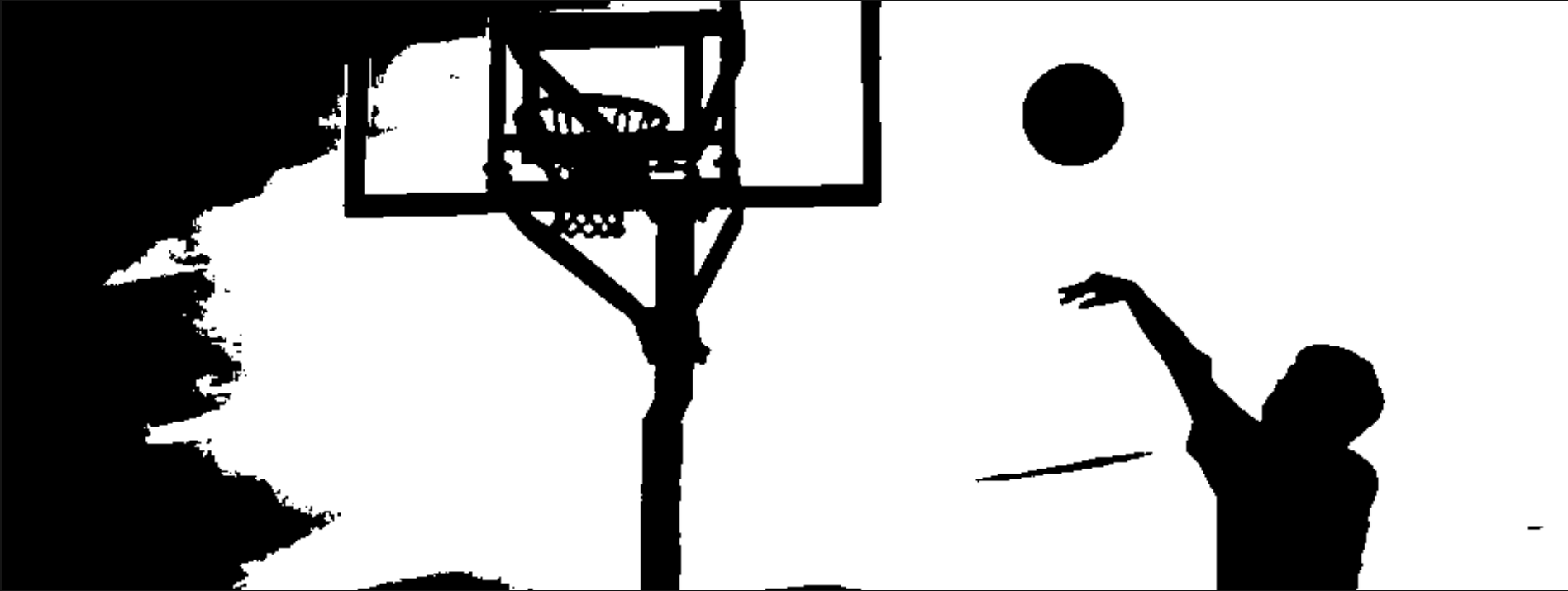


EST 1892

LSBU

VISUAL PERCEPTION IN SPORT



RITA F DE OLIVEIRA
Associate Professor
London South Bank University

Content

- The problem
- Theoretical positioning
- What is known
- Training
- Summary and an example

