HMS-utfordringer i Nordområdene: Helse og arbeidsmiljø

Kulde, mørke og avstand:
virkninger på mentale prosesser

Stein Knardahl

Solstrand, 23.-24. april 2014

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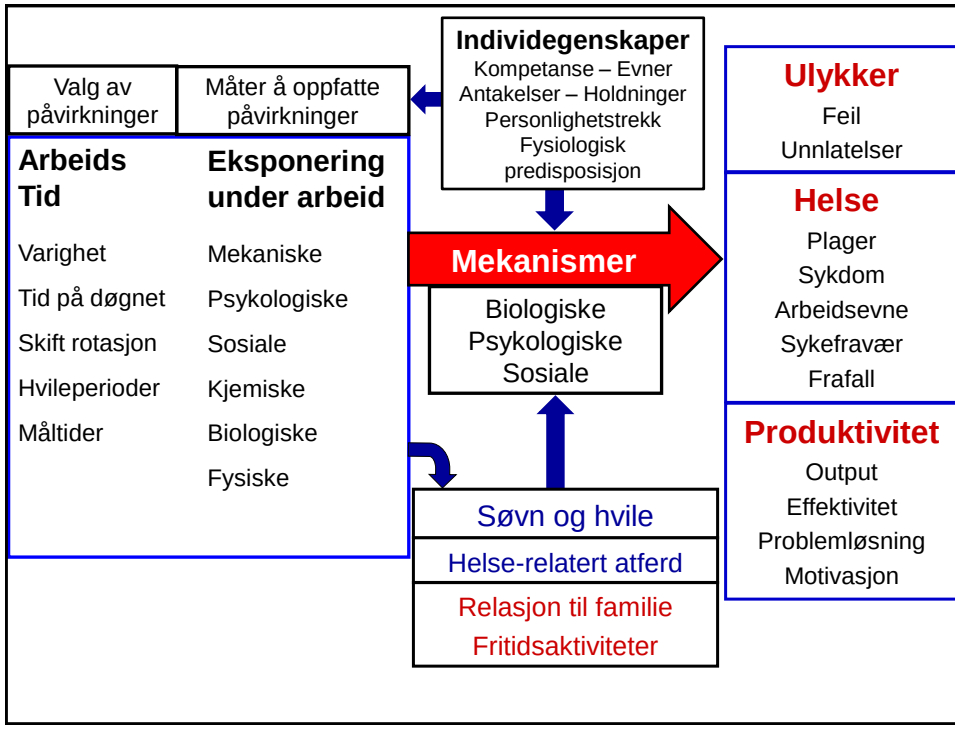

