

Committee on Temporomandibular Disorders (TMD):  
From Research Discoveries to Clinical Treatment  
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# Ontology of Orofacial Pain to Improve Patient Care

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# I'm not an expert in TMD, but ...

- Smith B *et al.* **Towards an Ontology of Pain**. In: Mitsu Okada (ed.), Conference on Logic and Ontology, Tokyo: Keio University Press, Feb 2011:23-32.
- Nixdorf D *et al.* **Classifying orofacial pains: a new proposal of taxonomy based on ontology**. Journal of Oral Rehabilitation 2012;39(3):161-169.
- Doing-Harris K, *et al.* **Applying Ontological Realism to Medically Unexplained Syndromes**. Stud Health Technol Inform. 2013;192:97-101.
- Schiffman E *et al.* **Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group**. Journal of Orofacial Pain and Headache 2014;28(1):6-27.
- Ceusters W. **Pain Assessment Terminology in the NCBO BioPortal: Evaluation and Recommendations**. International Conference on Biomedical Ontologies, ICBO 2014, Houston, Texas, Oct 6-9, 2014; CEUR Workshop Proceedings 2014;1237:1-6.
- Ceusters W. **An alternative terminology for pain assessment**. In Workshop on Definitions in Ontology, International Conference on Biomedical Ontologies, ICBO 2014, Houston, Texas, Oct 7, 2014; CEUR Workshop Proceedings 2014;1309:49-54.
- Ceusters W, *et al.* **Perspectives on Next Steps in Classification of Orofacial Pain – Part 1: Role of Ontology**. Journal of Oral Rehabilitation 2015;42(12):926-41
- Ceusters W, Smith B. **On Defining Bruxism**. Medical Informatics Europe (MIE2018), Goteborg, Sweden, April 24-26, 2018. Stud Health Technol Inform. 2018;247:551-555.

# The discipline of 'Ontology'

Describing reality within a taxonomy of precisely defined entities

Independent Continuant

Material Entity

Joint

TMJ

Dependent Continuant

Quality

Shape

Disposition

Function

Chewing function

# The discipline of 'Ontology'

Describing reality within a taxonomy of precisely defined entities

**Theoretical ontology → work of ontologists**

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**Applied ontology → work of ontologists and domain experts**

# Talking about definition(s) for TMD(s)?

- Many papers about classifications of TMDs or diagnosis of TMD don't mention a definition.
  - *'We defined the target group, those having pain-related TMD, as those having a diagnosis of pain-related TMD'*
- None pass ontological muster: ?
  - *the TMDs are a set of conditions affecting the masticatory muscles, temporomandibular joints (TMJ), and related structures.*

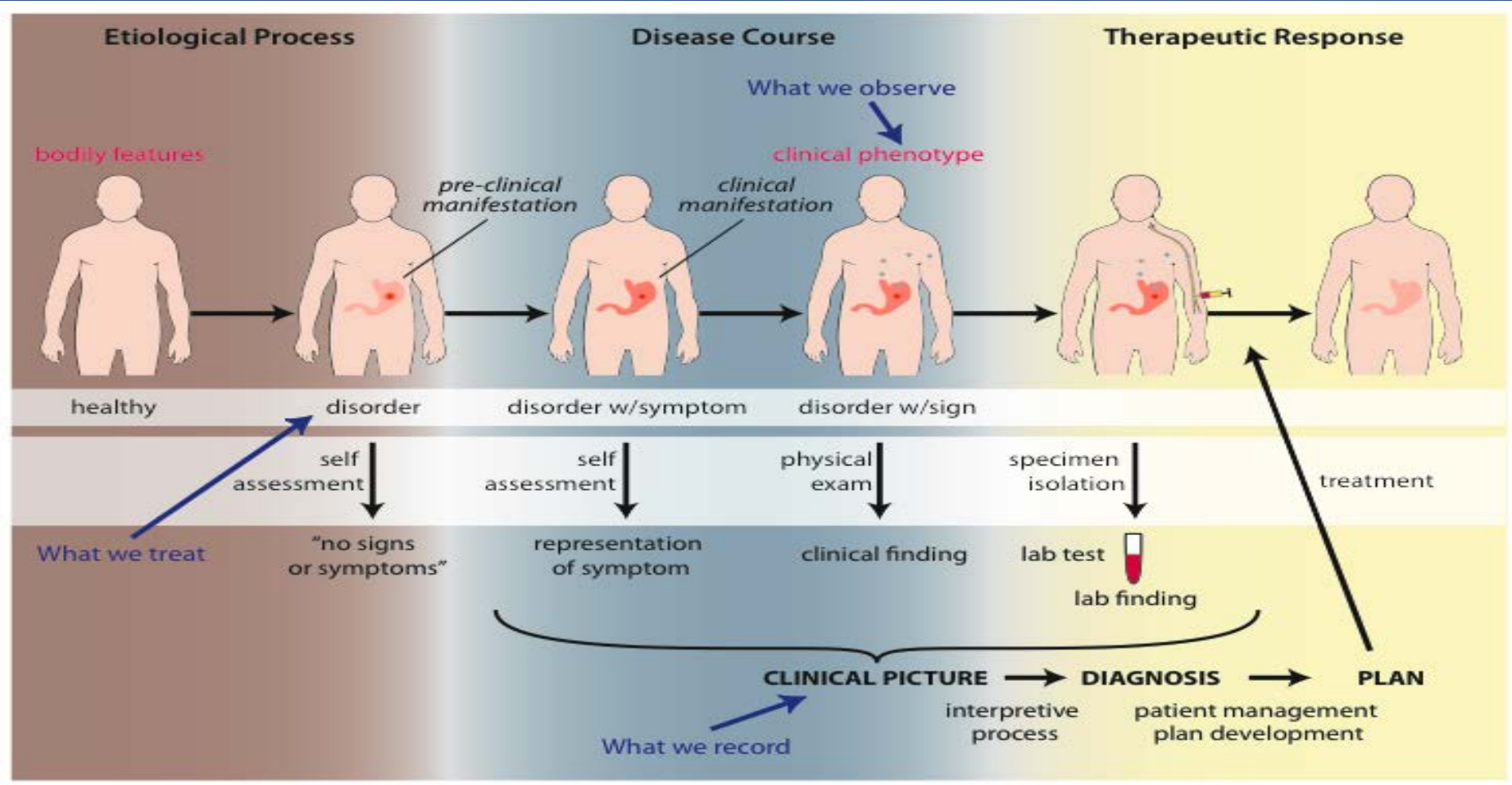
# Without ontologists ...

