

Swedish Rehabilitation Week, Lund, May 2023

*"Framtidens rehabilitering –
nytt arbetssätt – vart är vi på väg?"*

The concussed brain – How do we improve treatment, information and rehabilitation?

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The DANISH CONCUSSION CENTER

- national knowledge and resource center

Characteristics:

Expertise across subdisciplines

Gathers and conveys current evidence-based knowledge

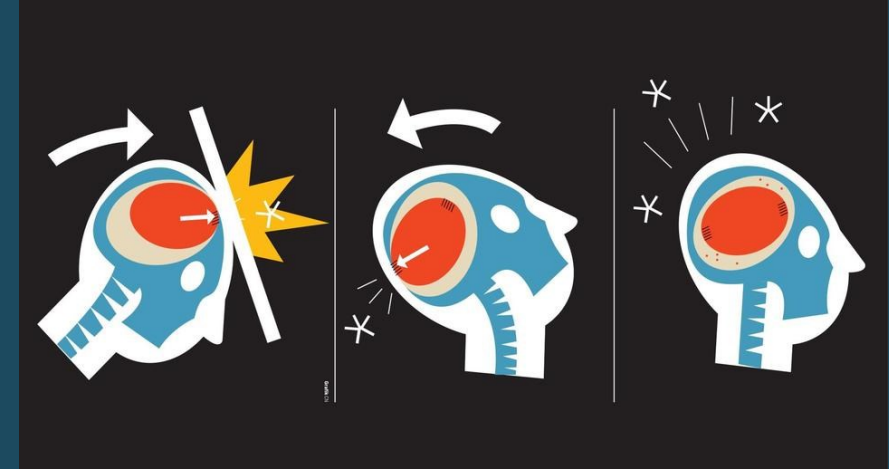
Provides guidance to clinicians and other professionals

Strong network of good collaborators

Contributes to development of the field (research)

WHAT is concussion

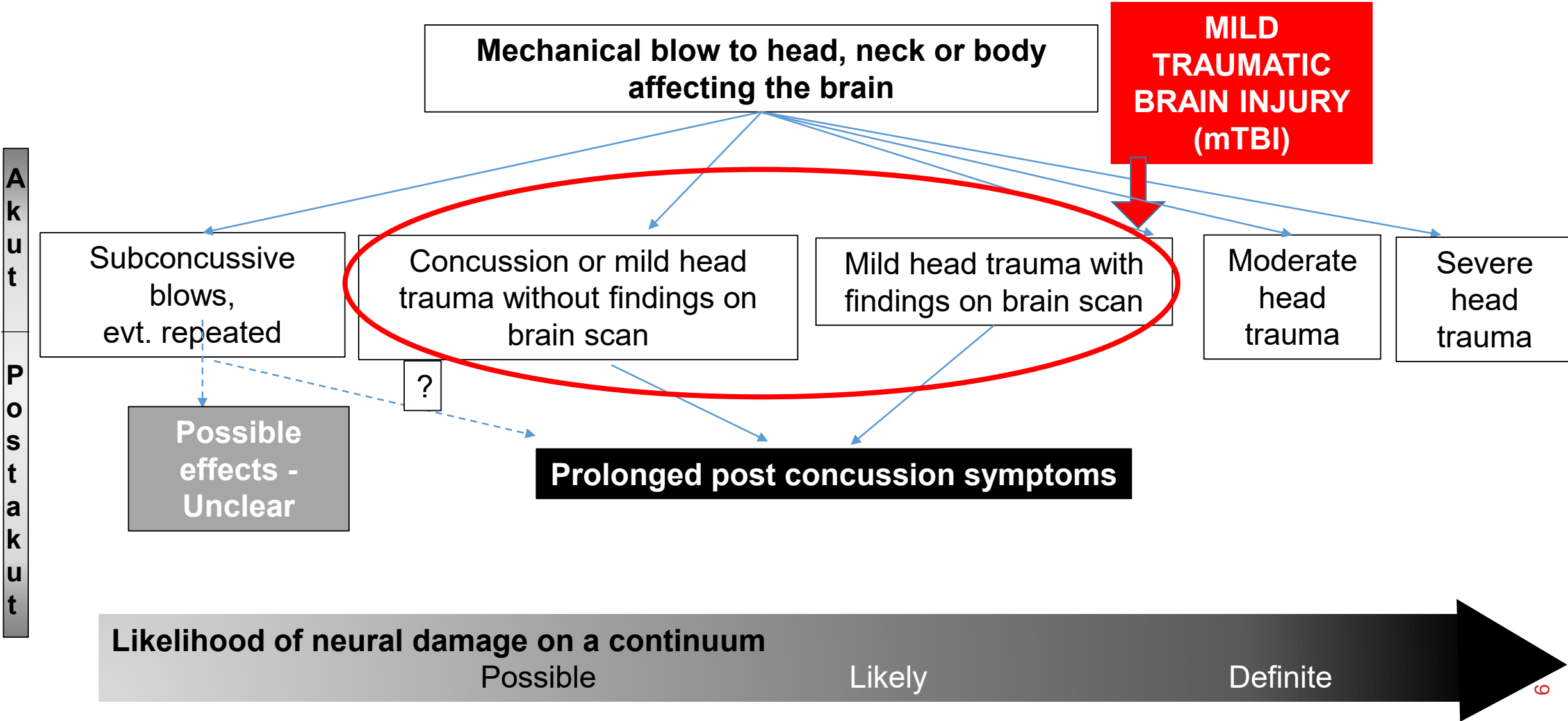
- Acute brain function-affecting event related to blunt impact or other mechanical energy applied to the head, neck or body (with transmitting forces to the brain), such as from sudden acceleration, deceleration or rotational forces



