

**Initial Development of a
Linked Data Infrastructure for
Strength Training Information:
Linked Fitness Training (LiFT) Ontology**

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AGENDA

Background

Aims of the Ontology

Methods

Ontology Classes and Properties

MuscleOrMuscleGroup

ExerciseType

Program

Resource

Future Directions

BACKGROUND

Lack of an infrastructure for aggregating and linking fitness information and resources

Fitness training as a body-centered hobby, and thus as a form of **serious leisure** (Codina et al., 2020)

Support for information behaviors related to serious leisure (Hartel et al., 2016; Mansourian, 2021)

BACKGROUND

KOS play a significant role in support of decision making regarding medical information (Zeng et al., 2020)

Ontologies exist for

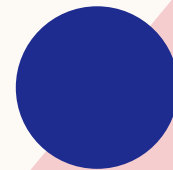
- **specialized diets** (Clunis, 2019; Hausmann et al., 2019)
- **sports information** (Zhai & Zhou, 2010)
- **exploratory web searching of exercises** (Kotzyba et al., 2015)
- **structured data related to physical activity** (Kim et al., 2019)
- **health and exercise advice** (Izumi et al., 2006)
- **nutrition and biomechanics information for Olympic weightlifters** (Tumnark et al., 2013; Tumnark, Abreu et al., 2018; Tumnark, Cardoso, et al., 2018)

AIMS

- Semantic model to support the development of personalized exercise and fitness plans
- Aggregation of web-based resources on strength training information
- Support potential users
 - People with an interest in strength training at all levels
 - Fitness professionals developing strength training plans and programs
 - People with specialized needs

AIMS

- Support reuse and interoperability by serving as a bridge between web resources about exercise and existing biomedical ontologies
- Allow semantic annotation to enable mechanisms for user choice and context



METHODS

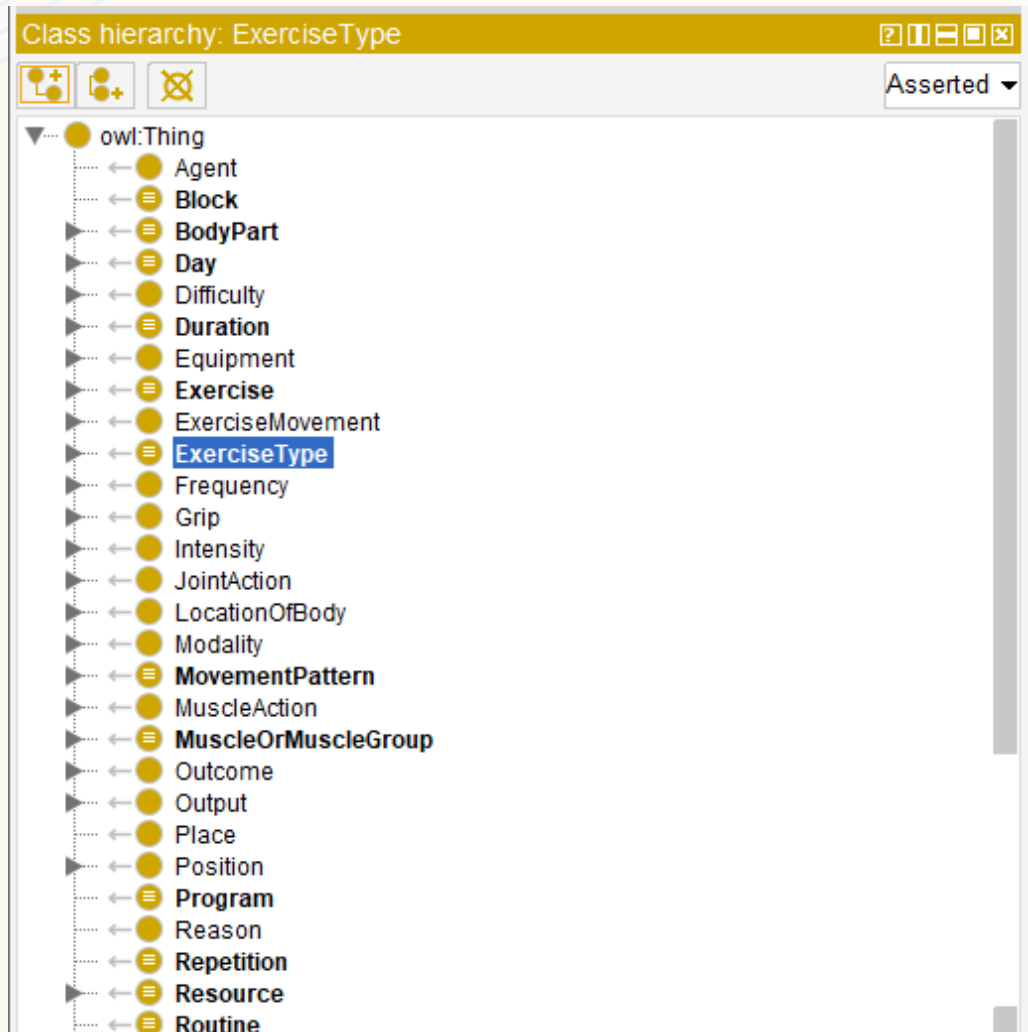
- Instrumental domain analysis
 - Hjørland & Albrechtsen, 1995; Hjørland, 2002; Tennis, 2012
- Facet analysis
 - Hjørland, 2013; Hudon, 2020
- Literary warrant
 - Barité, 2018
- Ontology Development 101 methodology
 - Noy & McGuinness, 2001
 - with Protégé software (Musen, 2015)



