Individual Susceptibility to Fatigue: Impacts for the Transportation Industry

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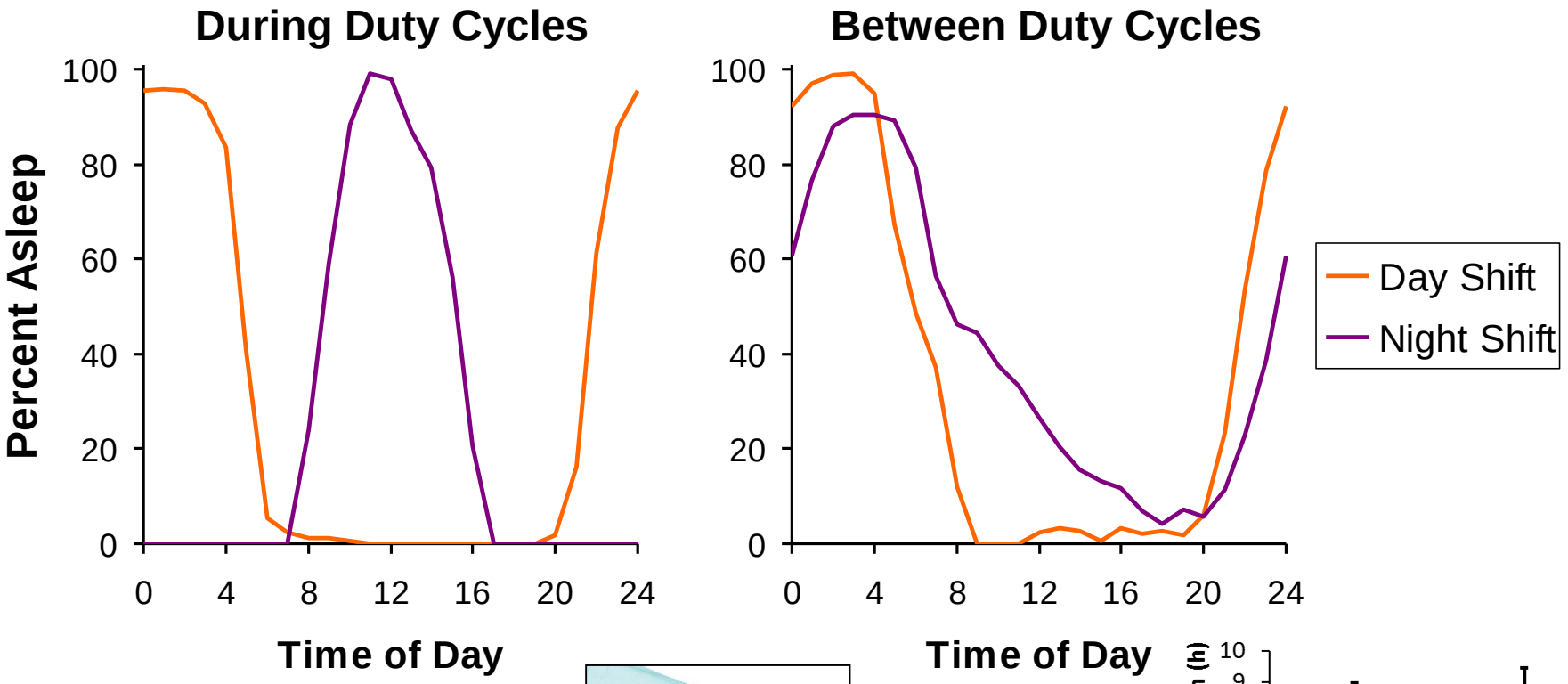
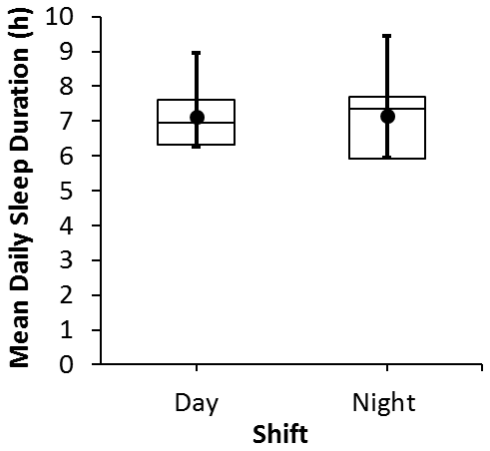
Naturalistic Patterns of Sleep in 24/7 Operations: Nurses Working 12-Hour Shifts



N=22 nurses
14 days measured

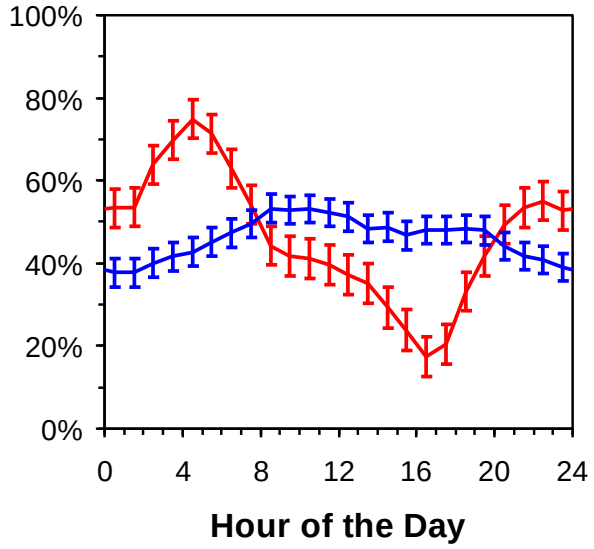


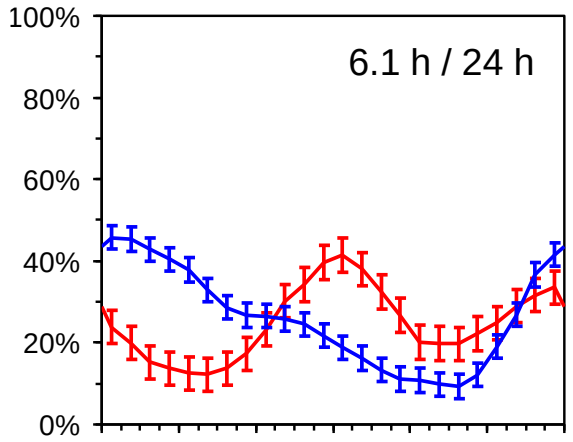
Wilson M, Permito R, English A, Albritton S, Coogle C,
Van Dongen HPA. Accident Analysis and Prevention, in press.