ONF, 2018, ASRM 2020

- Occur in many contexts and via several mechanisms
- Spontaneous recovery expected in 2-3 weeks, in adolescents up to 4 weeks
- Typically no abnormality on standard structural imaging

HEAD TRAUMA SPECTRUM



Global Occurrence of TBI

- Up to 90% of TBI cases are mild (GSC 13-15)
- Scarce evidence to inform treatment
- Need for increased public health interest

Maas et al. 2022

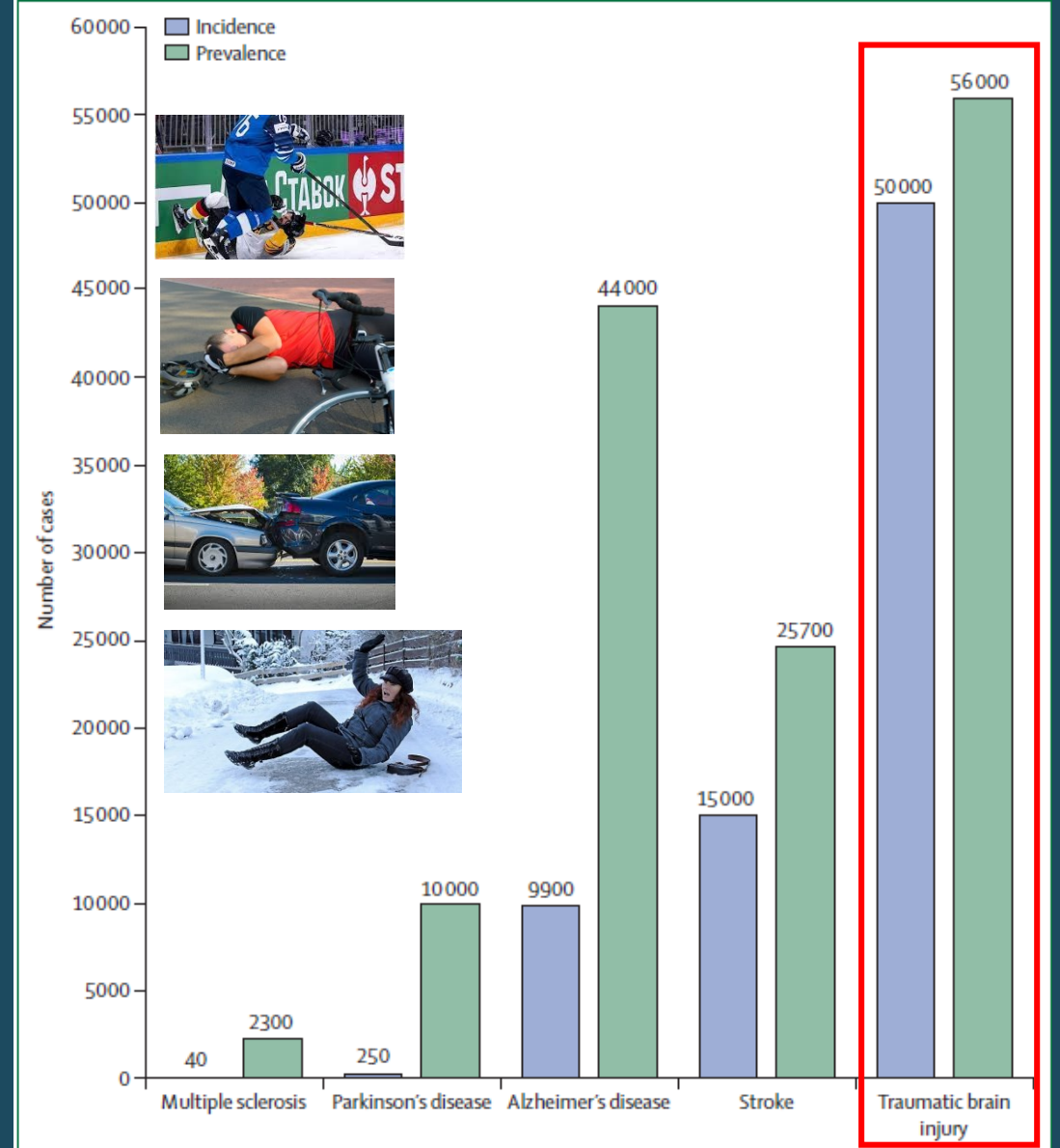
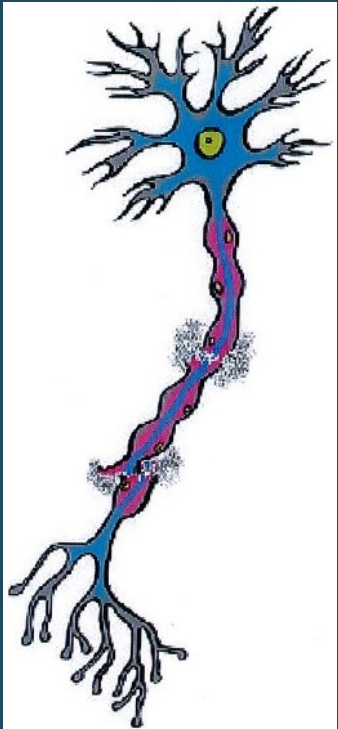


Figure 1: Global incidence and prevalence of traumatic brain injury compared with other common neurological diseases