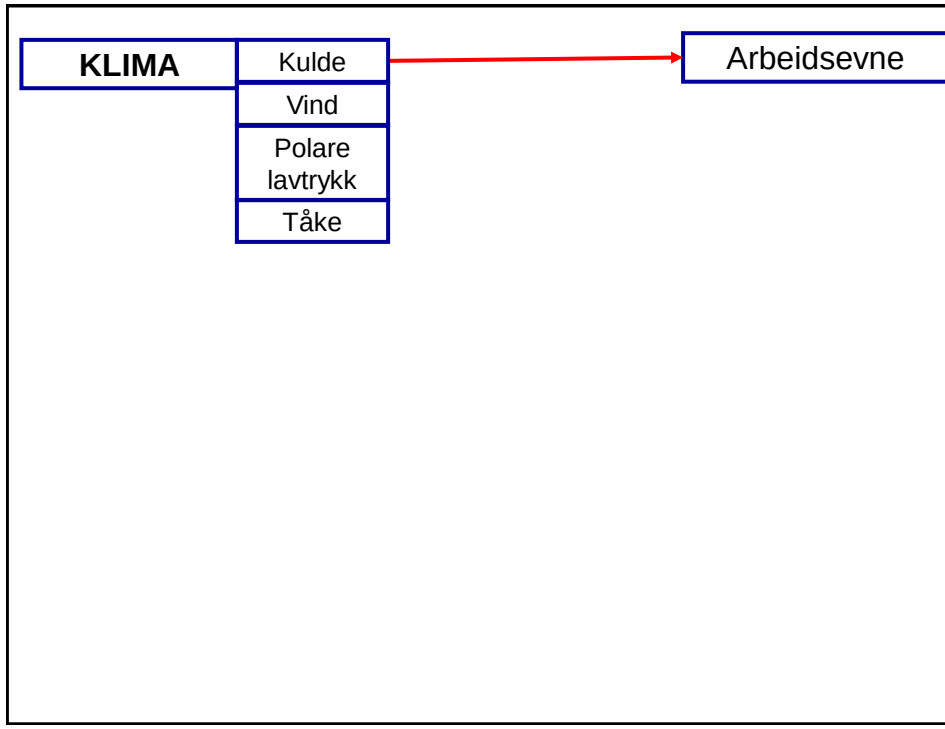

Heat loss

Radiation

All objects emit electromagnetic waves (radiation).

Conduction = Heat transmission

Skin in direct contact with medium with large heat transmission ability (conductivity).

Water has 25 X higher heat transmission ability (conductivity) than air. This is the background for much quicker cooling in water.

Holding a tool made of metal, one loses heat through the tool.

Convection = Transport of heat by movement in surrounding medium

Layer near skin is heated by conduction. When this layer is transported away, it is replaced by cold air (or water if submerged) which is heated. Heat is lost.

Heat loss by evaporation of sweat

Evaporation of water or other liquid requires energy.

If vapour transported away (convection), energy is lost, i.e. one loses heat.

Heat loss in respiration

Inspiratory air is heated in the airways to body temperature (37°C), expiratory air emits heat to the environment.

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Adaptation to cold

Reduce heat loss

Stop sveating

Reduce skin temperature

Close temperature regulating vessels in skin.

Produce heat

Shivering

Rapid, rythmic muscle contractions which produce heat.

Adrenalin-stimulation of heat production in muscles

The contribution of this mechanism not decided in humans.

Activation of brown fat

Sympathetic nervous activity activates brown fat or similar enzyme in muscle.

Thyroxine (T4) or T3 increases metabolic rate

The brain (hypothalamus) produces TSH which stimulates the thyroid gland to produce T4 and T3.

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Working in cold environments

- Effects of local cooling
- Effects of general cooling - Hypothermia

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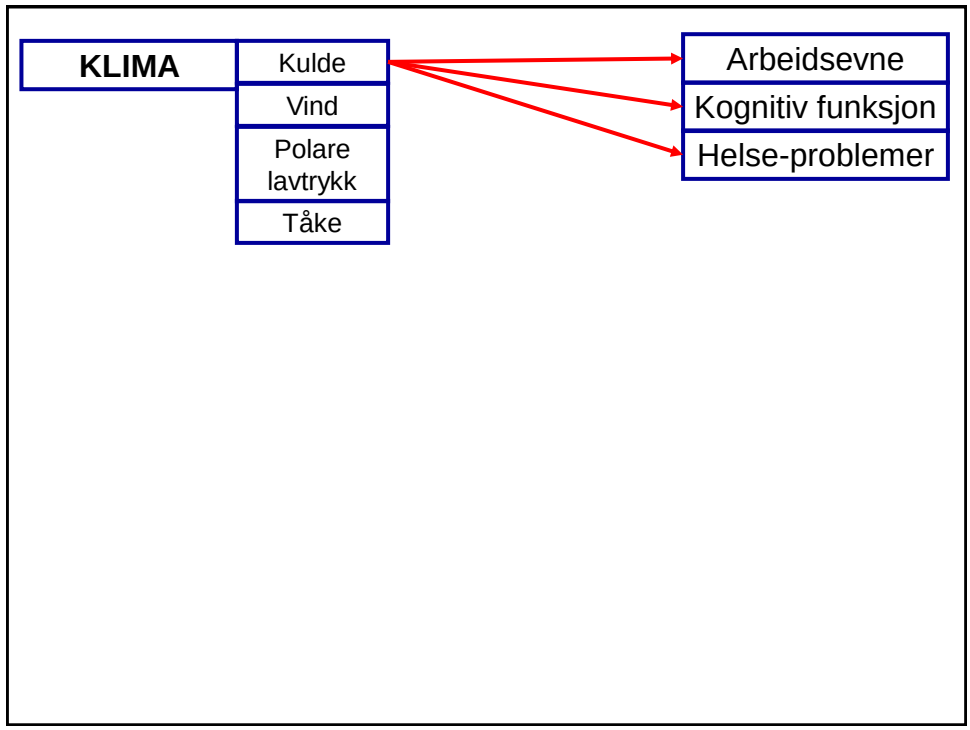