Naturalistic Patterns of Sleep in 24/7 Operations: Truck Drivers under U.S. Hours of Service Regulations

On Duty

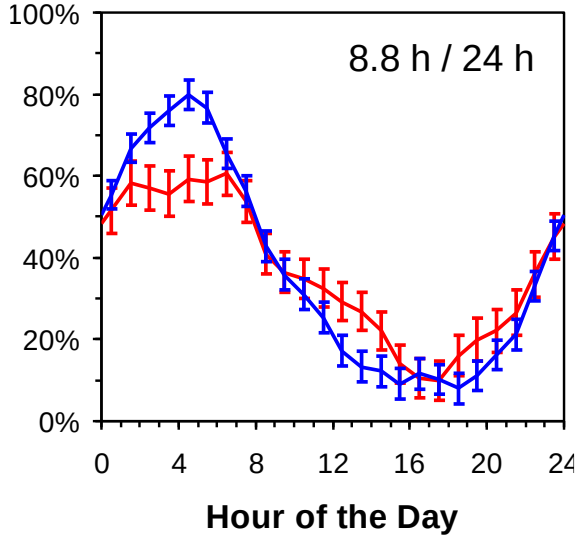
(% of total driver hours by hour of the day)





Sleep during Duty Cycles

(% of total driver hours by hour of the day)



Sleep during Restart Break

(% of total driver hours by hour of the day)

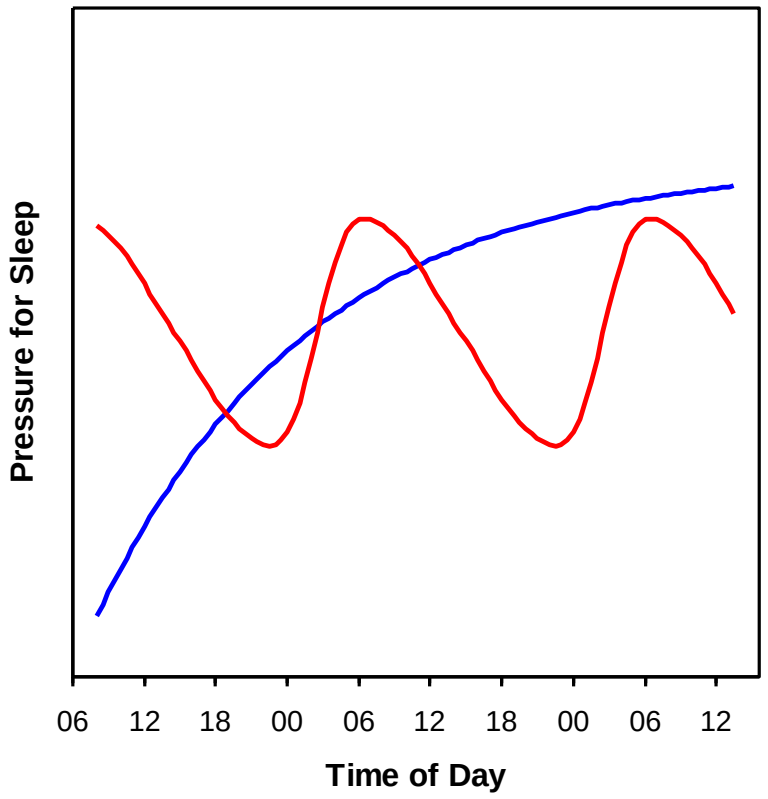
— 1 nighttime period (01:00−05:00) in prior restart break

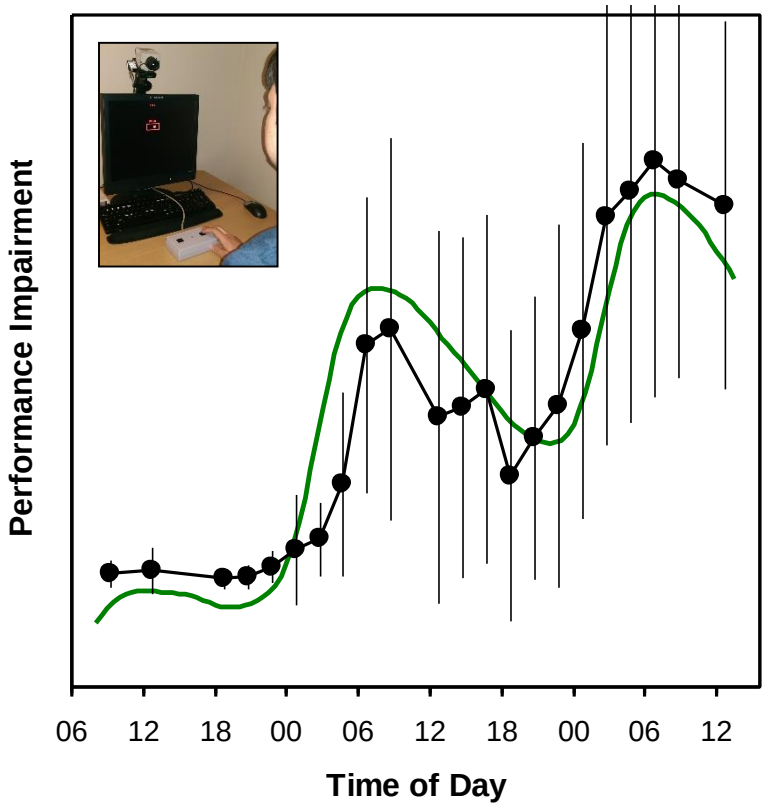
— more than 1 nighttime period (01:00−05:00) in prior restart break

Sparrow AR, Mollicone DJ, Kan K, Bartels R, Satterfield BC, Riedy SM, Unice A, Van Dongen HPA. Accident Analysis and Prevention, 2016; 93: 55-64.

