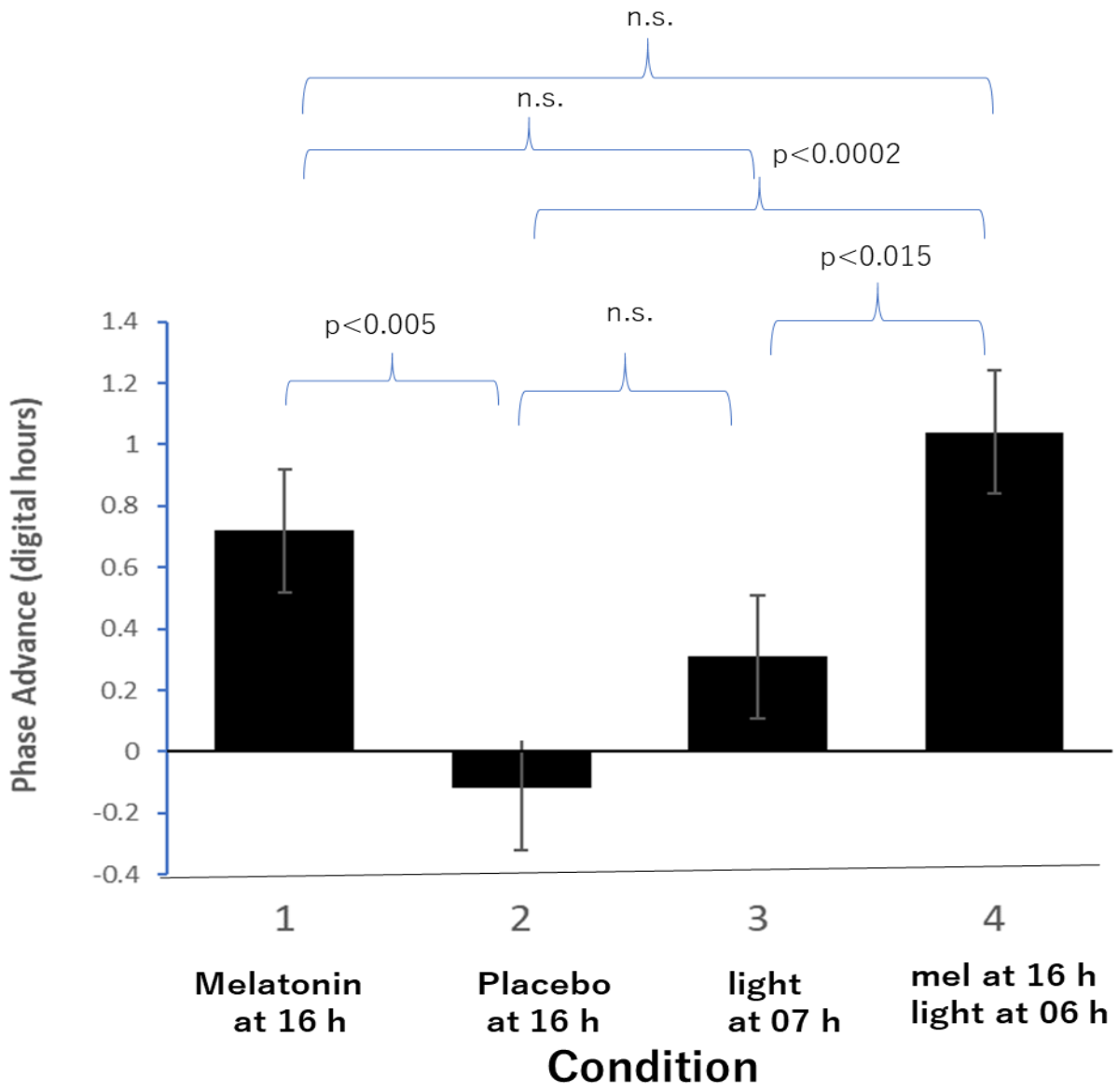




the dim light melatonin onset (DLMO)

Modified from : Burgess, et al.,
J Clin Endocrinol Metab. 95(7): 3325–3331, 2010.