- creating terms and definitions quickly runs awry:
  - 'Pain is a sensorial and emotional experience ...'
    - 'knee pain' → emotional experience in your knee?
  - '13.1.2.4 Painful Trigeminal neuropathy attributed to MS plaque' comes with the clarification 'Trigeminal neuropathy induced by MS plaque';
    - The term suggests an opinion on the side of the clinician,
    - The description suggests a causal relation on the side of the patient.
- Perspectives from outside the domain are more difficult to account for.
  - Theoretical ontology → domain independent!

# Three ontological perspectives relevant to the TMD problem

1. The biological / physiological perspective.
2. The epistemic perspective.
3. The BioPsychoSocial perspective:
  - 3a. The objective interpretation,
  - 3b. The subjective interpretation.

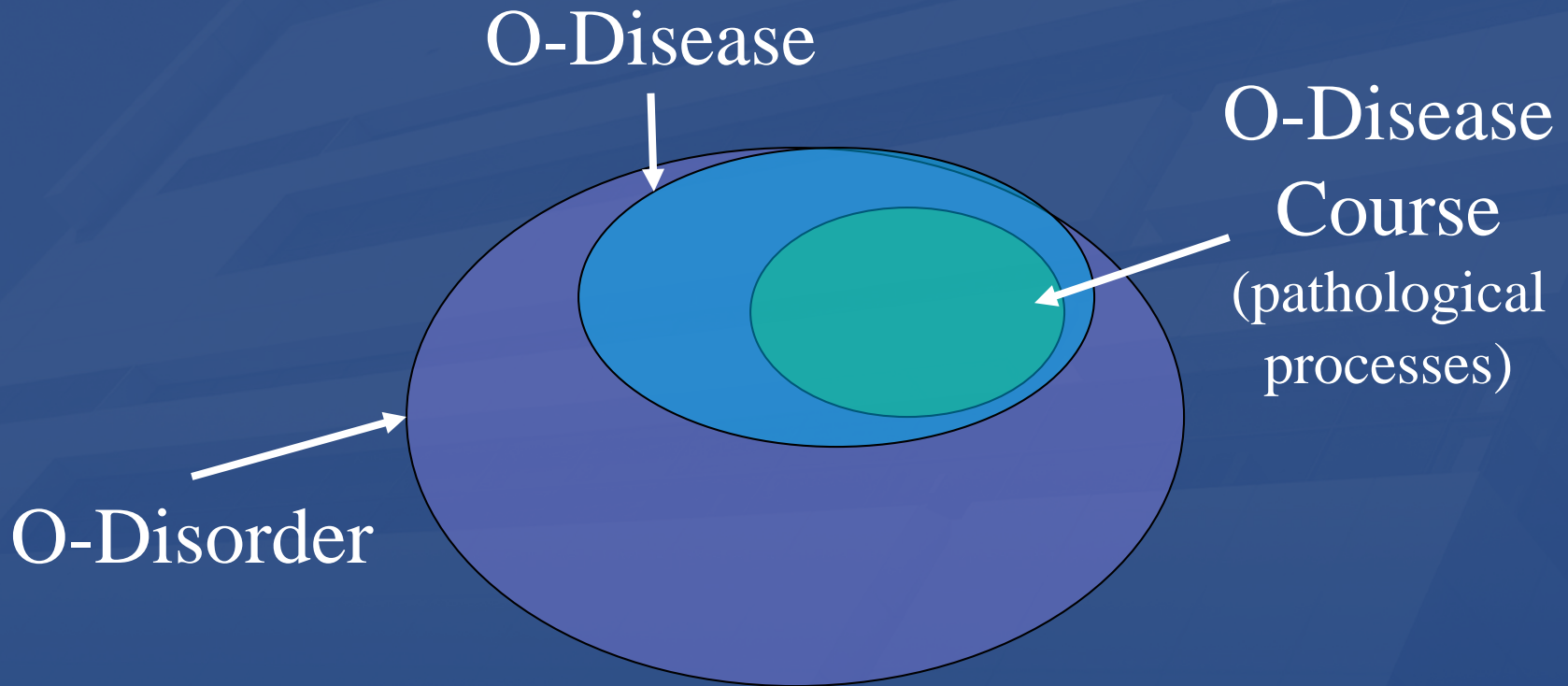
# (1) The biological perspective of OGMS





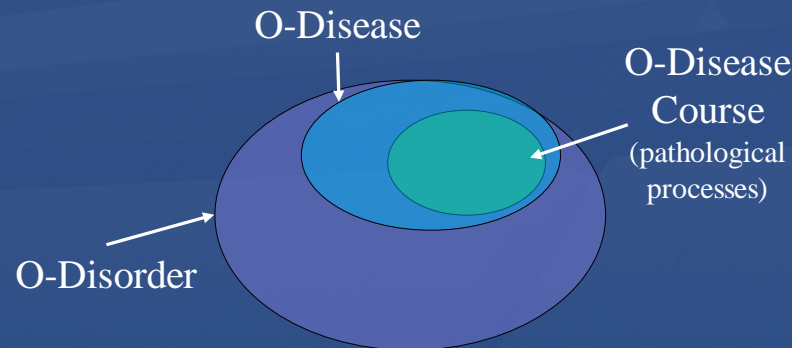
# (1) The biological perspective of OGMS

## Disorder / Disease / Disease course



# Key OGMS definitions

O-DISORDER	A causally relatively isolated <b>combination of physical components</b> that is (a) clinically abnormal and (b) maximal, in the sense that it is not a part of some larger such combination.
O-DISEASE	A <b>DISPOSITION</b> (i) to undergo PATHOLOGICAL PROCESSES that (ii) exists in an ORGANISM because of one or more DISORDERS in that ORGANISM.
O-DISEASE COURSE	The <b>totality of all PROCESSES</b> through which a given DISEASE instance is <b>realized</b> .



