

BRITISH  
JUDO



**1st4sport**  
Qualifications

# 1<sup>st</sup>4sport Level 3 in Coaching Judo

Module 16: Biomechanics for Judo



# Module 16: Biomechanics

## Module Outcomes

- Learn how to conduct a Functional Movement Screening
- Improve knowledge of the 100 Kodokan Classification of waza
- Identification of Movement Phases of a throw; traditional vs. modern contest
- Practicing breaking down waza using movement phases as coaching points
- Carry out comparisons of the Kodokan classification of waza vs. a biomechanical classification
- Perform an mat-based evaluation of traditional 2d models of Kuzushi vs. 3d models
- Develop an understanding of a deterministic model of a judo throw
- Gain an awareness of common physical components required for judo throwing and their related training exercises

# Module 16: Biomechanics

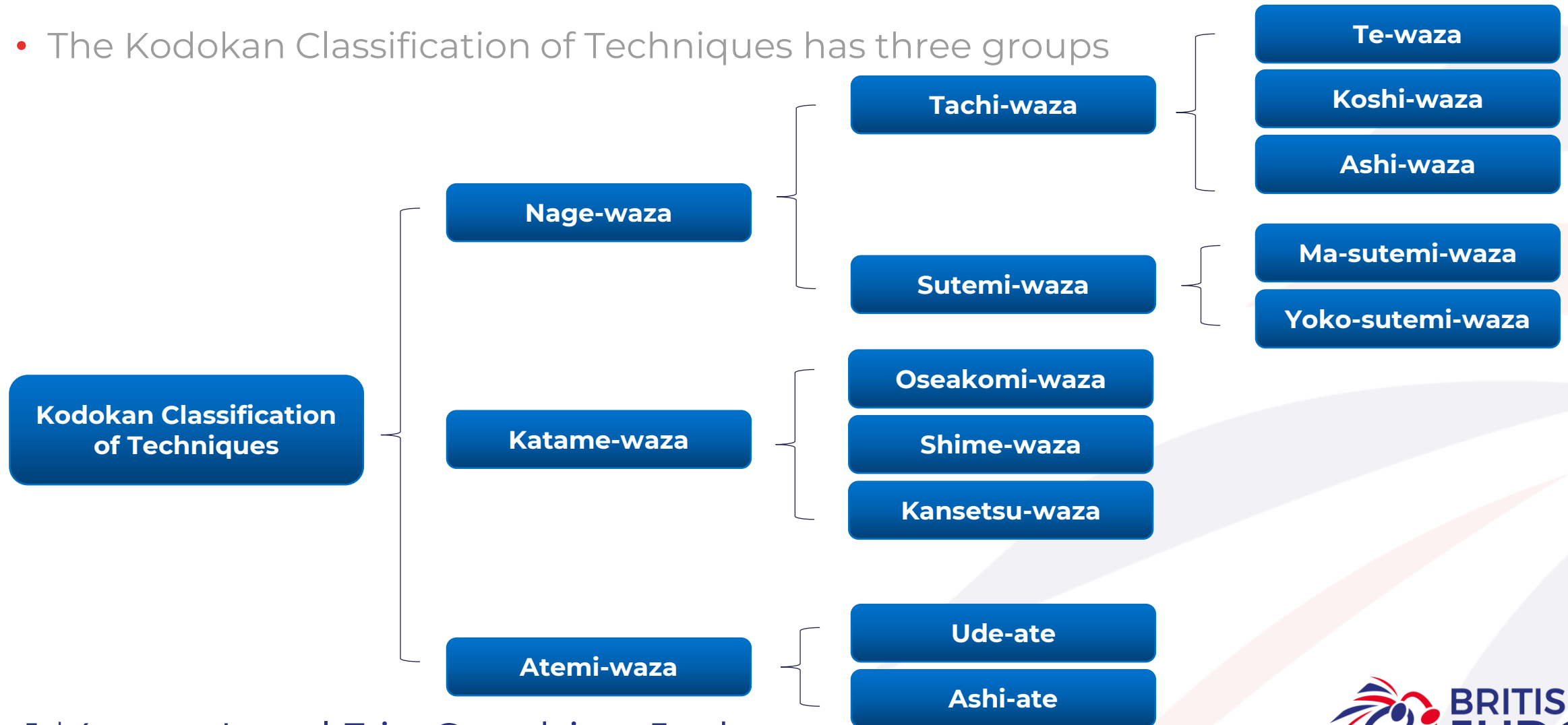
## Functional Movement Screen

- The FMS was developed as a simple method to identify movement pattern asymmetries and/or deficiencies
- A simple means to rate and rank basic movement patterns needed in everyday physical activity
- It is just a 'screen'; it is not a diagnostic tool, an assessment, or a test
- Pros;
  - Quick easy screen, takes about 10 – 12 mins per athlete
  - The score becomes a universal “language” among certified screeners
  - Most athletes struggle with the same screens
- Cons;
  - Assigning a number to the movement can become subjective
  - Not conducive to screening a large number of athletes by a solo coach

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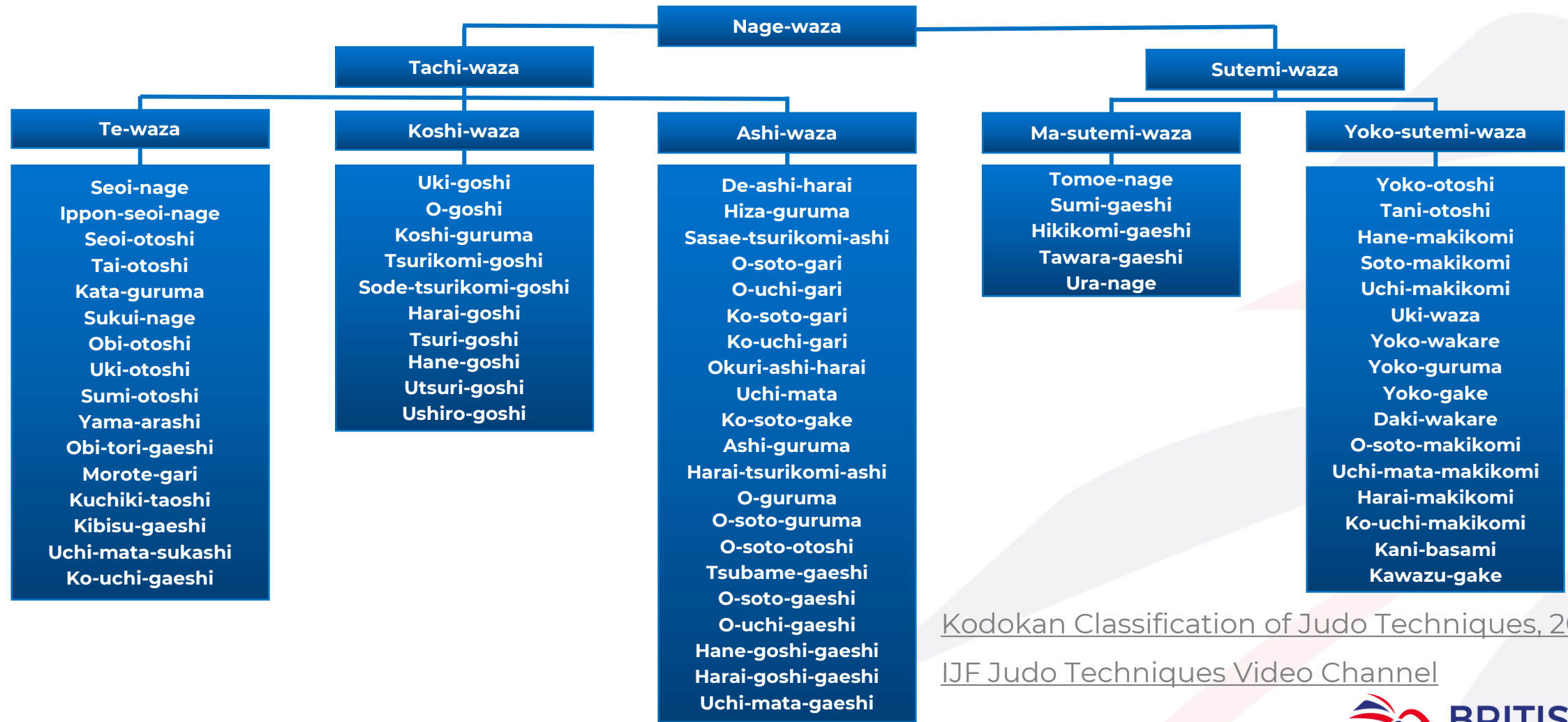
## Classification of Judo Techniques

