L’épaule du·de la sportif·ve : douleur et dysbalances musculaires

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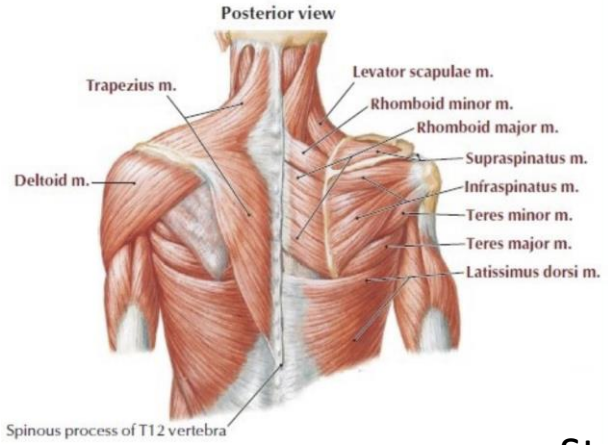
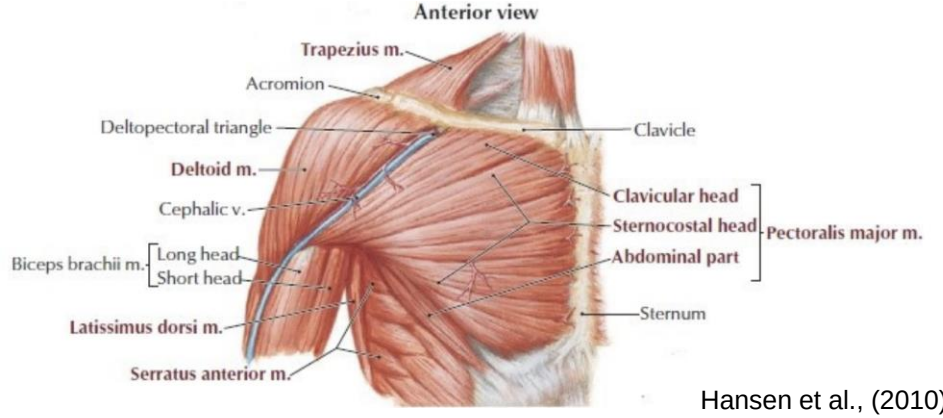
INTRODUCTION





Hansen et al., (2010)

Structure VS Fonction

Thomas Röhler / Getty images / Patrick Smith

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OBJECTIFS

- Définir la dysbalance d’épaule
- Explorer le processus de mesure de force d’épaule
- Connaître la relation entre douleur et dysbalance d’épaule
- Appréhender d’autres facteurs contributifs
- Explorer une démarche de prévention

DYSBALANCE D'EPAULE

- Littérature «overhead athletes» prédominante → valeurs références
- 18-50 ans, tennis/volleyball/handball/baseball
- **Athlete Shoulder Consensus Group** (Schwank et al., 2022):
  - Isométrique (dynamometer manuel):
    - Couché en DD, 90°ABD, rotation neutre: ratio ER/IR **0.7-0.75**
    - Assis, 90° ABD, rotation neutre: ratio ER/IR **0.9-1.00**
    - Assis, 90° ABD, 90° RE: ratio ER/IR **0.6-0.85**
  - Dynamique (isocinétisme):
    - Couché en DD, 90° ABD: ratio ERecc/IRconc **1.00**

(Cools et al., 2016; Schwank et al., 2022)

POPULATION CIBLE

- Classification des instabilités d'épaules:
  - **AIOS : Acquired Instability Overstress Syndrome**
    - Stress antérieurs répété → laxité acquise, rigidité de la capsule post
    - Sportifs overhead (lancers, etc)
    - GIRD (Cools et al., 2012)
  - TUBS : Traumatic, Unidirectionnal instability (anterior+), Bankart lesion, Surgery
    - Sports contact, haute cinétique
  - AMBRI : Atraumatic, Multidirectional, Bilateral, Rehabilitation, Inferior
    - Hyperlaxité
    - Natation, Gymnastique

OVERHEAD ATHLETES

- Considérations biomécaniques:
  - Volleyball
    - Position armé dès 150° ER
    - Vitesse angulaire IR impact 4’520°/s (±1020°/s)
    - 40’000 frappes/saison
  - Baseball
    - Position armé dès 180° ER
    - Vitesse angulaire lancer IR 9’000°/s
    - Décélération 500’000°/s^2