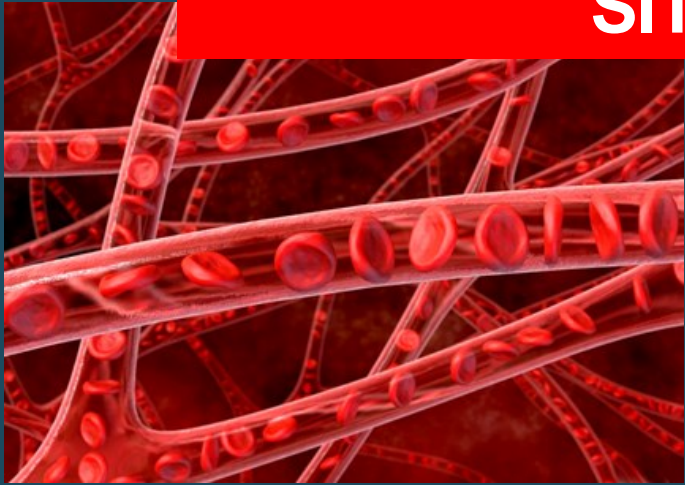
Data are from multiple sources. Incidence is quantified as the number of cases per year, and prevalence as the number of cases at a given time point. The numbers provided are best estimates. However, it should be recognised that data collection and reporting are inconsistent across different parts of the world, and that data reported for the various diseases do not always reflect exactly the same time period. Modified from a draft provided by Carl Long, NeuroTrauma Sciences.

Concussion affects the brain

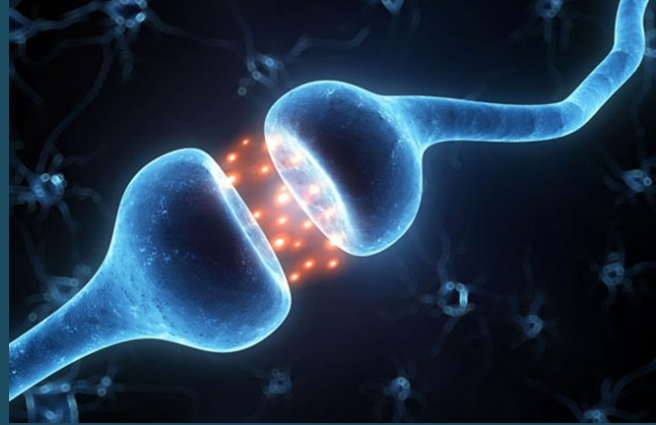
BRAIN IN VULNERABLE SITUATION



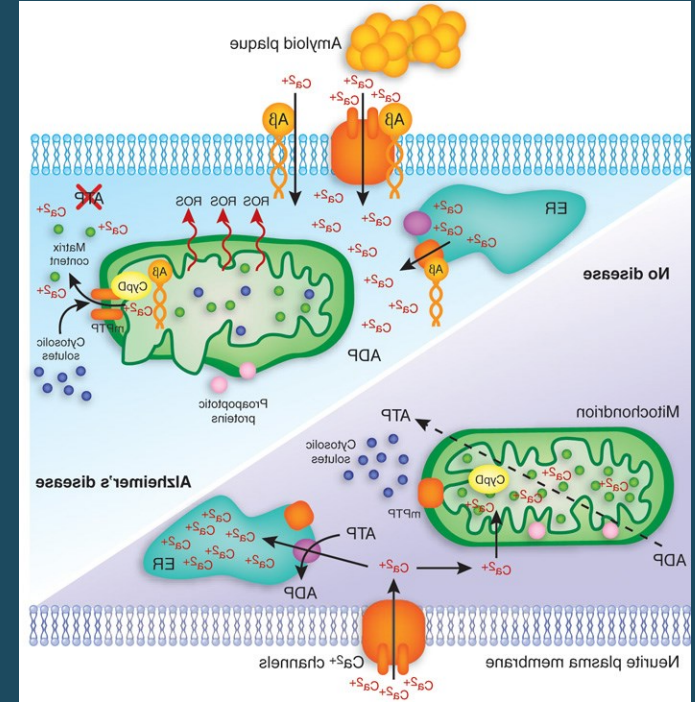
Injured connections



Vascular injury



Neurochemical and hormonal dysregulation



Impaired cell energy metabolism

HOW is concussion diagnosed?

Clinical diagnosis => clinical interview + plausible mechanism of injury + medical records if available

American Congress of Rehabilitation Medicine Diagnostic Criteria for Mild Traumatic Brain Injury (2023)

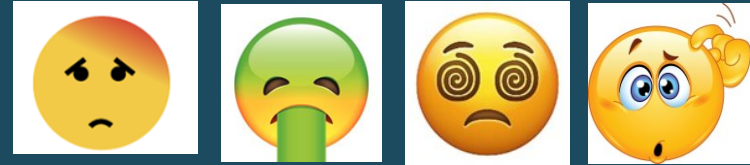
Mild traumatic brain injury (mTBI)

Diagnosed when, following a biomechanically plausible mechanism of injury one or more of the criteria listed below are met.

- 1) One or more clinical signs attributable to brain injury
/
- 2) At least two acute symptoms and at least one associated clinical or laboratory finding attributable to brain injury (within 72 hours).
/
- 3) Neuroimaging evidence of TBI, such as unambiguous trauma-related intracranial abnormalities on computed tomography or structural magnetic resonance imaging

WHAT are the SYMPTOMS of concussion

- Within min to hours - headache, nausea, balance problems, memory loss of the immediate event







- Within days to weeks – concentration difficulties, memory problems, light and noise sensitivity, fatigue, sleep disturbances, mood swings



- Most symptoms are NOT visible

PROLONGED post-concussion symptoms

 THINKING/ REMEMBERING	 PHYSICAL	 EMOTIONAL/ MOOD	 SLEEP DISTURBANCE
<ul style="list-style-type: none"> • Difficulty thinking clearly • Feeling slowed down • Difficulty concentrating • Difficulty remembering new information 	<ul style="list-style-type: none"> • Headache • Nausea or vomiting (early on) • Balance problems • Dizziness • Fuzzy or blurry vision • Feeling tired, having no energy • Sensitivity to noise or light 	<ul style="list-style-type: none"> • Irritability • Sadness • More emotional • Nervousness or anxiety 	<ul style="list-style-type: none"> • Sleeping more than usual • Sleeping less than usual • Trouble falling asleep