- The Kodokan Classification of Techniques has three groups



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## Classification of Judo Techniques – Nage-waza

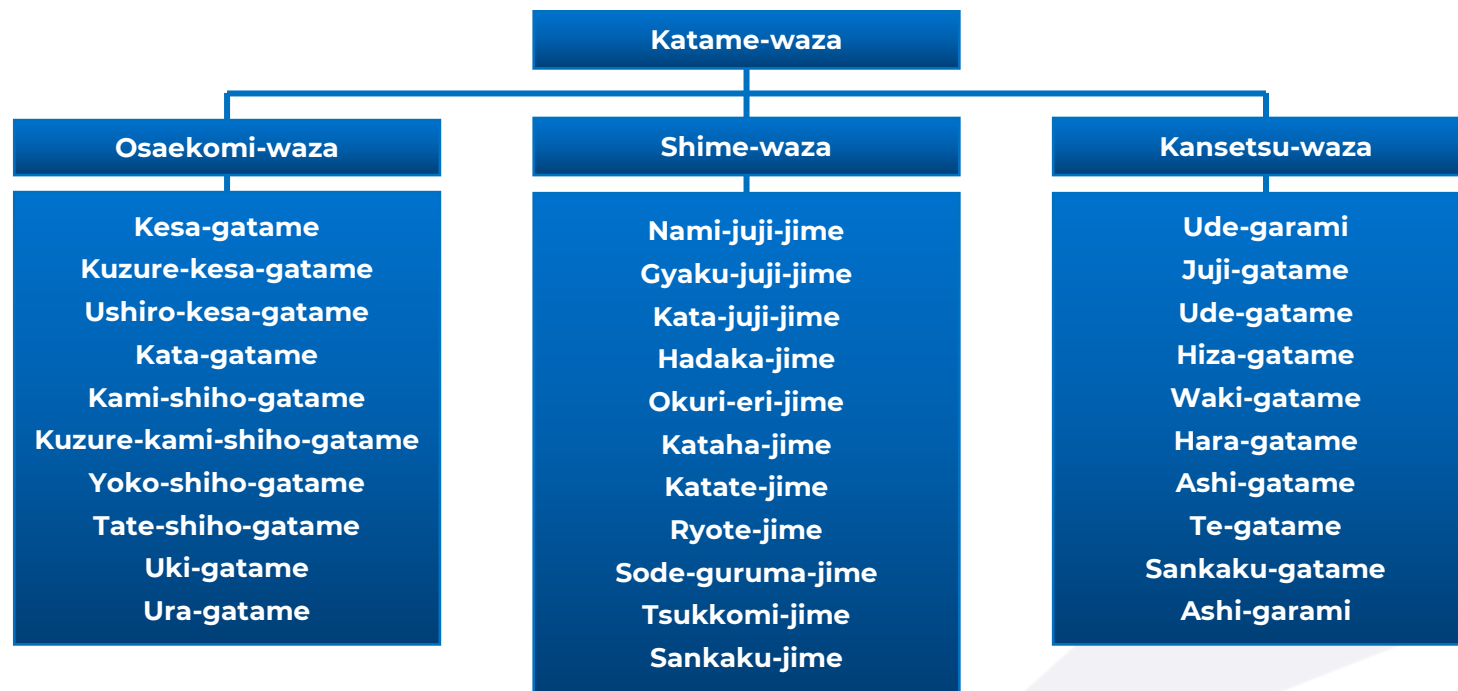


Kodokan Classification of Judo Techniques, 2017

IJF Judo Techniques Video Channel

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## Classification of Judo Techniques – Katame-waza