How can we hit a target? - basketball

Ripoll, 1986

- Head stabilisation
- Eye-head stabilisation

Vickers, 1996

- Long early visual fixations on target
- Stop visual fixation before movement

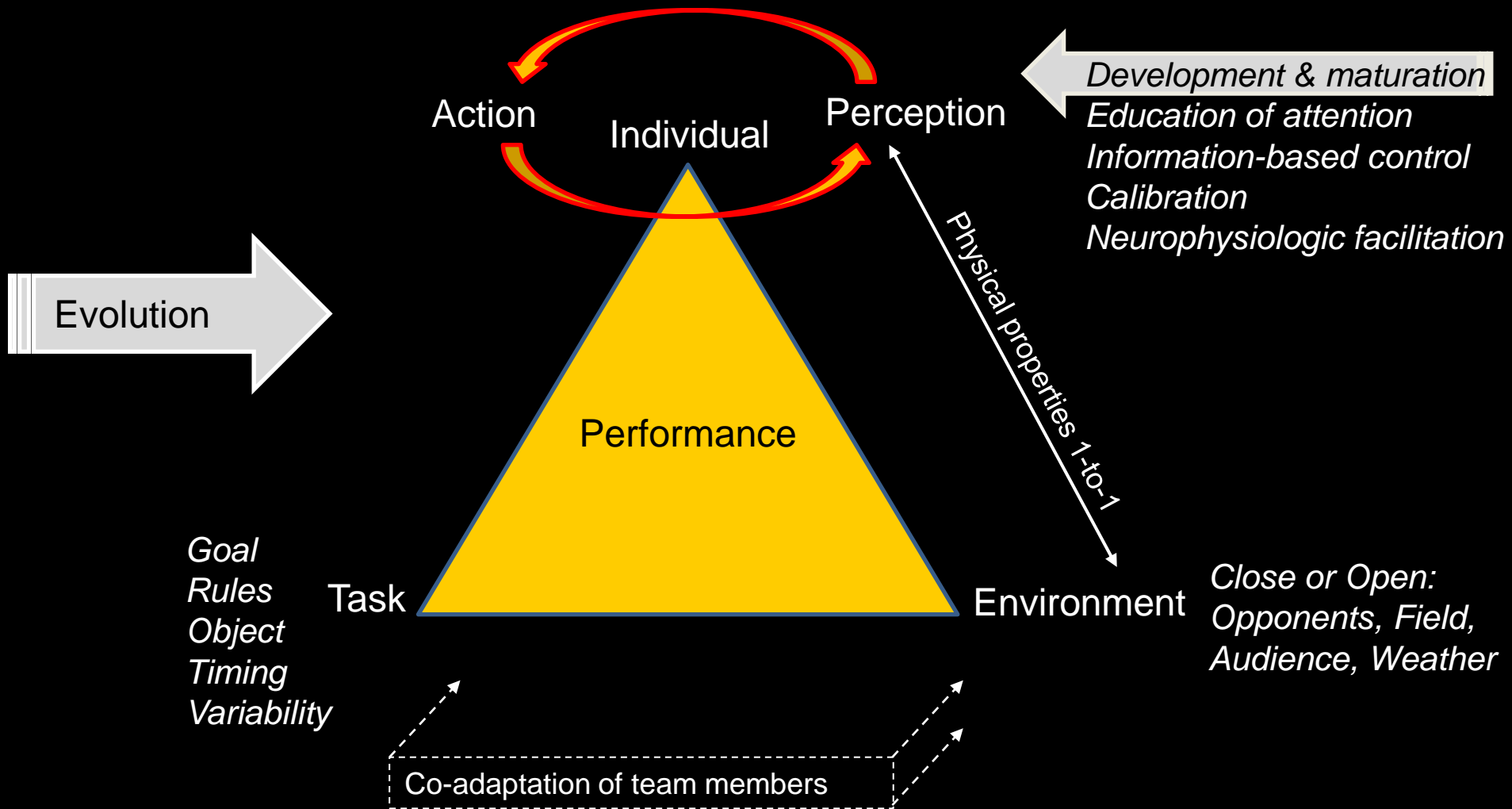
Oudejans et al 2002

- Late vision same as full vision
- Early vision as bad as no vision





ECOLOGICAL DYNAMICS APPROACH



QUESTION

How can we hit a target?