1 out of 5 has symptoms longer than 1 month
(Silverberg et al. 2020)

Up to 43% have symptoms 3 months post-injury, up to 34% have symptoms 6 months post-injury

(Cnossen et al. 2018, Voormolen et al. 2019)

If symptoms persist

- Common impairments:
 - reduced work capacity,
 - problems with social function,
 - family disruption,
 - other disabling symptoms

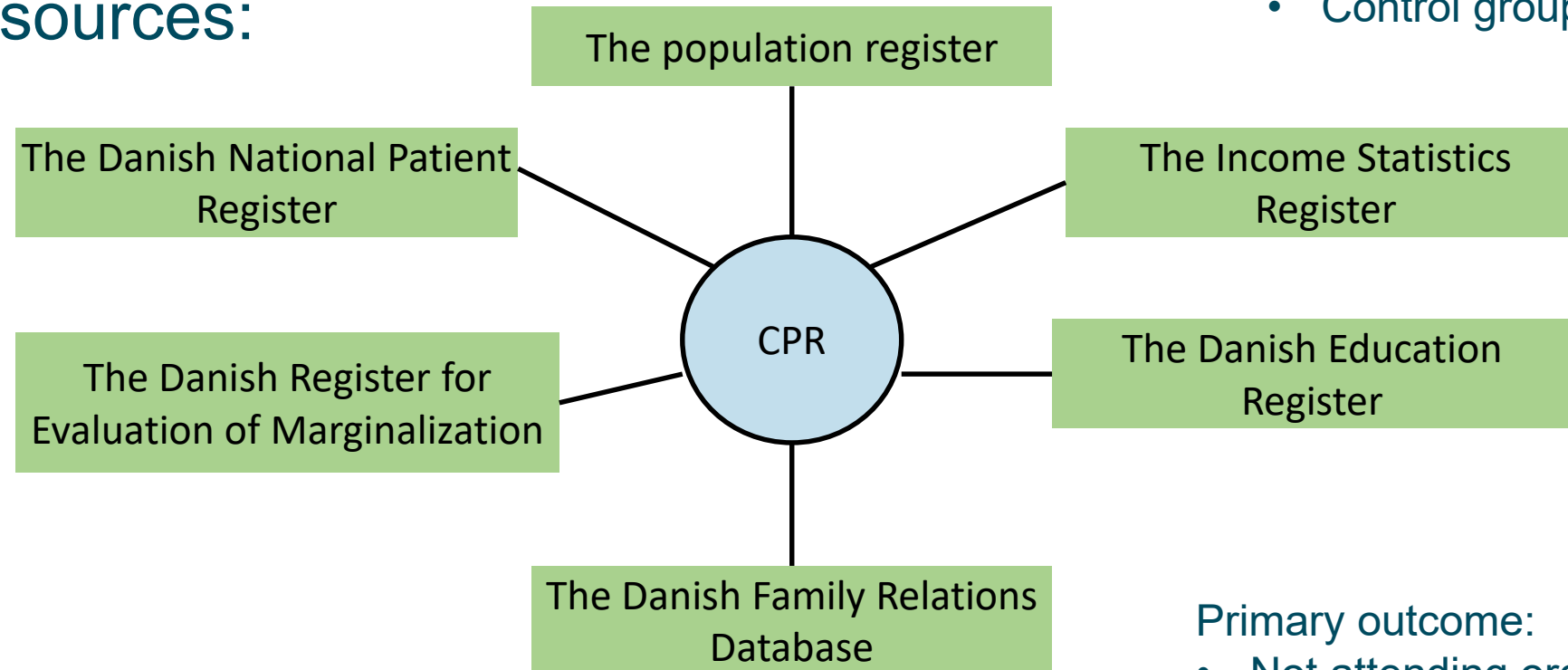
The 'mildness' paradox

TRACK-TBI studies and CENTER-TBI studies: around 50% have functional limitations 6 and 12 months after injury

Long-term impact – insights from register studies

- Working-age adults (N=20000)
- Hospital treated
- 5-year follow-up
- Control group

Data sources:



Primary outcome:

- Not attending ordinary work

Labour market attachment with 5-year follow up

Concussion is associated with greater prevalence and risk of :

- Not attending ordinary work
- Long term sick leave
- Reduced work ability
- Limited attachment to the labour market or even permanent exclusion from the labour market



Groups at long-term risk are:

- Younger adults
- Persons with longer educations
- Persons from ethnic minorities
- Persons with somatic comorbidities



Graff et al. 2019a, Graff et al. 2019b

Academic achievement and career advancement

Concussion is associated with :

- Impaired chances of finishing education or enrolling in an education at 5 years post-trauma
- Childhood concussion before age 18 – impaired changes of achieving highschool education or greater
- Impaired chances of career advancement and employment (labour market attachment and occupation) at 5 years post-trauma

Five-Year Trends in Marital Stability, Academic Achievement, and Socioeconomic Indicators After Concussion: A National Register Study

Heidi Jeannot Graff, MSc; Volkert Siersma, PhD; Anne Møller, PhD; Ingrid Egerod, PhD; Hana Malá Rytter, PhD

