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

L.P. Coladangelo
College of Communication and Information, Kent State University
NKOS Workshop @ DCMI 2022, October 7, 2022
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; Haussmann 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 (Sehema.org)
- matches in other ontology (SKOS)
- user generated alternatives
MuscleOrMuscleGroup Class

MovementPattern

involvesMuscle

includesMuscle

isPartOfBodyPart

BodyPart

External Vocabulary ID

rdfs:label

schema:description

skos:exactMatch

MuscleOrMuscleGroup

muscleWorkedBy

ExerciseType

muscleWorked

connectsToMuscle

Tendon

tendonWorked

isPartOfBodyPart
Example: Biceps Muscle

- **NCIT C32200**
- **PullMovement**
- **involvesMuscle**
- **includesMuscle**
- **isPartOfBodyPart**
- **Forearm**
- **Deltoids | Brachialis | Brachioradialis**
- **Triceps**
- **synergist**
- **agonist**
- **muscleWorkedBy**
- **BicepsCurl**
- **connectsToMuscle**
- **BicepsTendons**
- **tendonWorked**
Example: Biceps Muscle
Example: Type of Biceps Curl

- BicepsBrachii
- BicepsTendon
- Forearm
- PullMovement
- Isolation
- WeightedExercise
- Intermediate
- Dumbbell
- Standing
- ConventionalStance
- NeutralGrip
- Isotonic
- FlexionAction
- hasMuscleAction
- tendonWorked
- involvesBodyPart
- hasExerciseMovement
- hasModality
- hasDifficulty
- equipmentNeeded
- hasGrip
- hasPosition
- hasJointAction
- hasStance
- isPartOfMovementPattern
- muscleWorked
Example: Type of Biceps Curl
Alternative Exercises
Program Class and Related Classes

- Program
- Block
- Week
- Split
- Day
- Session
- Routine
- Exercise

hasPart relationship between the classes.
Program Class and Related Classes
Resource Class

Further description through

DCMI Metadata Terms
Schema.org

LiFT Class

Agent

Resource

isReferencedBy

creator

typeOf

resourceAbout | ( describes | demonstrates )
Resource Class

Hammer Curl

creator

American Council on Exercise

describes | demonstrates

https://www.acefitness.org/resources/everyone/exercise-library/10/hammer-curl/
Resource Class

https://www.physio-pedia.com/Biceps_Brachii

LiFT Ontology

BicepsBrachii

creator

resourceAbout

Physiopedia
Resource Class


Muscle and Fitness

creator

typeOf

Program
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

L.P. Coladangelo (he/him)
Email: lcoladan@kent.edu
Twitter: @lpc359
Wikimedia: LPC359