

OSH 2020 09 14

Safe shift schemes

Work hours, employee health and safe performance

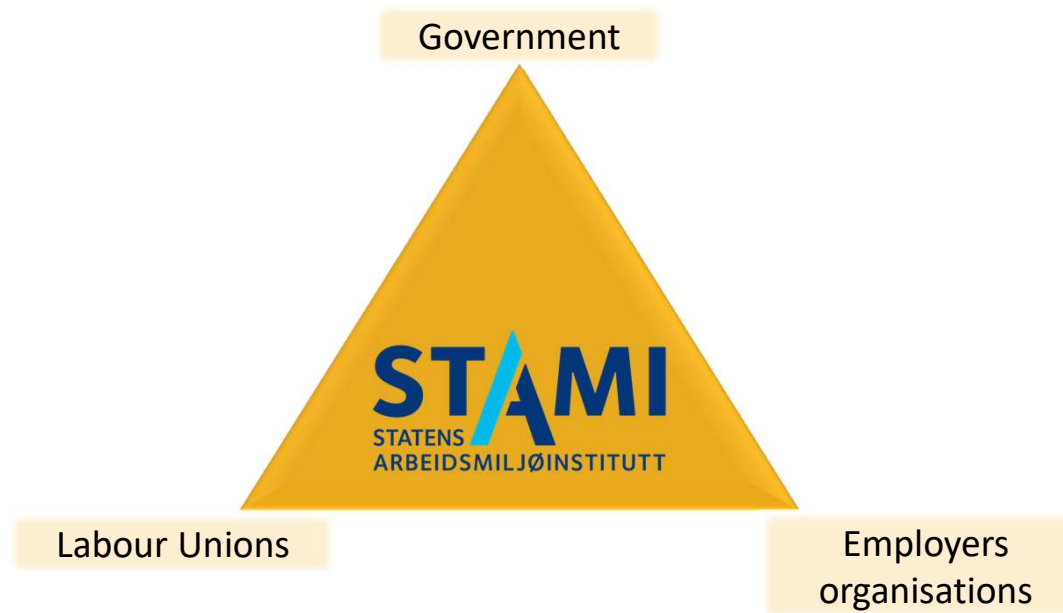
Elisabeth Goffeng

STAMI

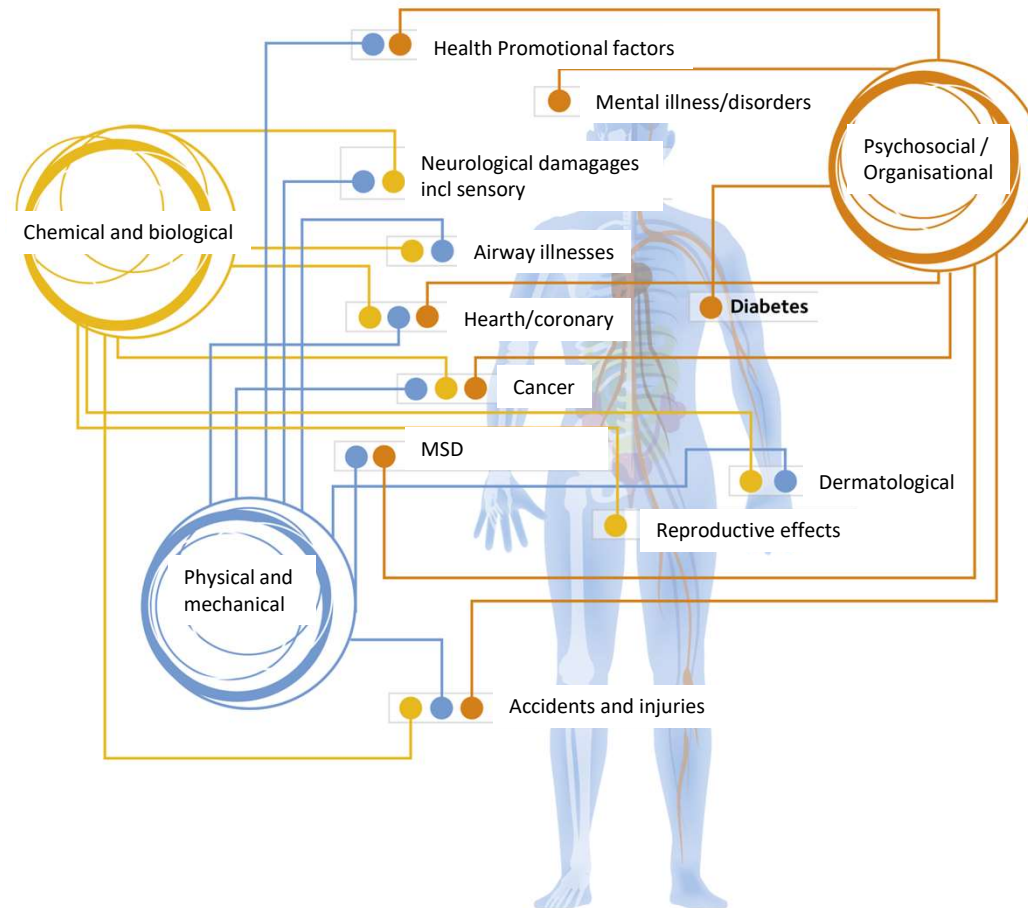
STAMI is the National Institute of Occupational Health in Norway

STAMI is a research institute funded by the Ministry of Labour and Social Affairs.

