

# Psychiatric Conditions and Fitness to Dive

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## Chart a Course...

- 1) Mental Health and Diver Performance
- 2) People are diving with mental health conditions
- 3) Positive effect of diving on mental health? – some evidence
- 4) Concerns about mental health and diving
  - 1) Increasing risk of diving-related injury
  - 2) Cognitive Performance inhibition
  - 3) Medications
- 5) Case Examples

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# Diver Performance

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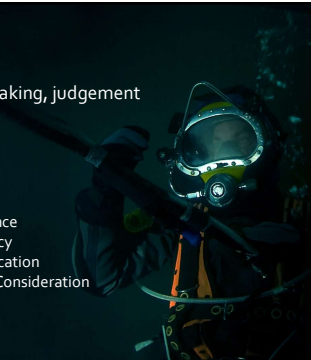
## Diver Performance

- 1) Physical Skill → heavy equipment, don/doff, lift out of water
  - Working in Water → tractionless/weightless
  - Swimming/current
- 2) Operational Skill → Occupational Tasks
- 3) Cognitive Skill → knowledge: physics & physiology, marine environment, work
  - Situational Awareness → monitoring
  - Planning and Adaptation

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## Diver Performance

- 3) Cognitive Skill (cont'd) → decision-making, judgement
  - Crisis handling
- 4) Teamwork Skill → Reliability
  - Competence
  - Consistency
  - Communication
  - Care and Consideration
- Rescue



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## Diver Performance

- Mental Fitness
  - Neurological
  - Cognitive
  - Psychiatric
- Physical Fitness
  - Cardiovascular
  - Musculoskeletal
  - Neurological
- Fitness in one of these affects the others...



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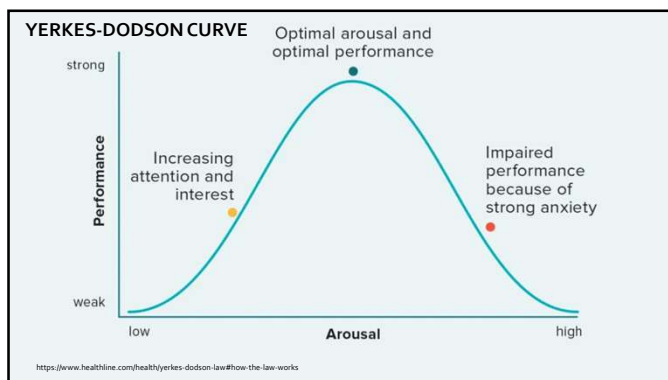
"...one of the most important preventative measures that can be used to manage stress and panic during a dive is improved physical conditioning." – Kovacs, CR, p. 190

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## Disorder = Dysfunction

- Everybody experiences some degree of anxiety or depressed mood at some point in their lives
- Majority of divers report a degree of anxiety before or during a dive at some point in their diving career
- A diagnosis of an anxiety or depressive *disorder* is given when the degree and duration of the symptoms are sufficient to cause *dysfunction*
  - *Disorder = dysfunction*

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## Diving with Mental Health Conditions

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## Psychiatric Conditions



- Almost 1:5 Canadians will experience mental health issues in any given year
  - That's 7.5 million people per year
- Mental health issues arise in 43% of Canadians across their lifetimes
- 93% of Canadians with a mental health diagnosis are on at least one medication for it

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## Divers' Surveys

- Dowse et al. 2019
  - Anonymous survey of UK sports divers – from dive clubs, exhibitions
  - Measured:
    - diver demographics
    - GAD-7 Anxiety and PHQ-9 criteria for anxiety and depression
    - MH Dx
    - Medications
    - Other comorbidities
    - Self-described perception of diving and MH

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## Divers' Surveys

- Dowse et al. 2019
- 729 respondents
- MH rates comparable to general population: 111/729 (~15%)
- 60 with active disease, of which 45 were diving with medications
- 119 reported diving to be beneficial to their MH

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## Divers' Surveys

- Taylor et al. 2002
- Cross-sectional survey of recreational divers in NZ and USA via dive clubs
- explore the concomitant use of medications while diving
- 709 respondents by mail
- Up to 3% respondents were on antidepressants, anti-epileptics, anxiolytics, and anti-psychotics
- More use demonstrated in the USA

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## Divers' Surveys...