N=106

Sleep/Wake History and Time of Day Determine Fatigue through Homeostatic and Circadian Biological Processes



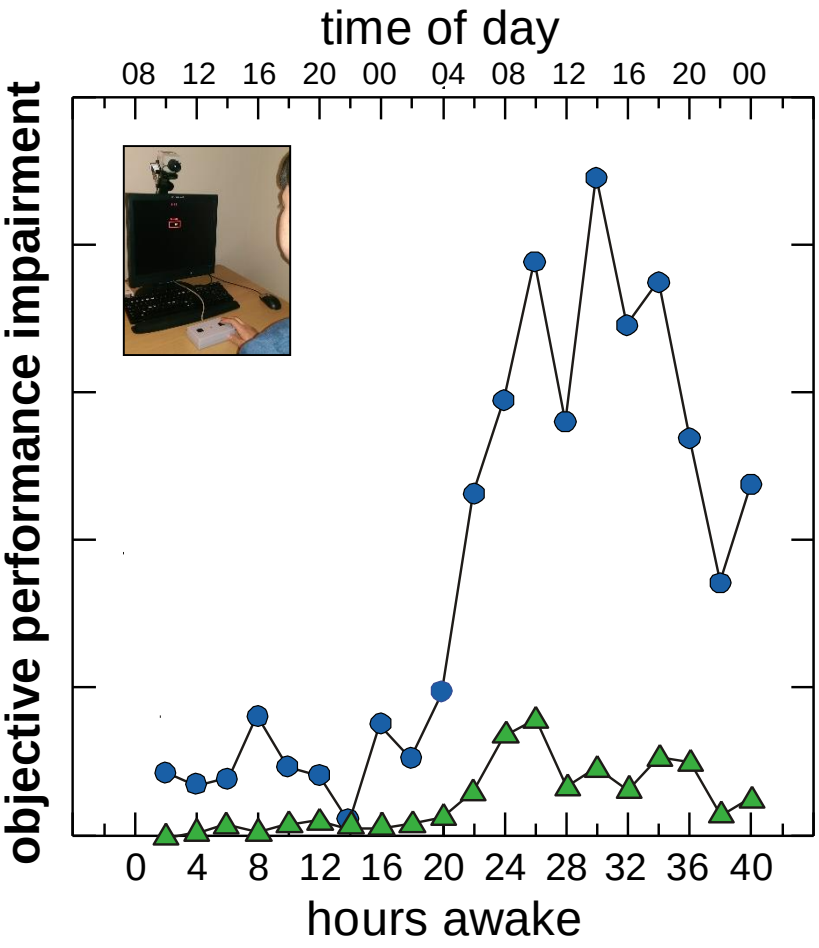


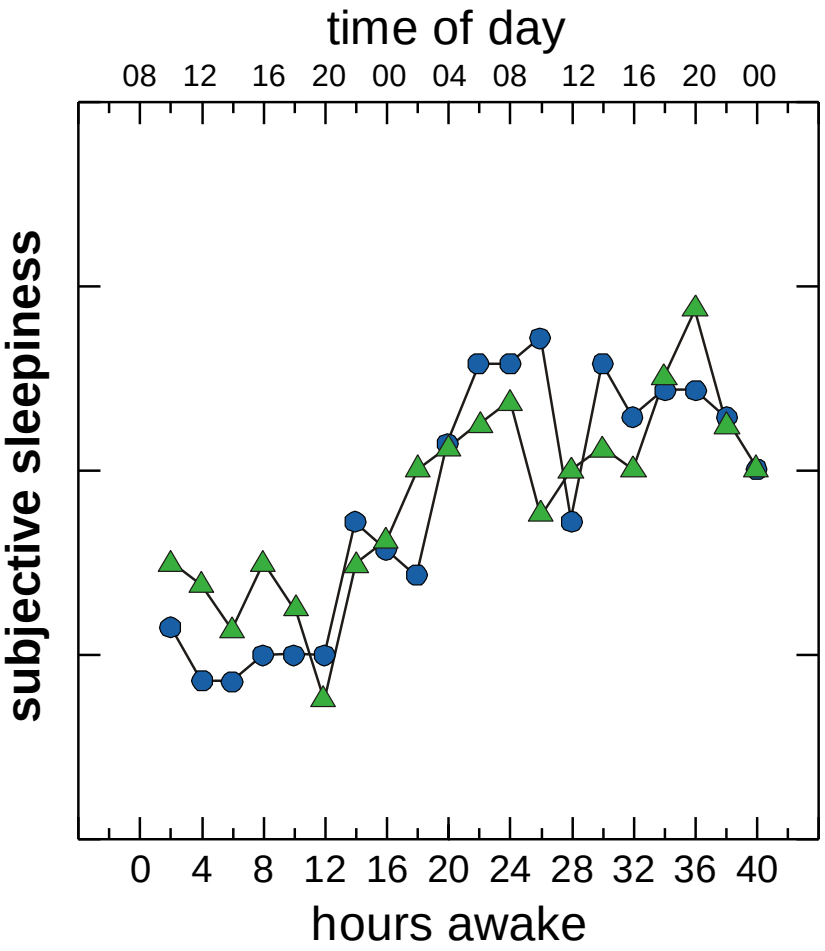
- Homeostatic process: more wakefulness causes greater pressure for sleep and thus greater fatigue; longer sleep provides greater recuperation
- Circadian process: there is greater pressure for sleep and thus greater fatigue at night than during the day

Achermann P, Borbély AA,
Biological Cybernetics, 1994; 71: 115-121.

Van Dongen HPA, Belenky G,
Industrial Health, 2009; 47: 518-526.