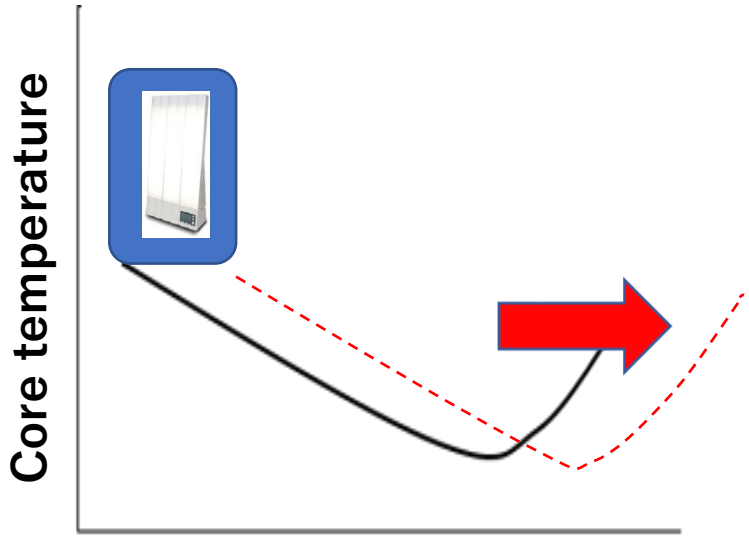
Phase Advance by condition



Paul et al. Psychopharmacology, 214(2):515-523, 2011

Pre-flight circadian phase-shift approach

Before westward flight

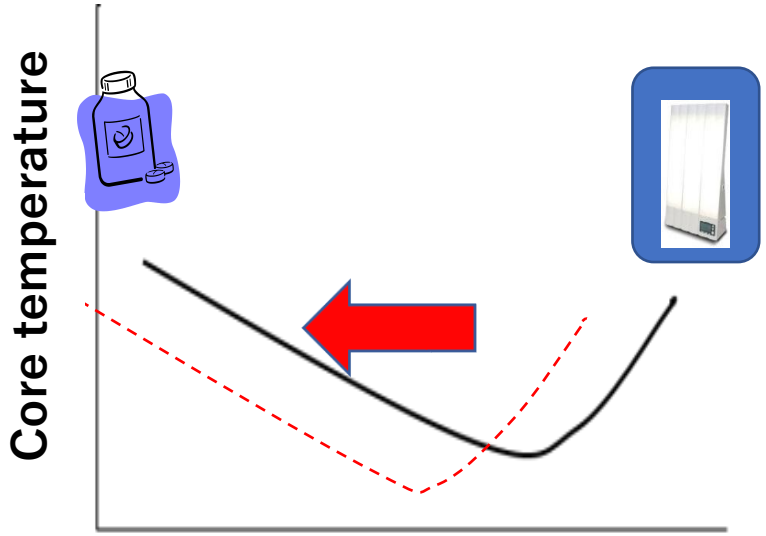


From the departure day

Sleep onset → Waking-up

Sleep onset → Waking-up

Before eastward flight



Sleep onset → Waking-up

Sleep onset → Waking-up

Sleep Science

Sleep Sci. 2013;6(1):16-21

ORIGINAL ARTICLE

Changes of the human core body temperature rhythm and sleep structure by 6-hour phase advance treatment under a natural light-dark cycle

Alterações do ritmo da temperatura central do corpo e da estrutura do sono por seis horas de tratamento de avanço de fase sob um ciclo claro-escuro natural

Takuto Kojima[1], Junya Sumitomo[1], Ami Nishida[1], Sunao Uchida[1]