- Forces compressives GH ++, et activation++ CDR

(Kugler et al., 1996; Briner and Kacmar, 1997; Escamilla and Andrews, 2009; Reeser et al., 2013; Seminati and Minetti, 2013; Wagner et al., 2014)

OUTILS & PROCEDURE DE MESURE

	Dynamomètre isocinétique	**Dynamomètre manuel**
Modalités	Dynamique (conc/exc)	Isométrique*
Avantages	Précision *Gold-standard*	Coût, portabilité
Positionnement	Assis (Davies), couché DD	Assis, couché DD
ICC intra	0.87 – 0.97 (rotateurs conc/exc)	0.93 (IR) & 0.84 (ER), expérience
Corrélation	ρ = 0.65-0.82, P<0.01 → strong/very strong (valeurs absolues, waterpolo)	

* Existence de protocoles de mesures dynamiques avec dynamomètre manuel, i.e. eccER (Johansson et al., 2015)

(Croteau, Robbins and Pearsall, 2021; Chamorro et al., 2021)

OUTILS & PROCEDURE DE MESURE

- Considérations en vue d'établir un protocole test:
  - Sport spécifique (poste-/athlète-dépendants)
    - Lancers, frappes : vitesse, capacité de décélération
    - Natation : force, endurance
    - Gymnastique : stabilité
  - Pic de couple (ratios), résistance fatigue, rapidité de contraction
  - Expérience évaluateur (dynamomètre manuel)
  - Accessibilité outils
  - Test-retest vs valeurs références
    - Valeurs référence : pré-blessure, controlatéral, benchmark sport-spécifique

(Schwank et al., 2022)

OUTILS & PROCEDURE DE MESURE

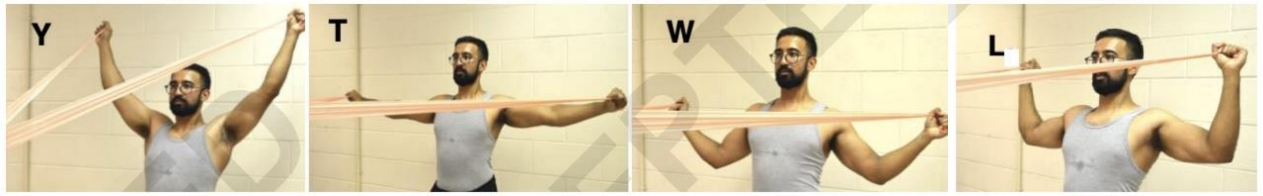
- Exemple de protocole inspiré de Forthomme et al. (2013)
  - Contractions concentriques sous-maximales RI/RE de 50° RI à 70° RE (10 répétitions)
  - Contractions maximales, séparées par des pauses d'une minute et trois répétitions sous-maximales de familiarisation:
    - contractions concentriques RI/RE 60deg/s (3 répétitions)
    - contractions concentriques RI/RE 240deg/s (5 répétitions)
    - contractions excentriques RI/RE 90deg/s (4 répétitions)

OVERHEAD
PICS DE COUPLE
RATIOS
RECHERCHE - CHUV

(Sung-Min Rhee et al., 2021)

OUTILS & PROCEDURE DE MESURE

- Exemple de protocole inspiré de Johansson et al. (2015)
  - ER excentrique (30deg/s)



  - Dynamomètre manuel, 2cm proximal processus styloïde ulna post
  - ER max → rotation neutre, tempo de 3s. (métronome)
  - Contraction sous-maximale (1x), Contractions maximales (3x), pauses 20s.