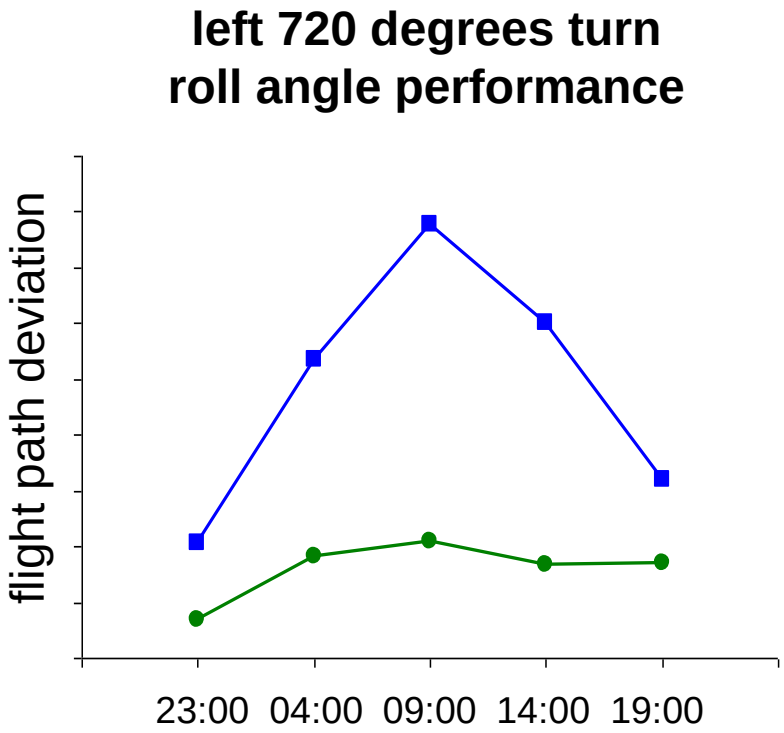
Individual Differences in Objective and Subjective Susceptibility to Fatigue from Sleep Loss

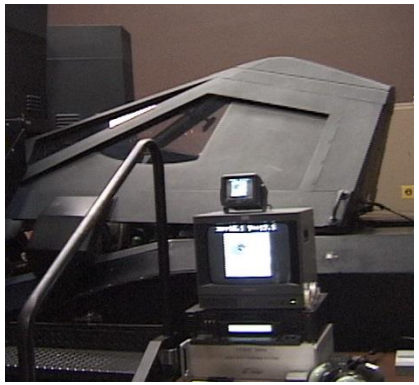




Van Dongen HPA, Maislin G, Dinges DF,
Aviat Space Environ Med, 2004; 75: A147-A154.

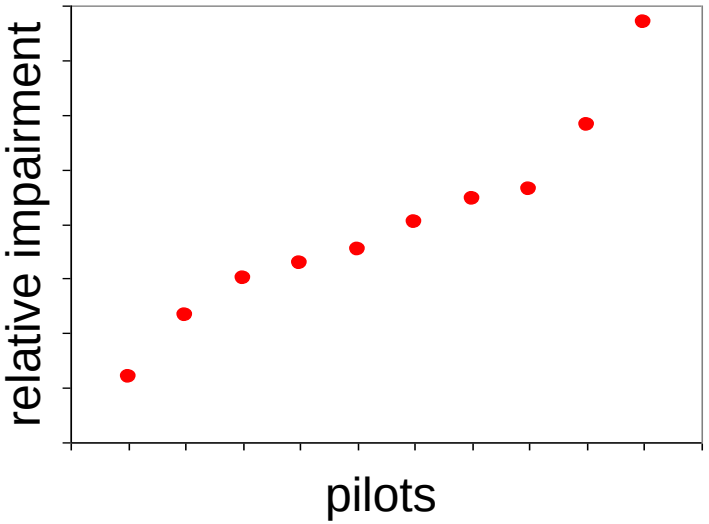
Individual Differences in Susceptibility to Fatigue in Highly Selected Populations