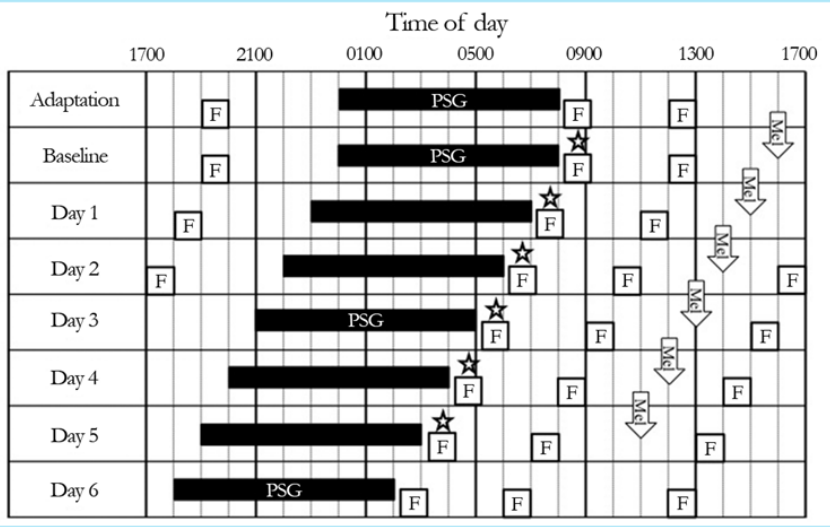


Figure 1. Experimental design: Filled black bars symbolize designated sleep periods. Symbol F, and ☆ indicates food, and bright light exposure. The core body temperature was recorded throughout adaptation to day 6. PSG was recorded on adaptation, baseline, day 3, and day 6 sleep periods.

