COGNITIVE IMPAIRMENT, FATIGUE AND EXERCISE

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FATIGUE MANAGEMENT AND EXERCISE WITH A NEUROLOGICAL DISORDER

- How do we assess fatigue?
- What is the etiology of fatigue in a neurological disorder?
- What is the effect of fatigue on the different parameters of functional Abilities?
- What is The difference between peripheral and central fatigue?

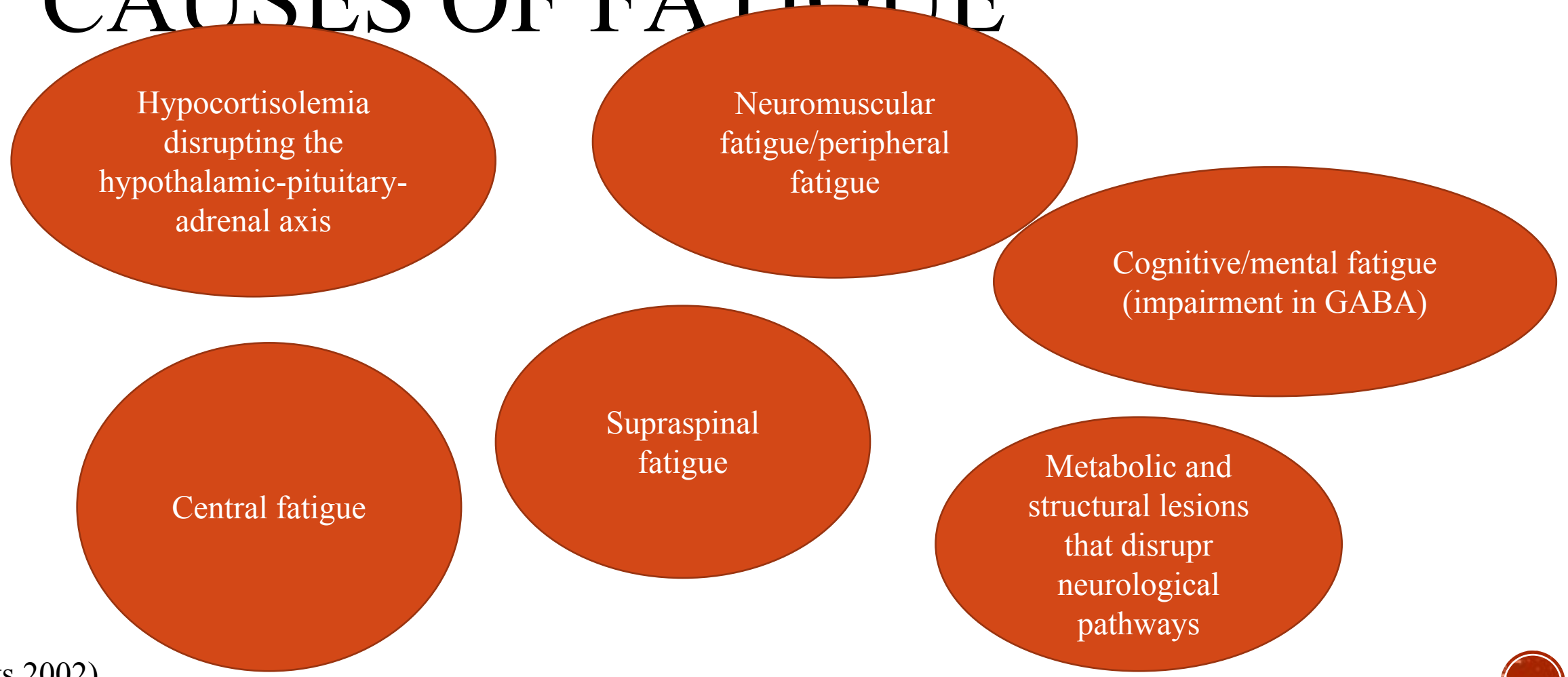
SOME FACTS ABOUT NEUROLOGICAL FATIGUE

- 50% of individuals with Parkinson's disease expeiriance fatigue (Siciliano, 2018)
- Overwhelming sense of tiredness, lack of energy or feeling exhaustion, difficulty initiating or sustaining voluntary effort, lack of mental energy, lack of motivation. (Mills, 2008)

Table 3 Prevalence of grouped themes (constituent themes are given in brackets)

	Theme	Description	Prevalence % (n = 635)
Grouped themes	N1	Cognitive features (6|8|26|28)	87.6
	N2	Motor features (1|2|3|25|29)	96.8
	N3	Abnormal sleep (42|43|44)	86.5
	N4	Rester (17|36|37|38)	93.7
	N5	Heat sensitivity (28|29|30|31)	85