# TMD literature: much less principled distinction

## 2. Joint disorders

### A. Disk disorders

1. Disk displacement with reduction
2. Disk displacement with reduction
3. Disk displacement without reduction
4. Disk displacement without reduction

### B. Hypomobility disorders other than disk disorders

1. Adhesions or adherence
2. Ankylosis

#### a. Fibrous

#### b. Osseous

### C. Hypermobility disorders

1. Dislocations
  - a. Subluxation
  - b. Luxation

## 3. Joint diseases

### A. Degenerative joint disease

1. Osteoarthritis
2. Osteoarthritis

### B. Systemic arthritides

### C. Condylitis or idiopathic condylar resorption

### D. Osteochondritis dissecans

### E. Osteonecrosis

### F. Neoplasm

### G. Synovial chondromatosis

## 4. Fractures

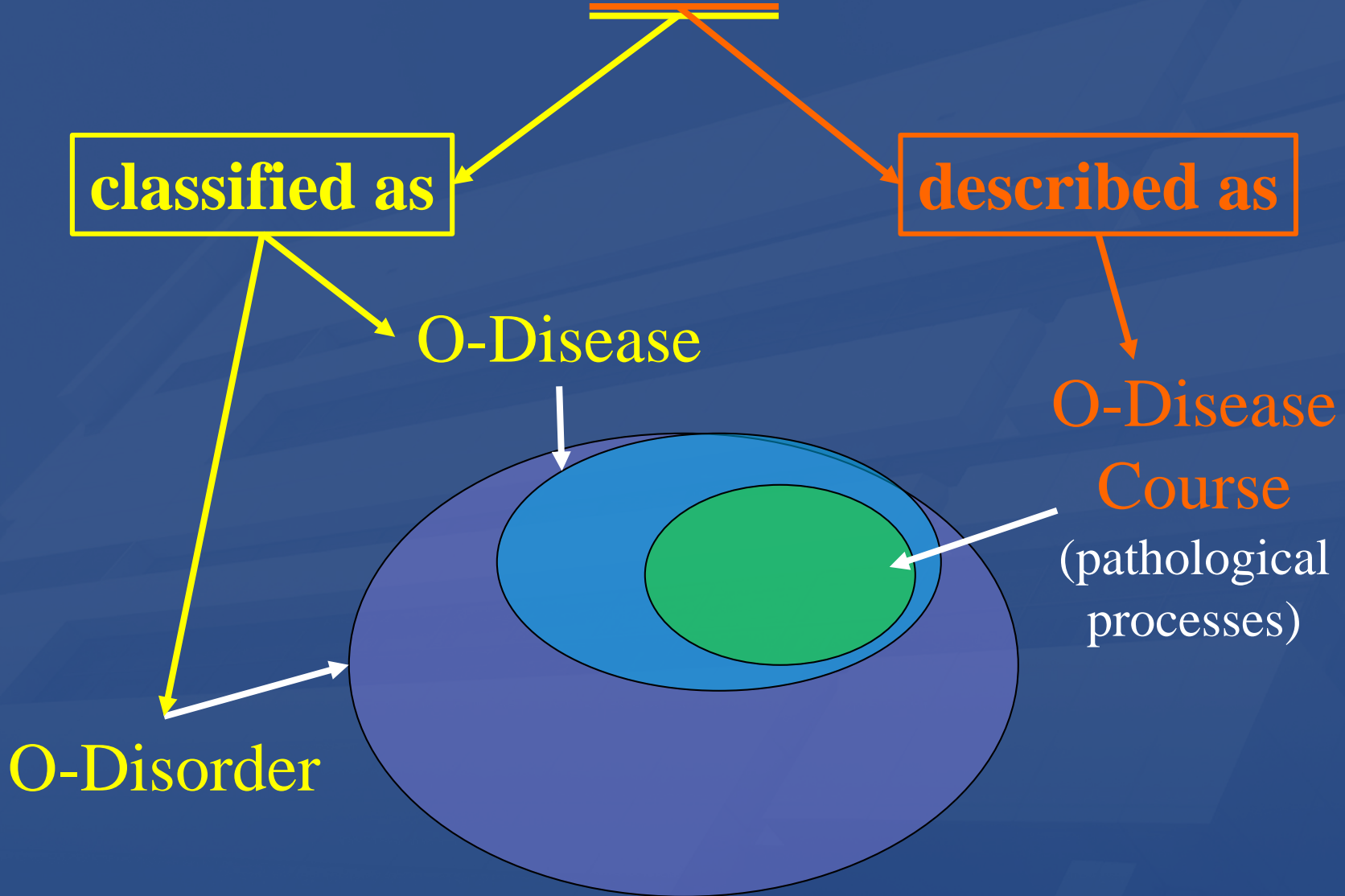
## 5. Congenital and developmental disorders