CLASSES AND PROPERTIES

Overview and Details on Specific Features

OVERVIEW



Main Classes: 40

Subclasses: 356

Total classes: 396

Object Properties: 52

Annotations for

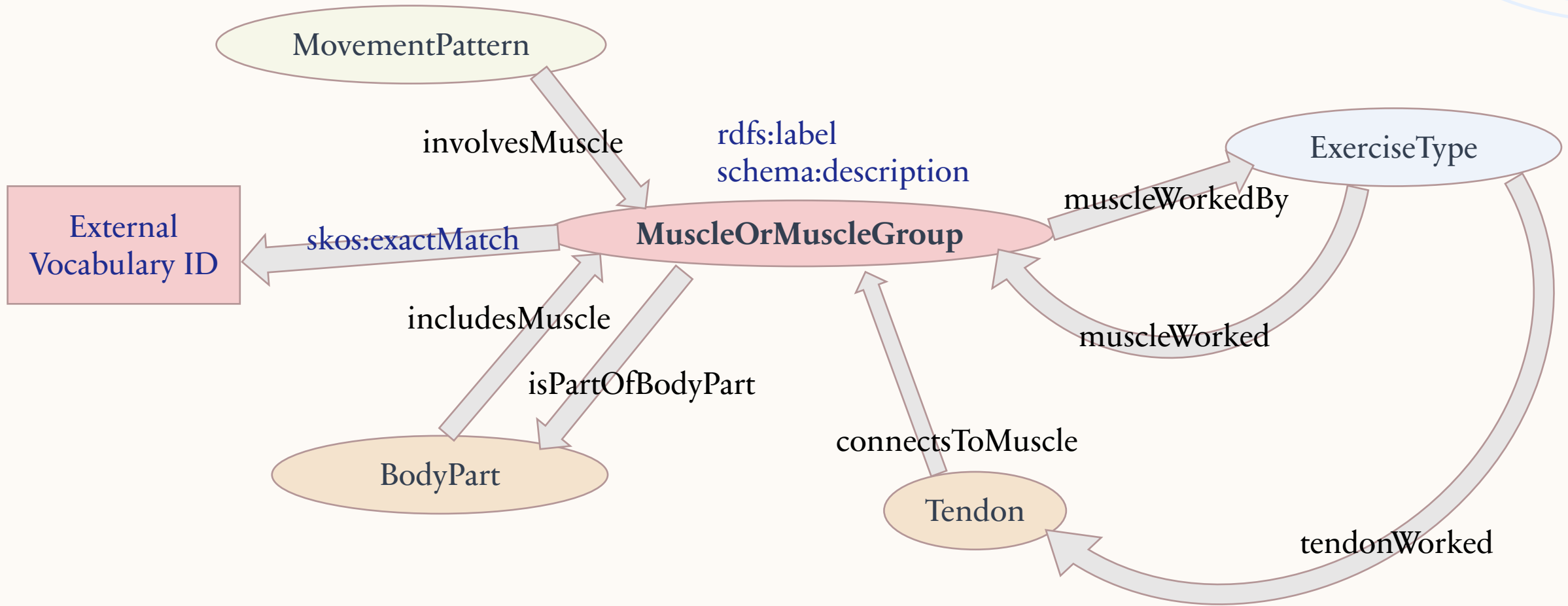
label (prefLabel, altLabel)

description (Schema.org)

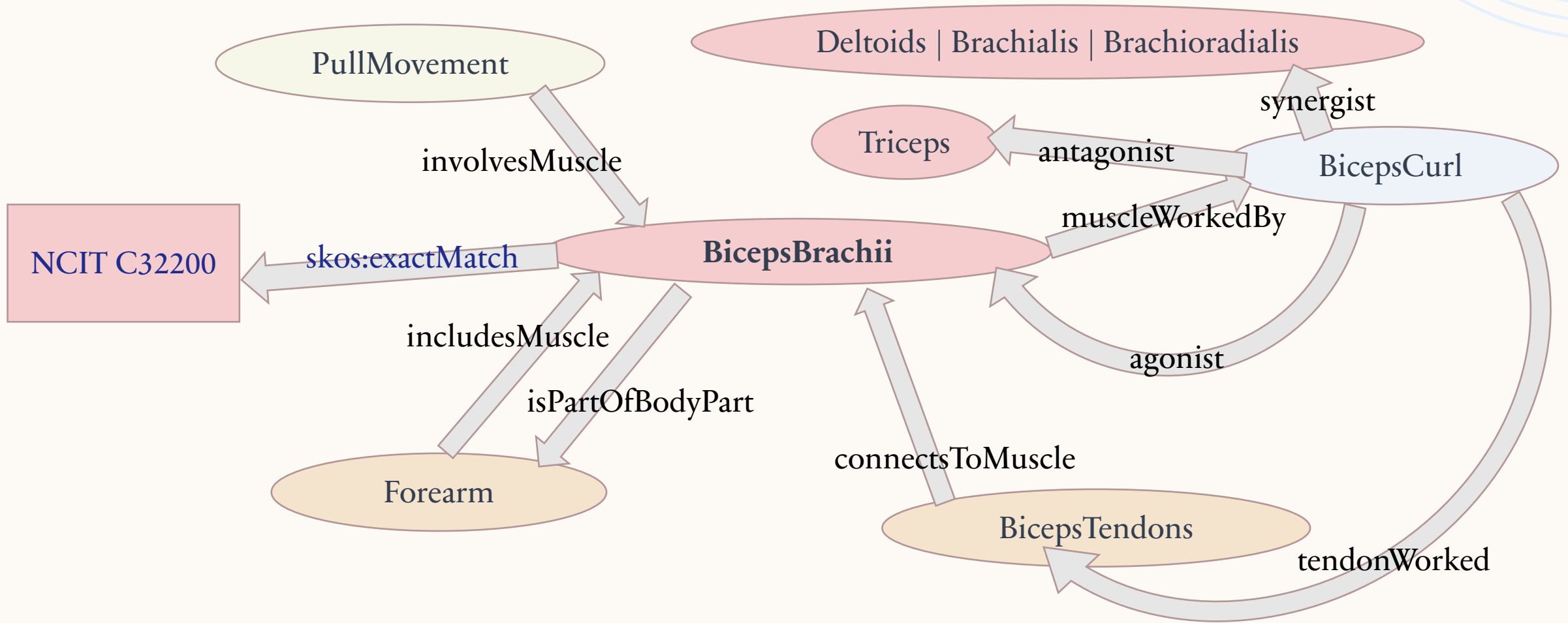
matches in other ontology (SKOS)

user generated alternatives

MuscleOrMuscleGroup Class



Example: Biceps Muscle



Example: Biceps Muscle

The screenshot displays the LiFT Ontology interface, showing the class hierarchy and annotations for the **BicepsBrachii** class.