National Institute of Occupational Health STAMI



Health Impacts



Extended work hours → ↑ risk of cardiovascular disease

More than 48 hours/week:

27 % increased risk of stroke

More than 50 hours/week

40 % increased risk of cardiovascular disease

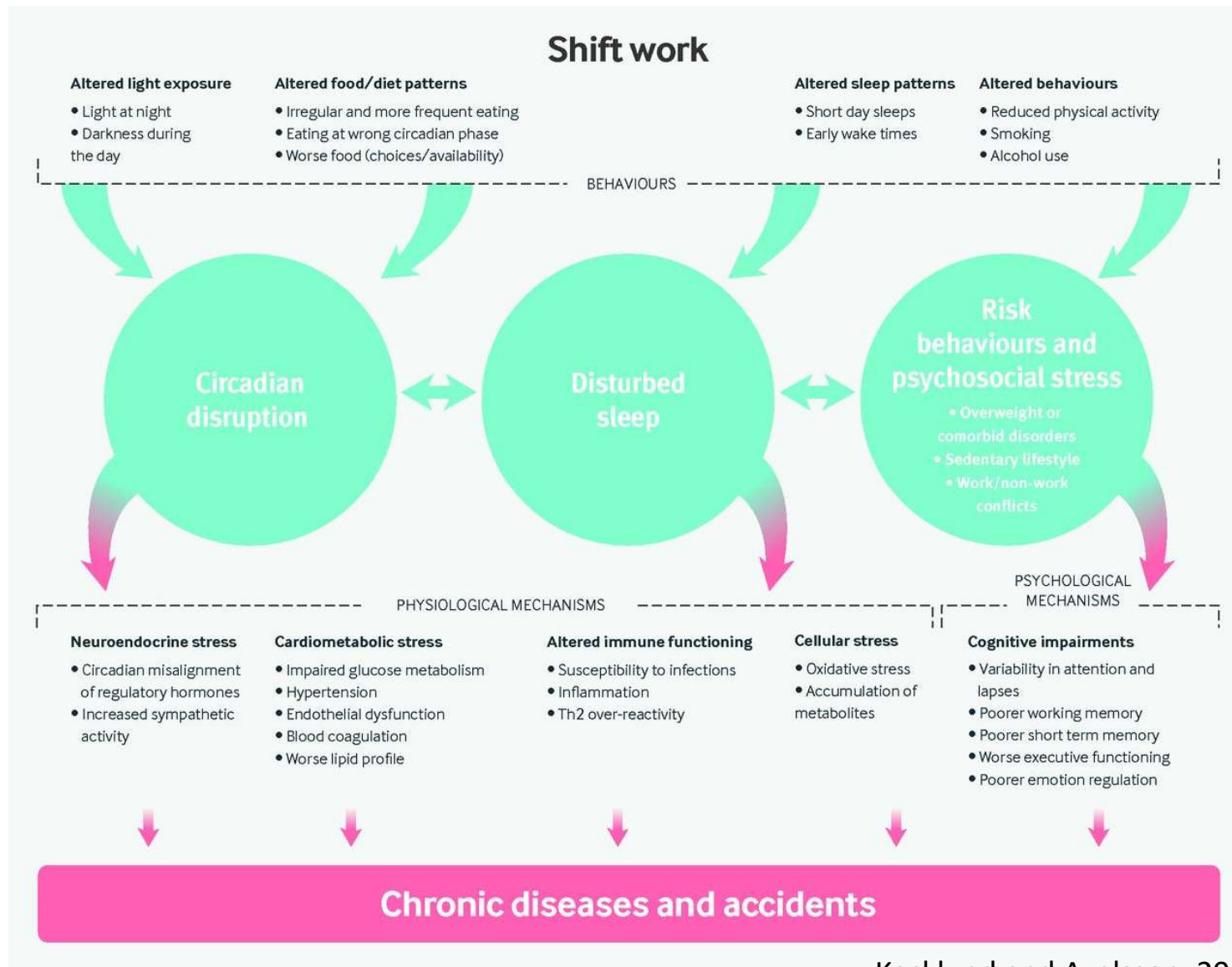
(Virtanen M et al, 2012)



Health effects of extended work hours (daily and weekly)

Acute: **Fatigue**

Long term: **Cardiovascular diseases**



Important factors when evaluating shiftschemes

- Length of the shifts
- Time for rest and recovery between shifts
- Day- or night shifts
- Sleep deficit (duration/quality)

Safe shift schemes

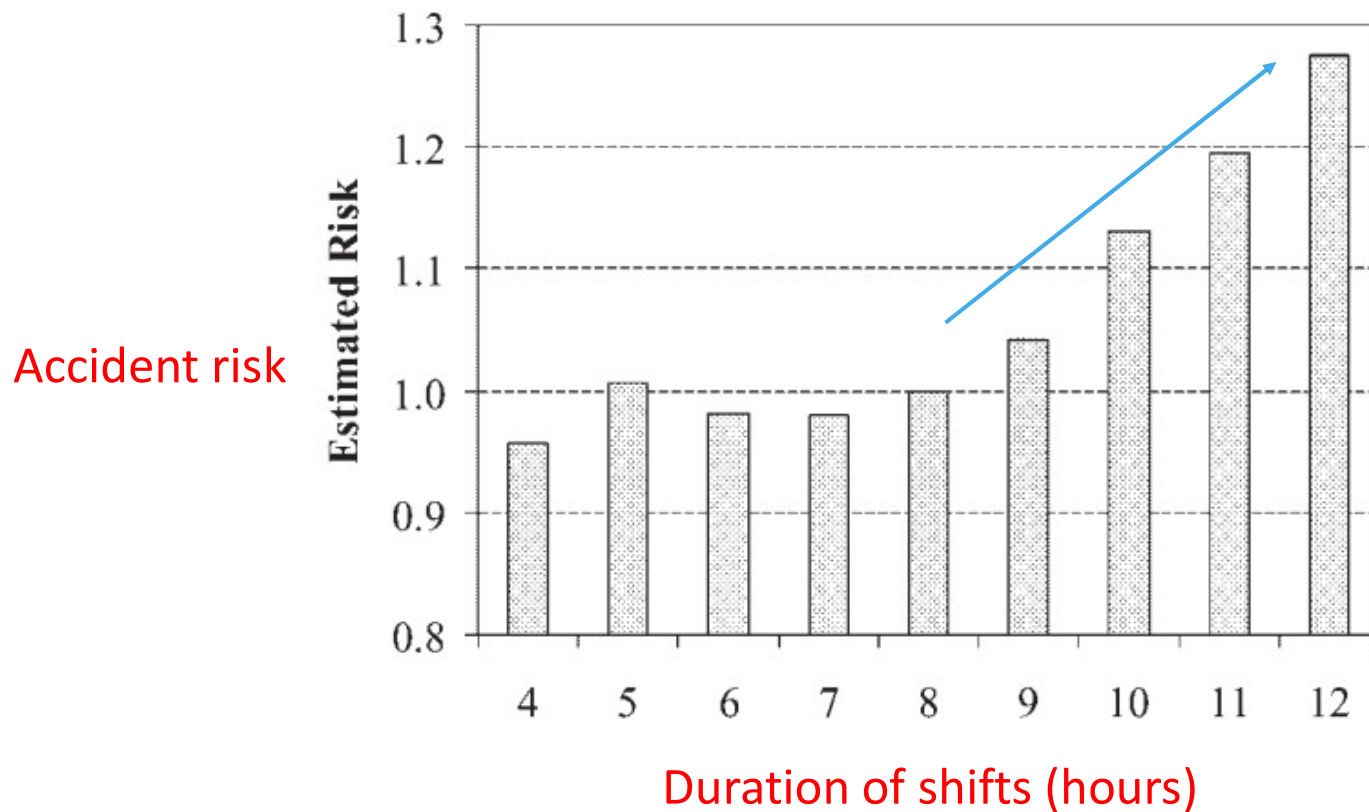
- Shift length
- Time for rest and recovery between shifts
- Day- or night shifts
- Sleep deficit
 - Sleep duration, sleep quality