Kodokan Classification of Judo Techniques, 2017

IJF Judo Techniques Video Channel

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## Phases of a Judo Throw

- Phases of movement – Every movement skill can be broken down into components



Phases of a Judo Throw, Kano ca. 1850



Phases of a Judo Throw, Hirano, 1969

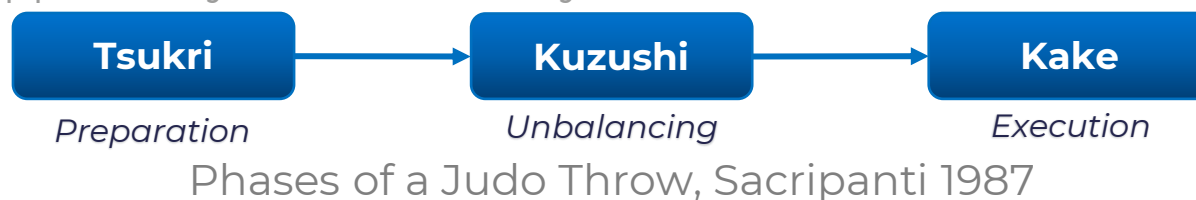


Phases of a Judo Throw, De Créé & Edmonds 2012

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## Sacripanti Biomechanical Classification of Judo Throwing Techniques

- Simplifying the sequential steps of the throwing movement using just three phases and reversing the traditional order of the first two phases
  - The order now more often observed in dynamic contest situations
  - Kuzushi requires opportunity and a final body collision or clash



- Generalising the classes of forces and Uke's body flight paths/symmetries, to group throwing techniques under two dynamic principles