How can we hit a target? - basketball

Ripoll et al, 1986

- Head stabilisation
- Eye-head stabilisation

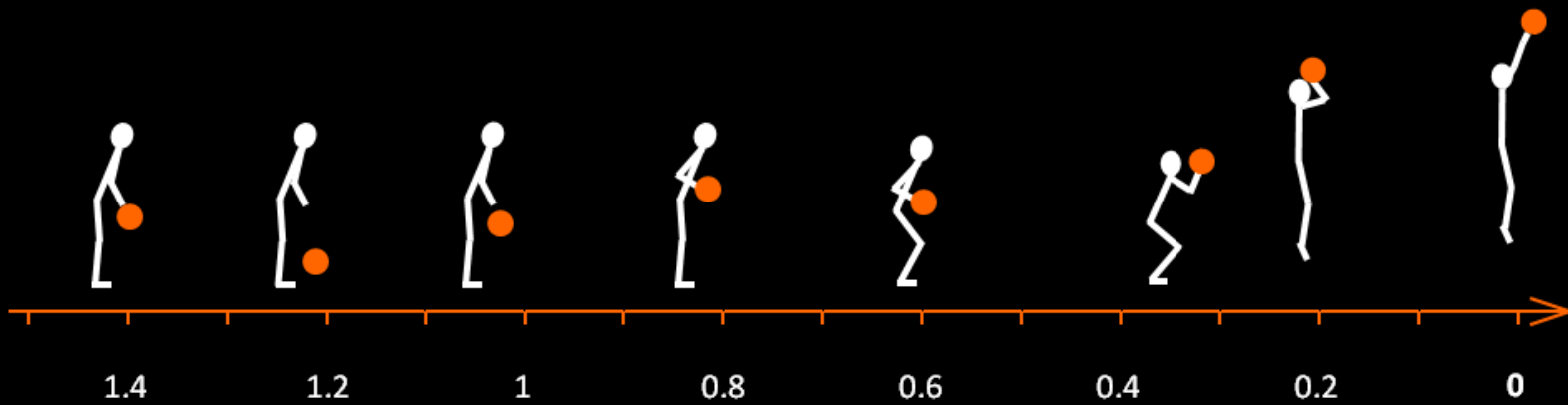
Vickers, 1996

- Long early visual fixations on target
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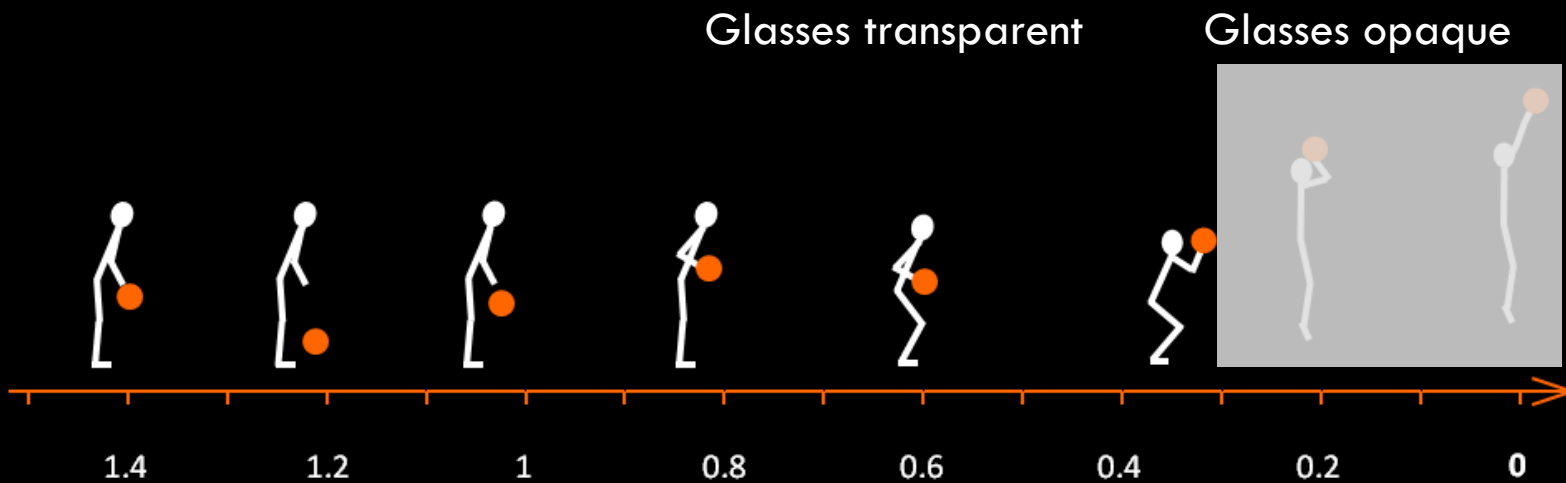