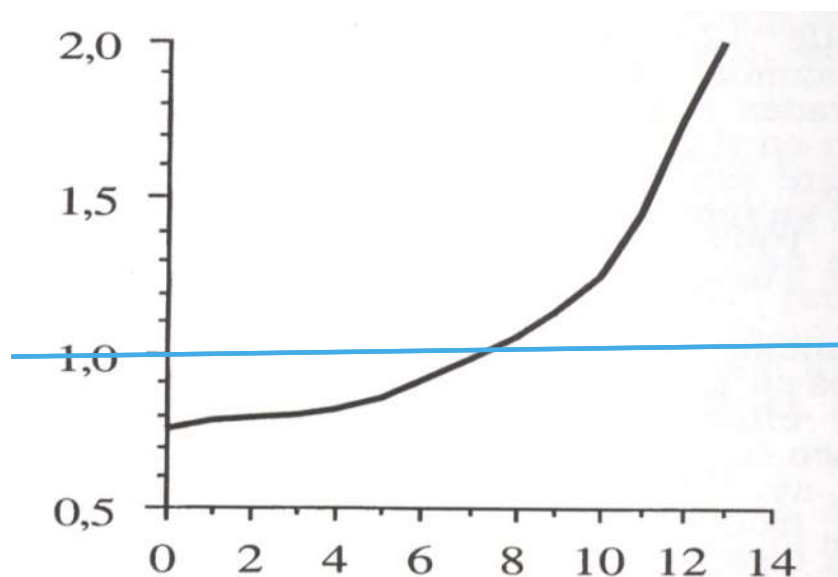
Shift duration and risk of accidents

TRENDS

Folkard and Lombardi, 2006

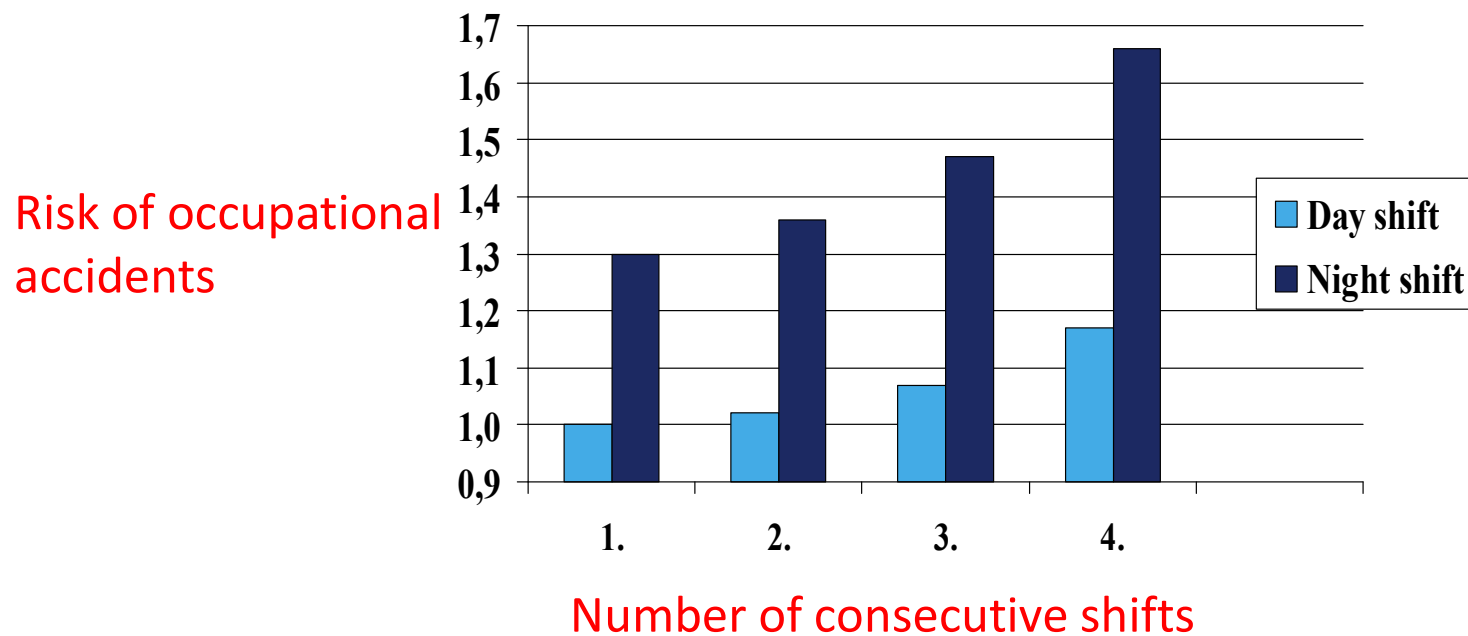


Number of work hours and injury risk



Number of consecutive shifts and injury risk Trends

Based on data from 7 different studies in mining industry



Folkard and Lombardi, 2006

Safe shiftschemes..