Class hierarchy: BicepsBrachii

- MuscleOrMuscleGroup
 - Abductor
 - Adductor
 - BicepsBrachii**
 - Brachialis
 - Brachioradialis
 - Deltoid
 - ErectorSpinae
 - ForearmPronators
 - Gastrocnemius
 - GlutealMuscle
 - Hamstring
 - LatissimusDorsi
 - Obliques
 - Pectoralis
 - Quadriceps
 - RectusAbdominus
 - Rhomboid
 - SerratusAnterior
 - Soleus
 - Sternocleidomastoid
 - Supinator
 - Supraspinatus
 - Teres
 - TibialisAnterior
 - TransverseAbdominus
 - Trapezius
 - TricepsBrachii
 - WristExtensors

Annotations: BicepsBrachii

- Biceps Brachii
- Biceps brachii
- biceps
- biceps brachii

skos:exactMatch

- <http://www.co-ode.org/ontologies/galen#BicepsBrachii>
rdfs:comment [language: en]
Galen Ontology
- <http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#C32200>
rdfs:comment [language: en]

BicepsBrachii — <https://purl.archive.org/domain/lift/BicepsBrachii>

Description: BicepsBrachii

Equivalent To

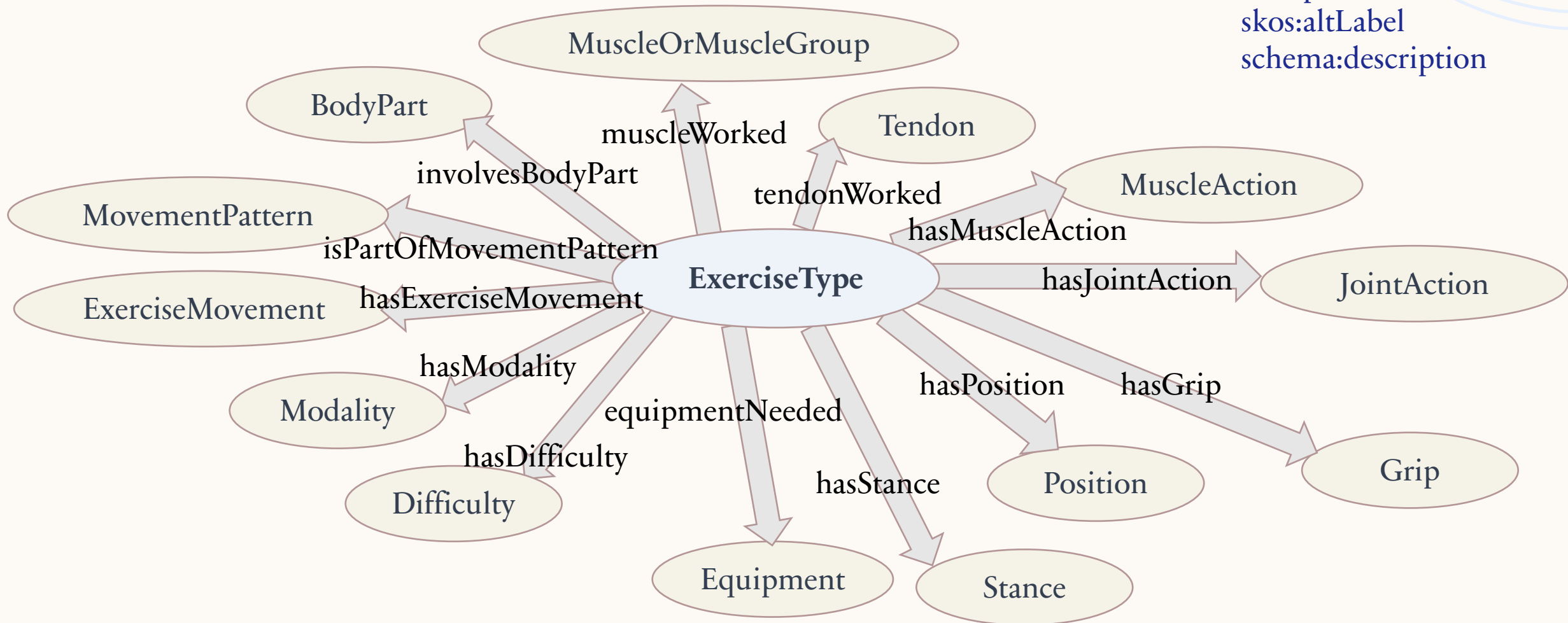
- muscleWorkedBy some BicepCurl
- isPartOfBodyPart only Forearm