Cognitive functions in cold environments

Moderate short-lasting cold

Sympathetic nerve activity + adrenalin Ability to maintain attention (vigilance) Ability to respond quickly	↑ ↑
General effects on the central nervous system	?
Effects on nerves + muscles: abiliy for tasks demanding precise movements	↓
Distress (”freeze”) influence attention and concentration	↓
Shivering influence attention and concentration	↓

Afterdrop (hyperthermia) after cooling

Selective attention	↓

Strong long-lasting cold producing hypothermia

Ability for parallell processing of information	↓
Severe hypothermia: general judgement	↓ Confusion

However: Inadequate knowledge to conclude which temperature and duration of cold exposure for cognitive functions to be reduced

Research on adaptation to cold exposure:

Physiology: mechanisms for adaptation

Animal experiments

Young healthy humans: submersion in water
cold air, light clothing
cold water in face/splash

Medicine/physiology: mechanisms and treatment to increase the survivial of cells in conditions with low oxygen

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Work in the petroleum industry

- Work periods last > 8 hrs - fatigue
- Work at night - Shift work
- Not all employees are healthy and young

  Existing knowledge based on studies of students and soldiers

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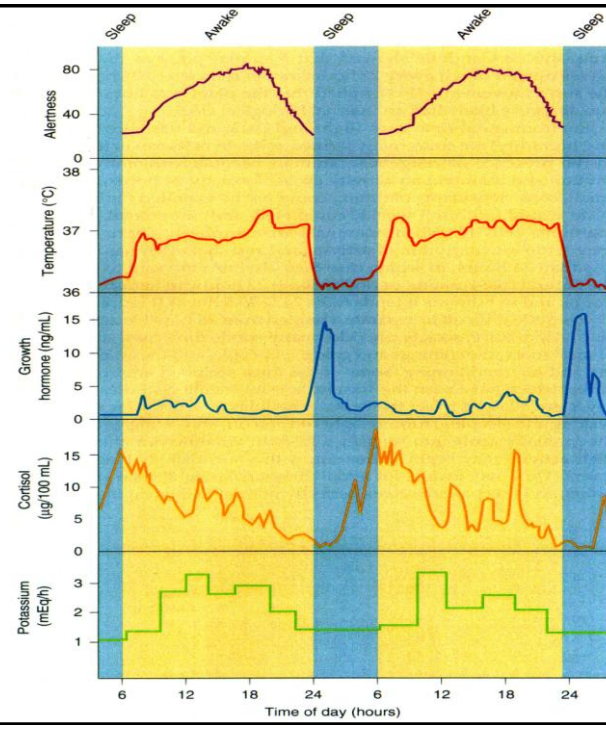
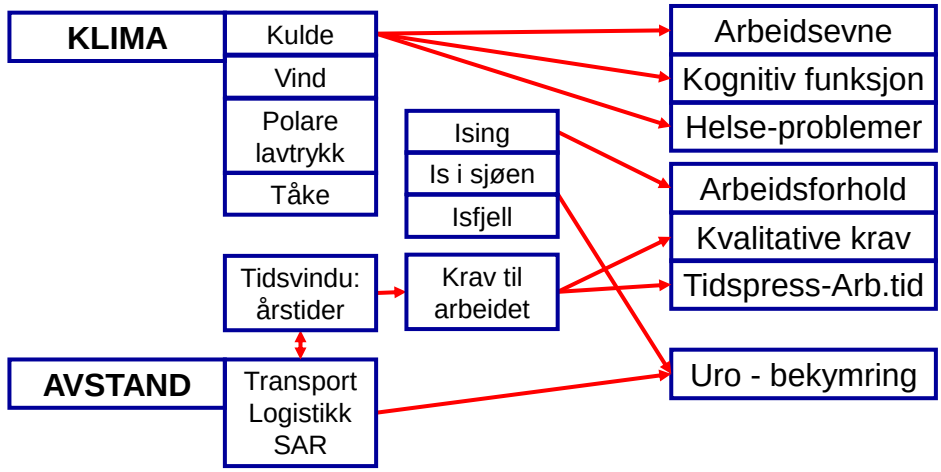
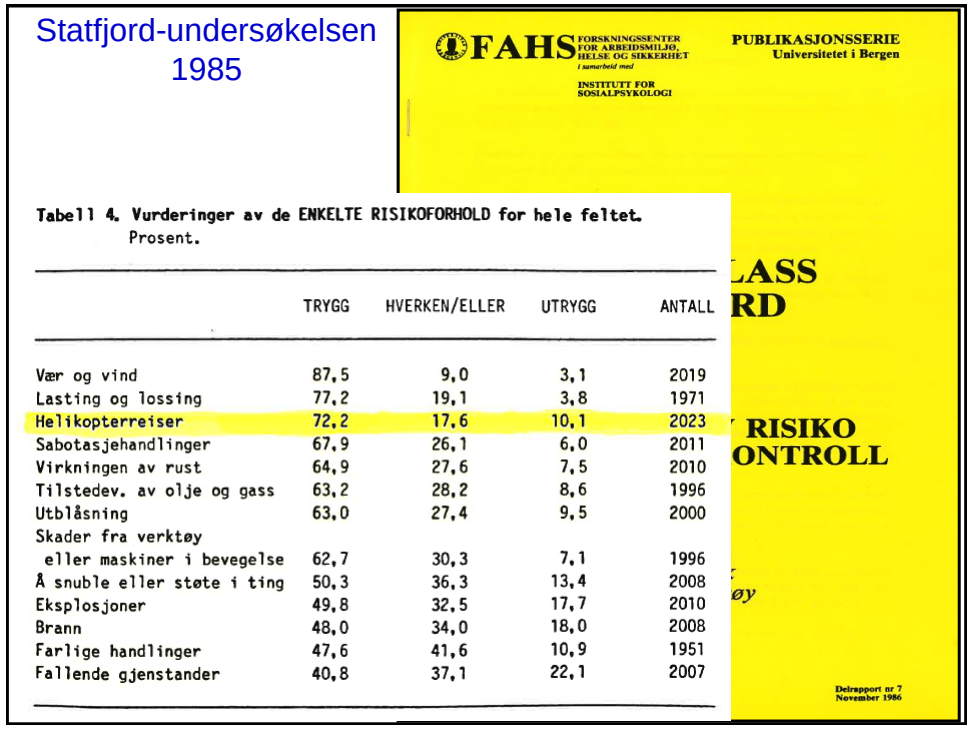
Diurnal rythms