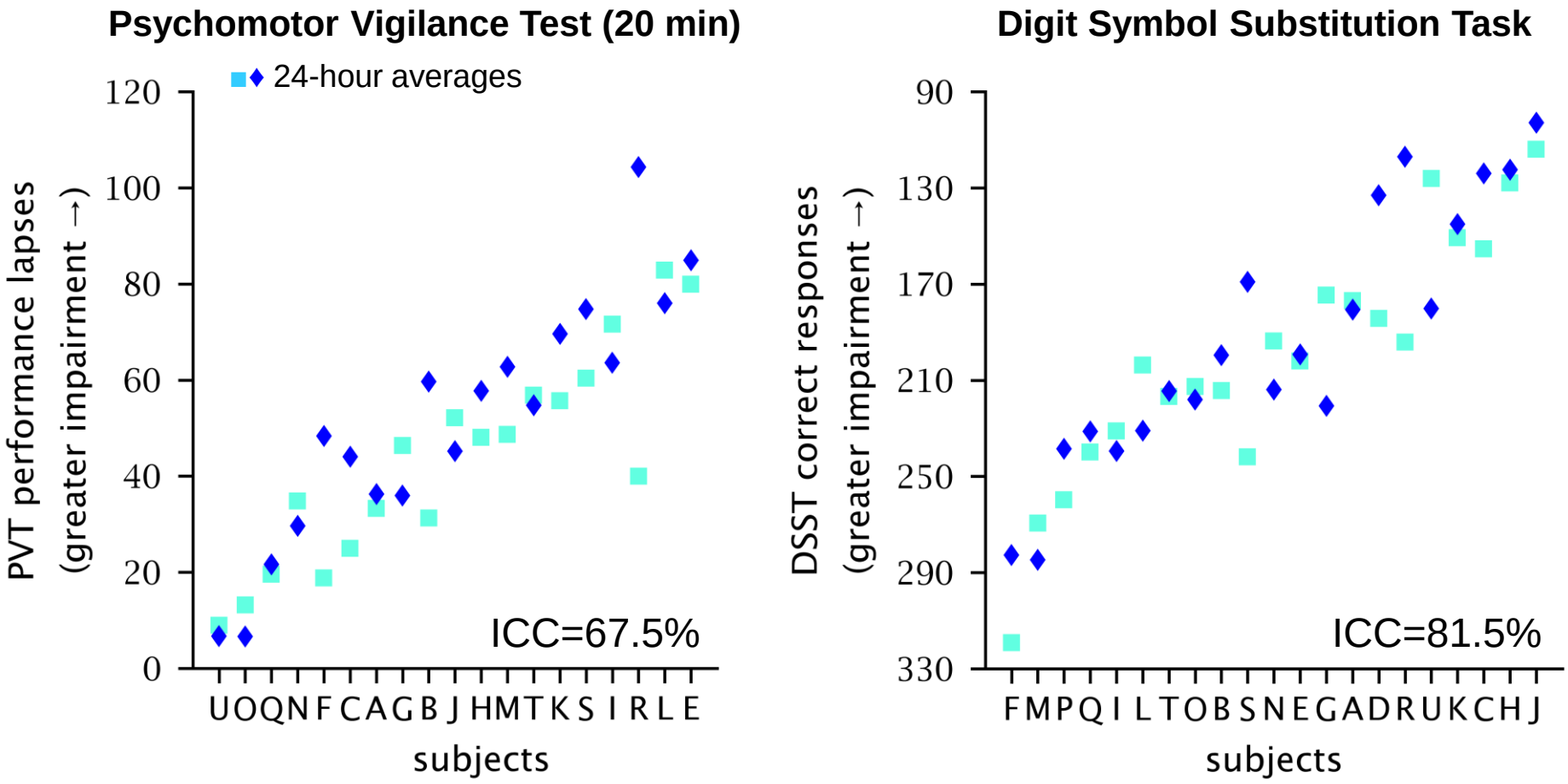
F-117A (Night Hawk) Fighter Pilots

(Self-)selection mechanisms do not eliminate individual differences in susceptibility to fatigue in operational settings



Van Dongen HPA, Caldwell JA, Caldwell JL. Behav Res Meth, 2006; 38: 333-343.

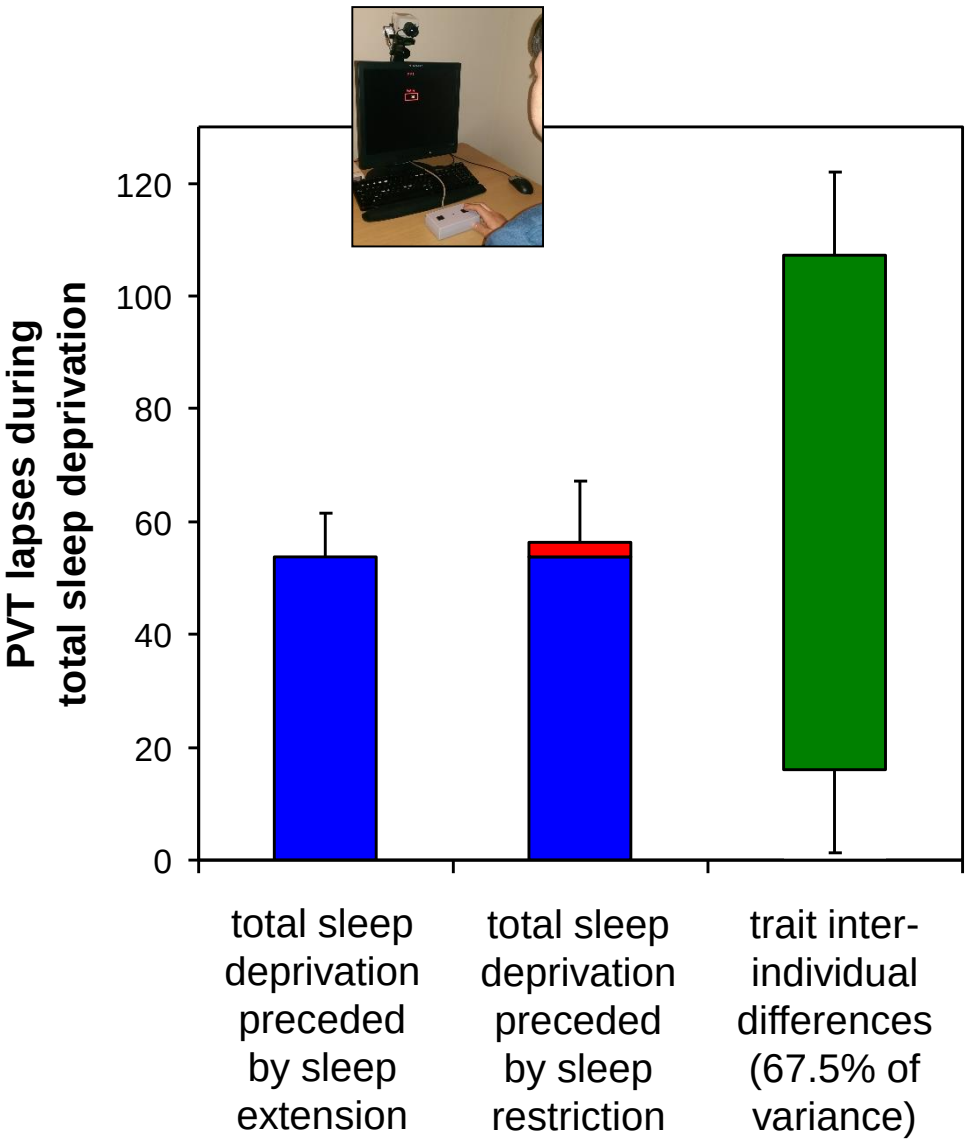
Individual Differences in Susceptibility to Fatigue Are a Biological Trait... and This Trait Is Task-Dependent