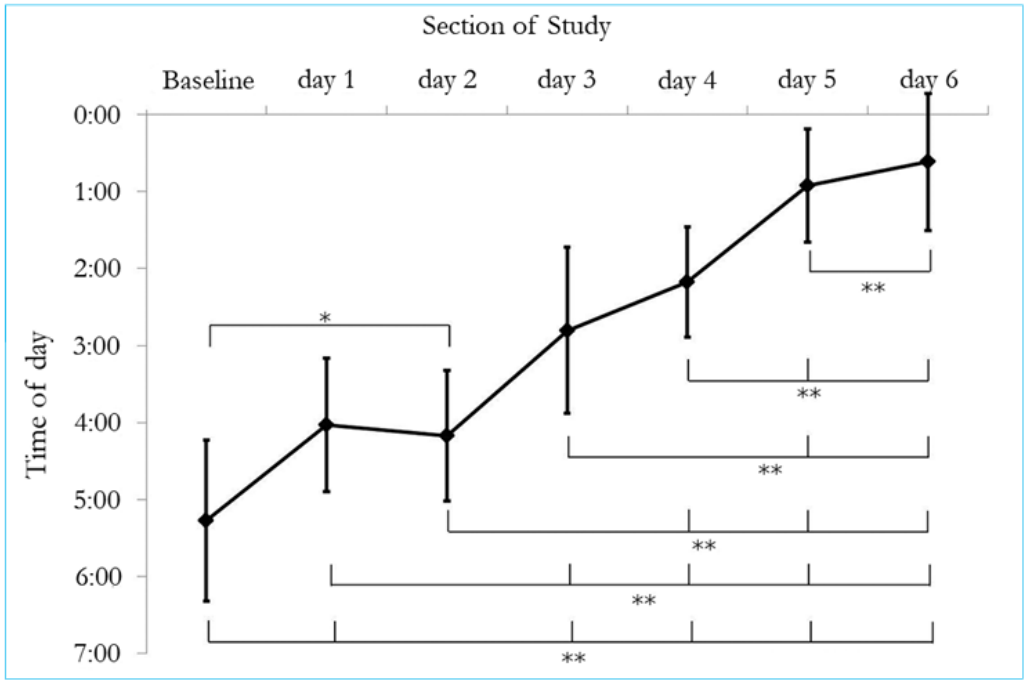
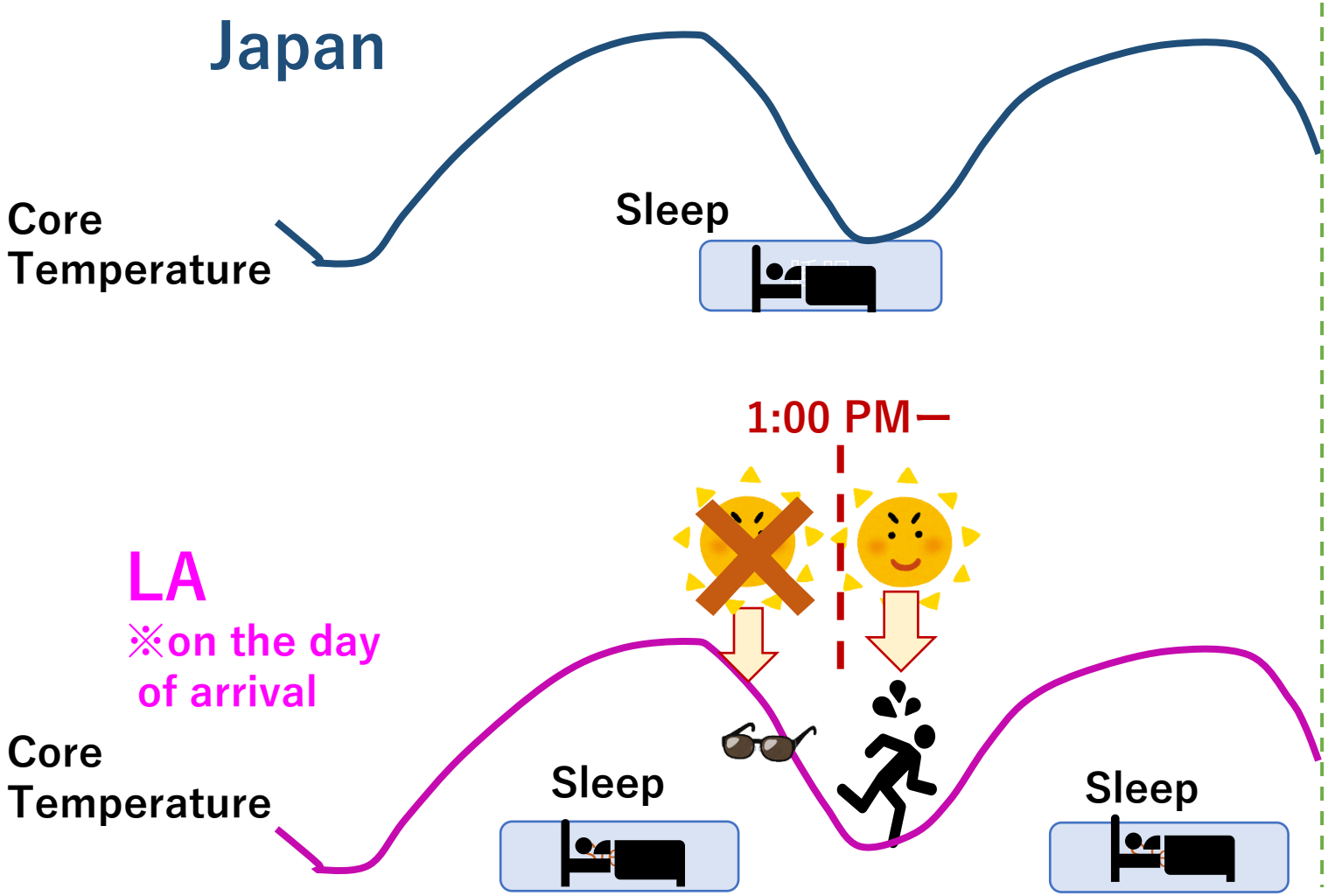