- Late vision same as full vision
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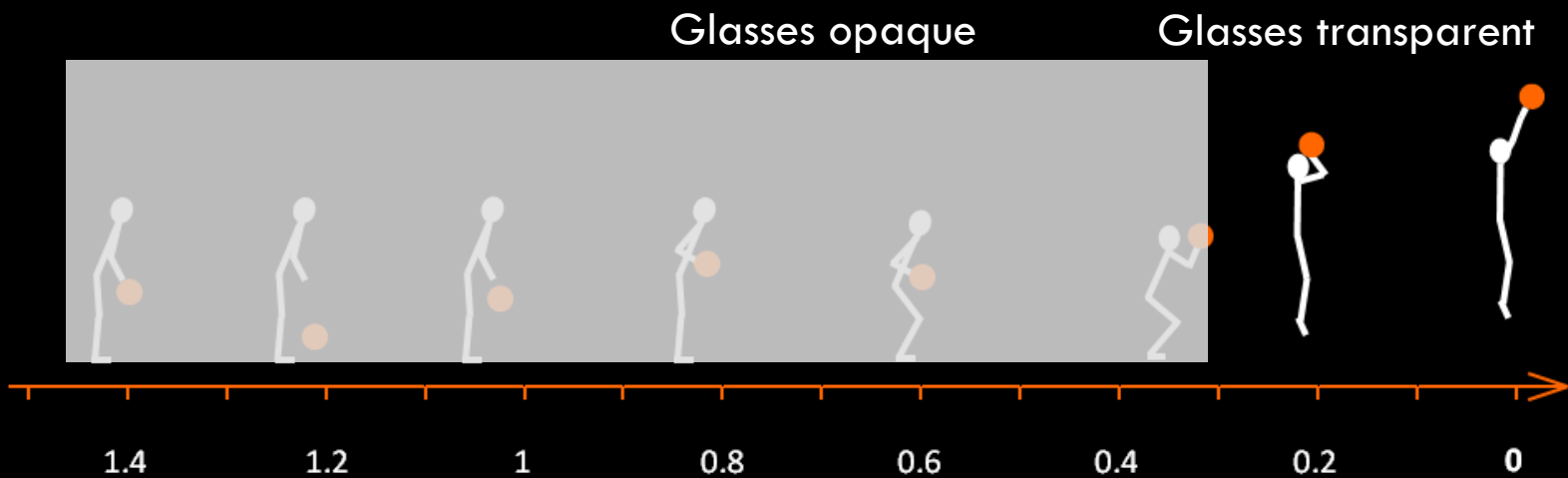
Basketball shooting in time (s)

[diagram by van de Langenberg, ca 2003]



Poor accuracy without last 350 ms

(Oudejans, Van de Langenberg, Hutter, 2002)