Circadian rythms





Statfjord-undersøkelsen 1985



FAHS FORSKNINGSSENTER FOR ARBEIDSMILJØ, HELSE OG SIKKERHET
i samarbeid med
INSTITUTT FOR SOSIALPSYKOLOGI

PUBLIKASJONSSERIE
Universitetet i Bergen

LASS
RD

RISIKO
ONTROLL

Delrapport nr 7
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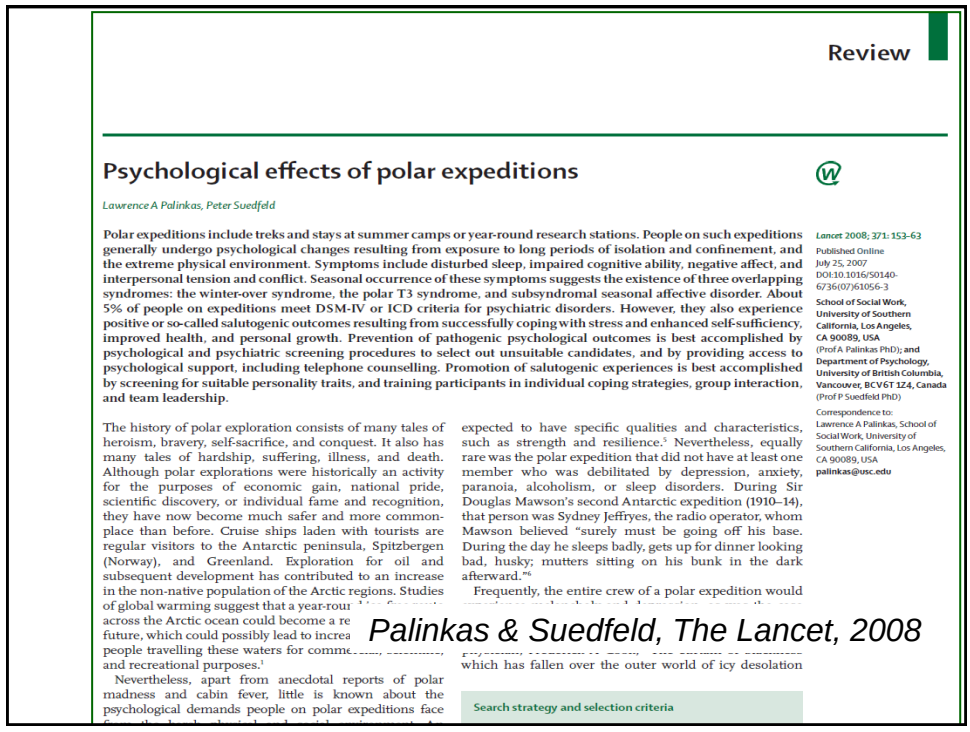
Tabell 4. Vurderinger av de ENKELTE RISIKOFORHOLD for hele feltet.
Prosent.

	TRYGG	HVERKEN/ELLER	UTRYGG	ANTALL
Vær og vind	87,5	9,0	3,1	2019
Lasting og lossing	77,2	19,1	3,8	1971
Helikopterreiser	72,2	17,6	10,1	2023
Sabotasjehandlinger	67,9	26,1	6,0	2011
Virkningen av rust	64,9	27,6	7,5	2010
Tilstedev. av olje og gass	63,2	28,2	8,6	1996
Utblåsning	63,0	27,4	9,5	2000
Skader fra verktøy eller maskiner i bevegelse	62,7	30,3	7,1	1996
Å snuble eller støte i ting	50,3	36,3	13,4	2008
Eksplosjoner	49,8	32,5	17,7	2010
Brann	48,0	34,0	18,0	2008
Farlige handlinger	47,6	41,6	10,9	1951
Fallende gjenstander	40,8	37,1	22,1	2007