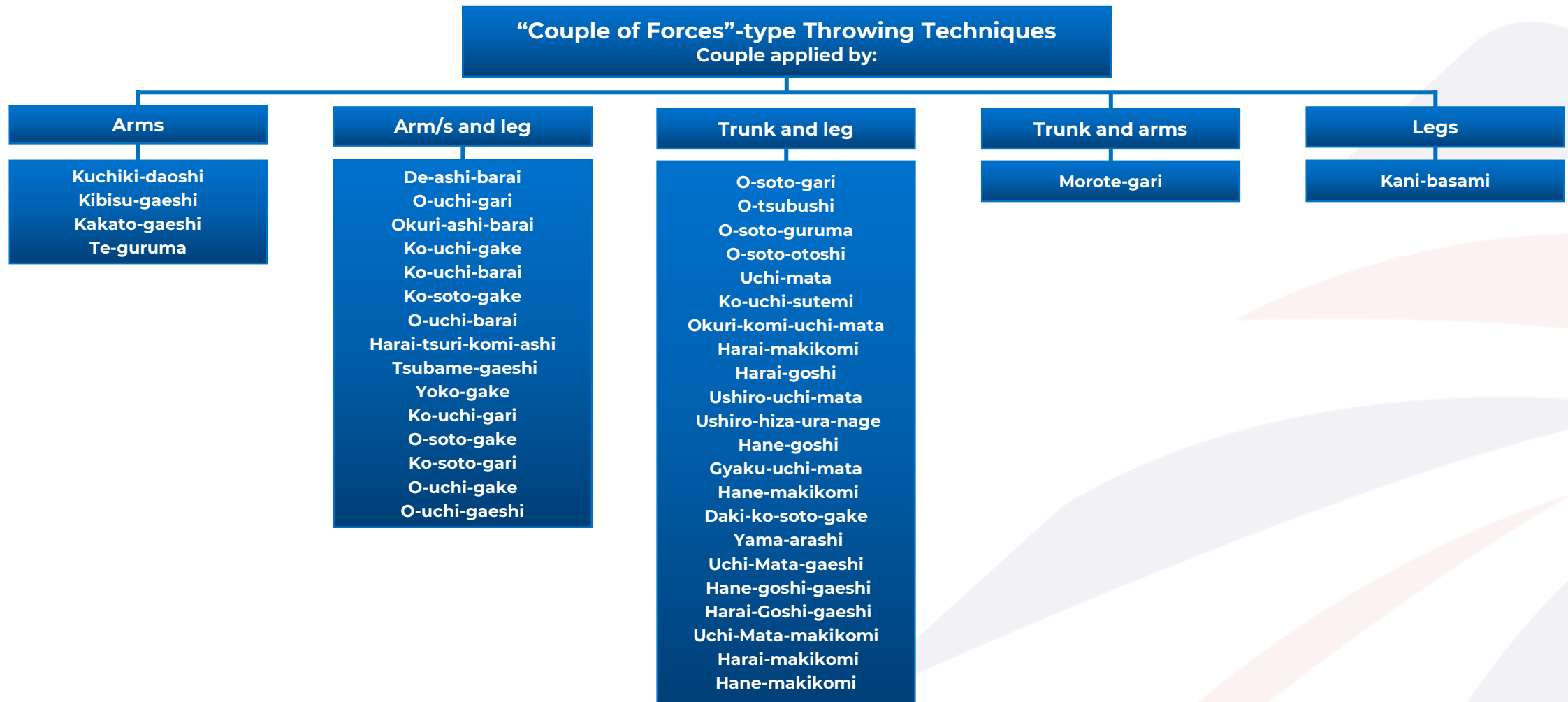


Dynamic Principles of a Judo Throw, Sacripanti 1987



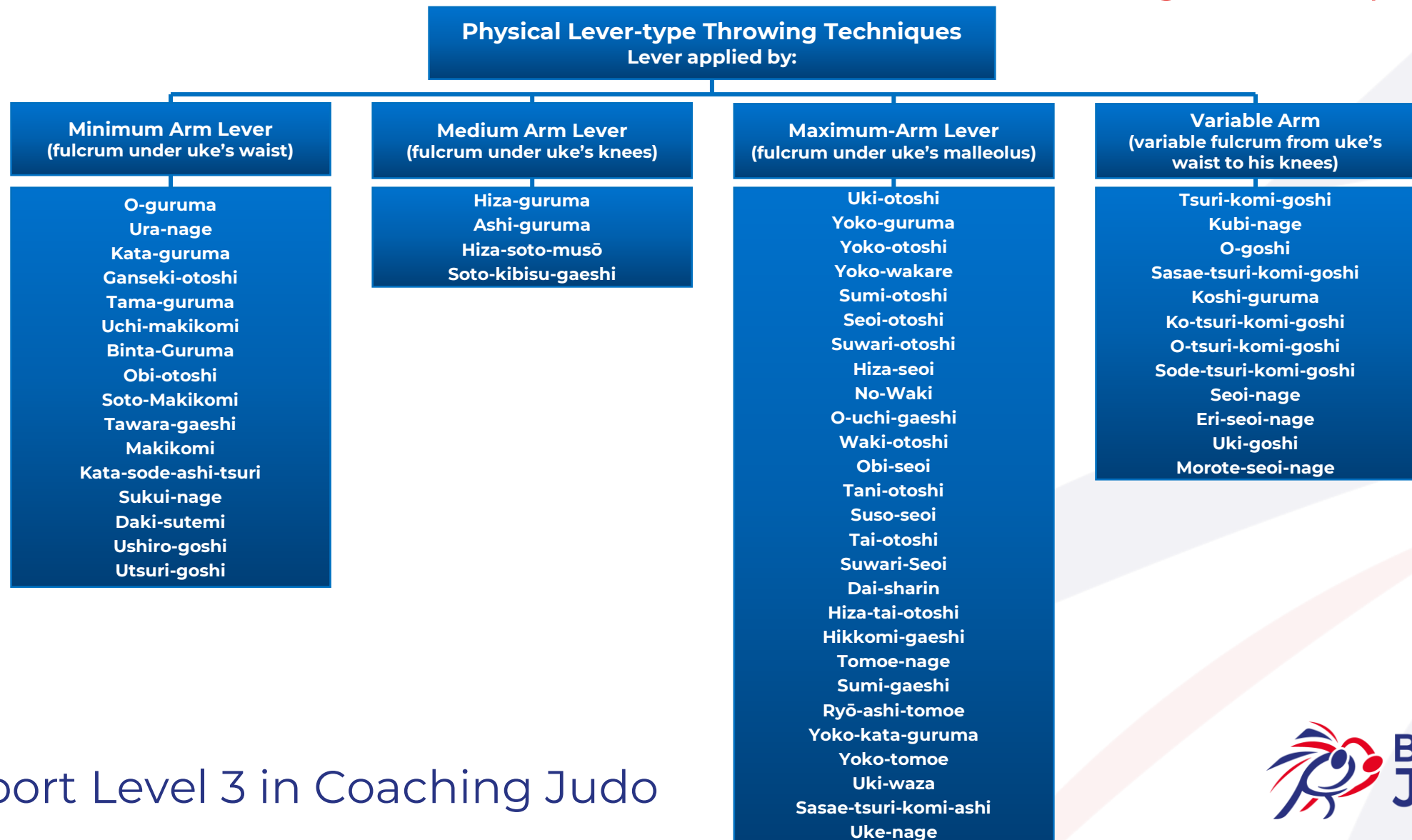
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## Sacripanti Biomechanical Classification of Judo Throwing Techniques