### A. Aplasia

### B. Hypoplasia

### C. Hyperplasia

# Current TMD literature

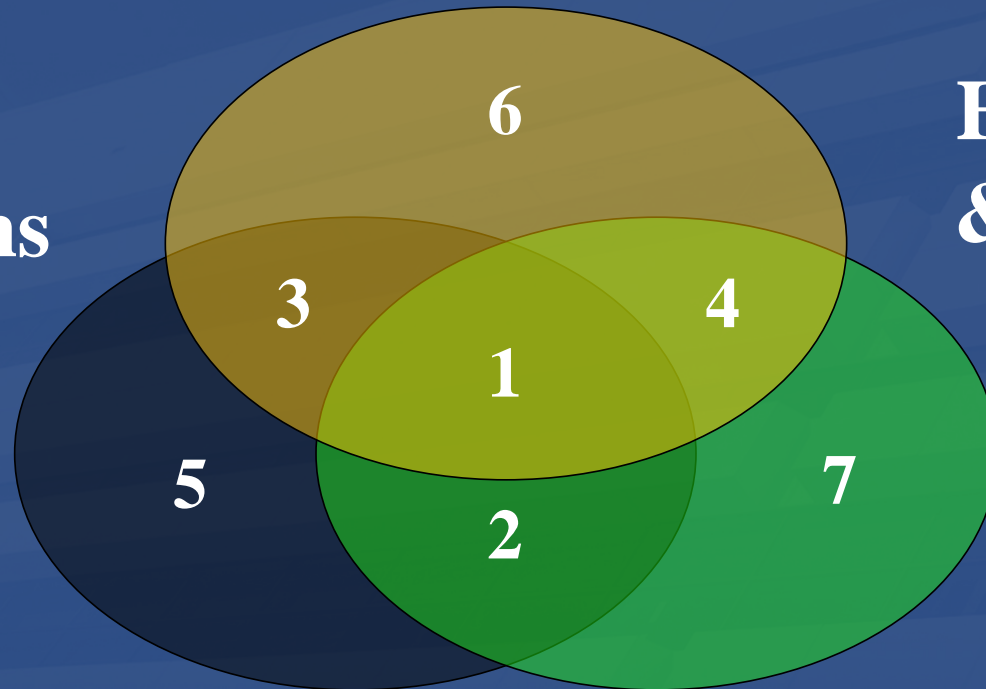


## (2) The epistemic perspective of OGMS

O-Observing / interpreting

Signs & symptoms

Hypotheses & diagnoses



O-Bodily feature

O-Representation

## (3a) The objective Bio-Psycho-Social perspective

- 'T-Disease':
  - a health problem that consists of a physiological malfunction that results in an actual or potential reduction in physical capacities and/or a reduced life expectancy
- 'T-Illness':
  - a subjectively interpreted undesirable state of health, consisting of subjective feeling states (e.g., pain, weakness), perceptions of the adequacy of their bodily functioning, and/or feelings of competence
- 'T-Sickness':
  - a social entity in virtue of the poor health or the health problem(s) of an individual defined by others with reference to the social activity of that individual

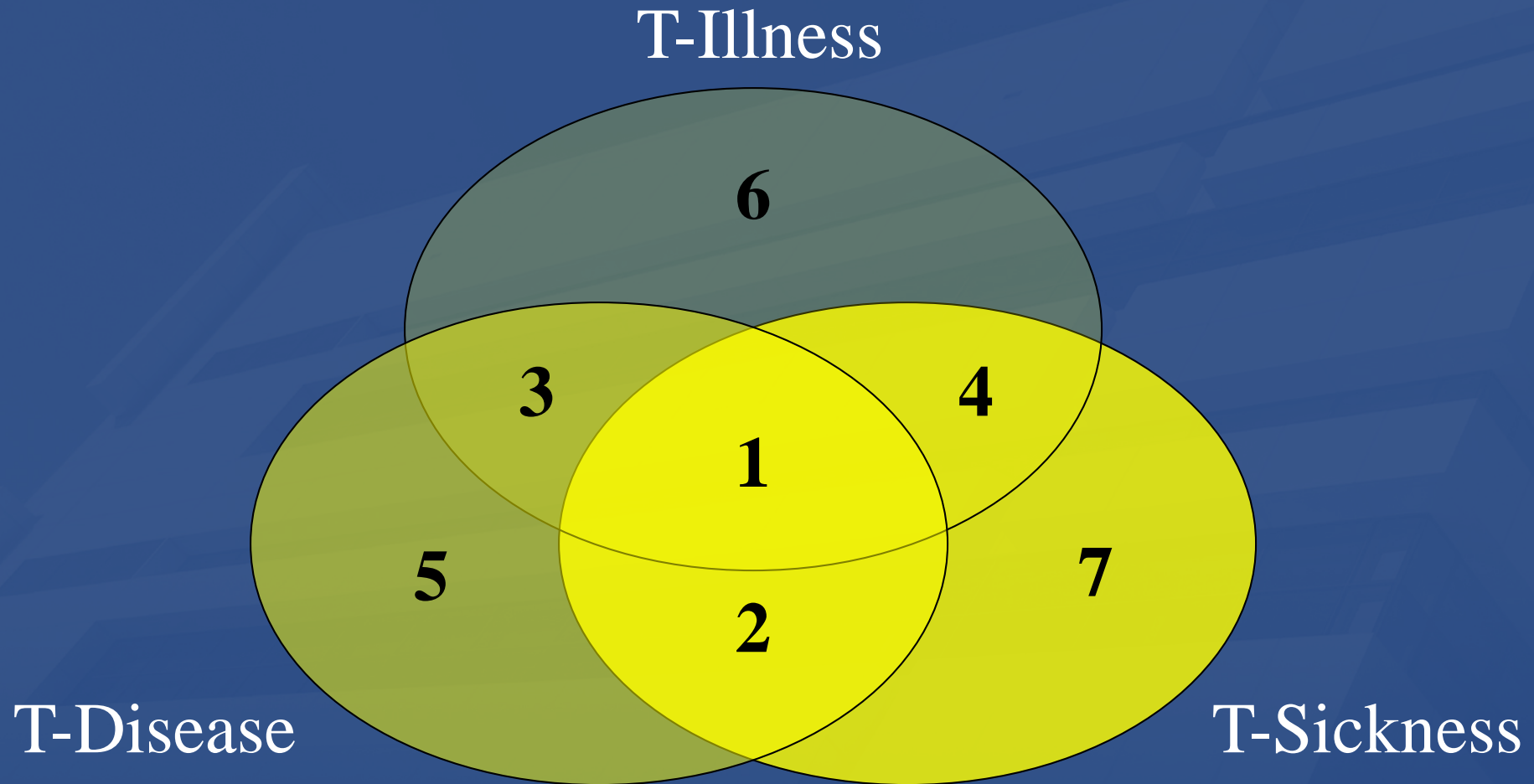
Twaddle, A. (1994a). Disease, illness and sickness revisited.  
In: A. Twaddle & L. Nordenfelt. (Eds.) Disease, Illness and Sickness: Three Central Concepts in the Theory of Health (pp. 1–18). Linköping: Studies on Health and Society, 18.

## (3b) The subjective Bio-Psycho-Social perspective

- T-Disease:
  - when there are negative bodily occurrences as conceived of by the medical profession.
- T-Illness:
  - when there are negative bodily occurrences as conceived of by the person himself.
- T-Sickness:
  - when there are negative bodily occurrences as conceived of by the society and/or its institutions.