SubClass Of

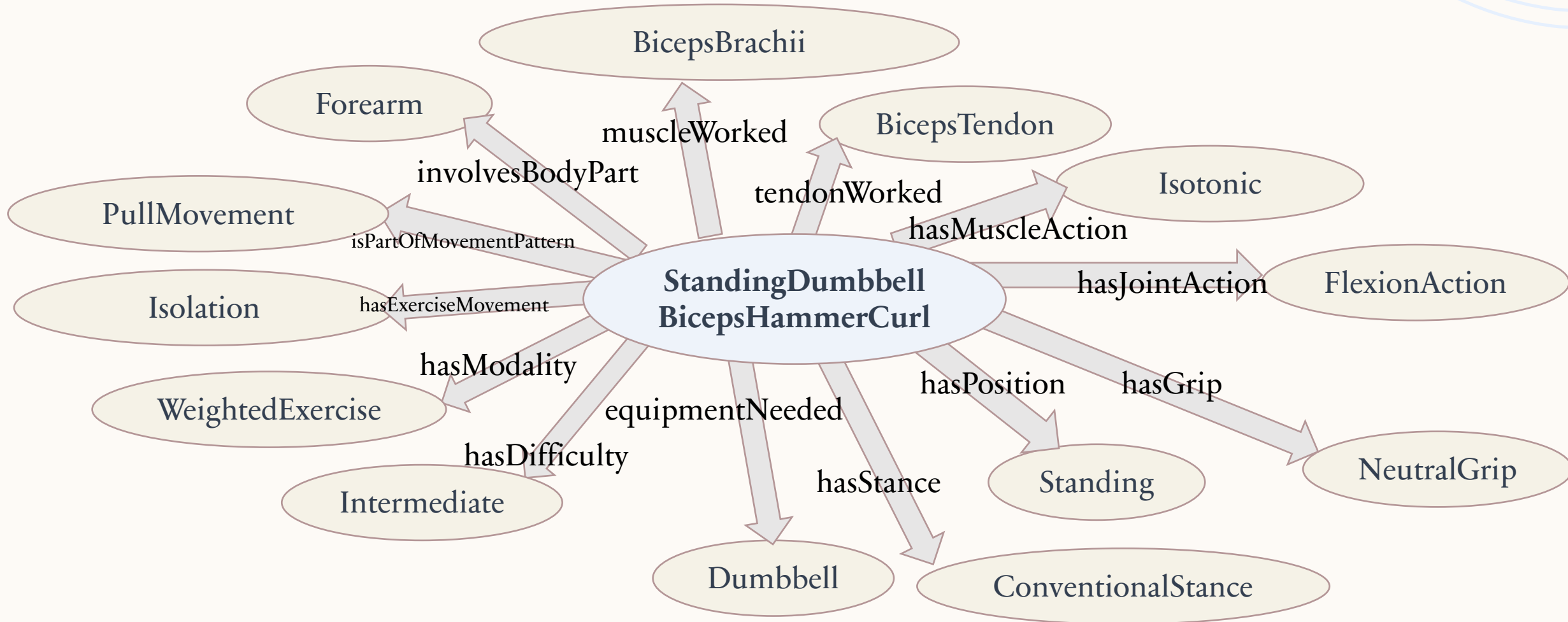
- MuscleOrMuscleGroup

General class axioms

ExerciseType Class



Example: Type of Biceps Curl



Example: Type of Biceps Curl

The screenshot displays an ontology editor interface for the LiFT Ontology. The left pane shows a class hierarchy tree with 'DumbbellHammerCurl' selected. The right pane provides details for this class, including its annotations, description, and various axioms.

Class hierarchy: DumbbellHammerCurl

- owl:Thing
 - Agent
 - Block
 - BodyPart
 - Day
 - Difficulty
 - Duration
 - Equipment
 - Exercise
 - ExerciseMovement
 - ExerciseType
 - Carry
 - ChinUp
 - Curl
 - BicepCurl
 - HammerCurl
 - DumbbellHammerCurl**
 - RopeHammerCurl
 - ReverseBicepCurl

- Deadlift
- Extension
- Fly
- Halo
- Press
- Pressdown
- Pulldown
- PullUp
- ReverseFly
- Row