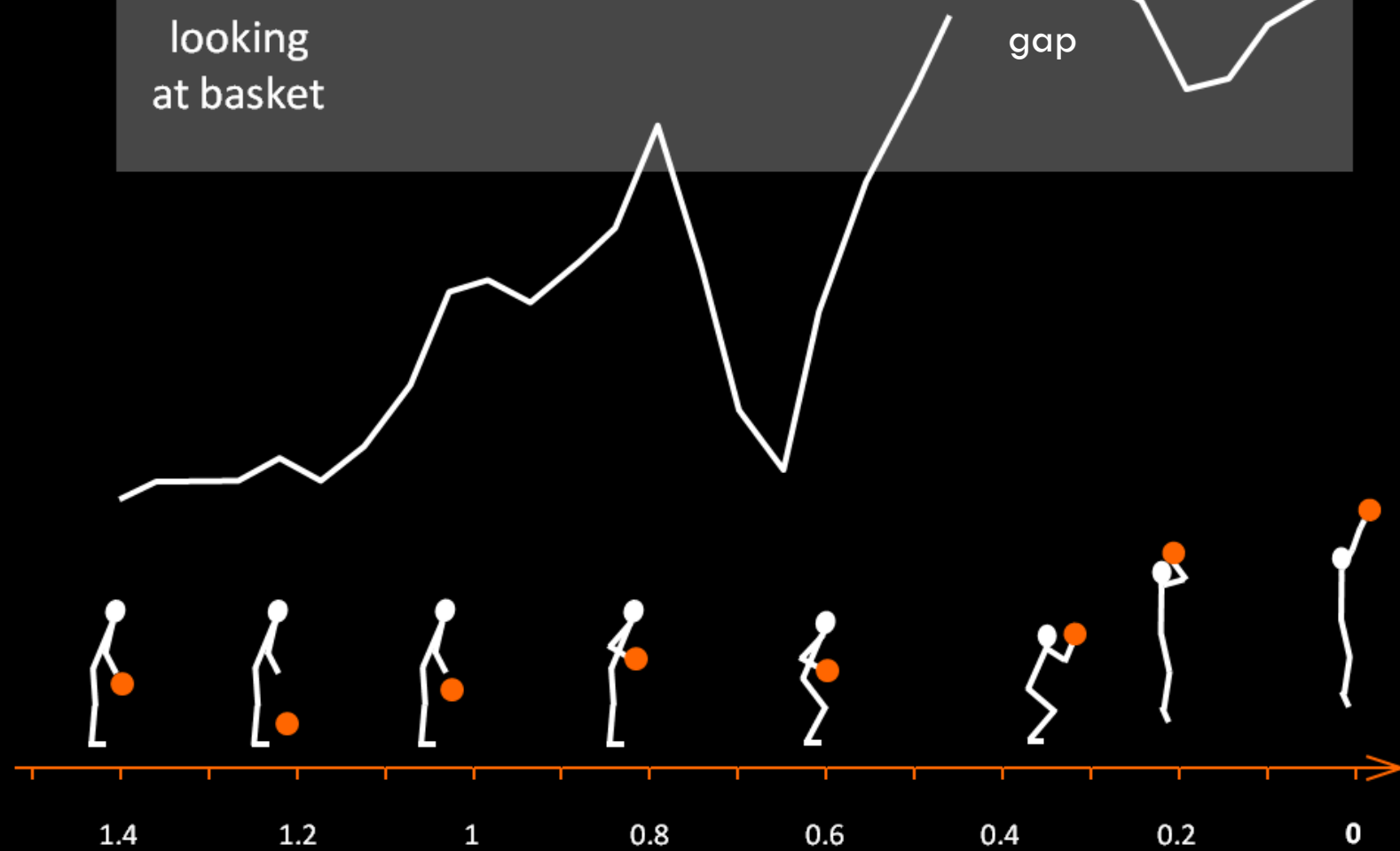


Good accuracy with only final 350 ms

(Oudejans, Van de Langenberg, Hutter, 2002)