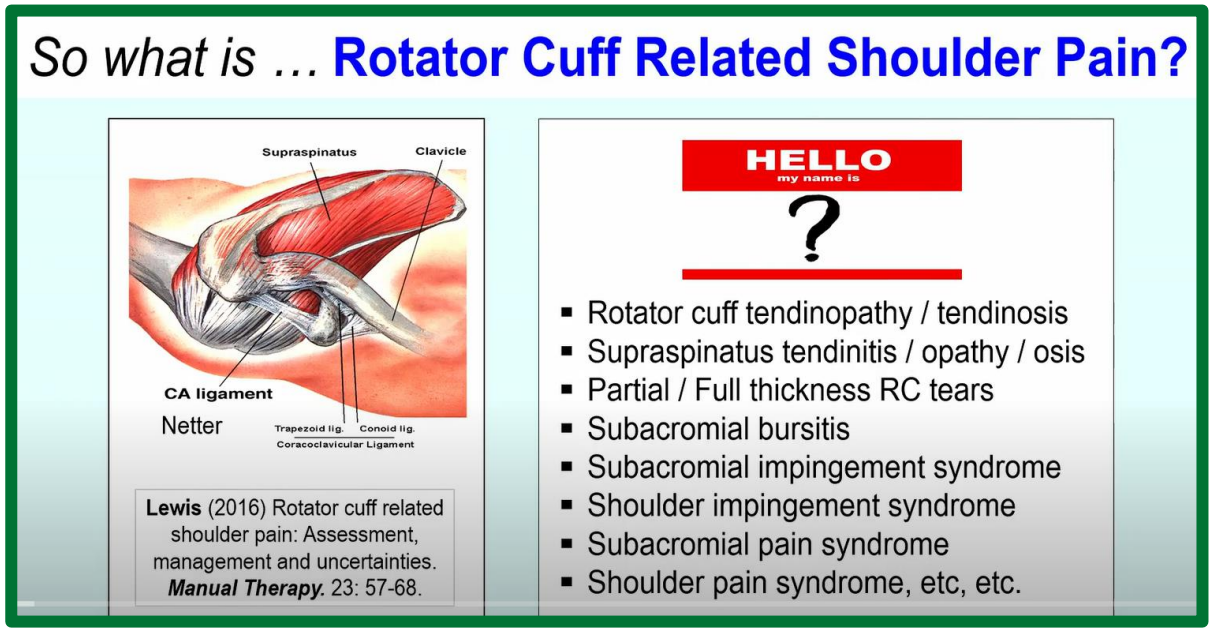
- Validé avec non-athlètes, validation nécessaire dans des populations spécifiques
  - Pearson correlation = 0.7-0.78 (bon)
  - ICC intra = 0.87 (excellent), ICC inter = 0.714 (bon)

OVERHEAD
AIOS
PROCHE RTP
CABINET

Joseph et al., (2019)

DYSBALANCE ET DOULEUR

- Se distancer de la structure → symptomatique et fonction

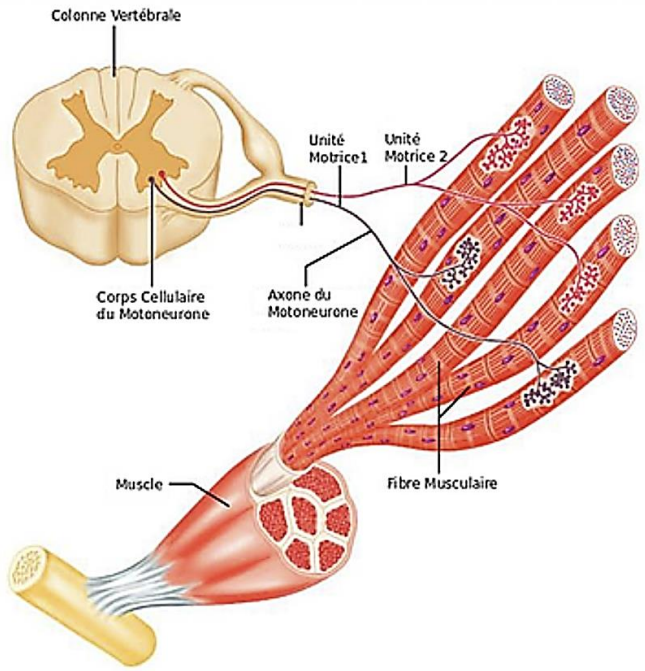


(2) Jeremy Lewis - Rotator Cuff Related Shoulder Pain & the athlete: Suggestions for management – YouTube

? **CAUSE** (prévention) **vs CONSEQUENCE** (réhabilitation) ?

DYSBALANCE ET DOULEUR

- Conséquence?
  - Douleur induite supra-épineux → inhibition infra-épineux
  - Douleur clinique et induite → ↓ MVC et **F**endurance durant contractions submaximales, alteration patterns activation et coordination lors de tâches dynamiques
  - Douleur induite quadriceps → ↓ **F**isométrique et maintien **F**isocinétique
    - Explication: modification stratégie de recrutement des UMs (↑ seuil d'activation UMs et amplitude PAs)