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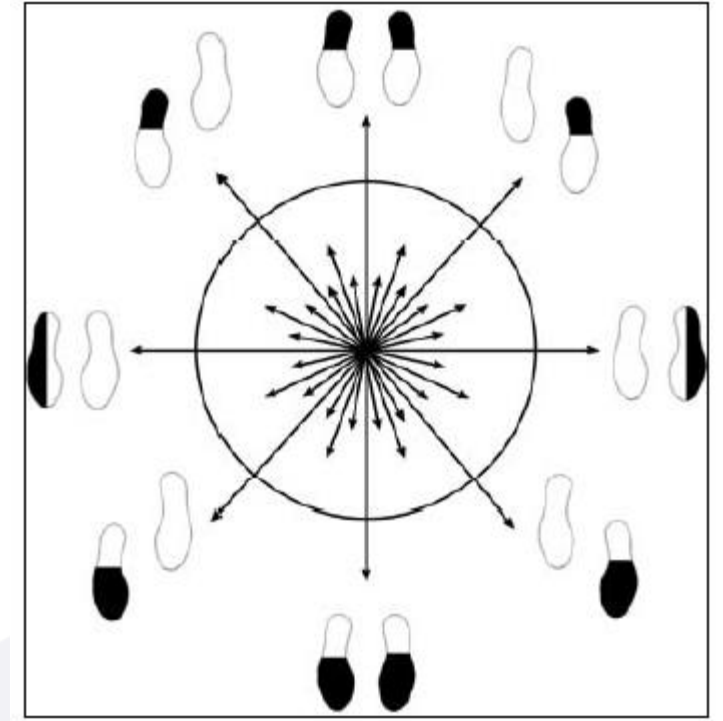
## Sacripanti Biomechanical Classification of Judo Throwing Techniques



