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ARRS

SLOVENIAN RESEARCH AGENCY

THE ROLE OF THE BRAIN IN MENTAL AND PHYSICAL FATIGUE.

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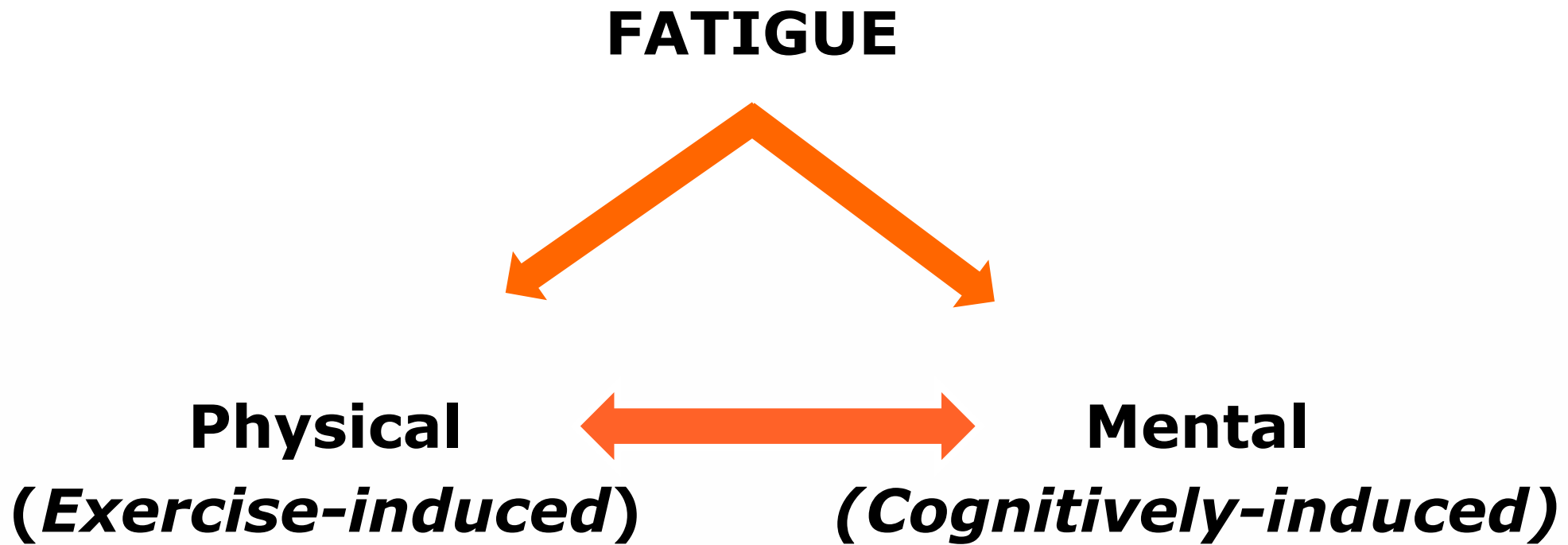


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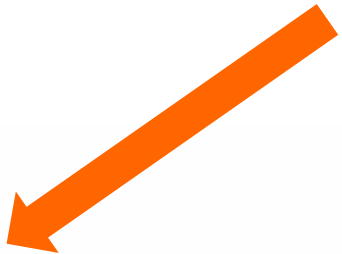
THE ROLE OF THE BRAIN IN MENTAL AND PHYSICAL FATIGUE



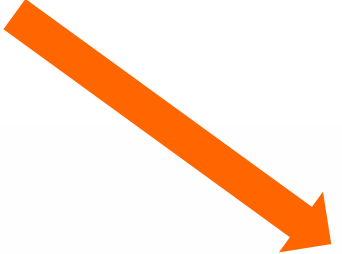
PHYSICAL – EXERCISE-INDUCED FATIGUE



Exercise-induced fatigue



Peripheral



Central



Central fatigue hypothesis

Pharmacological/nutritional manipulations of brain neurotransmitter concentrations :