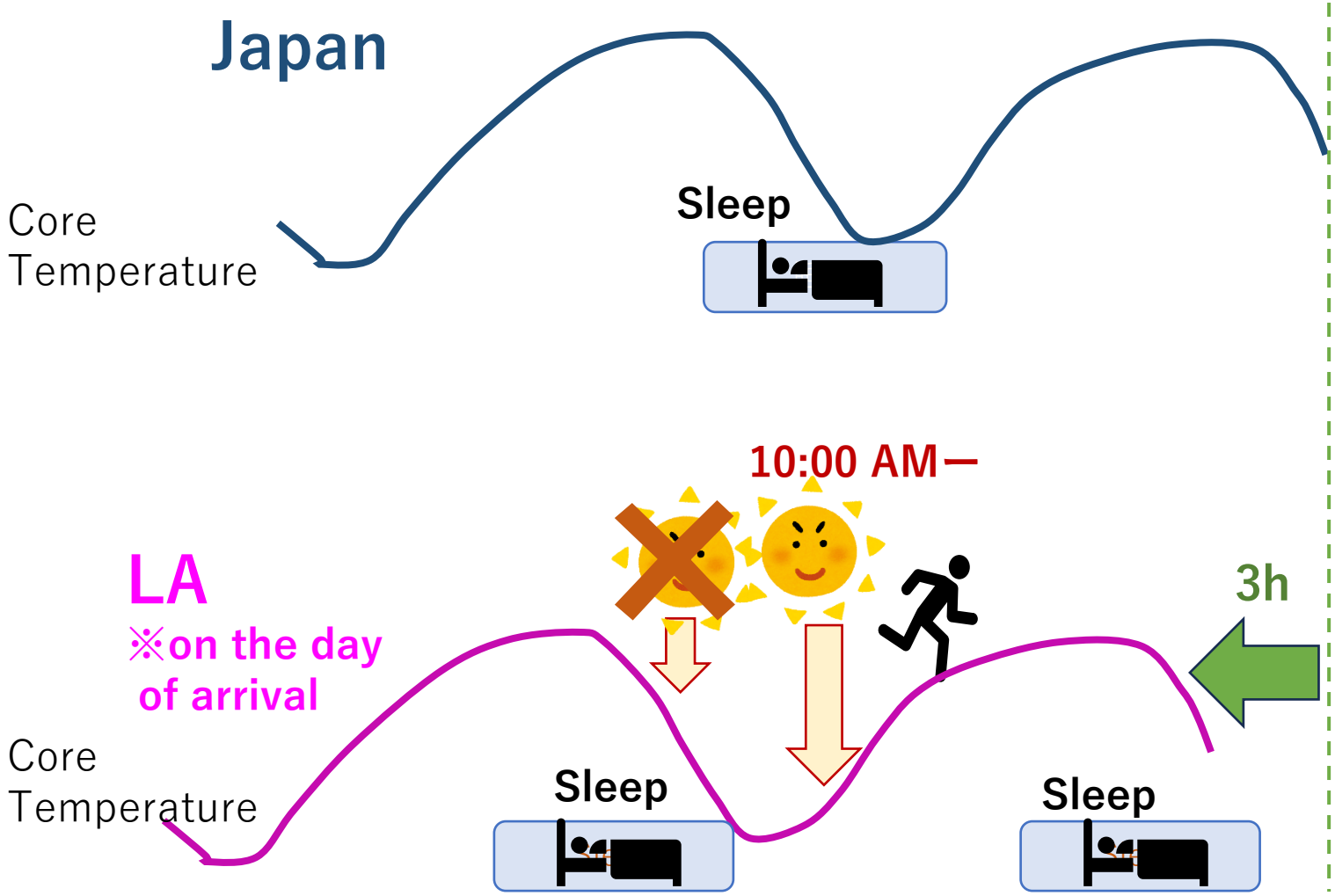
Figure 2. Core body temperature nadir phase advances on each experimental day. Statistically significant differences among days are indicated on the figure. * $p < 0.05$; ** $p < 0.01$.