Objective: To examine long-term trends in marital stability, academic achievement, income, and socioeconomic status in patients with concussion. **Design and setting:** Danish national register-based cohort study with 5 years of follow-up. **Participants:** A total of 23 549 hospital-admitted or emergency-treated patients between 18 and 60 years of age with concussion (*International Classification of Diseases, Tenth Revision* [ICD-10] diagnosis S06.0) and 22 228 matching controls. **Main measures:** Outcomes were the differences between patients with concussion and controls in the change from injury date to 5 years postinjury in the dichotomized outcomes—marital stability, academic achievement, income, and socioeconomic status. **Results:** Fewer patients had high education (19.43% compared with controls (23.96%) and the adjusted odds ratio (OR) of high education beyond the difference in prevalence at baseline became even lower at 5 years of follow-up (OR: 0.93, 95% confidence interval [CI]: 0.90-0.95). Patients were to a lesser extent gainfully employed (67.05%) compared with controls (77.32%) and had lower odds of being gainfully employed (OR: 0.83, 95% CI: 0.79-0.88), self-employed, leaders, or managers (OR: 0.89, 95% CI: 0.84-0.95) at 5 years postinjury, beyond differences at baseline. **Conclusions:** Academic achievement and socioeconomic status are affected by concussion. There is no evidence that marital stability and income are affected. Supporting interventions should be considered those at risk of persistent symptoms. **Key words:** academic achievement, concussion, employment, marital stability, mild traumatic brain injury, socioeconomic status

Rytter et al. (submitted), Graff et al. 2020

Prolonged symptoms are treatable

Evidence base is small, but exists – varies for the specific areas of treatment

<https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2785878>

JAMA
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Original Investigation | Neurology

Nonpharmacological Treatment of Persistent Postconcussion Symptoms in Adults A Systematic Review and Meta-analysis and Guideline Recommendation

Hana Malá Rytter, PhD; Heidi J. Graff, PhD; Henriette K. Henriksen, PT; Nicolai Aaen, MSc; Jan Hartvigsen, PhD; Morten Hoegh, PhD; Ivan Nisted, MSc; Erhard Trillingsgaard Næss-Schmidt, PhD; Lisbeth Lund Pedersen, MSc, PT; Henrik Winther Schyzt, MD, PhD, DMSc; Mille Møller Thastum, MSc, PhD; Bente Zerlang, OT; Henriette Edemann Callesen, PhD

Abstract

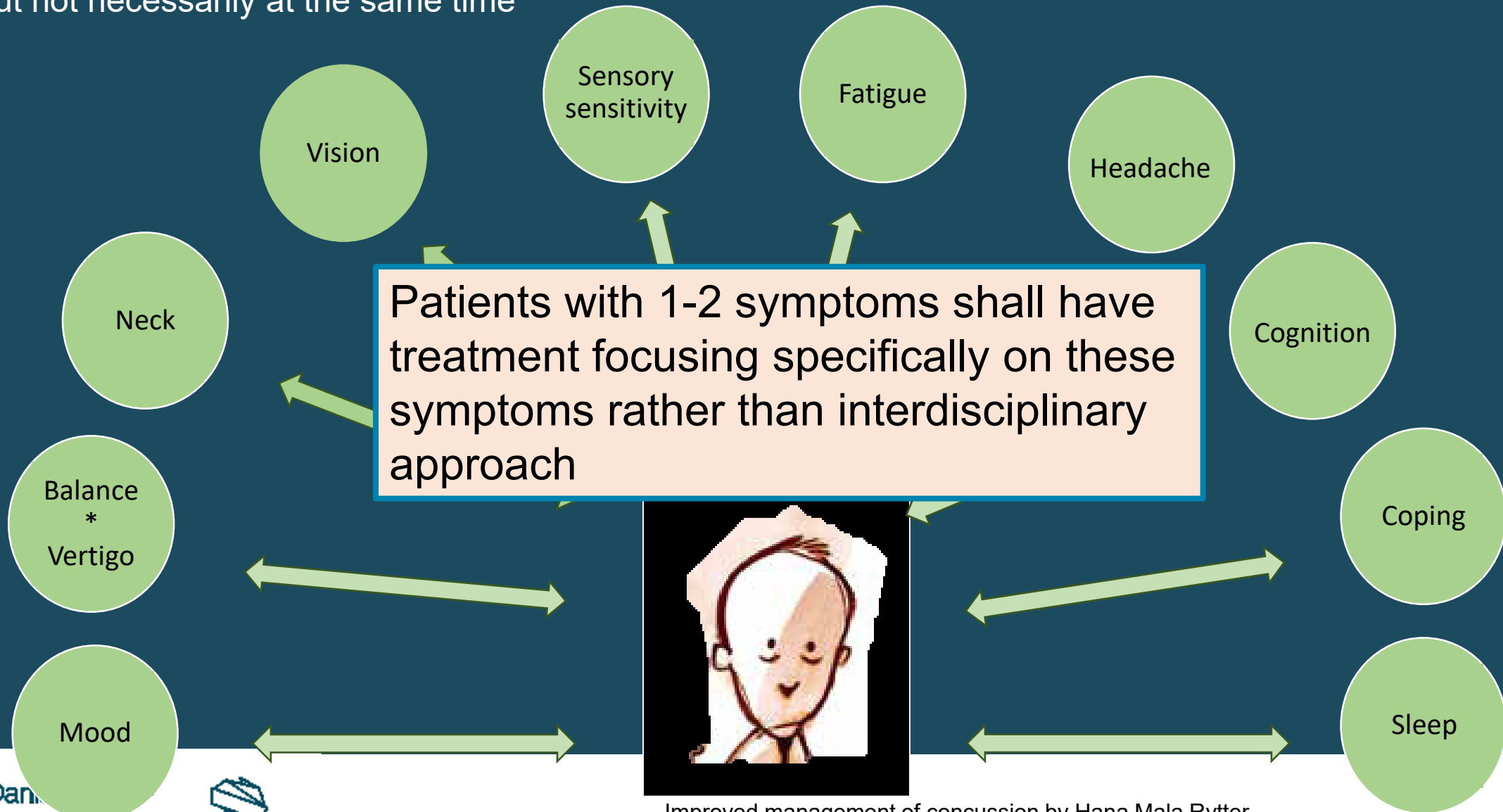
IMPORTANCE Persistent (>4 weeks) postconcussion symptoms (PPCS) are challenging for both patients and clinicians. There is uncertainty about the effect of commonly applied nonpharmacological treatments for the management of PPCS.