- Length of shifts
- Time for rest and recovery between shifts
- Day or night shifts
- Sleep deficit
 - (sleep duration/sleep quality)

Effects of quick returns

A study of 1900 Norwegian nurses)

Association between «quick returns» (< 11 hours) and

- Insomnia
- Excessive sleepiness
- Extreme fatigue
- Sleep disorders

(Eldevik et al 2013)



Insomnia, Excessive Sleepiness, Excessive Fatigue, Anxiety, Depression and Shift Work Disorder in Nurses Having Less than 11 Hours in-Between Shifts

Maria Fagerbakke Eldevik^{1,2*}, Elisabeth Flo^{1,3}, Bente Elisabeth Moen^{2,4}, Ståle Pallesen^{1,3}, Bjørn Bjorvatn^{1,2}

1 Norwegian Competence Center for Sleep Disorders, Haukeland University Hospital, Bergen, Norway, **2** Department of Public Health and Primary Health Care, University of Bergen, Bergen, Norway, **3** Department of Psychosocial Science, University of Bergen, Bergen, Norway, **4** Department of Occupational Medicine, Haukeland University Hospital, Bergen, Norway

Results: We found a significant positive association between quick returns and insomnia, excessive sleepiness, excessive fatigue and shift work disorder. Anxiety and depression were not related to working quick returns.

Conclusions: There is a health hazard associated with quick returns. Further research should aim to investigate if workplace strategies aimed at reducing the number of quick returns may reduce complaints among workers.

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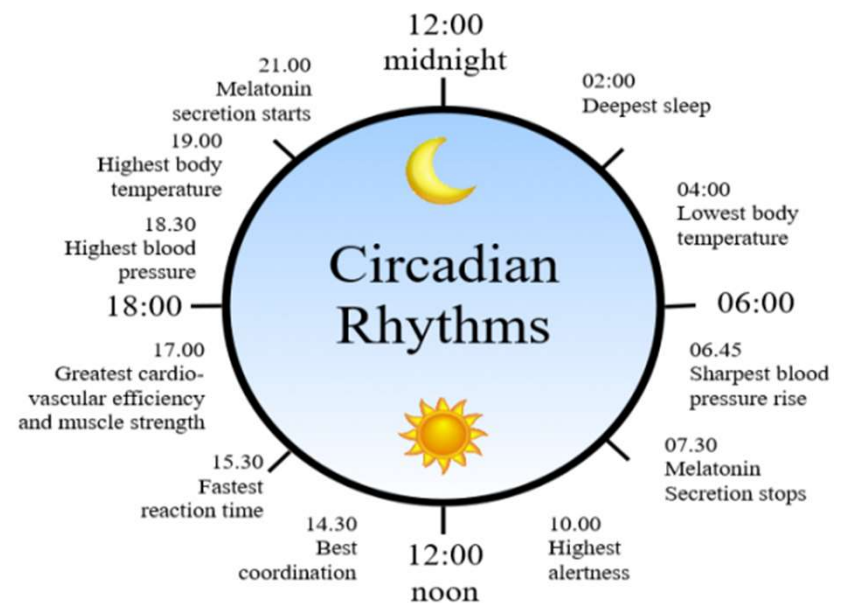
Systematic review of the relationship between quick returns in rotating shift work and health-related outcomes

Øystein Vedaa^{ab*}, Anette Harris^c, Bjørn Bjorvatn^{de}, Siri Waage^{de}, Børge Sivertsen^{bhi}, Philip Tucker^{fg} & Ståle Pallesen^{ae}

Practitioner summary: Quick returns have detrimental effects on acute health problems. However, the evidence regarding effects on chronic health is inconclusive.

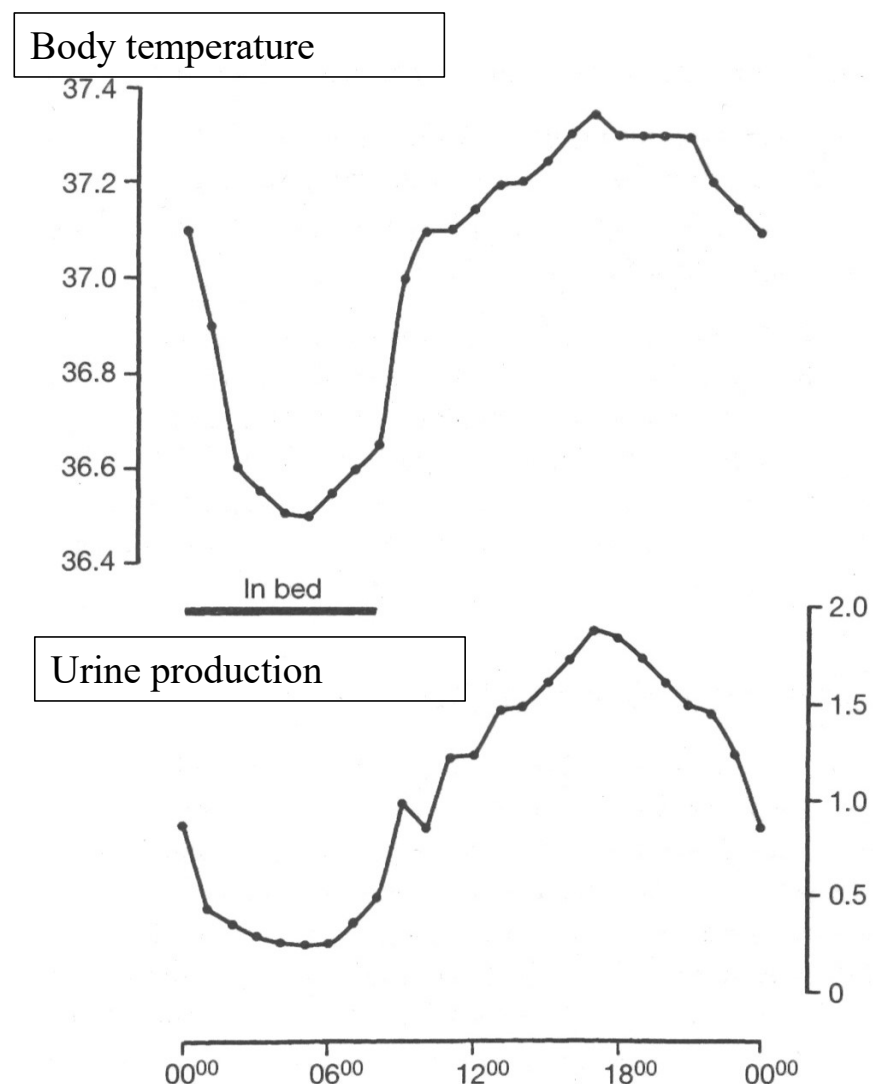
Safe shiftschemes..