4.5 h / 6 days

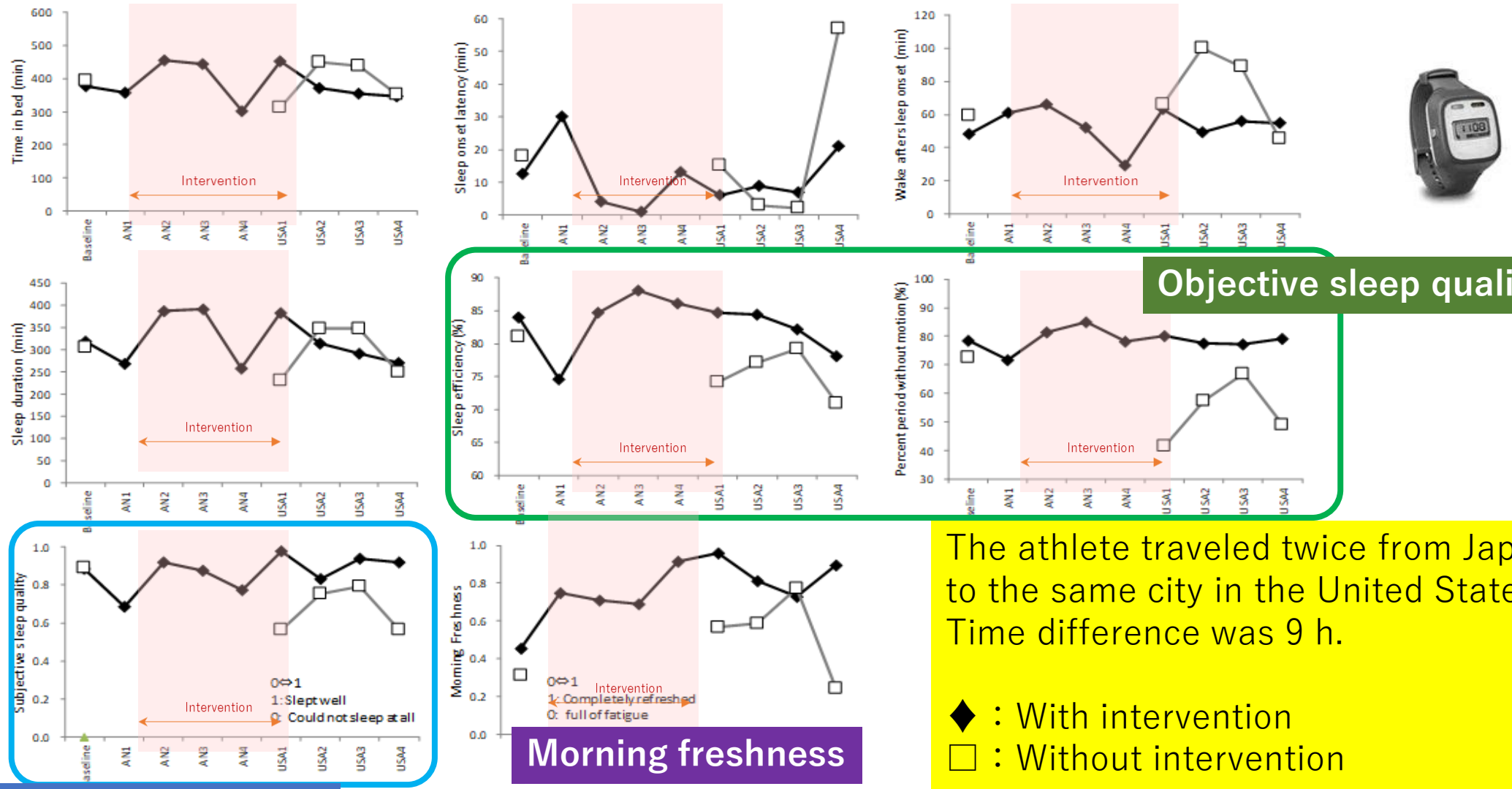
Without pre-flight circadian phase-shift



After 4days of pre-flight circadian phase-shift intervention (3h)



Effects of pre-flight circadian phase-shift intervention on sleep



The athlete traveled twice from Japan to the same city in the United States. Time difference was 9 h.