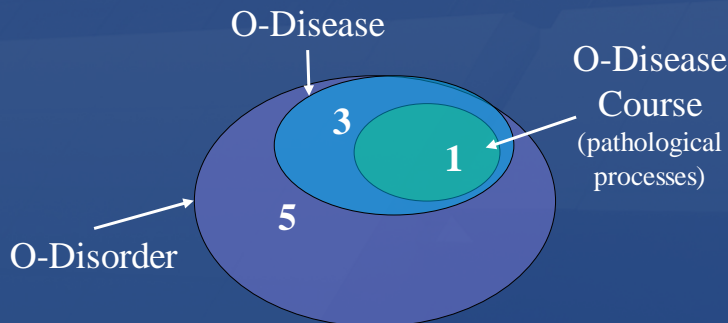
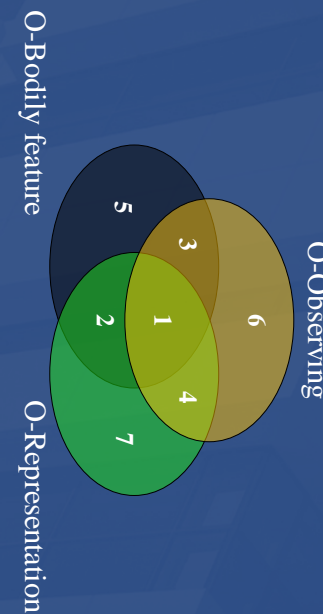
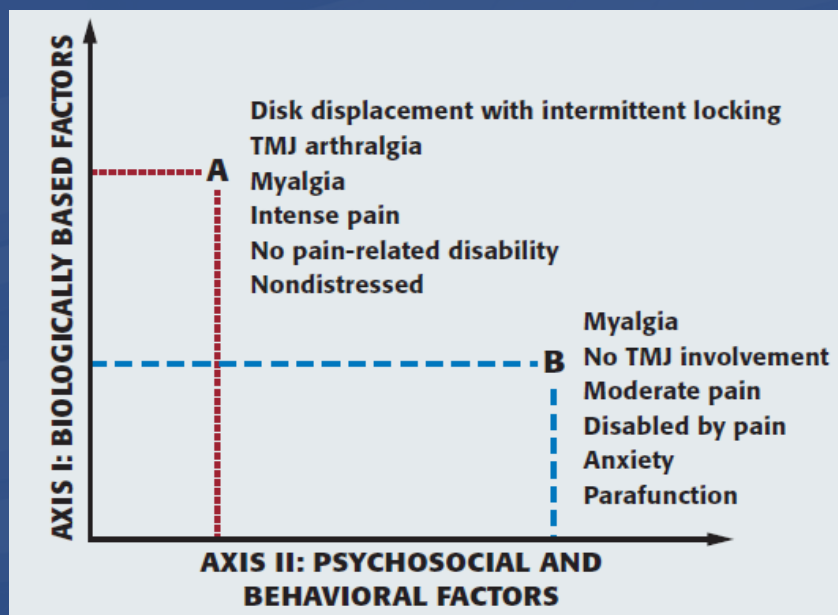
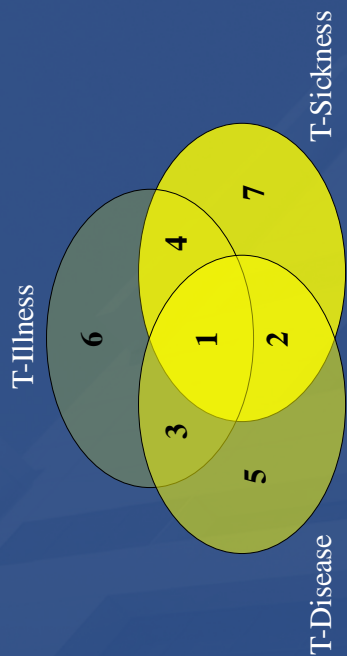
'Occurrence' here means 'process', 'state' or 'event'.