NEUROPHYSIOLOGICAL CAUSES OF FATIGUE



(Zwarts,2002)
(ortelli, 2021)

TESTING FATIGUE

Tiredness/Fatigue Scale	
10	Can barely sit up. Needs assistance getting out of bed.
9	Able to sit up for a short time and can walk short distances (with difficulty), e.g. to get a drink or go to the toilet. Can't eat.
8	Able to sit up for a while and walk around the house if absolutely necessary. Unable to eat most food. Holding a conversation is difficult.
7	Doesn't need to lie down and can walk around the house, but can't stand for more than a few minutes without resting. Finding it hard to eat some foods. Can't focus on anything easily.
6	Too tired to go out, but still able to move around the house and do activities that require little energy and focus. Preparing a meal is difficult. Can't work or study.
5	Mostly unable to work or study (except low effort tasks that can be done from home) can go out (for example to buy food) but only if essential.
4	Possibly able to do some work or studying, depending on how much effort it takes. May choose to work or study from home. Avoiding activities that take a lot of energy.
3	Tiredness makes it hard to enjoy activities that are usually fun, but still able to work or study (with some difficulty).
2	Finding everything more effort than usual, but still able to carry on.
1	Slightly tired, but still able to carry on as normal with little to no difficulty.
0	Not tired at all.

Surface EMG of the muscles

Magnetic stimulation of the motor cortex

Correlation between fatigue and sleeping hours during day time

Fatigue Severity Scale

Fatigue Severity Scale Questionnaire

Instructions: Circle the number that best represents your response to each question.
Scoring range: 1=strongly disagree with the statement to 7=strongly agree with the statement.

During the past week, I have found that:	Score						
1. My motivation is lower when I am fatigued.	1	2	3	4	5	6	7
2. Exercise brings on my fatigue.	1	2	3	4	5	6	7
3. I am easily fatigued.	1	2	3	4	5	6	7
4. Fatigue interferes with my physical functioning.	1	2	3	4	5	6	7
5. Fatigue causes frequent problems for me.	1	2	3	4	5	6	7
6. My fatigue prevents sustained physical functioning.	1	2	3	4	5	6	7
7. Fatigue interferes with carrying out certain duties and responsibilities.	1	2	3	4	5	6	7
8. Fatigue is among my three most disabling symptoms.	1	2	3	4	5	6	7
9. Fatigue interferes with my work, family, or social life.	1	2	3	4	5	6	7

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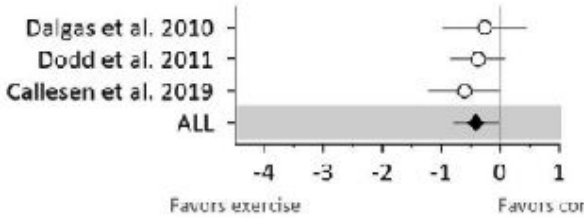
REVIEW ARTICLE (META-ANALYSIS)

Is Aerobic or Resistance Training the Most Effective Exercise Modality for Improving Lower Extremity Physical Function and Perceived Fatigue in People With Multiple Sclerosis? A Systematic Review and Meta-analysis

Laurits Taul-Madsen, MSc,[a] Luke Connolly, PhD,[b] Rachel Dennett, BSc,[b] Jenny Freeman, PhD,[b] Ulrik Dalgas, PhD,[a] Lars G. Hvid, PhD[a]