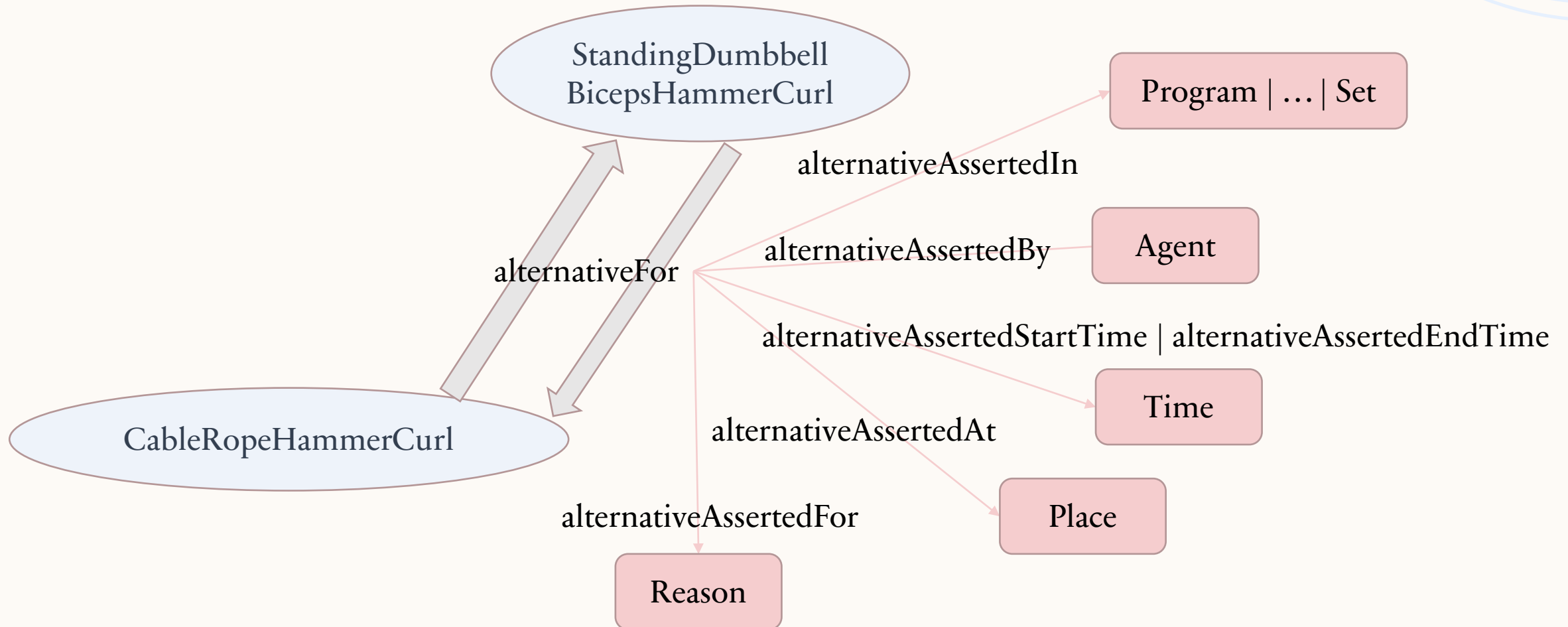
Annotations: DumbbellHammerCurl

- Annotations +
- `rdfs:label` (language: en)
 - Dumbbell Hammer Curl
 - dumbbell hammer curl

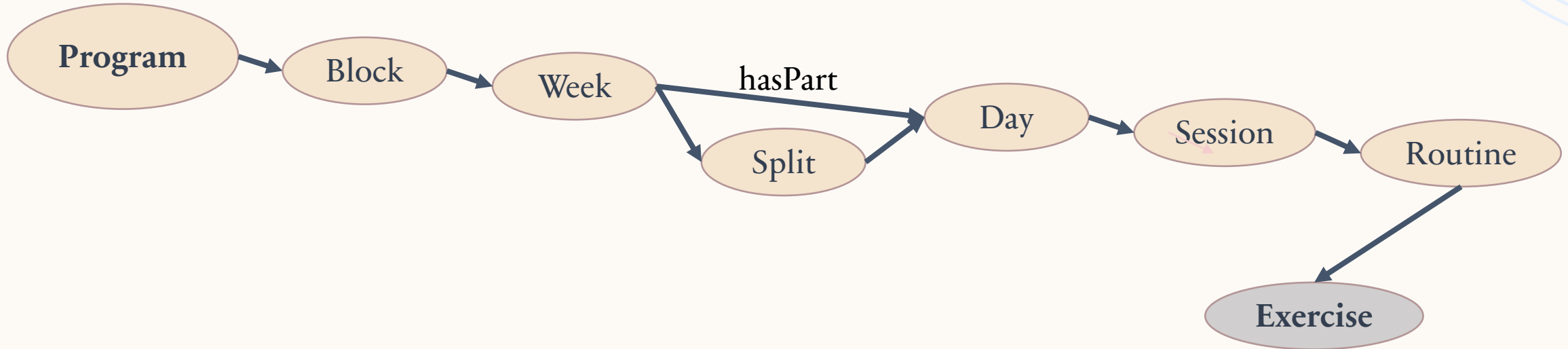
Description: DumbbellHammerCurl

- Equivalent To +
 - `equipmentNeeded` **only** Dumbbell
- SubClass Of +
 - HammerCurl
- General class axioms +
- SubClass Of (Anonymous Ancestor)
 - `agonist` **only** BicepsBrachii
 - `antagonist` **only** TricepsBrachii
 - `hasExerciseMovement` **only** Isolation
 - `hasGrip` **only** NeutralGrip
 - `equipmentNeeded` **some** Equipment
 - `hasJointAction` **some** JointAction
 - `hasMuscleAction` **some** MuscleAction
 - `hasDifficulty` **some** Difficulty
 - `hasModality` **exactly** 1 Modality