-Agonists

-Antagonists

-Re-uptake inhibition

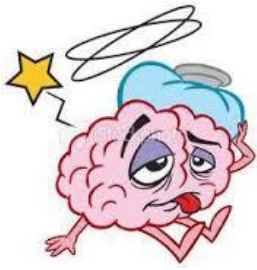
Serotonine, dopamine and noradrenaline



MENTAL – COGNITIVELY-INDUCED FATIGUE

Mental fatigue (MF) is a psychobiological state that arises during prolonged demanding cognitive activity and results in an acute feeling of tiredness and/or a decreased physical and/or cognitive ability (Habay et al 2021).

POTENTIAL MANIFESTATIONS OF MF



Mental fatigue

Subjectively

- Feelings of tiredness / fatigue ↑
- Vigor ↓
- Alertness ↓

Behaviorally

- Reaction time ↑
- Accuracy ↓

(Neuro)physiologically

- Heart rate ↑
- θ - and α -activity ↑
- ERP components \neq

The Effects of Mental Fatigue on Physical Performance

by Van Cutsem · Marcora · De Pauw · Bailey · Meeusen · Roelands, Sports Medicine 2017

Mental fatigue is a psychobiological state caused by prolonged periods of demanding cognitive activity

Negative effect on endurance performance

This decline is associated with a higher than normal perceived exertion

No effect on the physiological variables traditionally associated with endurance performance (HR, blood lactate, etc.)

VS

No effect on maximal strength, power & anaerobic work

- 1 The high cognitive demands of sport are most probably mentally fatiguing when prolonged over time
- 2 This opens new opportunities to improve endurance performance by minimizing as much as possible the cognitive load during competitions
- 3 ... and/or by increasing resistance to the negative effects of mental fatigue on perception of effort and endurance performance