High-style
Jump shot

This was
compared
with low-
style and
with free
throw



Gaze behavior before and during basketball shot

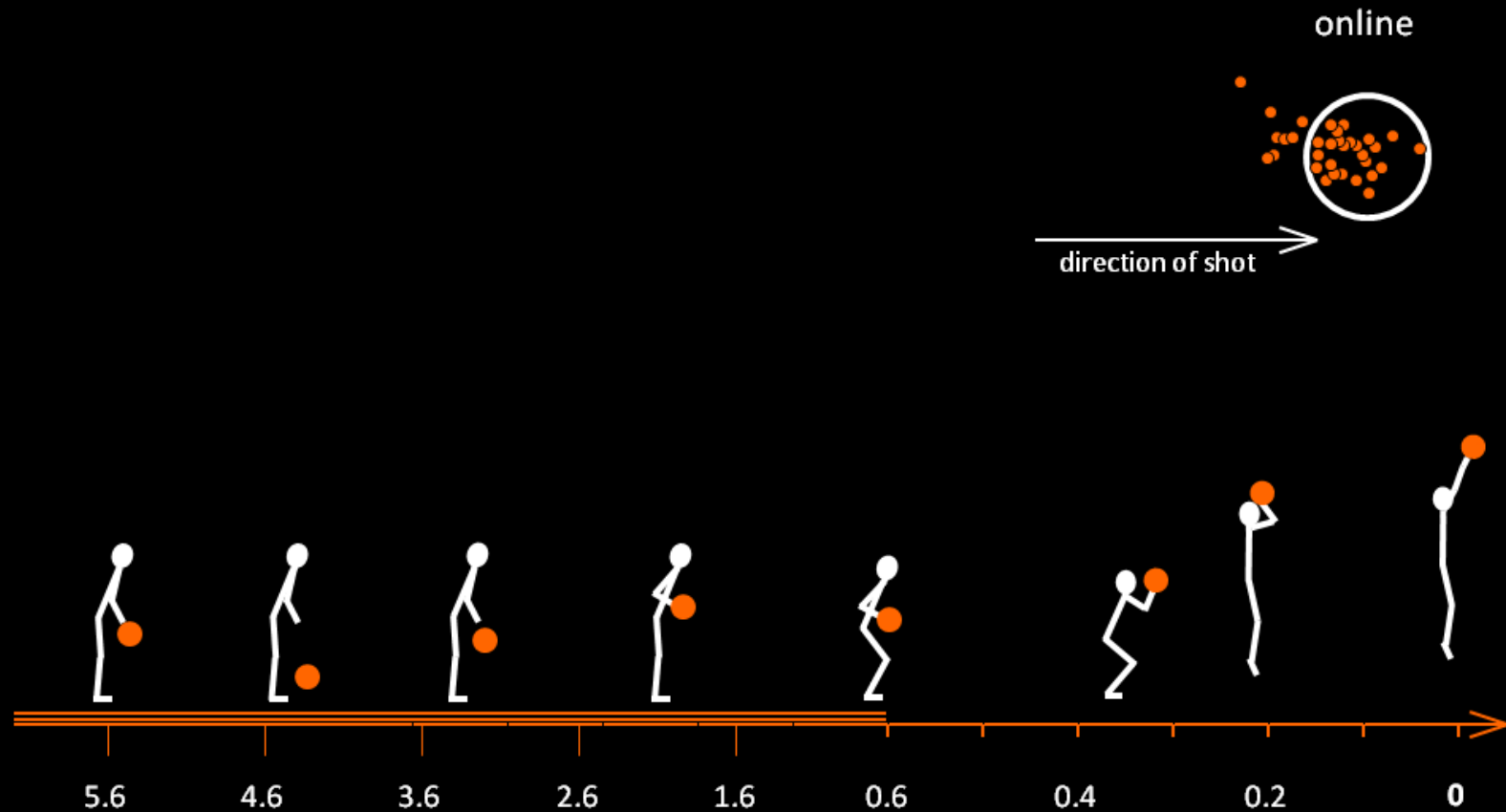
(de Oliveira, Oudejans & Beek, 2008)



Landing position of the ball (not just shooting %)