- Length of shifts
- Time in between shifts
- **Day or night shifts**
- Sleep deficit



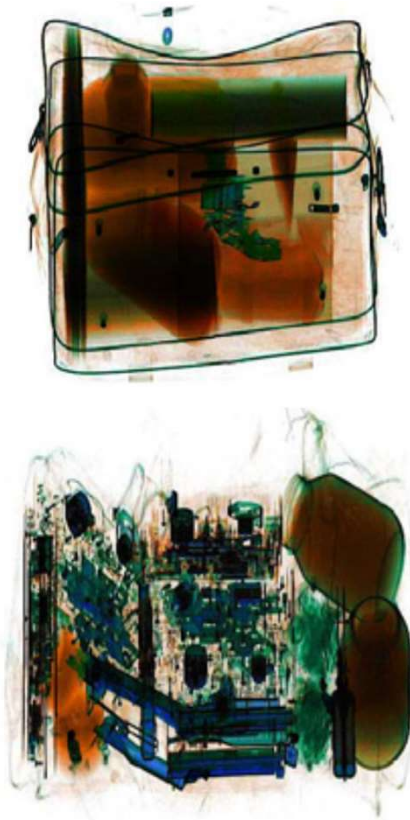
Nightwork desynchronise* the biological clock

*** Mess up!**



(Waterhouse 2002)

Night work, sleep deficit and speed/ accuracy of object recognition



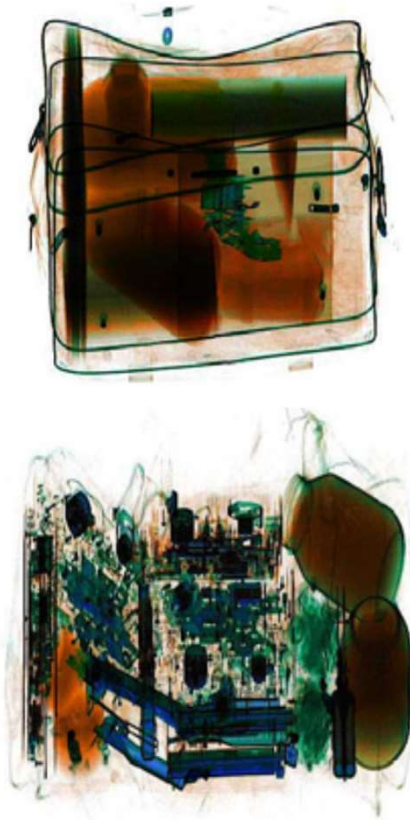
5.800 simulated X-rays of cabin luggage

25% containing a knife or pistol



(Basner M, 2008)

Night work, sleep deficit and speed/accuracy of object recognition



5.800 simulated X-rays of hand luggage

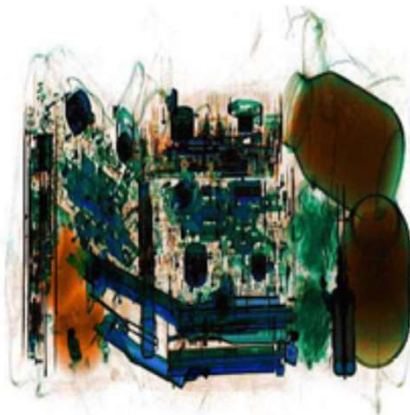
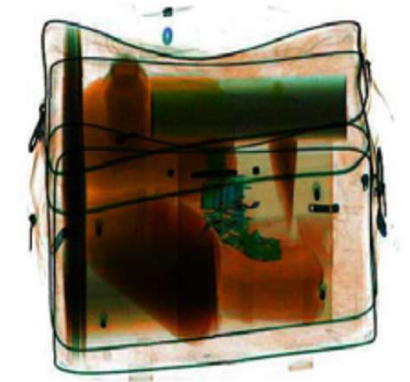
25% containing a knife or pistol

Study

- target rate (T)
- false alarm rate (FA)
- Accuracy (N)

(Basner M, 2008)

Night work, sleep deficit and speed/accuracy of object recognition



5.800 simulated screening of hand luggage

25% containing pistol or knife

Examine

- target rate (T)
- false alarm rate (FA)
- Accuracy (N)

During night shift:

- significant reduced N
- significant increased FA

After a sleepless night:

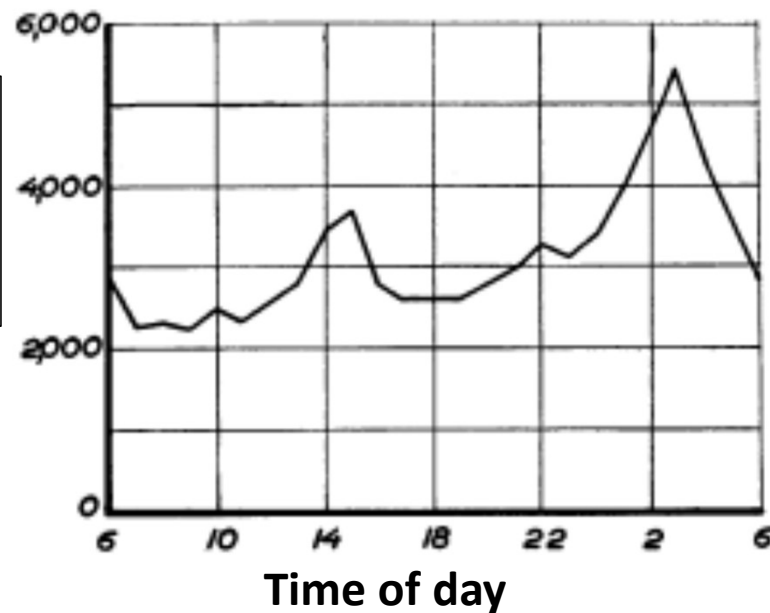
- significant lowered T
- significant reduced N

(Basner M, 2008)

The performance follows the circadian rhythm

Number of errors

Meter reading
every hour
around the clock



(Bo Bjerner m.fl. B J Ind Med 1955:12;103)

Early starts and sleep deficit

70 Australian short haul pilots

Self-reported tiredness:

- most pronounced in shifts starting between 4 and 5AM
- least pronounced in shifts starting between 8 and 9AM

15 minutes of sleep is lost for every hour the shift starts before 9AM



(Roach et al, 2012)

Safe shift schemes?

- Shift duration
- Time in between shifts
- Night or day shifts
- **Sleep deficit**



Sleep disorders

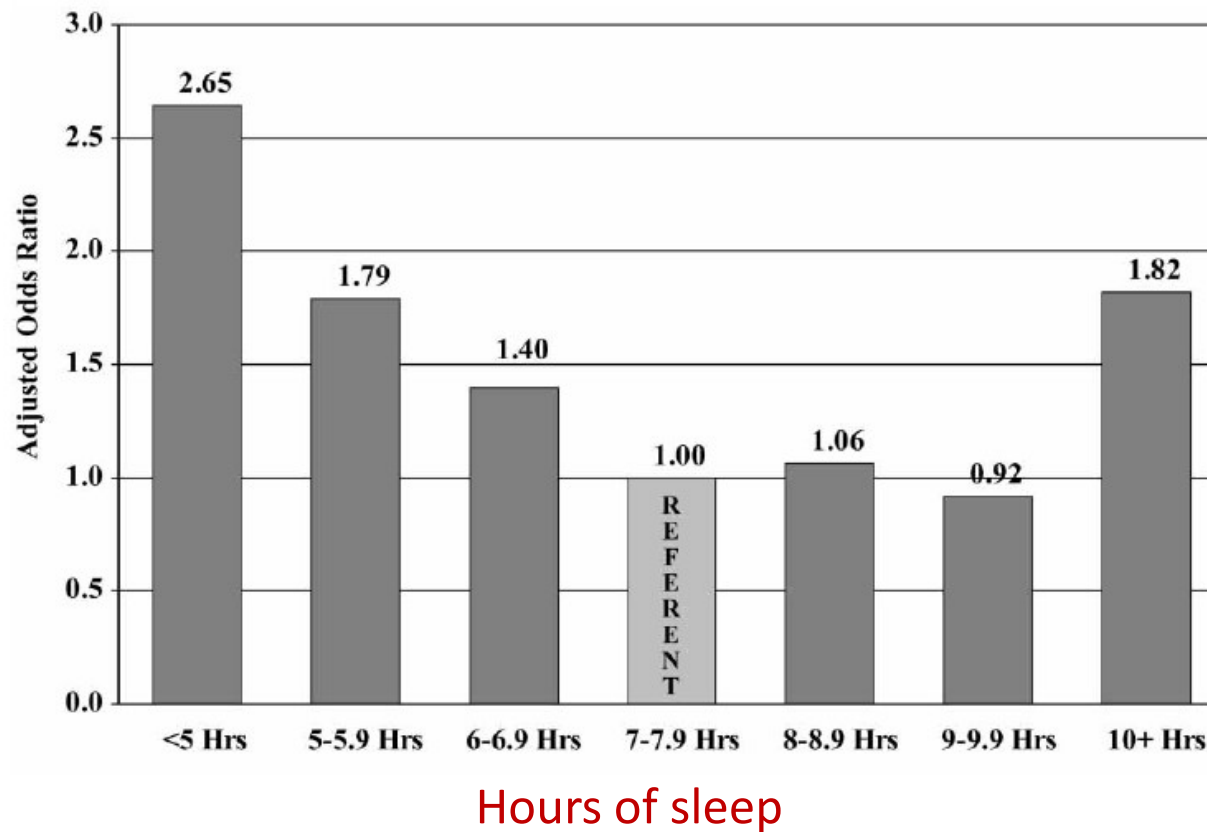
-The single factor that has the greatest impact on shiftworkers