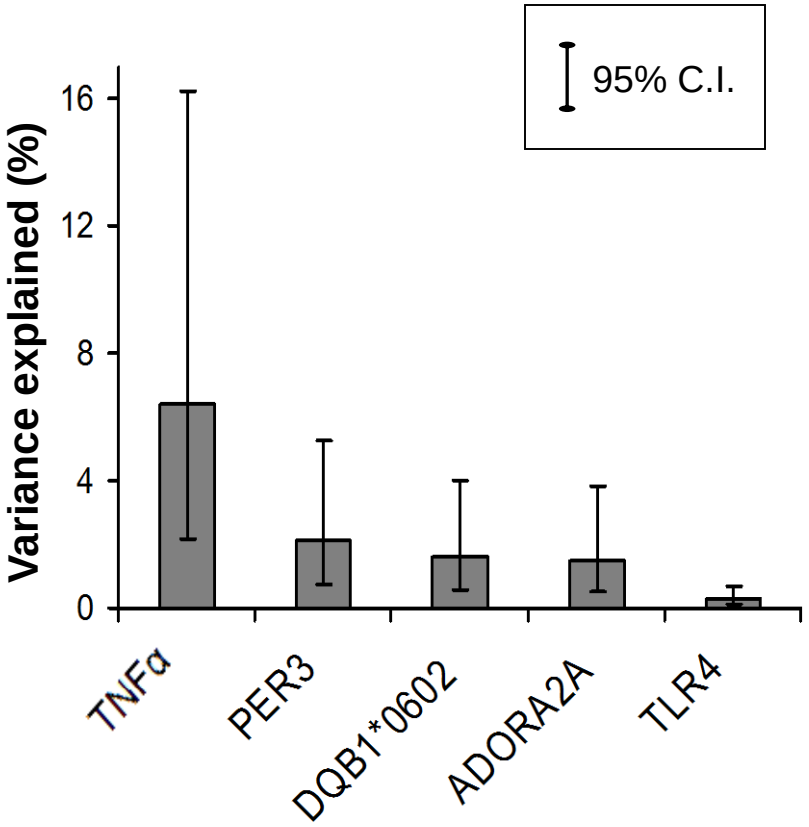


Van Dongen HPA, Baynard MD, Maislin G, Dinges DF. Sleep, 2004; 27: 423-433.

Notice the rank order differences between tasks!

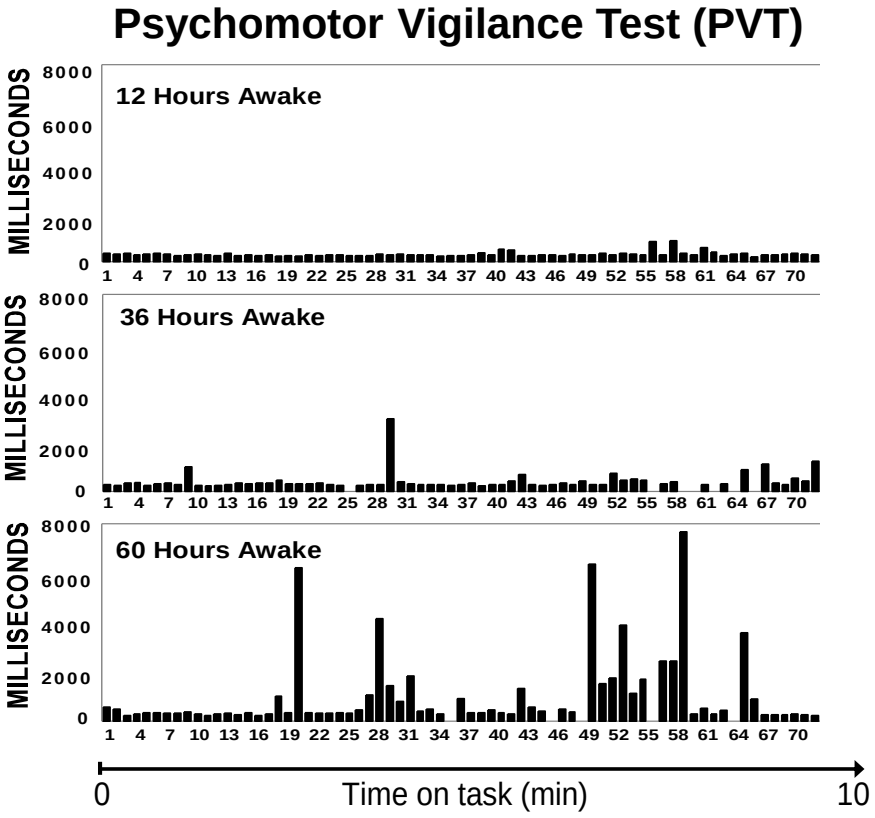
Individual Differences in Susceptibility to Fatigue Are Overwhelmingly Large, but Difficult to Predict