Key Points

Question What is the evidence for nonpharmacological interventions to treat persistent postconcussion symptoms?

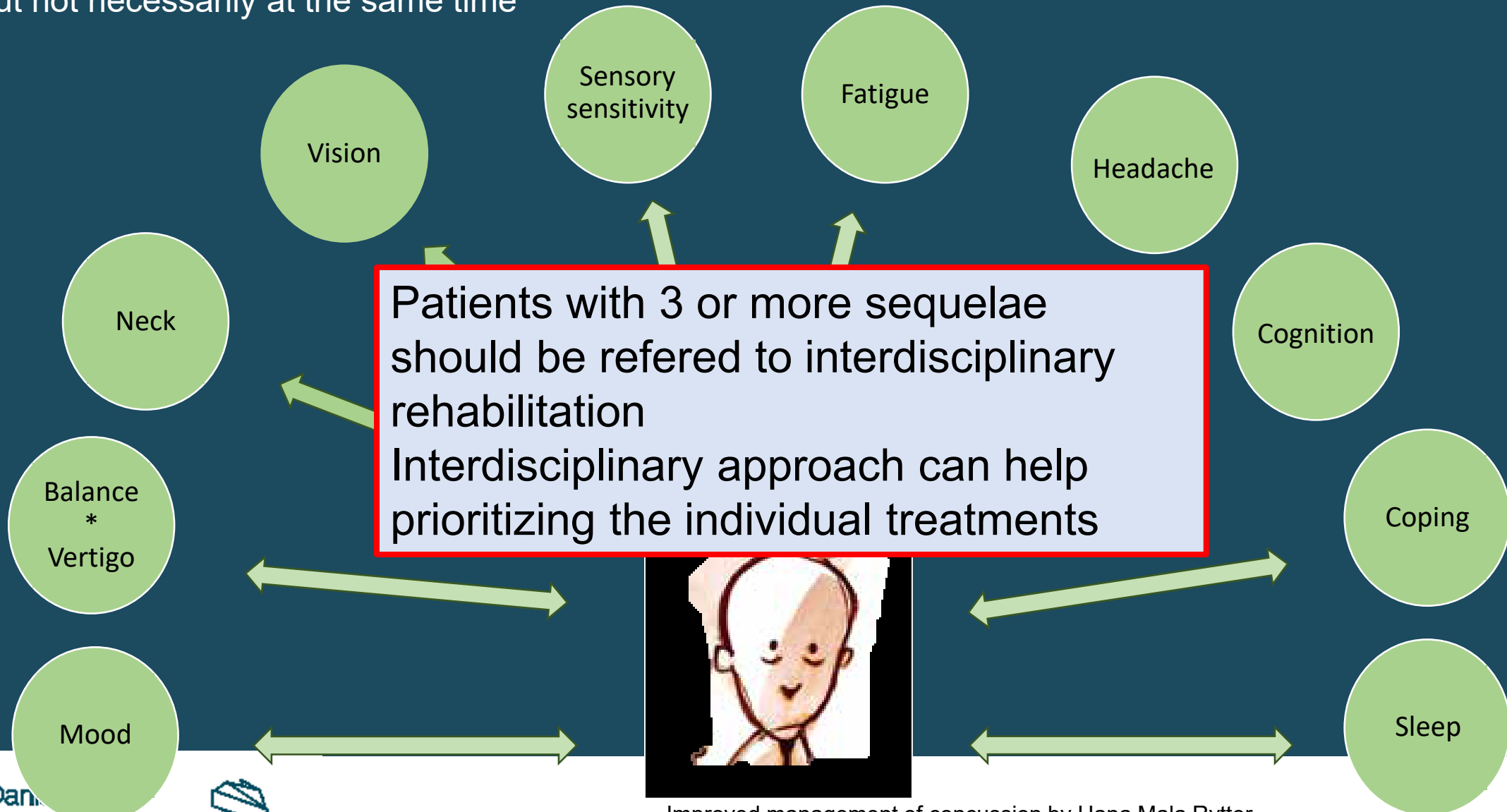
Treat what you can treat

- But not necessarily at the same time



Treat what you can treat

- But not necessarily at the same time



If symptoms persist > 1 month

- Closer assessment of
 - Headache
 - Dizziness/Vertigo
 - Sleep disturbances
 - Vision problems
 - Fatigue
- Furthermore:
 - Screening for anxiety and depression
 - If cognitive symptoms that limit daily life activities, consider neuropsychological assessment and guidances regarding treatment and adjustments

**FIGURE OUT EARLY
what is to be treated**

Silverberg et al. 2020

If symptoms persist > 6 weeks

- If the early strategies do not have an effect
 - Refer to a specialist within a specific discipline regarding further assessment
 - Refer to interdisciplinary rehabilitation
- Pay particular attention to
 - 1) Patients with high symptom burden
 - 2) Patients with known risk factors for prolonged recovery
 - 3) Patients who are not able to resume their daily roles and functioning
 - 4) Patients who are to perform at high level (e.g. students at exams, prof. athletes, managers at deadlines...)
 - 5) Patients with limited access to care (e.g. due to long waiting lists)