Review

Psychological effects of polar expeditions

Lawrence A Palinkas, Peter Suedfeld

Polar expeditions include treks and stays at summer camps or year-round research stations. People on such expeditions generally undergo psychological changes resulting from exposure to long periods of isolation and confinement, and the extreme physical environment. Symptoms include disturbed sleep, impaired cognitive ability, negative affect, and interpersonal tension and conflict. Seasonal occurrence of these symptoms suggests the existence of three overlapping syndromes: the winter-over syndrome, the polar T3 syndrome, and subsyndromal seasonal affective disorder. About 5% of people on expeditions meet DSM-IV or ICD criteria for psychiatric disorders. However, they also experience positive or so-called salutogenic outcomes resulting from successfully coping with stress and enhanced self-sufficiency, improved health, and personal growth. Prevention of pathogenic psychological outcomes is best accomplished by psychological and psychiatric screening procedures to select out unsuitable candidates, and by providing access to psychological support, including telephone counselling. Promotion of salutogenic experiences is best accomplished by screening for suitable personality traits, and training participants in individual coping strategies, group interaction, and team leadership.

The history of polar exploration consists of many tales of heroism, bravery, self-sacrifice, and conquest. It also has many tales of hardship, suffering, illness, and death. Although polar explorations were historically an activity for the purposes of economic gain, national pride, scientific discovery, or individual fame and recognition, they have now become much safer and more common-place than before. Cruise ships laden with tourists are regular visitors to the Antarctic peninsula, Spitzbergen (Norway), and Greenland. Exploration for oil and subsequent development has contributed to an increase in the non-native population of the Arctic regions. Studies of global warming suggest that a year-rou
across the Arctic ocean could become a re
future, which could possibly lead to increa
people travelling these waters for comme
and recreational purposes.[1]

Nevertheless, apart from anecdotal reports of polar madness and cabin fever, little is known about the psychological demands people on polar expeditions face

expected to have specific qualities and characteristics, such as strength and resilience.[5] Nevertheless, equally rare was the polar expedition that did not have at least one member who was debilitated by depression, anxiety, paranoia, alcoholism, or sleep disorders. During Sir Douglas Mawson's second Antarctic expedition (1910–14), that person was Sydney Jeffryes, the radio operator, whom Mawson believed "surely must be going off his base. During the day he sleeps badly, gets up for dinner looking bad, husky; mutters sitting on his bunk in the dark afterward."[6]