# Overlap in the Bio-Psycho-Social perspective

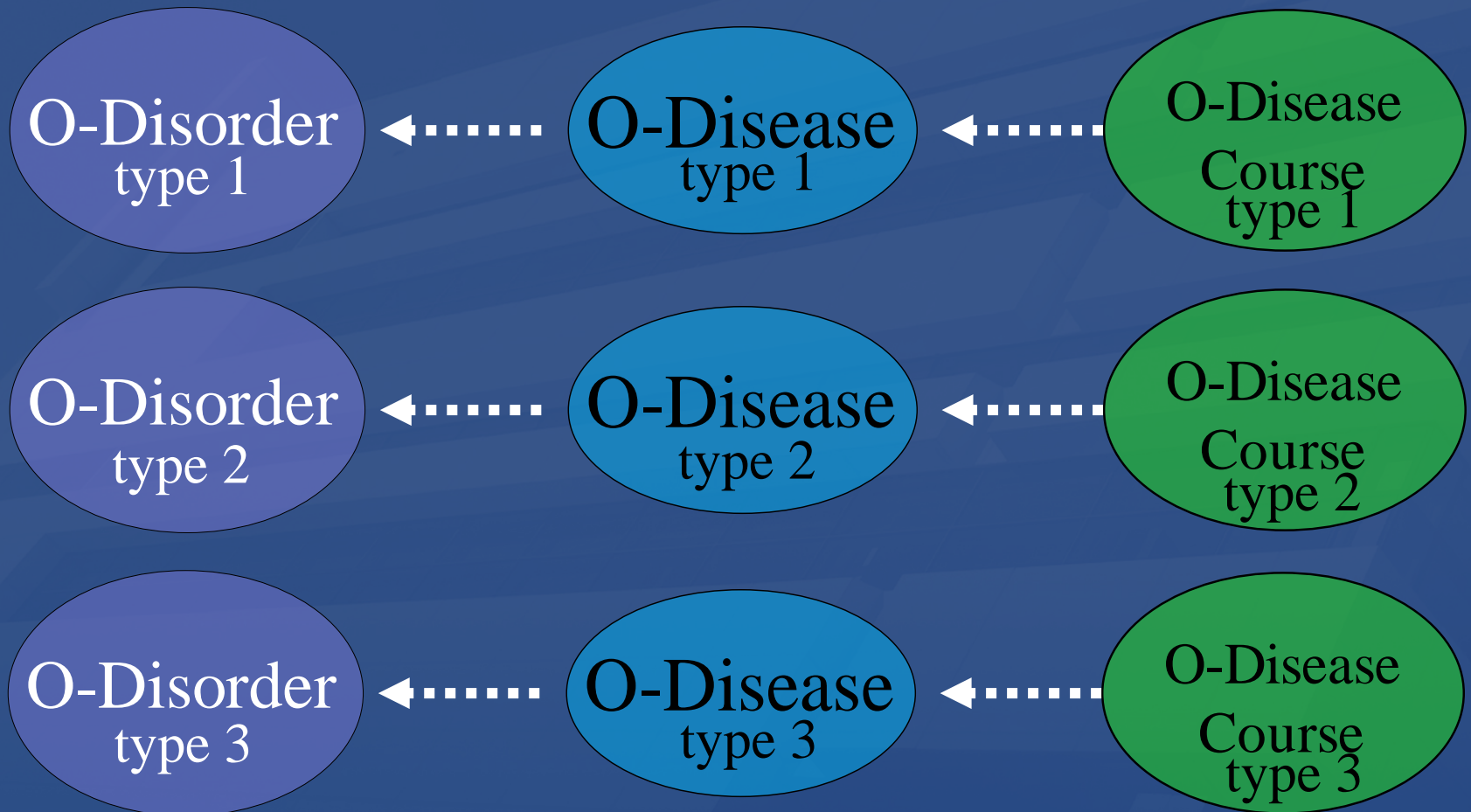




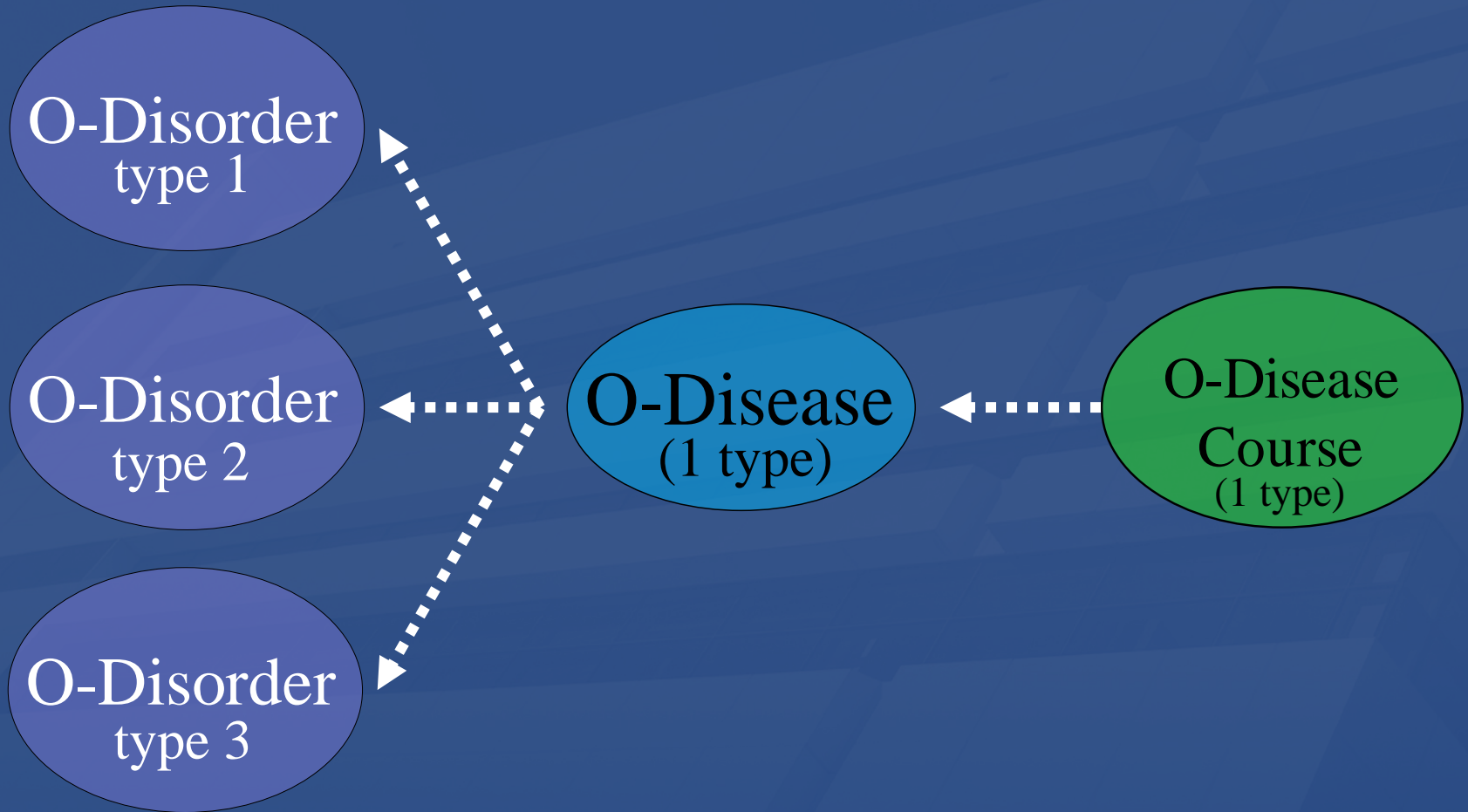
# Suggestion: use the perspectives as scaffolding for a definition of TMD (and its subtypes)