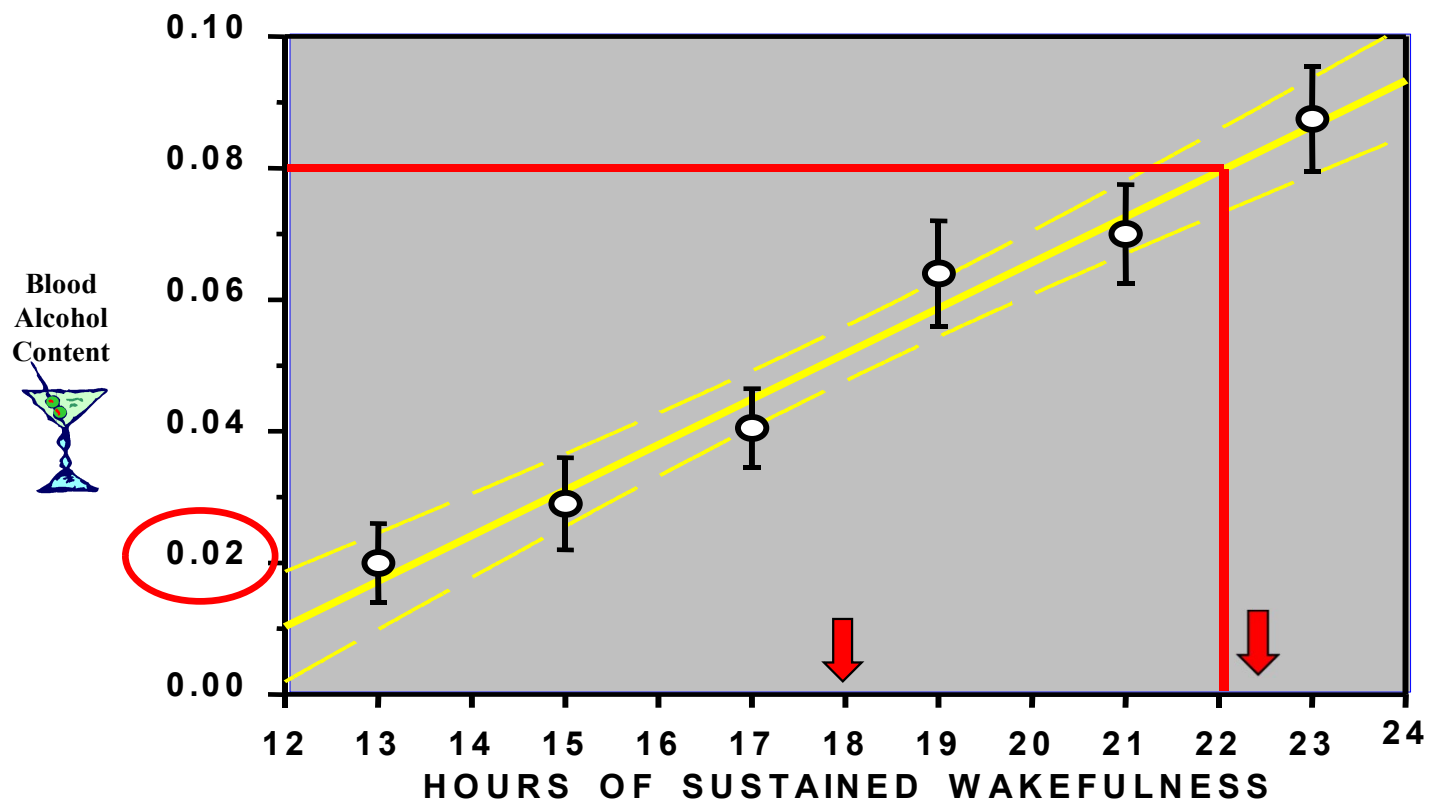
Shiftwork and occupational accidents

Lombardi et al, 2010

Risk of
occupational
accidents



A similarity between being influenced by alcohol and judgement and performance



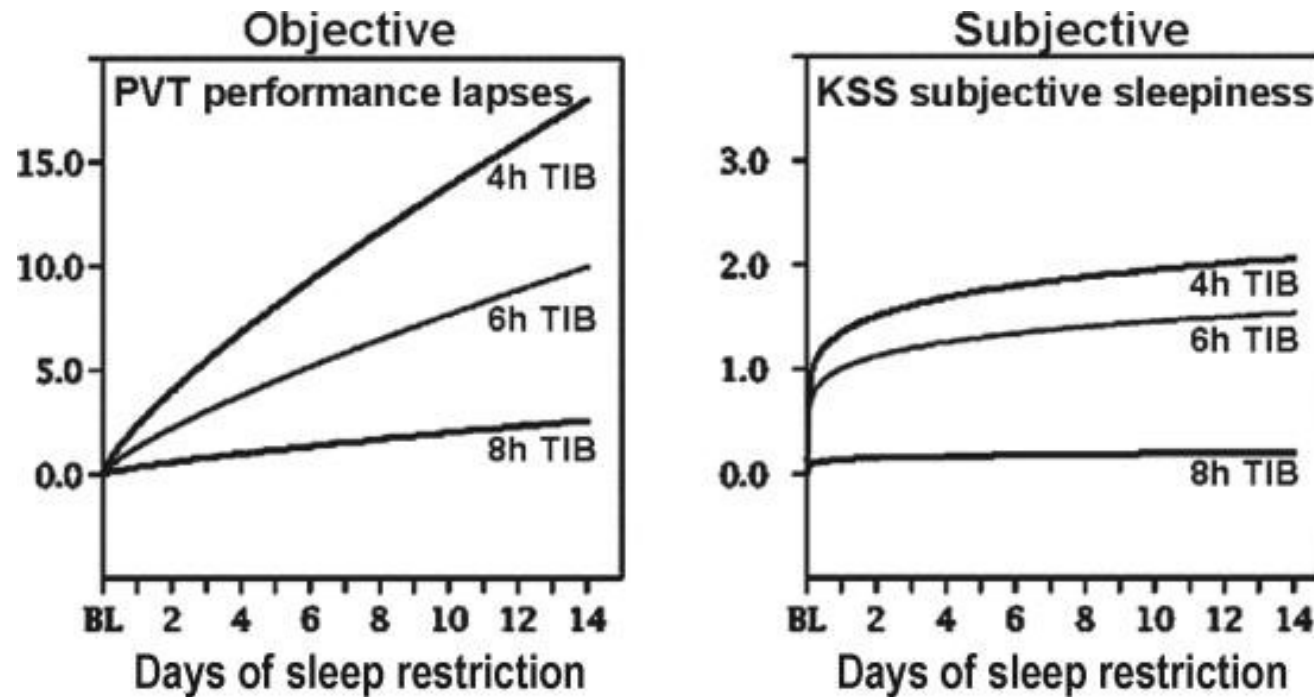
(Lånt av Øyvind Lauridsen, Petroleumstilsynet)

Adapted from Dawson and Reid 1997

Micro sleep

- Typically on night – or early morning shifts
- <1 second - 60 seconds
- You are not aware
- On the road driving becomes wobbly, you overlook stop signals or red traffic lights
- Requires barriers against the consequences

We overestimate our own performance



S Banks, D. F. Dinges J Clin Sleep Med. Aug 15, 2007; 3(5): 519–528. Adapted from Van Dongen et al. Sleep. 2003;26:117–26.