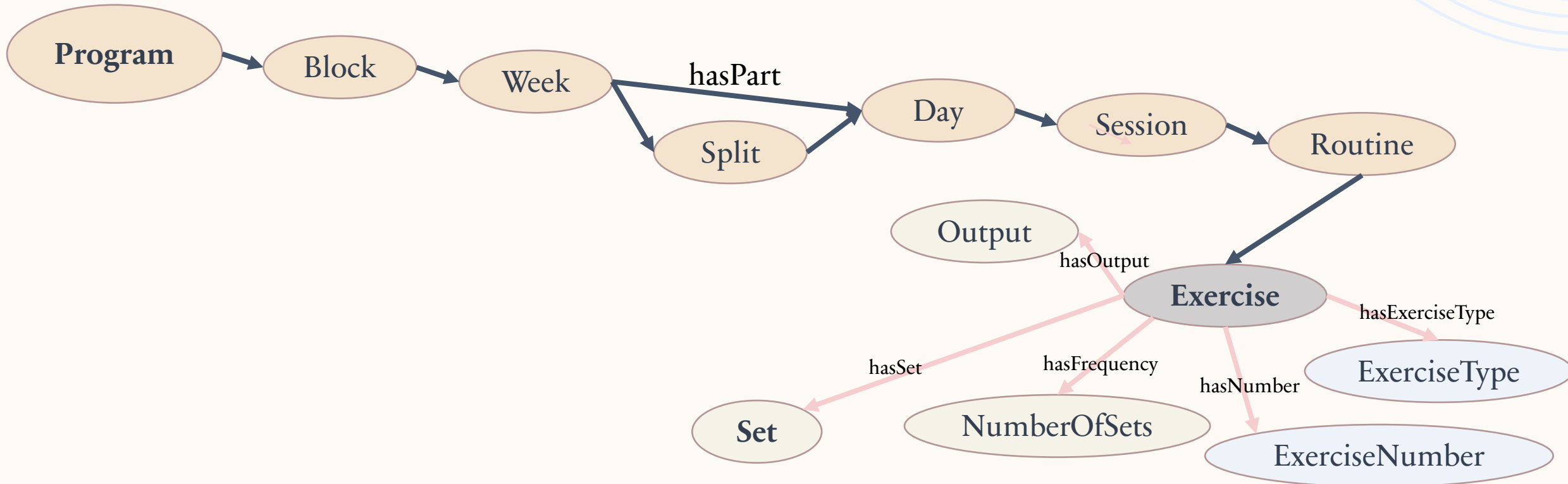
Alternative Exercises



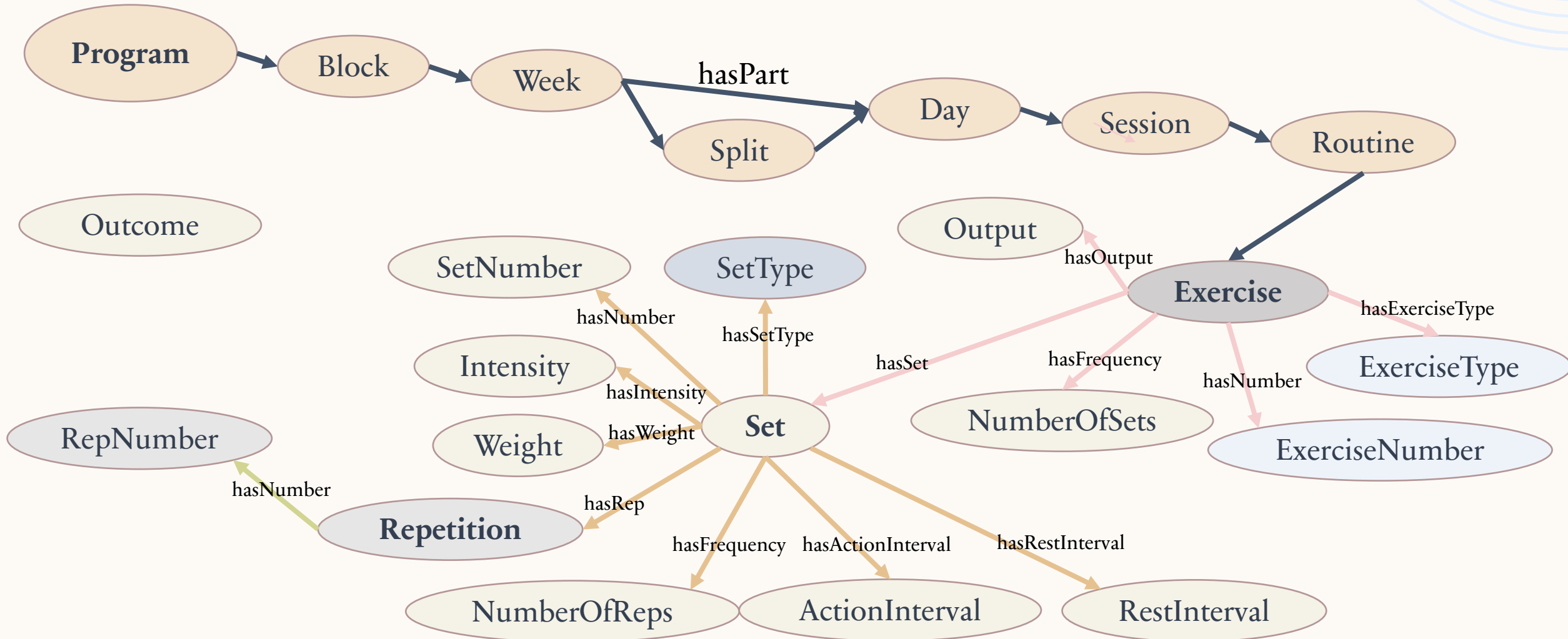
Program Class and Related Classes



Program Class and Related Classes