# Module 16: Biomechanics

## Kuzushi – Eight Directions of Unbalancing

- Adopted from Tenjin Shin'yōryū jujutsu
- 8 straight horizontal directions parallel to the tatami
- Only considers two dimensions
  - Kuzushi entails more than just horizontal directions
- The human body is flexible, it is not a rigid object
  - The body's centre of mass (COM) changes its position both inside and outside the body
- Does not account for different types of entry
  - For example, a lift-pull entry or a spinning entry
- Based on traditional Kuzushi precedes Tsukuri phase order
  - Relies on using different types to tai-sabaki to describe the entry type:
    - Mae-sabaki, Ushiro-sabaki, Mae-mawari-sabaki, Ushiro-mawari-sabaki



Happō-no-kuzushi  
*Eight directions of unbalancing,*  
Kano ca. 1850

# Module 16: Biomechanics

## Kuzushi – Upward and Downward Movement

- Seven different ways of using the arms to realize a three-dimensional model of kuzushi

**Katate-sabaki**

*Single-handed preparation*

**Ryōte-sabaki**

*Double-handed preparation*

**Taiko-tataki**

*Drumbeating*

**Tobi-agari**

*Jumping up*

**Hiza-mage**

*Knee-bending*

**Sutemi**

*Sacrificing*

Jōge-no-kata (Forms of Up- and Downward Movement), Hirano 1972

- These kuzushi movements are typically preceded by an explosive pull downwards followed by a suri-ashi (sliding step) that leads to a tsuru-komi (upwards pulling)

**Tsuru-komi**

*Lift and pull entry*

**Mawari-komi**

*Spinning entry*

**Tobi-komi**

*Jumping entry*

**Handō**

*Reactive entry*

**Oi-komi**

*Chasing entry*

**Hiki-dashi**

*Pulling open entry*

Types of Entry, Hirano 1972

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## Kuzushi – Rotational Unbalancing and Reactions

- Seven different methods for rotational unbalancing

**Dai-en**

*Large circle*

**Katate-dai-en**

*Single-handed large circle*

**Ryōte-sho-en**

*Double-handed large circle*

**Naname-en**

*Diagonal circle*

**Ito-sabaki**

*Surprise turn*

**Kaiten-en**

*Rotating circle*

Endō-no-kata (Forms of Circular Motion), Hirano 1972

- Seven different types of waves (reactions) that provided the basis for seven different tsukuri-kuzushi entities