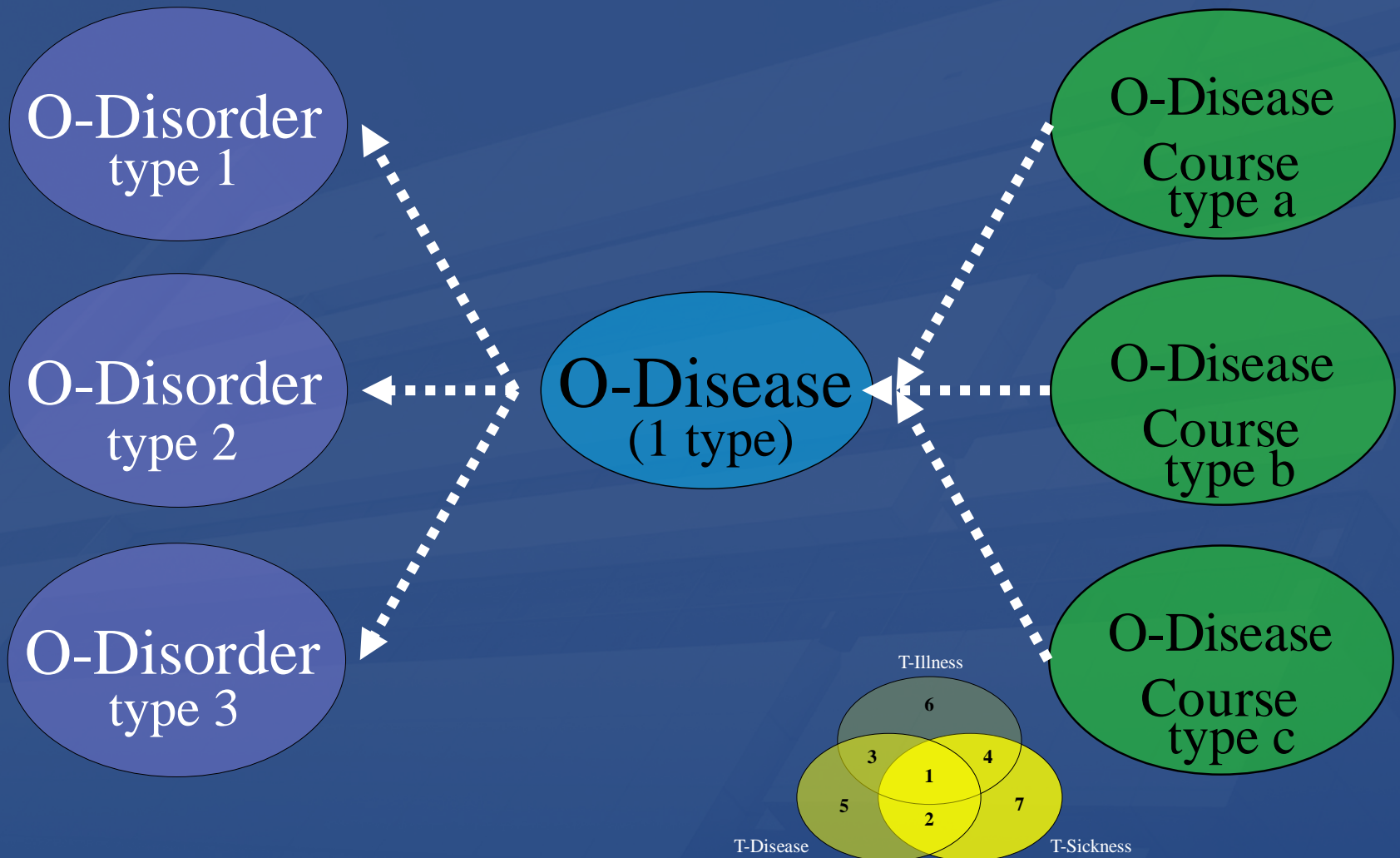
# Example: OGMS perspective on TMDs as ‘a group of ...’



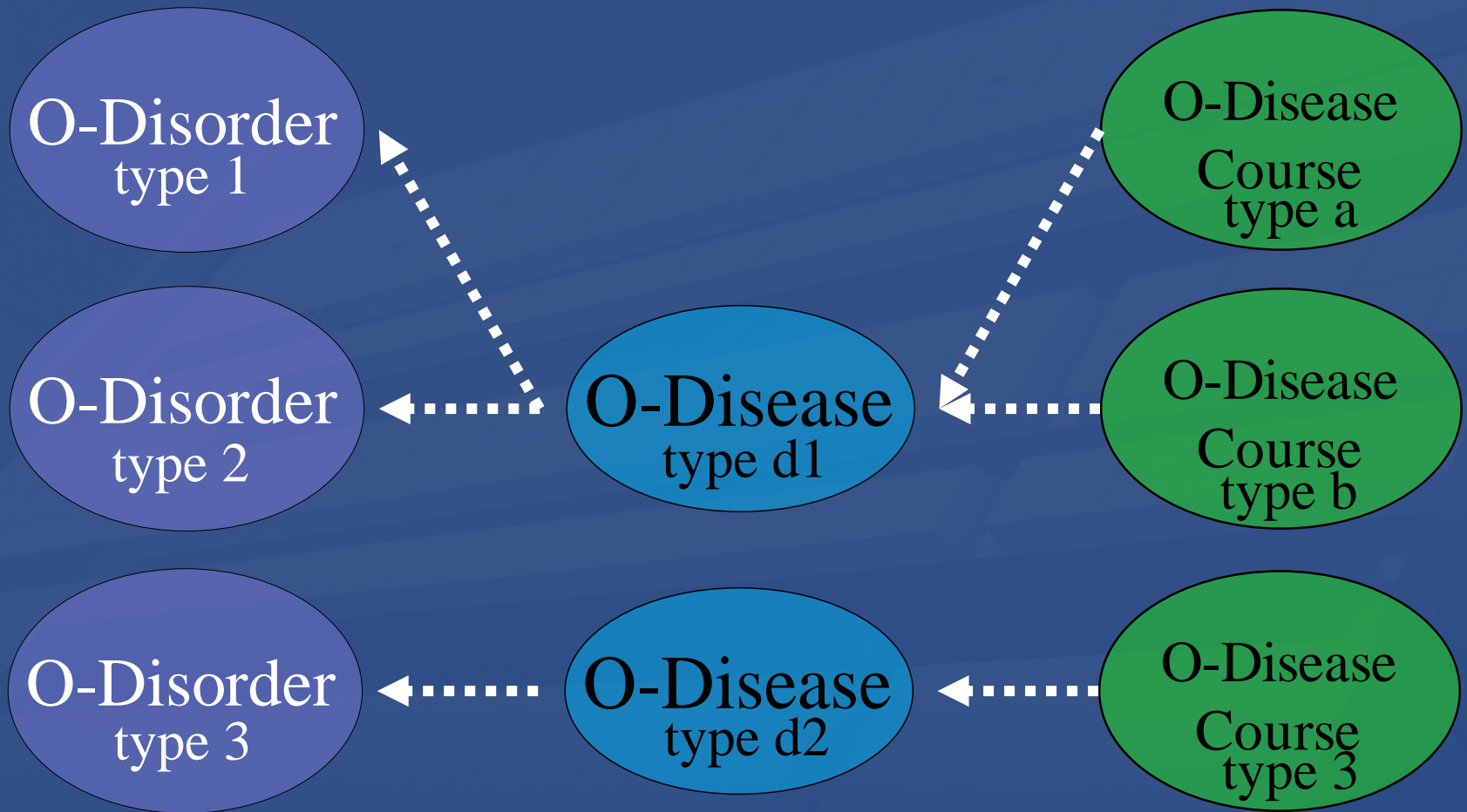
# TMDs as ‘a group of ...’