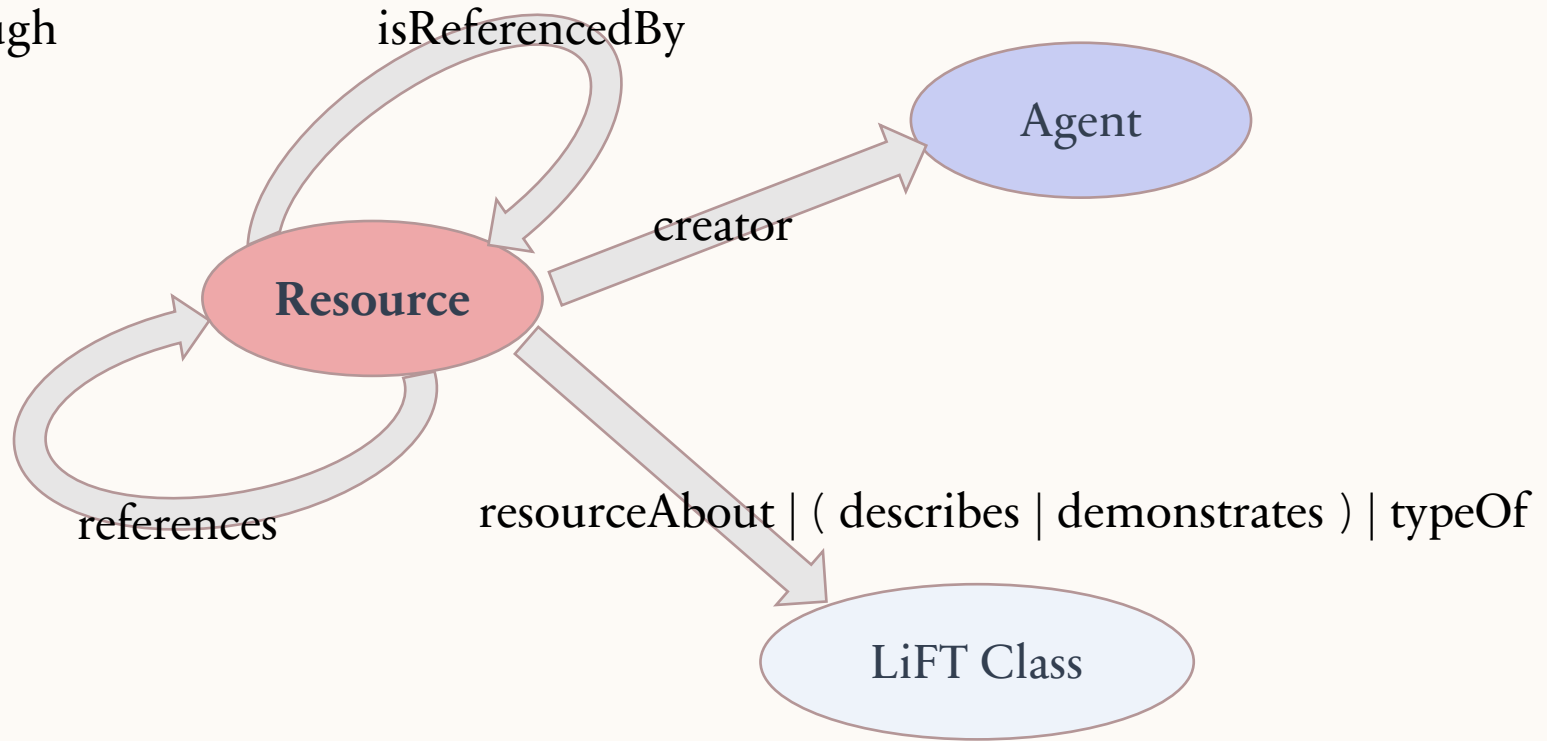
Program Class and Related Classes



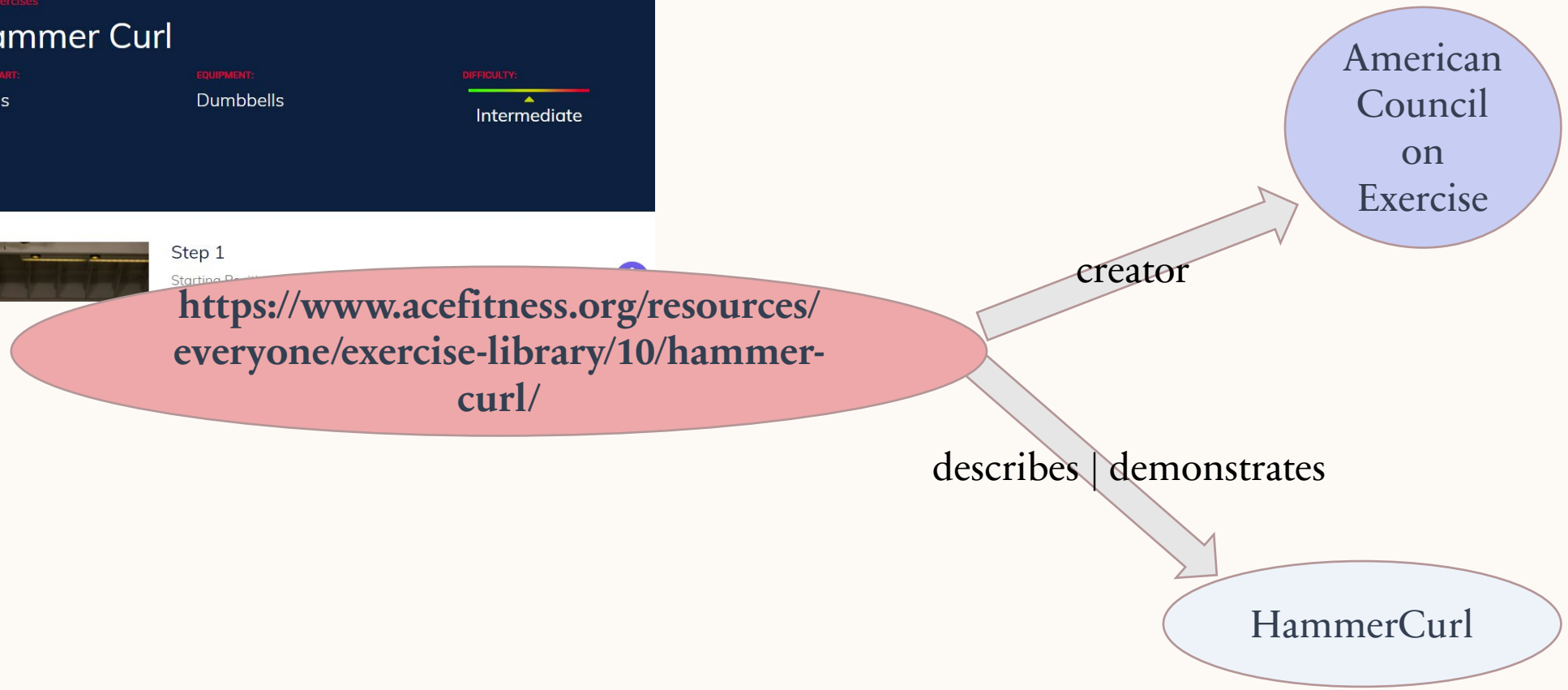
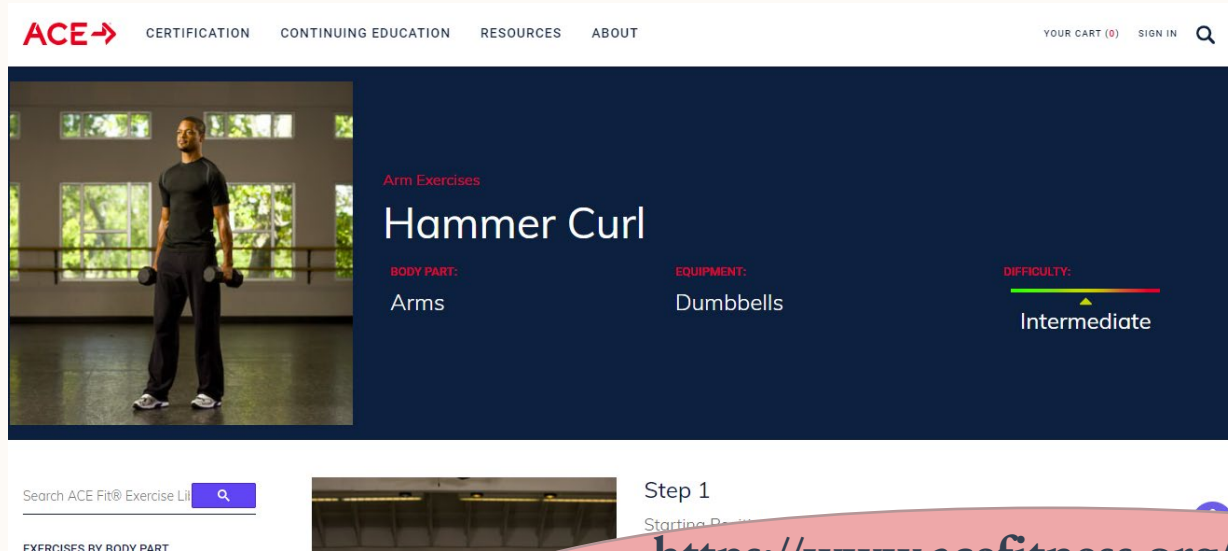
Resource Class