Silverberg et al. 2020

Concussion and rehabilitation

Psyke og Logos, 2021

Psyke & Logos, 2021, 42, 84-106

HJERNERYSTELSE OG REHABILITERING AF LANGVARIGE SYMPTOMER EFTER HJERNERYSTELSE

Af Hana Malá Rytter¹

Hjernerystelse udgør op til 90 % af alle hovedtraumer. Størstedelen af personer med hjernerystelse oplever spontan bedring i løbet af de første to-tre uger; men en betydelig andel oplever langvarige fysiske, kognitive og følelsesmæssige symptomer. Ca. 35 % har fortsat symptomer tre-seks måneder efter traumat, og hos 5-20 % varer symptomerne mere end et år. Symptomerne bevirker; at man har svært ved at fungere i hverdagen, og er forbundet med store personlige og arbejdsmæssige konsekvenser. Adskillige perimorbide, præ- og postmorbide faktorer har betydning for prognosen. Forskning i behandling af langvarige symptomer er fortsat i sin spæde begyndelse med få studier i stærkt design. Men der ses lovende resultater. Indsatser rettet mod psykologiske faktorer kan reducere den samlede symptombyrde, forbedre emotionelle symptomer og have positiv indvirkning på livskvalitet. Behandling bygger på principper af individuel tilpasset, tværfaglig rehabilitering, som forankres i biopsykosocial forståelse af lidelsen, da bedringsprocessen afspejler et komplekst samspil mellem disse faktorer. Og der er behov for en langt mere aktiv tilgang til personer; der er i risiko for et langvarigt forløb.

BIO-PSYCHO-SOCIAL INTERACTION

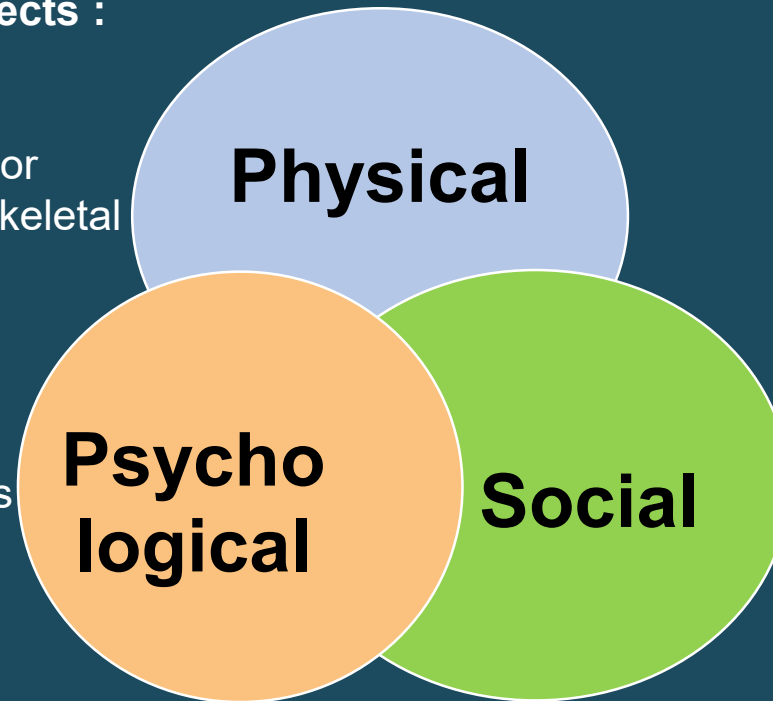
- influencing factors

Physical effects :

- Neural
- Cervical
- Oculomotor
- Musculoskeletal

Reaction to the concussive event and subsequent problems :

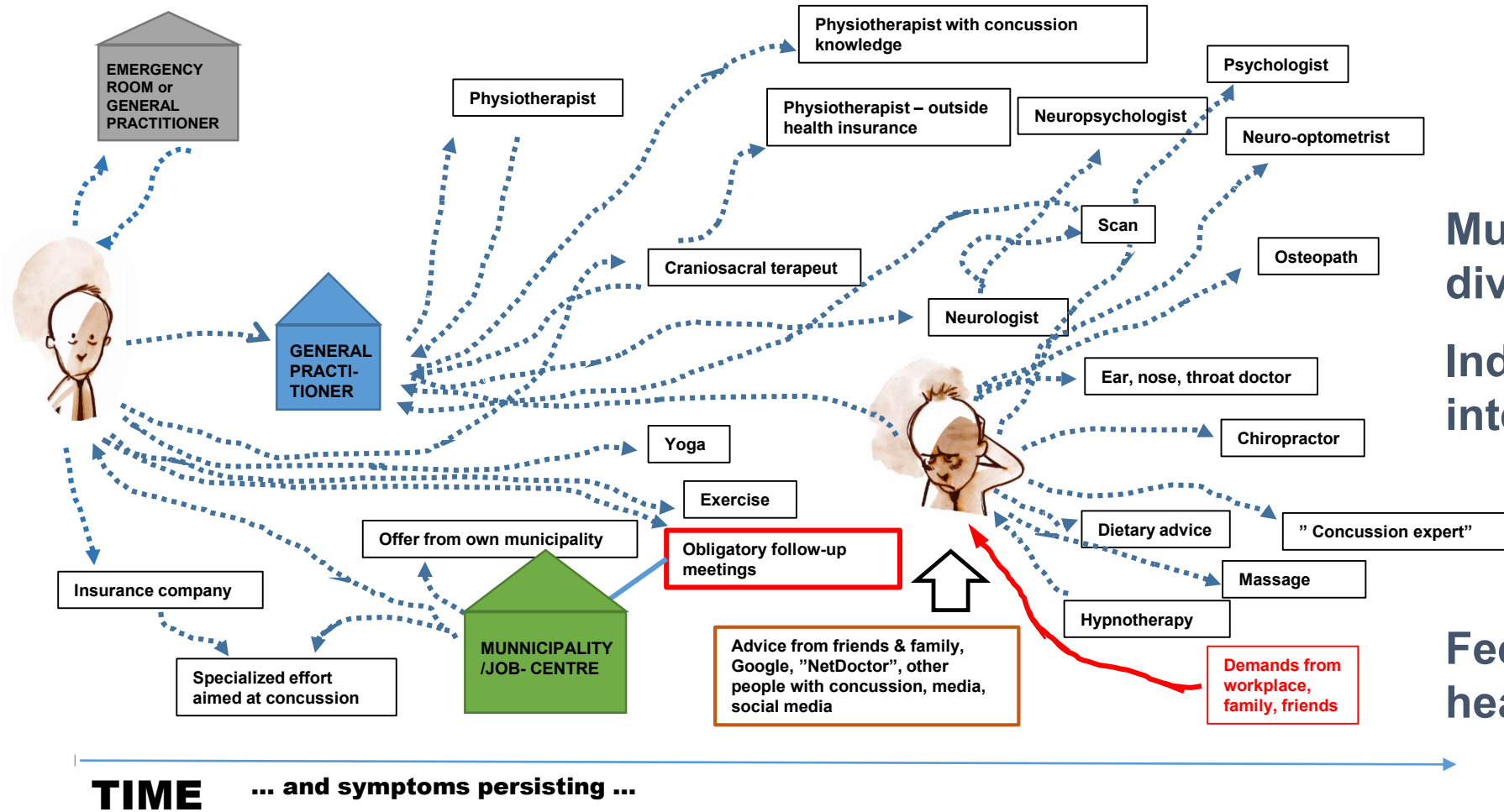
- Coping and problem solving strategies
- Activity levels
- Personality
- Identity
- Stress