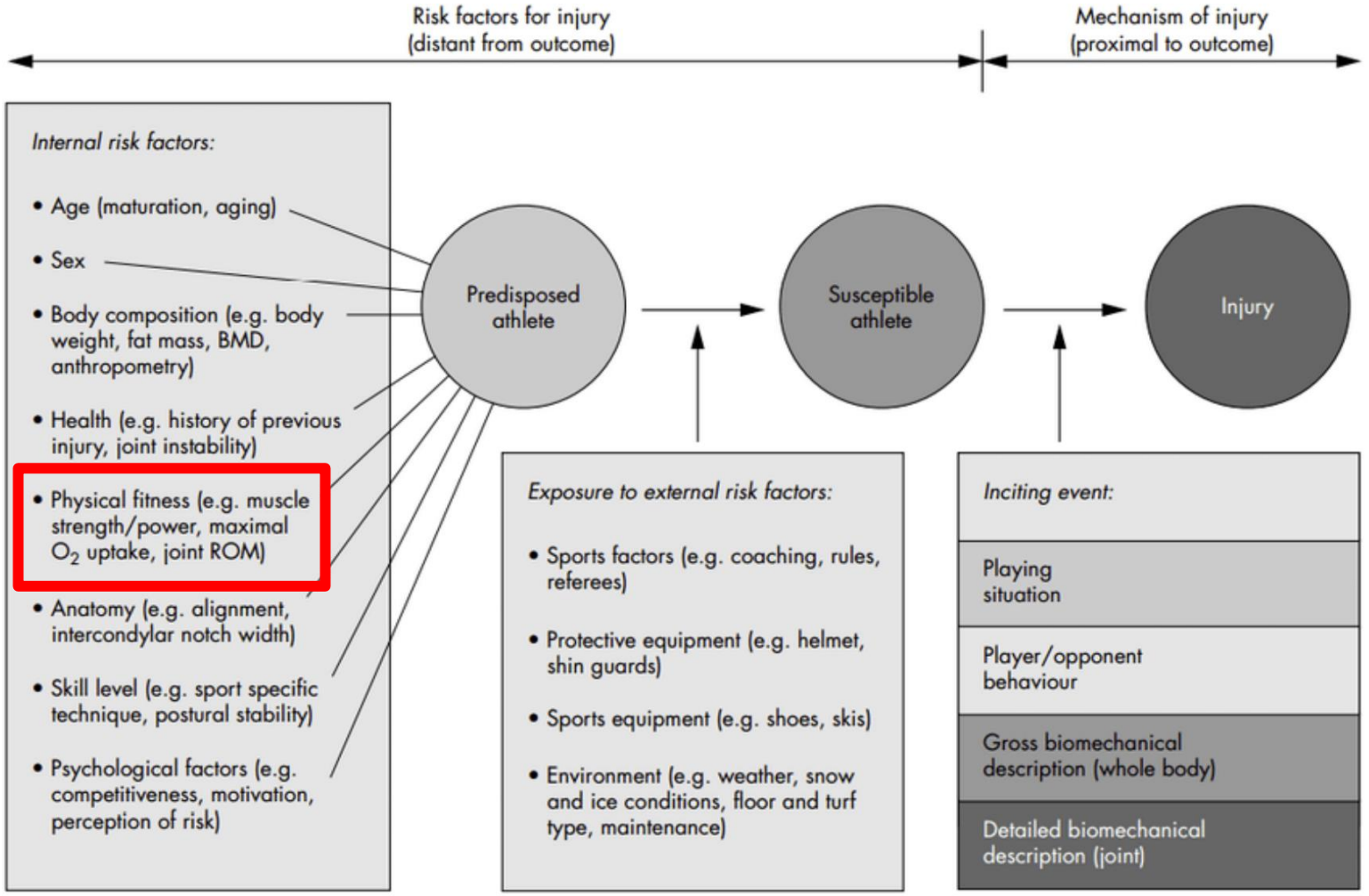


(Graven-Nielsen et Arendt-Nielsen, 2008; Castelein et al., 2017; Becker et al., 2022)

DYSBALANCE ET DOULEUR

- Cause?

van Mechelen, Hlobil and Kemper (1992)



Krosshaug et al. (2005)

DYSBALANCE ET DOULEUR

- Altération de force d'épaule (overhead) → facteur de risque intrinsèque modifiable (Byram et al., 2010; Clarsen et al., 2014a; Achenbach et al., 2020)
- Etudes prospectives uniquement!