**Ōnami**

*Large wave*

**Yokoshibuki**

*Sideways splash*

**Uchi-age**

*Up-shooting wave*

**Oinami**

*Overtaking wave*

**Tatsumaki**

*Waterspout*

**Nami-no-hana**

*Foaming wave*

**Uzumaki**

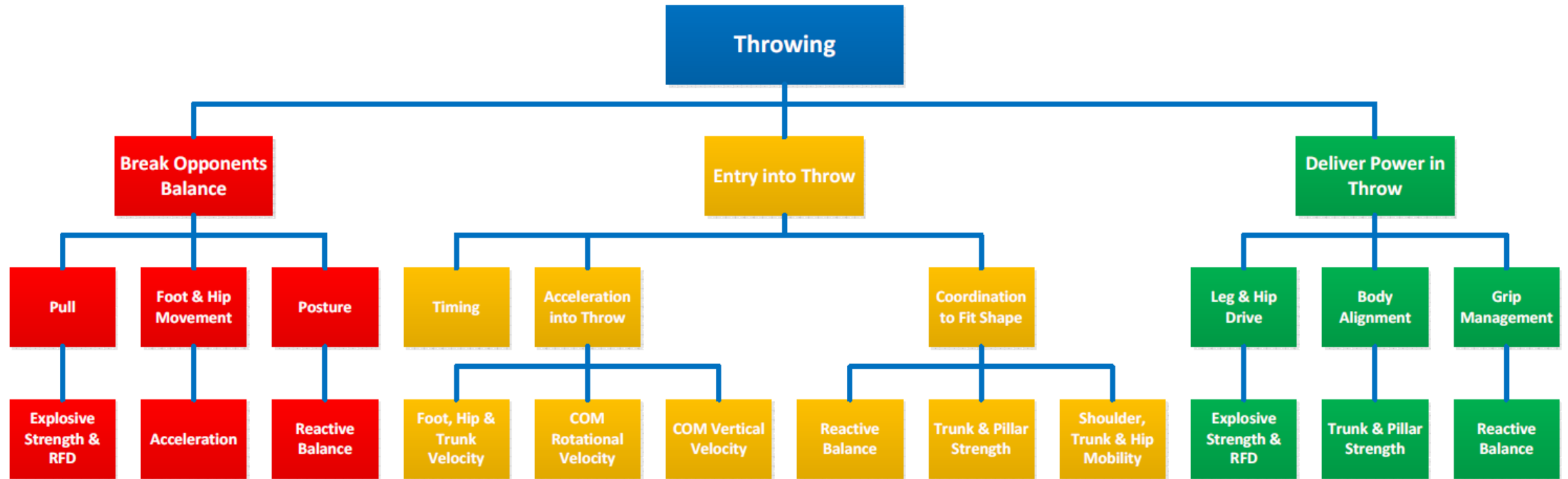
*Whirlpool*

Handō-no-kata (Forms of Reactions), Hirano 1972

# Module 16: Biomechanics

## Deterministic Model for a Judo Throwing Technique

- Deterministic modelling - modelling that determines the relationships between a movement outcome and biomechanical factors

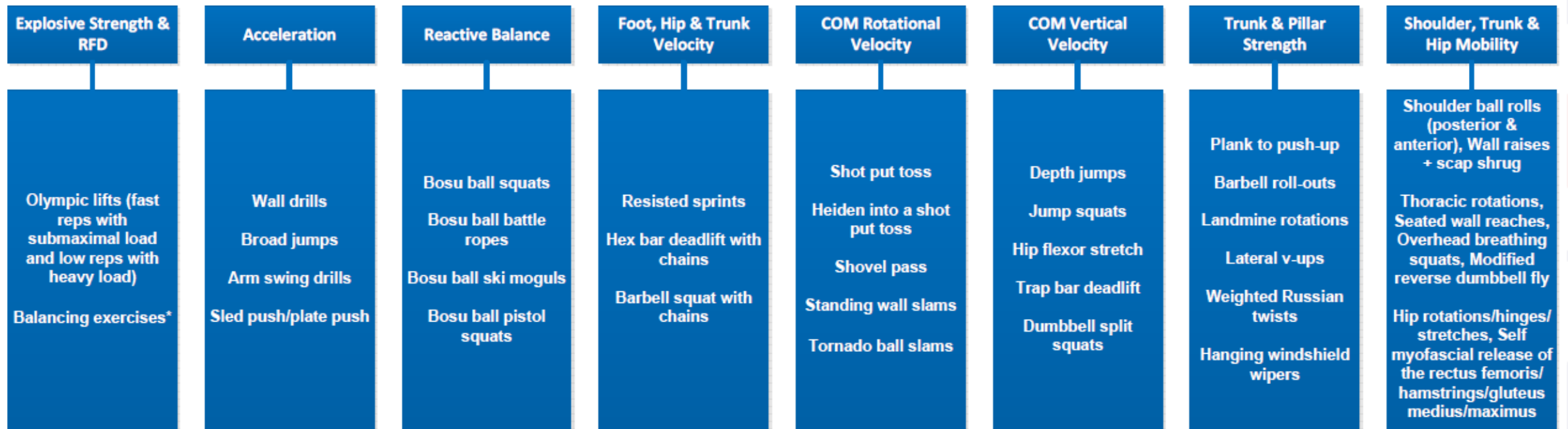


Deterministic Model for a Judo Throw, MacDonald 2016

# Module 16: Biomechanics

## Physical Factors of a Judo Throw

- Common underpinning physical components recognised by deterministic modelling of a judo throw, and specific training exercises identified to develop each component



Common Physical Components & Training Exercises for Judo Throwing, Nunn 2018