- Recreational divers ARE diving with mental health conditions
- Possibilities:
  - Divers are unaware of the concerns of diving with a mental health condition
  - Divers are aware and:
    - Believe in a therapeutic benefit of diving
    - Believe that the actual risk of diving with mental health disorders is low
    - Are avoiding medical consultation in fear of not being able to continue diving

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## Positive Effect of Diving on Mental Health?

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## Blue Spaces

- Carreño et al. 2020
- POMS (Profile of Mood States)
- Tested before and after visiting a conservation park near Barcelona
- Beach-goers and SCUBA divers (2 separate dives)

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## Blue Spaces

- Carreño et al. 2020
- POMS score decreased significantly (improved mood) after BOTH activities
- No significant difference BETWEEN beach and SCUBA excursions
- Divers on a medication for MH Dx:
  - Higher overall POMS score
  - Decreased POMS post-dive
  - Significantly more of a decrease compared with other divers and beachgoers

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## Blue Spaces

- Small sample size, but take aways:
- Blue/Green Space Exposure
  - Consistent with wider literature (medical and non-medical)
- Solar Therapy ☺
- Physical Activity
- Group Activity/Social Component
- Primarily *Recreational*
- *Benefits might not be from diving per se*

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## What about Occupational Divers?

- Applicants with the following are not favourably considered:
  - ADHD
  - Anxiety
  - Mental Health conditions requiring medication

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## Concerns about Mental Health in Divers

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## General Approach to Comorbidities and Diving

- 1) Condition or treatment → ↑ risk for dive-related injury
- 2) Diving → exacerbate the condition
- 3) Condition or treatment → ↓ physical fitness
- 4) Condition or treatment → ↓ ability to respond to emergency
- 5) Can the condition present a diagnostic dilemma with a diving injury?

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## Question 1: What Type of Diving?

- Increased physical and mental demands:
- Special Circumstances → Recreational → Professional → Scientific  
→ Technical → Public safety → Commercial → Military
- Recreational – can choose not to dive that day
- Recreational – accepting risk for a leisure activity...
- Scientific onwards are supervised, regulated, and monitored

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## Question 2: Stage of Diving Career?

- Beginner vs Experienced

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### Question 3: Severity of Disease?

- Pre-existing or new-onset?
- Disorder = Dysfunction
- How much dysfunction?

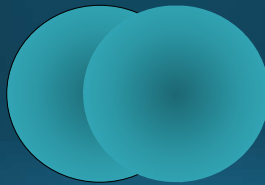
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### Psychiatric Conditions

- Anxiety Disorders
- Affective Disorders
- ADHD
- Mania/Bipolar Disorder
- Psychotic Disorders
- Impulse Control/Addiction Disorders
- Personality Disorders

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### Anxiety and Affective Disorders



Considerable Overlap

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### Depression

- Impairment of concentration, perception, insight
- Suicidal Ideation
- Anxiety
- Medications

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### Anxiety

- Generalized Anxiety Disorder
- Panic Disorder
- Phobias
  - Claustrophobia

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### Phobias

- Phobias can be overcome:
  - Patient's motivation and determination
  - Exposure/desensitization through training and repetition

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## Panic and Diving Accidents

- Panic is implicated in diving accidents
  - Recognized risk factor
- It can be predicted by recognizing/detecting traits in diving initiates
- *To some extent*, it can be managed with training and fitness

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## Trait Anxiety Predicts Panic Behaviour

- Morgan et al. 2004
- STAI-T Testing – State (acute) or Trait Anxiety
- Blinded testing of recreational initiates in a 4-month course
- Blinded reporting by Dive Instructors of panic events
- Statistically Significant Prediction of Trait Anxiety on Panic Behaviour

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## Anxiety and Cognitive Function

- Tsai et al. 2020
- Small sample size, n=27
- 2 groups by STAI-T testing (low and high, cutoff score 39)
- Dry Test – time to completion of 4 standardized cognitive tests
- Wet Test – 5 m in a controlled pool environment
  - time to completion again; diving skills (mask clearing, etc)

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## Anxiety and Cognitive Function

- Tsai et al. 2020
- Stat significant difference between:
  - Dry – high STAI-T scorers had longer time to completion scores
  - Wet – difference was even more pronounced at depth
  - Wet – mask clearing – longer time to completion; not other diving skills

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## Anxiety and Cognitive Function

- Tsai et al. 2020
- Small sample size, but controlled and supervised conditions
- Can extrapolate to Open Water conditions, and continued diving with less/no supervision
- Consider additive effect of:
  - Cooler water
  - Inert Gas Narcosis
- Implications for working dives