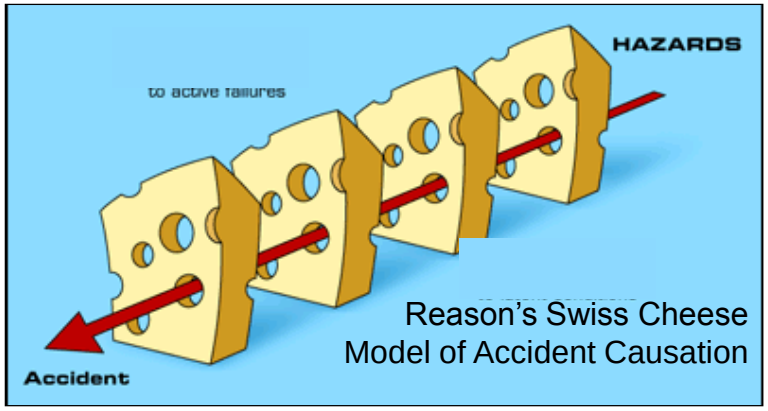


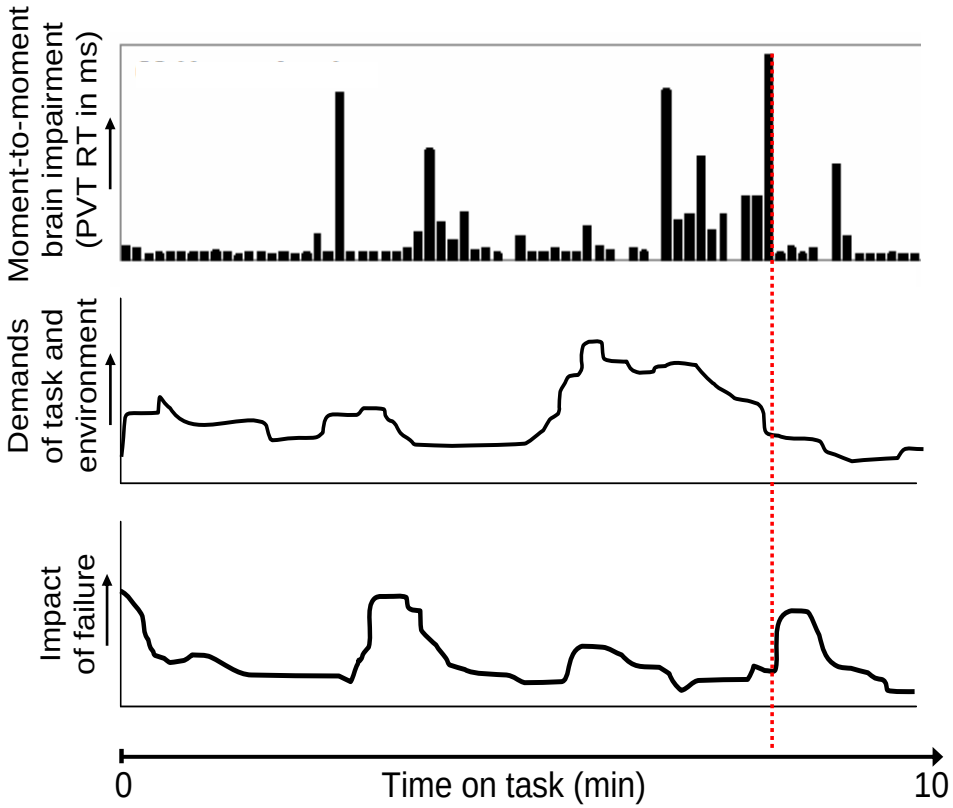


Satterfield BC, Wisor JP, Field SA, Schmidt MA, Van Dongen HPA. Brain, Behavior, and Immunity, 2015; 47: 66-74.

Mechanisms Underlying the Effects of Fatigue on Transportation Safety: Lapses in Vigilant Attention





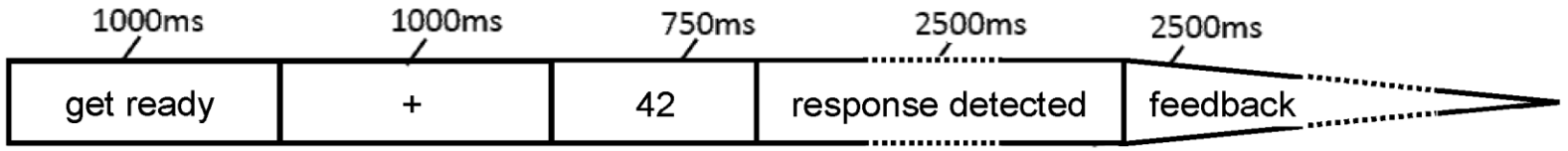


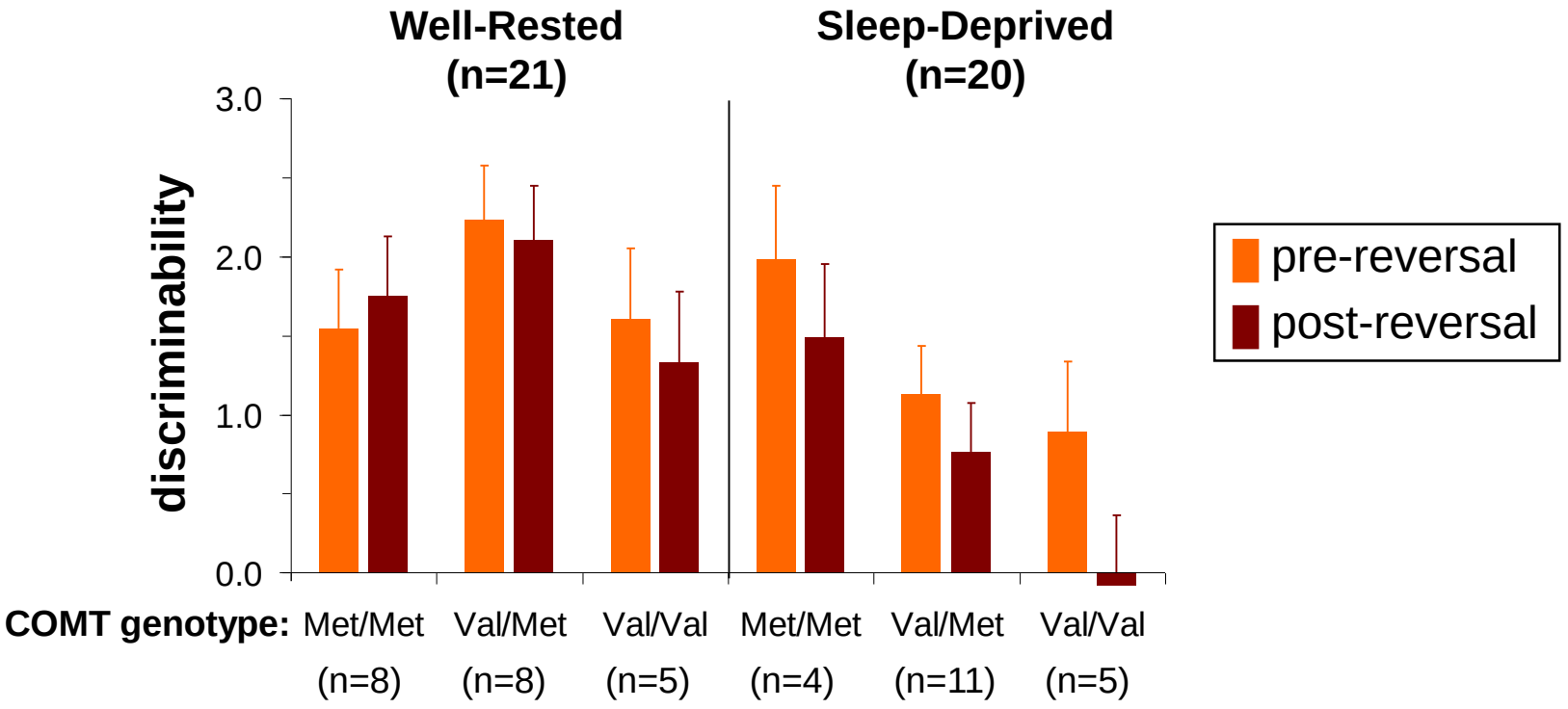
Doran SM, Van Dongen HPA, Dinges DF. Arch Ital Biol, 2001; 139: 253-267.