Facteur de risque	Population	Outils	Modalités	Auteur(s)
ERconc/IRconc < 0.69, RR2.57 IRecc/ERconc > 1.61, RR2.08	Handball	Isocinétisme, assis (Davies)	240°/s 60°/s	Edouard et al., (2013)
↓IRecc & ↓ERecc ↑1Nm → ↓1% risque surcharge	Volleyball	Isocinétisme, couché	60°/s	Forthomme et al., (2013)
↓IRconc PT ↑ ERecc/IRconc	Baseball universitaire	Isocinétisme, assis (Davies)	300°/s	Vogelpohl and Kollock, (2015)
↓ERecc/IRconc < 0.68, RR4.5	Natation, ado.	Isocinétisme, assis (Davies)	60°/s	Drigny et al., (2020)
↓IRiso & ↓ERiso	Waterpolo	HHD, assis, 90-90 et coude-au-corps	-	Hams et al., (2019)
↓IRiso, HR 2.37 ↓ERiso, HR 2.44	Handball, ♀ ado.	HHD, assis	-	Asker et al., (2020)

HETEROGENEITE +++ populations, protocoles, définitions de blessure

DYSBALANCE ET DOULEUR

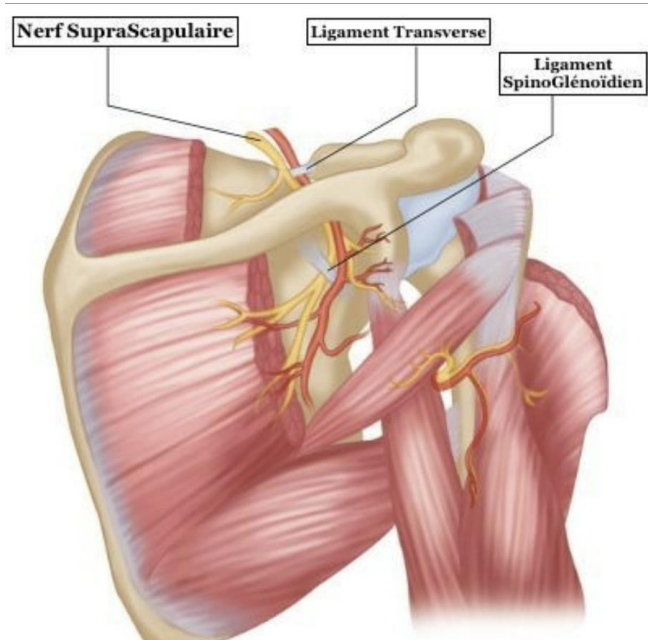
"Due to the heterogeneity of ratios suggested for different sports, we are unable to recommend specific values. Absolute or raw values for ER and IR strength and power are more important than a universal ER/IR ratio, as ratios alone do not indicate readiness to RTS […]"

The Athlete Shoulder Consensus Group (Schwank et al., 2022)

Connaître les spécificités des demandes biomécaniques et pathologies susceptibles d'affecter l'athlète, un exemple:

Volleyball, neuropathie supra-scapulaire

→ amyotrophie infra-épineux & ↓ER



Nerf supra-scapulaire (drmilin-epaule-grenoble.com)

AU-DELA DE LA DYSBALANCE

- Interaction facteurs : altération de force et charge
  - A:C workload ratio (sem en cours / moyenne 4sem précédentes) (Andrade et al., 2020)
  - Handball, charge = heures de jeu (Møller et al., 2017)

ACWR	Population totale	Sous-groupes selon ratio ER/IR
< 1.2	-	Faible risque, indépendamment du ratio
1.2 – 1.6	-	**Ratio <.75 → ↑risque**
> 1.6	**HR 1.91** (95% IC 1.0-3.7)	Risque élevé pour tous **Ratio <.75 → ↑risque**

Ratio cut-off ER/IR = 0.75

AU-DELA DE LA DYSBALANCE

- Chaîne cinétique : puissance et activation différentielle
  - Contributions biomécaniques
    - Service de tennis: 54% MIs et tronc (Kibler et al., 1995)
  - Activation différentielle mm. périscapulaires durant élévation (Borms, Maenhout and Cools, 2020)
    - Exemple: ↑ EMG DA squat UP statique (vs debout)
  - Renforcement du tronc et performance
    - Métanalyse, min.10sessions/6sem (Saeterbakken, 2022)

↑ **Vitesse de course**
↑ **Changements de direction et agilité**
↑ **Performances sportives (distances lancers/frappes, chronos)**