♦ : With intervention
□ : Without intervention

(Hosihkawa et al., Sleep Biol Rhythm, 2018)

https://brightlight-store.ovtp.net/price/post_15.html

In our domitory (Athlete village)

Original Research

The Journal of Strength and Conditioning Research™

Gradual Advance of Sleep-Wake Schedules Before an Eastward Flight and Phase Adjustment After Flight in Elite Cross-Country Mountain Bikers: Effects on Sleep and Performance

Lucas Garbellotto,[1,2] Elisabeth Petit,[1] Emmanuel Brunet,[2] Sandrine Guirronnet,[2] Yvan Clolus,[2] Valérie Gillet,[3] Hubert Bourdin,[4,5] and Fabienne Mougin[1]

J Strength Cond Res 37(4): 872–880, 2023

Participants: 6 elite cross-country mountain bikers

1,500 lux, **20 min**
Sleep schedule shift
melatonin

Circadian Shifts
2.5 h / 6 days

https://weatherly.jp/SHOP/43-001.html

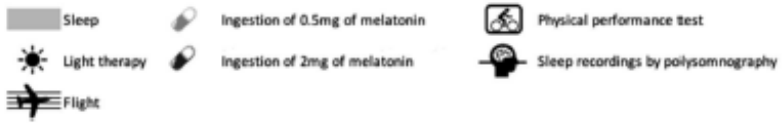
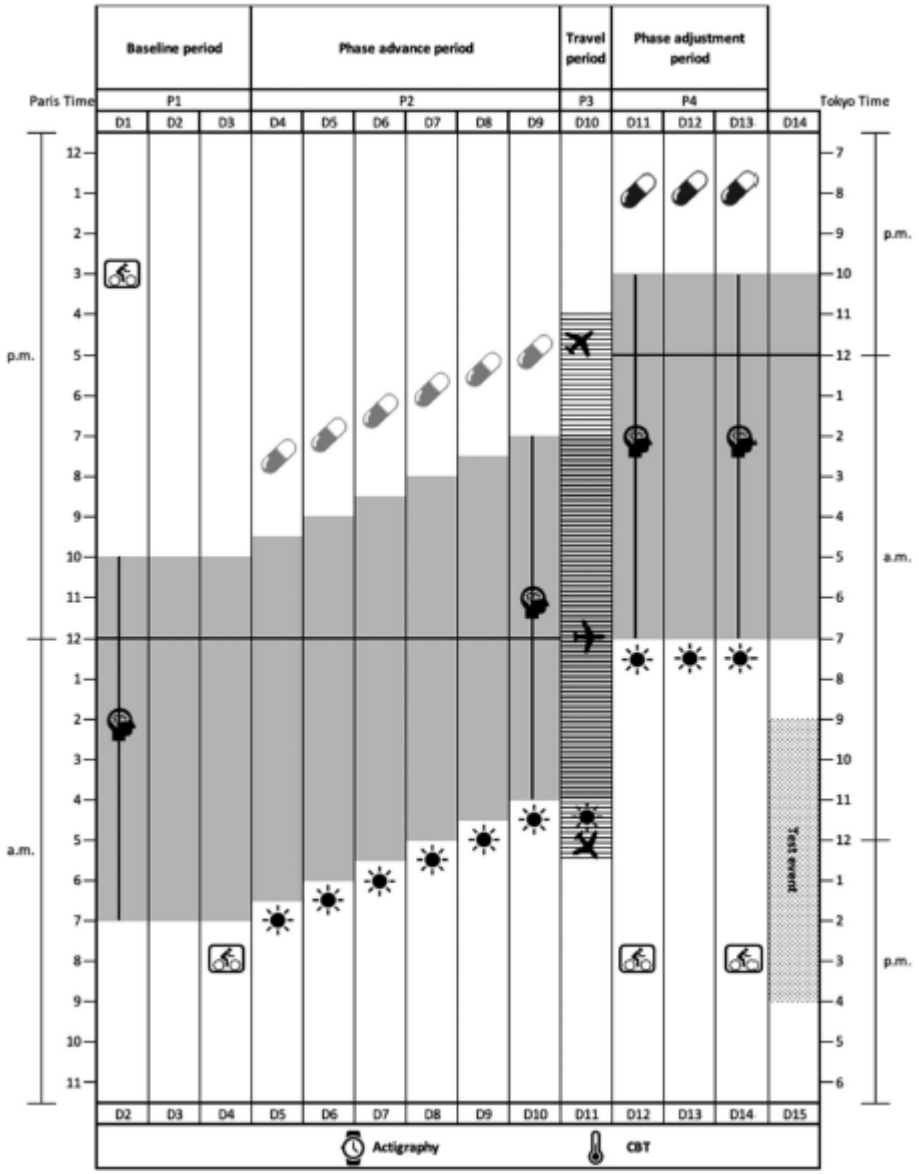