Life circumstances :

- Family (demands, tasks, support)
- Social network (understanding, help, isolation)
- Work situation (work related pressure, unemployment)
- Privat economy and housing situation
- Invisible impairments (lack of understanding, suspicion)

The challenges of a concussed person with persisting symptoms

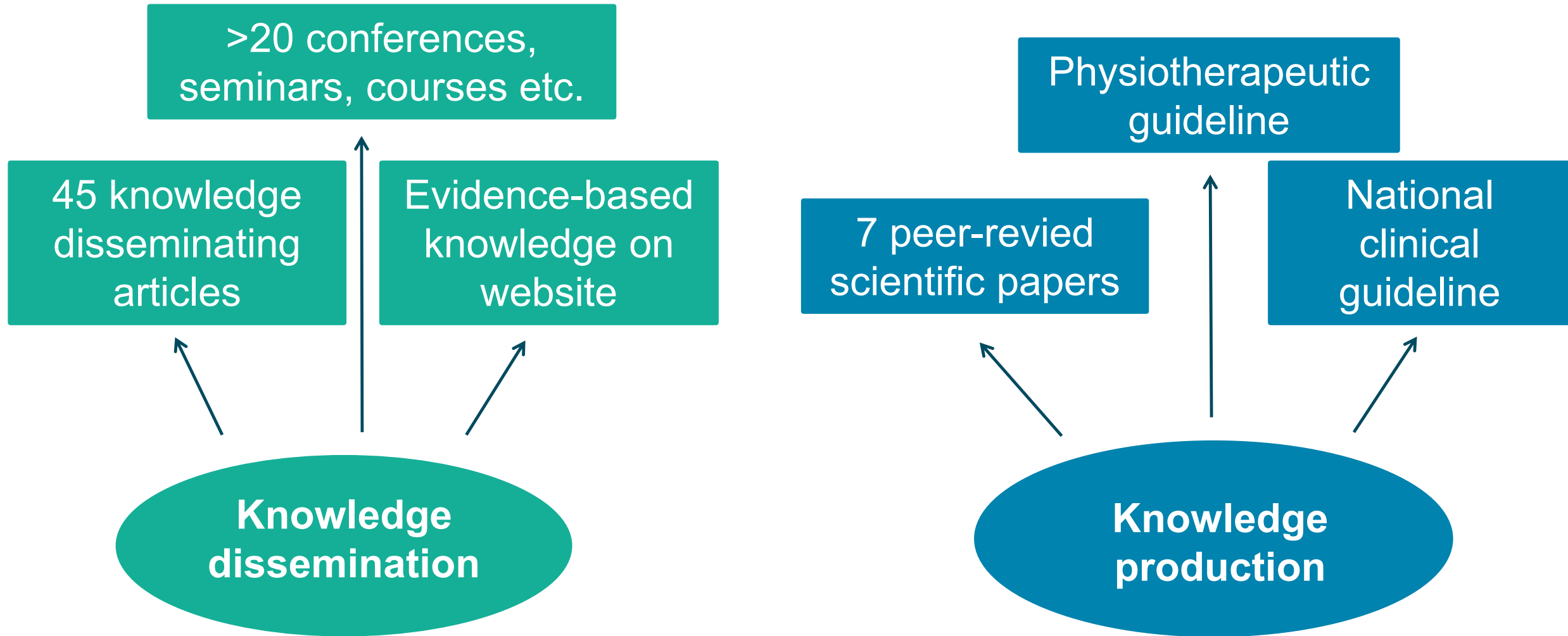


Multiple and diverse treatments

Individual or interdisciplinary

Feeling lost in health care system

The Danish Concussion Center has gathered, produced and communicated knowledge in 4 yrs



Future work of the Danish Concussion Center

- Continuous effort to support knowledge dissemination in the field (counterbalance Dr. Google)
- More uniform information to patients/clients
- Easier access to evidence-based information
- Foster interdisciplinary dialogue
- Improve early management
- Improve knowledge on management of long-term sequelae (incl. rehabilitation)

Thank you for your attention

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