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## The Stress Response

- Precipitating/Debilitating Event:
  - Equipment Failure/Low on Air
  - Environmental – entanglement, dangerous marine animal
  - Environmental – weather shift, current, cold
  - Pushed to physical limits
- Response
  - physiological (increased HR, BR)
- Fear, Apprehension
  - Perceptual narrowing
  - Impaired situational awareness
- Panic
  - Emergency ascent
  - Breath-holding
  - Diving Injury

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## Mitigation of Anxiety

- Recognize anxiety trait
- Judgement call on severity of dysfunction – maybe DON'T become a diver, OR
- Education on Panic:
  - Recognize it as a Risk Factor
  - Recognize anxiety build-up in realtime
- Training
  - Build up physical fitness and exercise-capacity
  - Build up experience
  - Stop, breathe, reassess, ask for help

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## Medications

- Anxiety
  - Anxiolytics – these are sedating and are not compatible with diving!
- Anxiety and Affective Disorders
  - Anti-depressants
  - Weighing risk vs benefit

Unmanaged  
DiseaseMedication  
Considerations

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## Anti-Depressants

- 1) Traditional – amitriptyline, clomipramine, doxepine, imipramine
- 2) Modern – SSRIs, SNRIs
- 3) Other – Trazadone, Bupropion, Mirtazapine, MAOIs

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## Anti-Depressants – Concerns...

- 1) Sedation – traditional type; high dose SSRI/SNRI
  - 1) Not compatible with diving
- 2) Seizure Risk – all antidepressants, especially: SSRI/SNRI, TCAs, Bupropion, Clomipramine
  - 1) Additional consideration re: O2 Toxicity
- 3) Arrhythmia – via prolonged QT – Venlafaxine, Citalopram

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## Anti-Depressants – Concerns...

- 4) Increased Bleeding Tendency – SSRIs
- 5) Hypo/Hyperglycemia – depends on patient/med factors
- 6) Anticholinergic – Traditional
  - dry mouth, blurred vision

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## Anti-Depressants – Concerns...

- 7) Psychotropic Effect, Mania:
  - 14% in bipolar
  - 6% in monopolar
- 8) Psychotropic Effect, Suicidal Ideation
  - more common in young patients
- 9) Psychotropic Effect, Withdrawal – all antidepressants

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## Dutch Association for Diving Medicine, 2015

- No diving when symptomatic
- Use only Modern anti-depressants
- Use only 1 anti-depressant/psychotropic
- Do not combine with NSAIDs/anticoagulants
- No concomitant seizure history
- Special consideration for Diabetics

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## Dutch Association for Diving Medicine, 2015

- New Medication
  - No Diving for 14 days – 3 months
  - No serious side effects
  - Improved and stable mood/anxiety
- Dose adjustment
  - No Diving for > 7 days
- Diving Profile
  - Limit depth to 20m
  - Caution with EAN

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## ADHD

- Generally incompatible with occupational diving
  - Some professional divers have mild ADHD
  - If mild deficits not requiring medications, can consider case-by-case
- Consider attention/focus
  - Wide range across individuals
  - Wide range across contexts (school, home, work)
  - Impaired focus
  - Hyper-focused
  - Both lead to impaired situational awareness
  - Open Water environment = lots of distractions

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## ADHD

- Consider attention/focus
  - Not just diving for yourself
  - Danger to other divers
  - Impaired rescue of other divers
- Consider hyperactivity/risk-taking/judgement
  - Need for excitement
  - Risk-taking
  - Judgement and insight impaired
  - Self-awareness

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## ADHD

- Consider Personality traits
  - Motivation
  - Organization
  - Self-awareness

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## ADHD – Medications...

- 1) Stimulants
  - 1) Agitation, insomnia
  - 2) Potentiate seizure risk – CNS O<sub>2</sub> Toxicity
    - 1) Observed in children with unmanaged or undiagnosed epilepsy
    - 2) Unclear risk in children without epilepsy
  - 3) Hypertension
  - 4) Rebound – worsening attention when drug wears off, usually evening/night

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## ADHD – Medications...

- 2) Atomoxetine
  - Potentiate CNS O<sub>2</sub> Toxicity
  - somnolence
- 3) Bupropion
  - 1-10% blurred vision, dizziness, tinnitus
  - high dose (> 450 mg) – risk of seizure

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## ADHD – Medications...