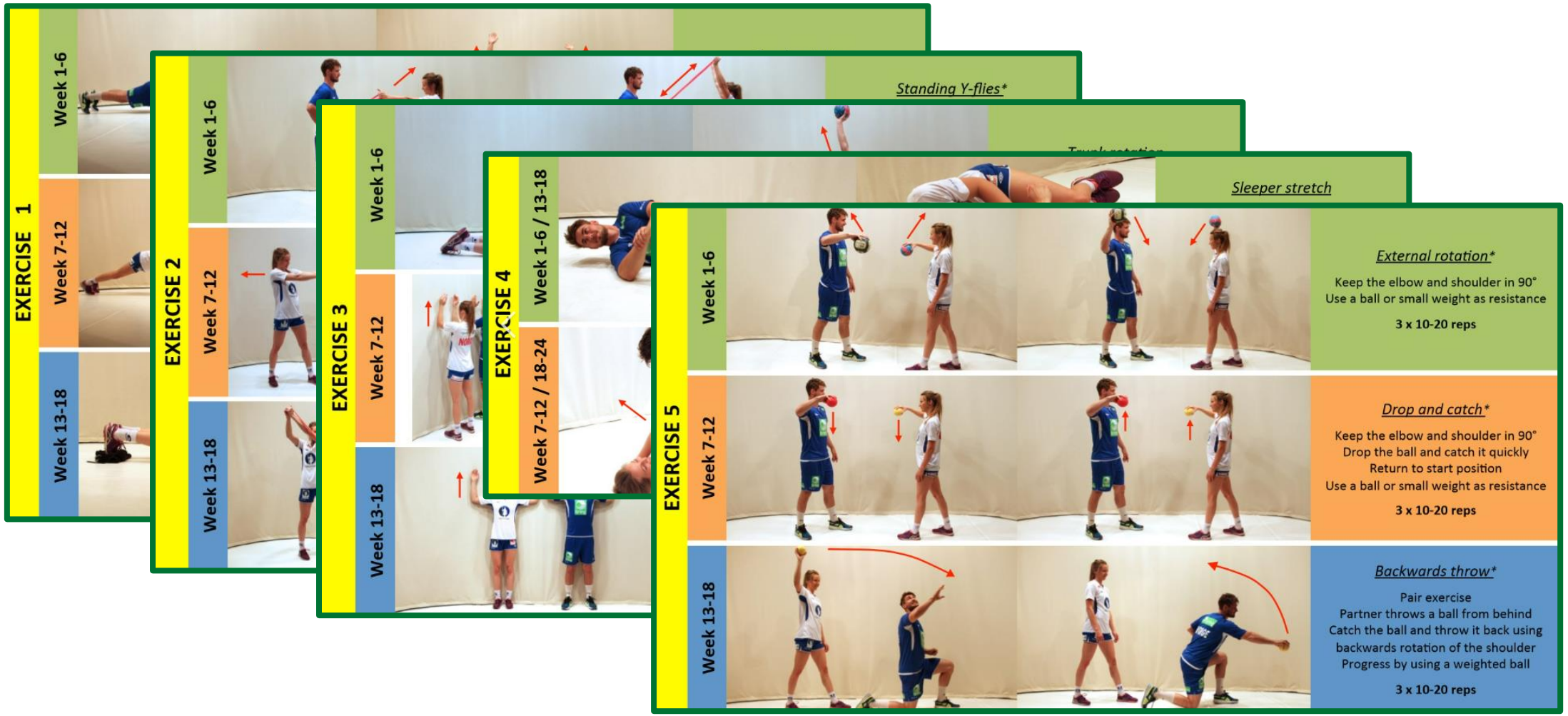
PREVENTION : AUJOURD'HUI

- Blessures de surcharge d'épaule c/athlètes *overhead*
- Cluster de facteurs de risque
- Un exemple: **OSTRC** shoulder injury prevention programme
  - Handball elite, échauffement 3x/semaine
  - ↓28% problèmes épaule (↓22% problèmes sévères)

van Mechelen, Hlobil and Kemper (1992)

(Andersson et al., 2017)

OSTRC PROGRAMME



(Andersson et al., 2017)

TAKE HOME MESSAGE

- Reconnaître les caractéristiques de l'individu
- La douleur peut causer une dysbalance
- Influence de la dysbalance sur les blessures de surcharge : pas de consensus
- Utiliser des valeurs absolues pour RTS
- Considérer le A:C workload ratio
- Explorer et impliquer la chaîne cinétique
- Implémenter un programme de prévention générique (OSTRC)

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