Van Dongen HPA, Hursh SR. In Kryger MH, Roth T, Dement WC, eds. Principles and Practice of Sleep Medicine, 5th ed. Elsevier, 2010: 753-759.

Mechanisms Underlying the Effects of Fatigue on Transportation Safety: Reduced Cognitive Flexibility

Go/No-Go Task with Reversal





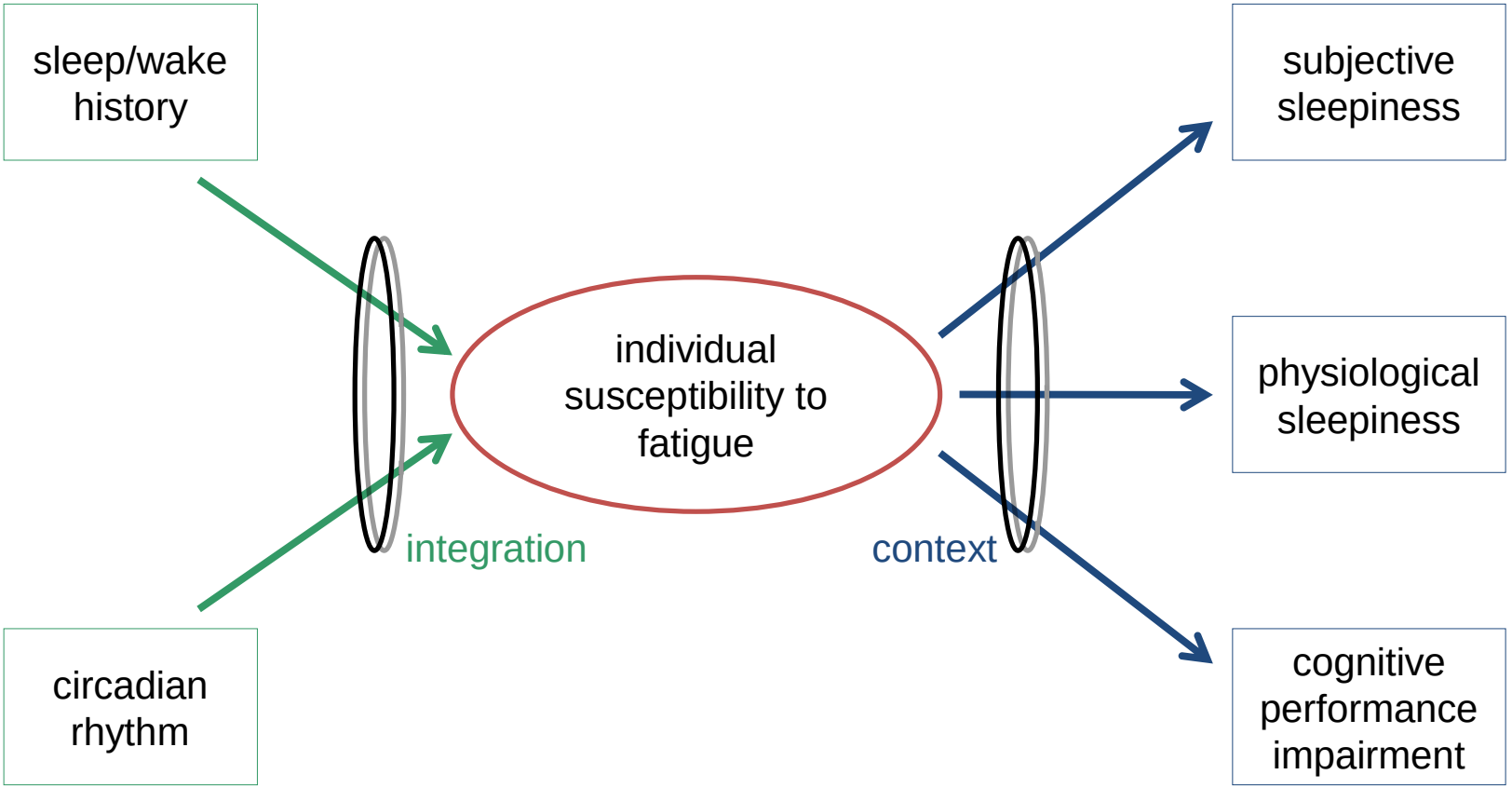
Satterfield BC, Hinson JM, Whitney P, Schmidt MA, Wisor JP, Van Dongen HPA. Cortex, 2018; 99: 179-186.

Distinct and Dissociable Aspects of Individual Susceptibility to Fatigue

Vigilant Attention Problem

Cognitive Flexibility Problem

Distinct Dimensions of Individual Susceptibility to Fatigue Are a Challenge for Drowsiness Detection



Oonk M, Tucker AM, Belenky G, Van Dongen HPA. International Journal of Sleep and Wakefulness, 2008; 1: 141-147.