- 4) Modafinil
  - HA, blurred vision, mood changes
- 5) Guanfacine
  - somnolence

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## Case Examples

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### Case I – Mr. Kiyan Focus

- 28 year-old male
- Applying for a college Underwater Skills Program
  - to become a commercial diver
- Needs a fitness-to-dive medical
  - mandated by the college application process
- Previously a dancer and gymnast
- No previous diving experience
- Motivation?
  - Seeking an adventurous career

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### Mr. Kiyan Focus arrives late...

- He is 30 min late to the appointment
  - Went to the wrong address
- He does not have the necessary paperwork with him
  - your admin helps him download and print it
  - takes another 30 min filling it out in your waiting room

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### Mr. Kiyan Focus

- Past Medical History:
  - Social smoking history
  - Social use of marijuana
  - Social drinker
  - No Cardiorespiratory conditions
  - ORIF R wrist, remotely, healed, no residual functional limitations
  - ADHD since childhood
    - Maintained on Aderall

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## Mr. Kiyan Focus' Exam

- Thin athletic build, BMI 24
- Vitals WNL
- Normal Exam:
  - Eyes
  - ENT
  - Cardio
  - Resp
  - Abdo
  - Neuro/MSK
- Skin:
  - healed surgical scars R wrist and forearm
  - extensive tattooing on chest and shoulders

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## Mr. Kiyan Focus' Psychomotor Exam

- Affect:
  - Normal, pleasant
- Voice:
  - Normal intonation, inflection
- Speech:
  - Normal rate
- Thought process & content
  - Disorganized at first, but otherwise appropriate
- Interaction
  - Needs repeated commands before following
  - Often misinterprets the command
- Insight & Judgement
  - Difficult to assess in one day, but there are clues...

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## Mr. Kiyan Focus – Next steps?


- Psychologist Assessment 4 years ago
- You speak with the Psychologist
  - She feels he is a good candidate for commercial diving, that it will be good for his ADHD, and she supports his application
- You request the notes from her last assessment...

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## Mr. Kiyan Focus – Psychological Analysis

- Diagnoses: ADHD, nonverbal learning disability
- Parameters:
  - Very intelligent but:
  - Low memory span
  - Very low visual motor skills
  - Low-average long-term storage and retrieval in memory
  - Low ability to keep attention
- Average range hyperactivity/impulsivity
  - Persistent challenges with task completion, forgetfulness, distractibility, disorganization, attention/focus
  - Restless, fidgety, impulsive, irritable
  - Less than 1<sup>st</sup> percentile attention
  - 1<sup>st</sup> percentile response control – impulsivity errors

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## Mr. Kiyan Focus – Functional...

- Aderall
  - Needed originally for classroom only
    - Summer medication breaks
  - Now taking regularly
  - He tells me he's willing to come off of it...
- What's the dilemma?

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## Mr. K Focus

- The Dilemma:
  - Off meds: significant inattention and hyperactivity/impulsivity
  - On meds: potentiate O<sub>2</sub> Toxicity in the Commercial Diver context
- Additional Observations:
  - No previous diving experience, questionable motivation
  - Presentation in office
- Counseling is required here!
  - To suggest a different career...

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## Case II – Ms. Jane Doe

- 35 yo female
- Her new partner is a diver
- She has no previous dive experience
- Curious to try recreational diving
- Intake questionnaire triggered FTD assessment

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## Ms. Jane Doe - PMHx

- Social smoker x 15 years
- No other cardiorespiratory conditions
- Fairly active – runs 5 d/wk - yoga

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## Ms. Jane Doe - PMHx

- MDD, mild anxiety and claustrophobia
  - No previous suicidal ideation/attempts
- Stable on 1 SSRI x 5 years
- Works as head admin for a Family Medicine practice
- No panic attacks
- MRI last year for her knee – no Ativan needed

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## Ms. Jane Doe - Exam

- Athletic build, vitals stable
- Normal physical exam
- Psychomotor: reassuring, appropriate

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## Affective Disorders and Diving

- Depression
  - No diving during a depressive state
  - Only 1 antidepressant, stable for 3 months
  - Newer SSRIs are favored – but recall
    - Sedating
    - CNS potentiating
    - Anticoagulant
    - blood sugar control

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## Back to Ms. Jane Doe

- Recreational Diving
- Phobias – can be overcome with training/exposure
- Anxiety – no panic, stable, 1 SSRI
- Have a discussion!
  - Increase self-awareness and agency
  - CNS O<sub>2</sub> Toxicity <-> EAN
  - N<sub>2</sub> Narcosis <-> depth limits/AOW

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