Shift Work Disorder in Nurses – Assessment, Prevalence and Related Health Problems

Elisabeth Flo^{1,2*}, Ståle Pallesen^{1,2}, Nils Magerøy^{3,4}, Bente Elisabeth Moen^{4,5}, Janne Grønli^{1,6}, Inger Hilde Nordhus^{1,7}, Bjørn Bjorvatn^{1,5}

- 44% of the nurses who worked morning, evening and night shifts reported of sleep disorders
- 44% Nurses working night shifts only reported of sleep disorders
- Need to move the focus from the individuals to an organizational level

Individual coping strategies in shift work



A healthy life style



Family and social network
A positive attitude towards work



Protect your eyes from sharp sunlight
Dark bedroom during daytime sleep
A nap before night shifts

The Norwegian Labour Inspectorate

Er arbeidstidsordningen forsvarlig?

Arbeidstilsynet

Arbeidstilsynet åpner for forskjellige former for tilpassede arbeidstidsordninger. Disse skal sørge for at arbeidstakere unngår fysiske eller psykiske belastninger, eller redusere ubehagene på arbeidsplassen.

Arbeidsgiverens ansvar
Arbeidsgiver skal alltid vurdere om arbeidstidsordningen er forsvarlig. Det gjelder også når det er innført arbeidstidsordninger i tariffavtale, eller ved særlige vernetiltak fra arbeidstidsbestemmelser.

Tariffavtaler kan inneholde bestemmelser om arbeidstidsordninger som gir regler om arbeidstidens lønns grenser. Arbeidsgiver og arbeidstaker kan likevel ikke inngå avtaler om arbeidstid som truer helse og sikkerhet.

Hvilke arbeidstidsordninger skal vurderes?
Ordinære arbeidstidsordninger med inntil ni timer på dagtid, kan anses som forsvarlig uten noen nærmere kartlegging og vurdering. I denne sammenheng spiller arbeid i helger og på helligdager i seg selv ingen rolle. Det er arbeidstidsordninger som avviker fra lovens utgangspunkt og normal dagrytme, som må vurderes nærmere.

Det vil for eksempel si:
 • arbeidstakere i skift eller turnus
 • dagarbeidere som deltar i vaktordninger
 • usædvanlig overtid
 • usædvanlig gjennomarbeidingsdag
 • nattarbeid

Når skal arbeidstidsordningene vurderes?
Forsvarlighetsvurdering må gjøres ved etablering av nye og endring av eksisterende arbeidstidsordninger. Det bør også gjøres regelmessige vurderinger - for eksempel årlig - for å vurdere utfordringer og behov for endringer i arbeidstidsordningene.

Skal med kartlegging
For å oppfylle kravet må arbeidsgiver kartlegge og vurdere de aktuelle risikofaktorene i arbeidet. Det krever kunnskap om hvordan arbeidstidsordninger kan virke inn på de ansatte.

helse. Både kartleggingen og forsvarlighetsvurderingen skal gjøres i samarbeid med verneombud, arbeidstakere og deres tillitsvalgte.

Kravet til forsvarlighet kan blant annet føre til at en ikke kan utnytte de maksimale lønnsene som loven setter for arbeidstid.

Kartleggingen må være konkret, med utgangspunkt i forholdene på den enkelte arbeidsplassen. Kartleggingen må også ta hensyn til den enkelte arbeidstaker. For eksempel kan alder, helsestatus og familiefølelse ha betydning.

Kartleggingen bør inneholde beskrivelse av:
 • arbeidstidsordningen
 • fordeling av arbeidstid og fritid
 • angivelser på vaktene
 • antallet nattesvinter på natt

Hvordan vurderer om arbeidstidsordningen er forsvarlig?
Etter kartleggingen, må arbeidsgiver legge en forsvarlighetsvurdering som minimum bør inneholde informasjon om:
 • hvilke arbeidstidsordninger virksomheten har
 • arbeidsoppgaver, krav til arbeidsvare, forholdet mellom aktiv og passiv periode
 • arbeidet kan utføres sikkert, selv om arbeidstakeren er sliten eller trett
 • hvordan balansen mellom arbeidstid og sosialt liv fungerer

Hva kan belastede arbeidstidsordninger føre til?
Konsekvenser av belastede arbeidstidsordninger kan være:
 • svekket fysisk/mentalt helse
 • redusert fysisk og mental funksjon
 • risiko for å gjøre feil
 • psykiske plager
 • vanskelig balanse mellom arbeidstid og fritid

Nattarbeid har blant annet en vel dokumentert sammenheng med økt risiko for hjerte- og karsykdom og en begrenset sammenheng med risiko for brystkreft.

Bedriftshelsetjenesten kan bidra med å kartlegge risikofaktorer og vurdere konsekvenser.

Arbeidstilsynets svarlinje: 73 19 97 00 www.arbeidstilsynet.no

- Lower number of consecutive shifts or shorter shifts
- Longer time for rest and recovery between shifts
- Forward rotating shifts
- Reduced workload
- Organization of the work day
- Increased staffing

Safe shift schemes

- Type and intensity of work
- Sufficient time for breaks
- Particularly important for older workers
- Sufficient staffing
- The shift plan must be evaluated as a whole
- Need for systematic efforts to improve the working environment

•
Peter Knauth, 2006

Organizational measures for limiting risks of health and safety

- **Minimize sleep deficit and circadian rhythm disorders**
 - Fast forward rotating shifts
 - Minimum 11 hours between two consecutive shifts
 - Avoid extended weeks(≥ 60 hours), and extended shifts(≥ 10 hours)
- **Offer employees a high control over working hours**
- **Regularly screen shift workers for clinical sleep disorders**

Kecklund and Axelsson, 2016

The optimal shift scheme?

does not exist.....

...it is dependent on:

- type of industry
- workplace
- workforce

Thank you!