Frequently, the entire crew of a polar expedition would

which has fallen over the outer world of icy desolation

Search strategy and selection criteria

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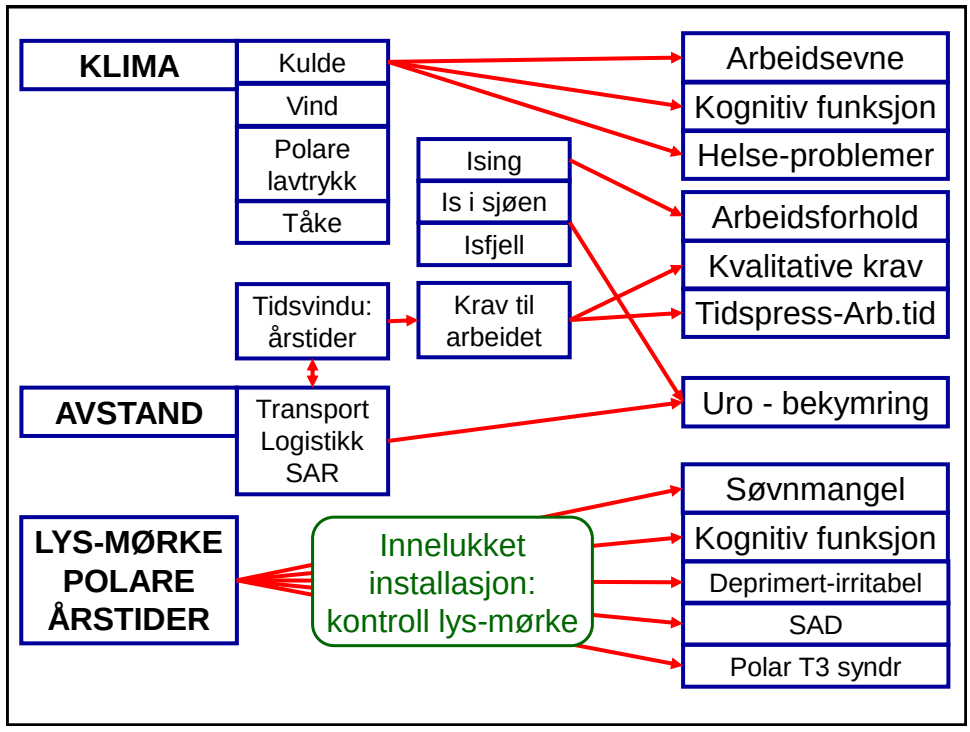
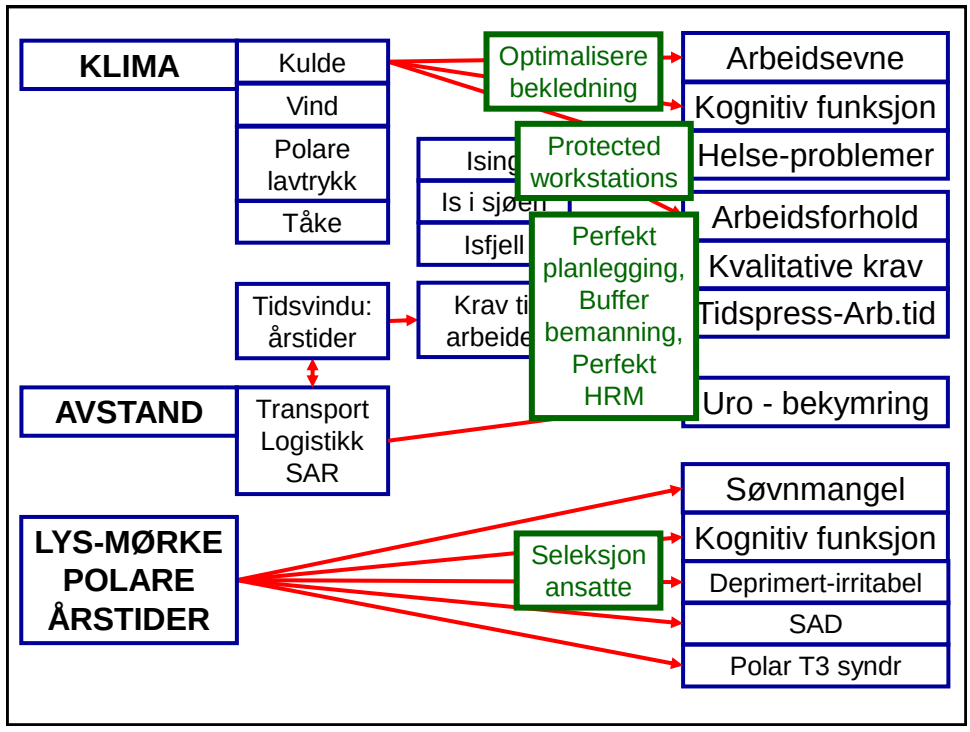
Palinkas & Suedfeld, The Lancet, 2008


KLIMA
Kulde
Vind
Polare lavtrykk
Tåke
Ising
Is i sjøen
Isfjell
Tidsvindu: årstider
Krav til arbeidet
AVSTAND
Transport
Logistikk
SAR
LYS-MØRKE
POLARE
ÅRSTIDER
Innelukket installasjon: kontroll lys-mørke
Arbeidsevne
Kognitiv funksjon
Helse-problemer
Arbeidsforhold
Kvalitative krav
Tidspress-Arb.tid
Uro - bekymring
Søvnmangel
Kognitiv funksjon
Deprimert-irritabel
SAD
Polar T3 syndr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Optimalisere bekledning
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Perfekt planlegging, Buffer bemanning, Perfekt HRM
Seleksjon ansatte
Arbeidsevne
Kognitiv funksjon
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