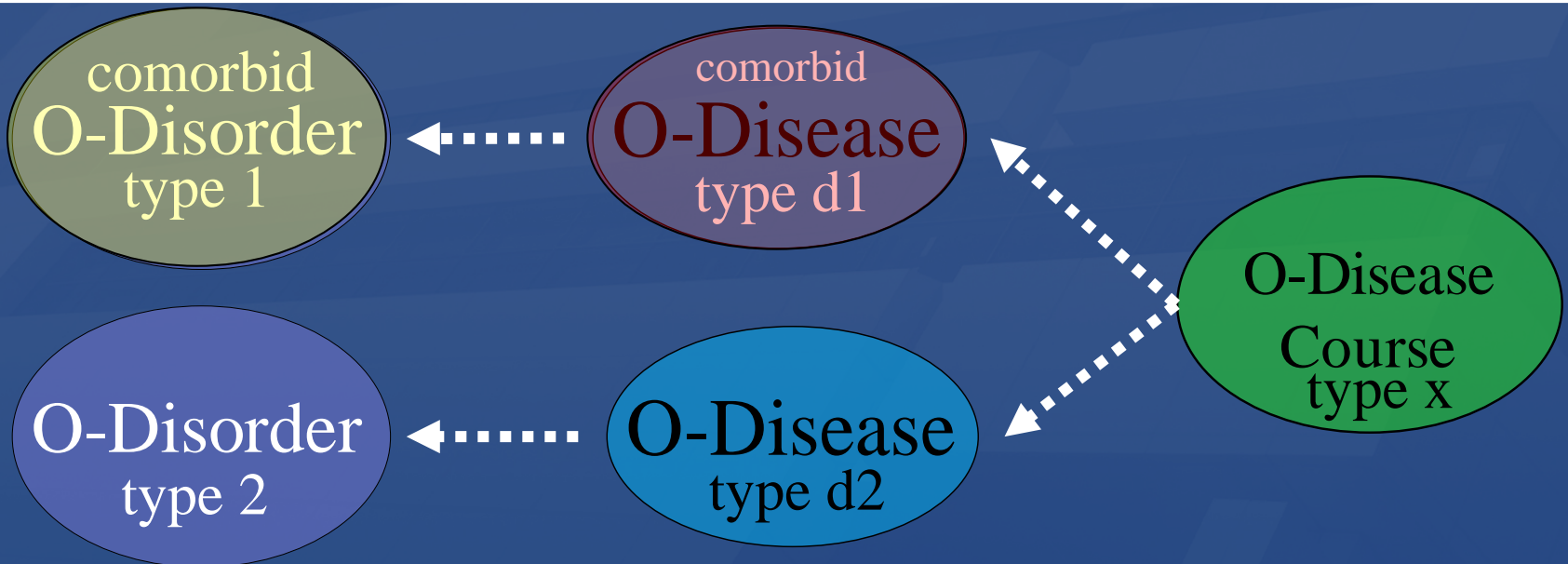
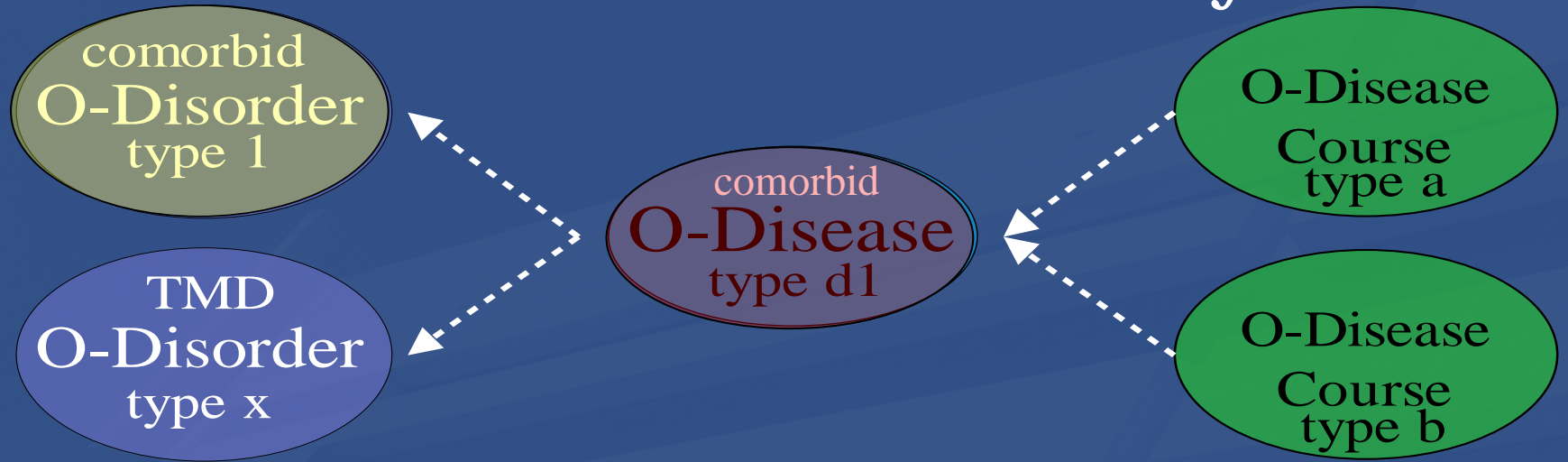
# TMDs as 'a group of ...'



# TMDs as 'a group of ...'



# TMDs and comorbidity



# Conclusion

- How to arrive at an appropriate definition ?
  - Retrospective:
    - Re-examine existing data,
    - Classify variables used according to the 3 perspectives,
      - Pathological processes,
      - Disorders,
      - Diseases,
      - ...
    - Generate hypotheses about the interplay of entities in an across the perspectives.
  - Prospective:
    - Design future studies comparing 'groups' (perspectivized TMD types / comorbidities) to (dis)prove hypotheses.