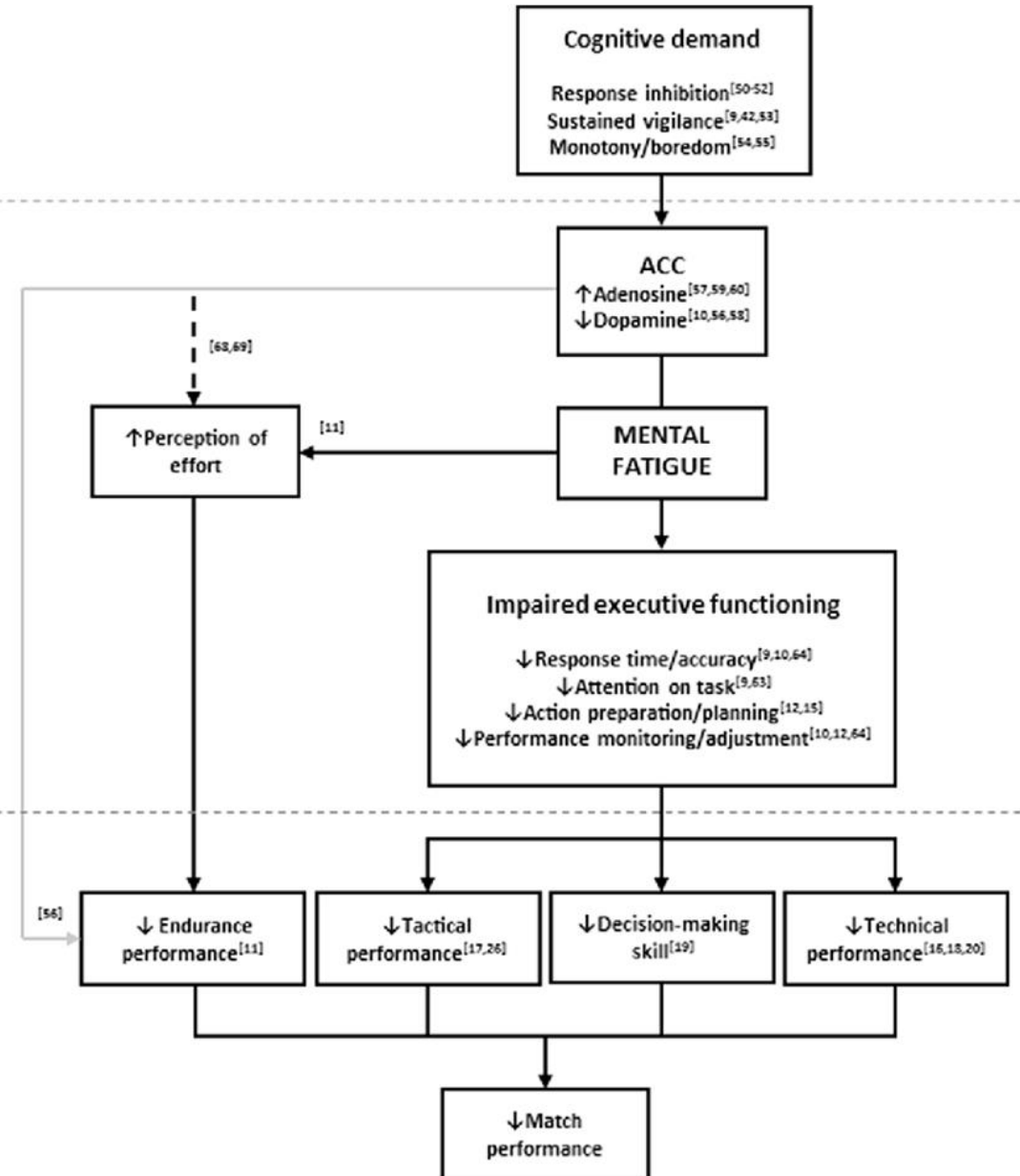
Designed by @YLMSportScience



STIMULUS

MECHANISM

OUTCOME





RESEARCH GOALS

Improve our understanding of the fundamental mechanism of physical and mental fatigue

Determine the role of brain neurotransmission in the onset of fatigue, identify the brain areas involved.

Determine how brain activity and neuromuscular efficiency change during the onset of fatigue.

THE TEAM



THE PAST

How it started

=> 2013: PhD student Uros Marusic comes to our research group for an internship

2014 and following: We meet at conferences, we work together on data and papers

2019: First unsuccessful submission of an FWO proposal on physical and mental fatigue by Bart and Kevin

2019: Together with Uros we make further plans to intensify our collaboration

2020: Second unsuccessful submission by Bart and Kevin

2021: Met Uros and discussed different research ideas, started talking about the 'fresh' rejection, identified the WEAVE program => started re-working our application

2021: Quite a lot of online and in-person meetings

THE PRESENT

END 2021: Successful FWO Weave project application

NOW: carry out the project, guide 2 PhD students; disseminate findings

=> We set up an active structure that ensures frequent meetings (online + in person), PhD students perform longer research stays between our institutions

-Recently submitted a European project: Horizon Europe: 2022: ERA Talents for boosting and balancing brain circulation (TBrainBoost)

-TwinBrain summer schools on neuroscience (Slovenia)

THE FUTURE

- Looking into potential FWO follow-up projects
- Developing valorization strategies for the outcomes, mainly focused on EEG during movement
- European grant applications with additional partners – network events / conferences are great for this!
- Further student and staff exchanges between our institutes (and other Slovenian institutes within the network; cfr Eutopia)

PERSONAL TAKE-AWAYS FROM THIS PROCESS/WEAVE PROGRAM

Informal and formal **communication**

Co-creation

Clear **integration of partners**, show added value

The **WEAVE program** provided us a platform to apply for funding => opportunity!

It is a **catalyst** for further collaborations on different levels (labs, institutes, larger networks)

This is not only the case for a successful project proposal!

Very good personal relationships, beers and science, friends => make collaboration something natural