Further description through

DCMI Metadata Terms
Schema.org

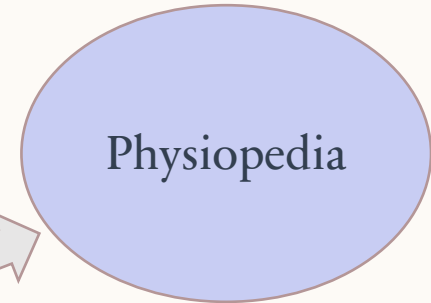


Resource Class



Resource Class

The screenshot shows the Physiopedia website interface. At the top, there is a navigation bar with links for About, News, Contribute, Courses, Resources, and Contact. Below this is a secondary navigation bar with icons for Contents, Editors, Categories, Share, and Cite. The main content area is titled "Biceps Brachii" and features three course recommendations: "Online Course: Tennis Elbow Assessment", "Online Course: Tennis Elbow Management", and "Online Course: Anatomy, Biomechanics and Regional Interdependence of the Thorax". An "Introduction" section begins with the text: "The biceps brachii (BB), commonly known as the biceps, is a large, thick muscle on the ventral portion of the upper arm." A small anatomical illustration of a human head and neck is visible. The URL https://www.physio-pedia.com/Biceps_Brachii is highlighted in a red oval.

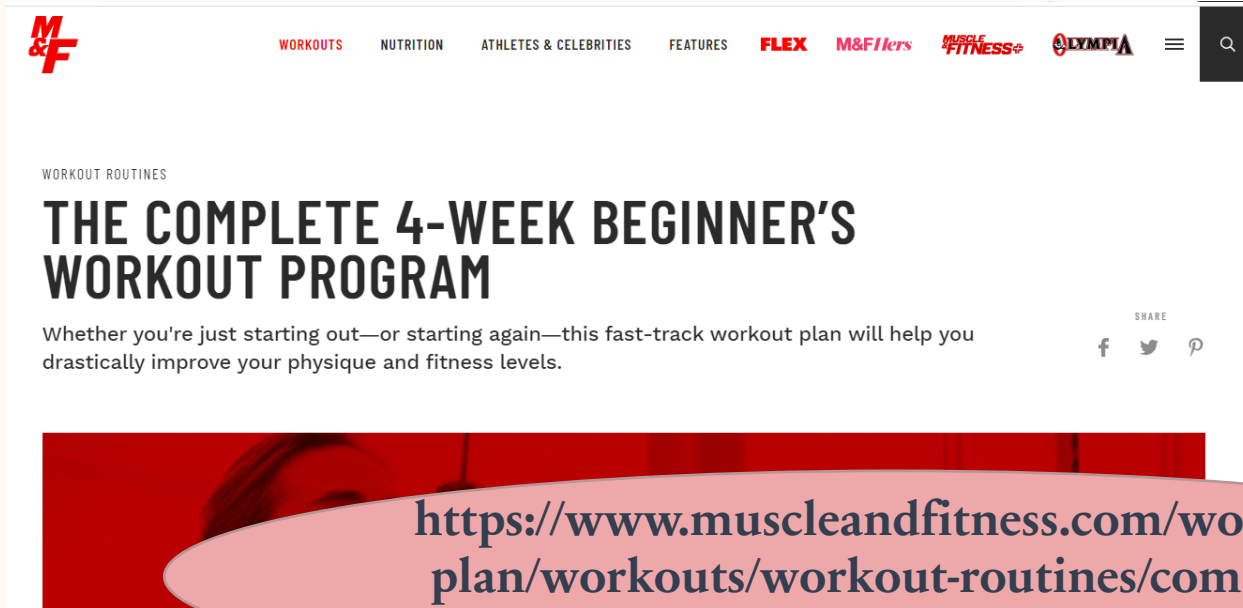


creator

resourceAbout



Resource Class



<https://www.muscleandfitness.com/workout-plan/workouts/workout-routines/complete-mf-beginners-training-guide-plan/>



creator



typeOf

FUTURE DIRECTIONS

Further Refinement

- User Communities & Use Cases
 - Persona Method
 - Delphi Method
 - Case Study Method
- Revisions in line with
 - FAIR (Garijo & Poveda-Villalón, 2020) and
 - 5-star (Vatant, 2012) principles for linked data vocabularies

THANK YOU

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