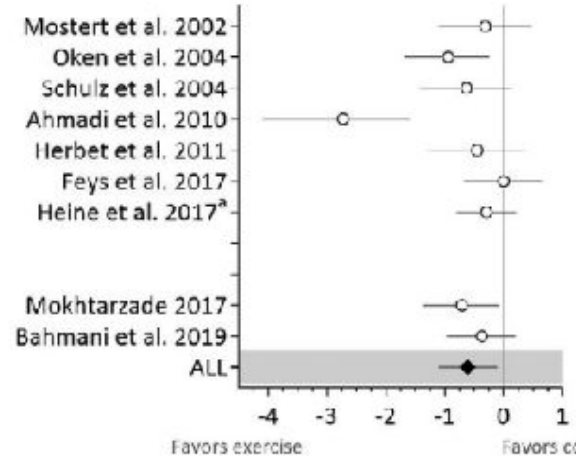
RT - Fatigue



	Exercise (RT)					Control						
	n	$Mean_{Pre}$	SD_{Pre}	$Mean_{Post}$	SD_{Post}	n	$Mean_{Pre}$	SD_{Pre}	$Mean_{Post}$	SD_{Post}	Weight	SMD (random), 95% CI
Dalgas et al. 2010	15	5.8	0.7	5.2	1.6	16	5.5	1.0	5.6	1.4	22.1%	-0.26 [-0.99; 0.45]
Dodd et al. 2011	36	41.9	14.0	31.7	11.3	35	40.0	15.8	37.0	16.9	48.8%	-0.37 [-0.84; 0.10]
Callesen et al. 2019	17	43.9	15.8	29.5	14.0	18	41.9	15.3	38.6	15.7	29.0%	0.60 [1.23; 0.01]
ALL	68					69					100.0%	-0.41 [-0.80; -0.02]

Overall effect: p = 0.000. Heterogeneity: I^2 = 0%.

AT - Fatigue



	Exercise (AT)					Control						
	n	$Mean_{Pre}$	SD_{Pre}	$Mean_{Post}$	SD_{Post}	n	$Mean_{Pre}$	SD_{Pre}	$Mean_{Post}$	SD_{Post}	Weight	SMD (random), 95% CI
Mostert et al. 2002	13	5.10	1.80	4.40	1.90	13	5.20	1.60	5.00	1.90	10.5%	-0.31 [-1.10; 0.47]
Oken et al. 2004	15	13.2	4.0	12.1	2.8	20	15.1	3.4	14.9	3.0	11.3%	-0.94 [-1.68; -0.24]
Schulz et al. 2004	15	23.0	15.4	21.1	15.0	13	37.0	15.7	30.3	13.3	10.6%	-0.63 [-1.42; 0.13]
Ahmadi et al. 2010	11	3.38	1.73	1.79	0.65	10	4.17	1.28	4.23	1.04	6.3%	-2.73 [-4.09; -1.60]
Herbet et al. 2011	13	51.0	8.6	44.3	16.4	12	55.9	11.6	52.1	17.1	10.2%	-0.45 [1.28; 0.35]
Feys et al. 2017	18	32.9	9.4	27.1	11.4	17	32.9	9.4	27.1	11.4	11.9%	0.00 [-0.67; 0.67]
Heine et al. 2017[a]	*33*	*5.2*	*1.0*	*5.1*	*0.9*	*30*	*5.3*	*0.9*	*5.2*	*1.0*	*14.3%*	-0.29 [-0.80; 0.21]
		40.8	*12.1*	*38.6*	*12.0*		*41.5*	*12.3*	*41.5*	*11.9*		
		42.6	*8.0*	*37.3*	*9.5*		*42.4*	*8.5*	*42.2*	*8.8*		
Mokhtarzade 2017	22	3.45	0.87	2.67	1.28	18	3.51	1.11	3.56	1.16	12.1%	-0.71 [-1.38; -0.07]
Bahmani et al. 2019	26	39.1	12.6	39.3	17.2	21	42.7	13.3	45.1	11.8	13.0%	-0.37 [-0.97; 0.20]
ALL	166					154					100.0%	-0.61 [-1.10; -0.11]

Overall effect: p = 0.005. Heterogeneity: I^2 = 58%.

TYPES OF COGNITIVE IMPAIRMENT AFFECTING PHYSICAL PERFORMANCE

NEUROPHYSIOLOGICAL EFFECTS OF EXERCISE ON COGNITIVE IMPAIRMENTS

TYPES OF COGNITIVE TRAINING

BOTH AEROBIC EXERCISE AND COGNITIVE –BEHAVIORAL THERAPY REDUCE CHRONIC FATIGUE IN FSHD: AN RCT (BLEIJENBERG 2014)

Exercise mode/N	Duration	Frequency	Intensity	Improved outcome
Cycling N = 20 Cognitive-behavioral therapy N = 13 Usual care N = 24 (19)	16 weeks	3 days/week (2 days at home and 1 day supervised) 38 min/session, including a 5 min warm up 30 min exercise 3 min cool down Cognitive-behavioral therapy comprised of 6 modules: Dysfunctional cognitions regarding fatigue, activity, pain, or other symptoms; fatigue catastrophizing (a cognitive process that involves negative outcome expectations from fatigue); dysregulation of sleep or activity; poor social support; and negative social interactions. Both aerobic exercise therapy and cognitive behavioral therapy were found to be superior to usual care in reducing fatigue	50-65% HRmax 12-14 RPE (Borg Scale)	Fatigue