Figure 1. Raster plot of the experimental protocol for an athlete going to bed at 10:00 PM and getting up at 7:00 AM. For 3 baseline days (D1 to D3), sleep episodes were scheduled from 10:00 PM to 7:00 AM. Thereafter, the bedtime was gradually advanced resulting in a 3-hour advance (30 minutes each day) of the bedtime over 6 days (D4 to D9). Then, at destination, sleep-wake schedules were resynchronized to Japanese time (D11 to D14). Melatonin was given at a dose of 0.5 mg, 2 hours before bedtime, from D4 to D9, then the dose was increased to 2 mg from D11 to D13. Immediately after waking up, athletes were exposed to 20 minutes of light therapy at 1,500 lux from D5 to D14.

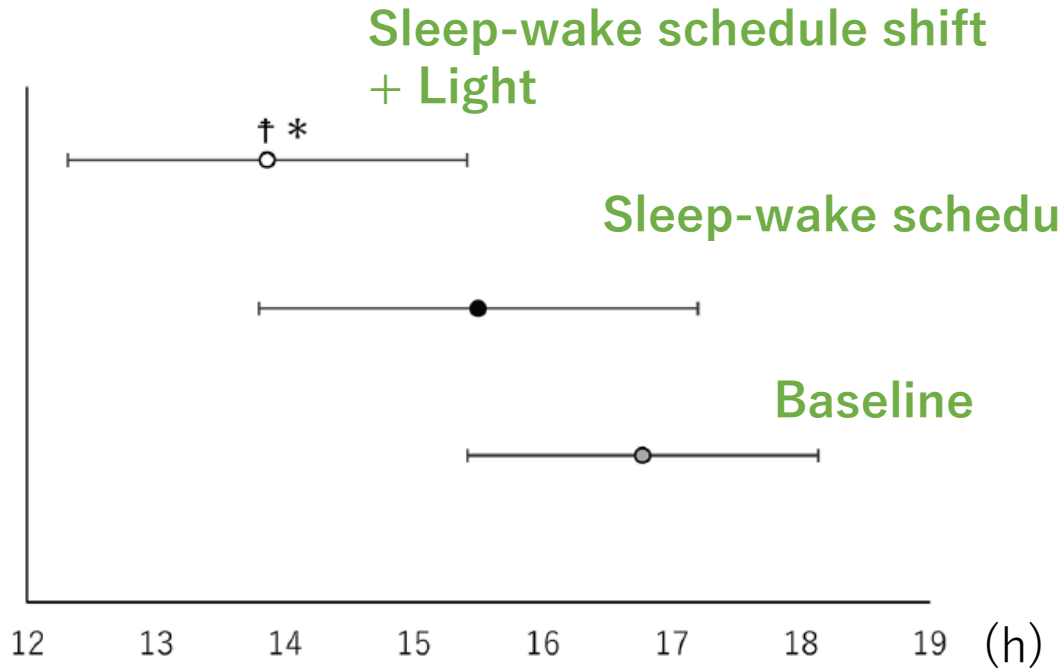


Testing Light Glasses (30 min)

Participants: healthy 8 persons

Light glasses
https://www.dencom.co.jp/product/lg/index.html

Core temperature
(CorTemp, HQ Inc.)



Time at peak core temperature

Sleep-wake schedule shift : 1 h / 6 days
Sleep-wake schedule shift + Light : 3 h / 6 days

(Ando, Journal of Training Science for Exercise and Sport, 2024)

-3 year

-2 year

-1 year

Trials

The Game

Experiment /
Field study