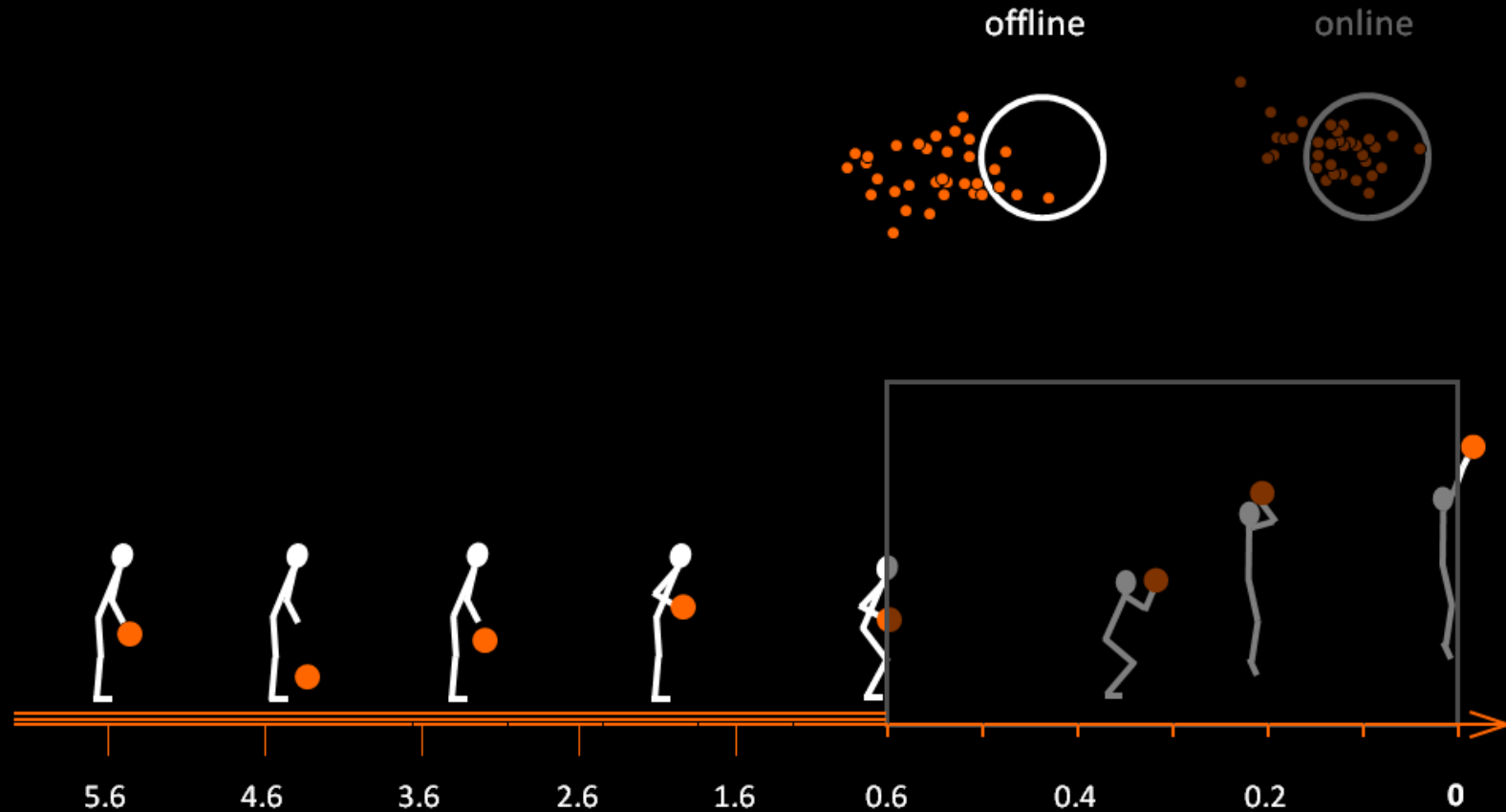
de Oliveira et al., 2007, 2009





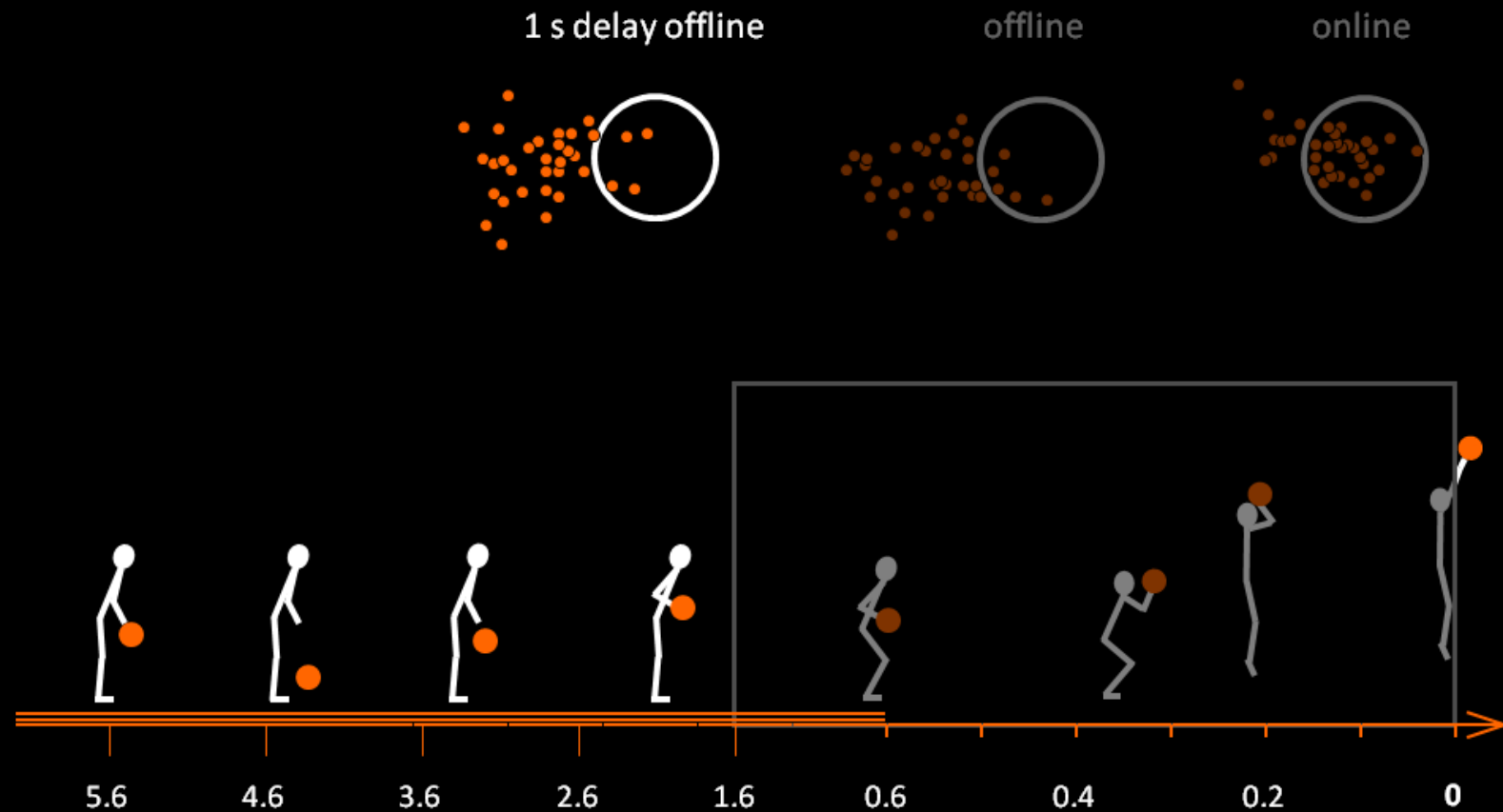
Ball landing positions with full vision

(de Oliveira, Huys, Oudejans, van de Langenberg & Beek, 2007)



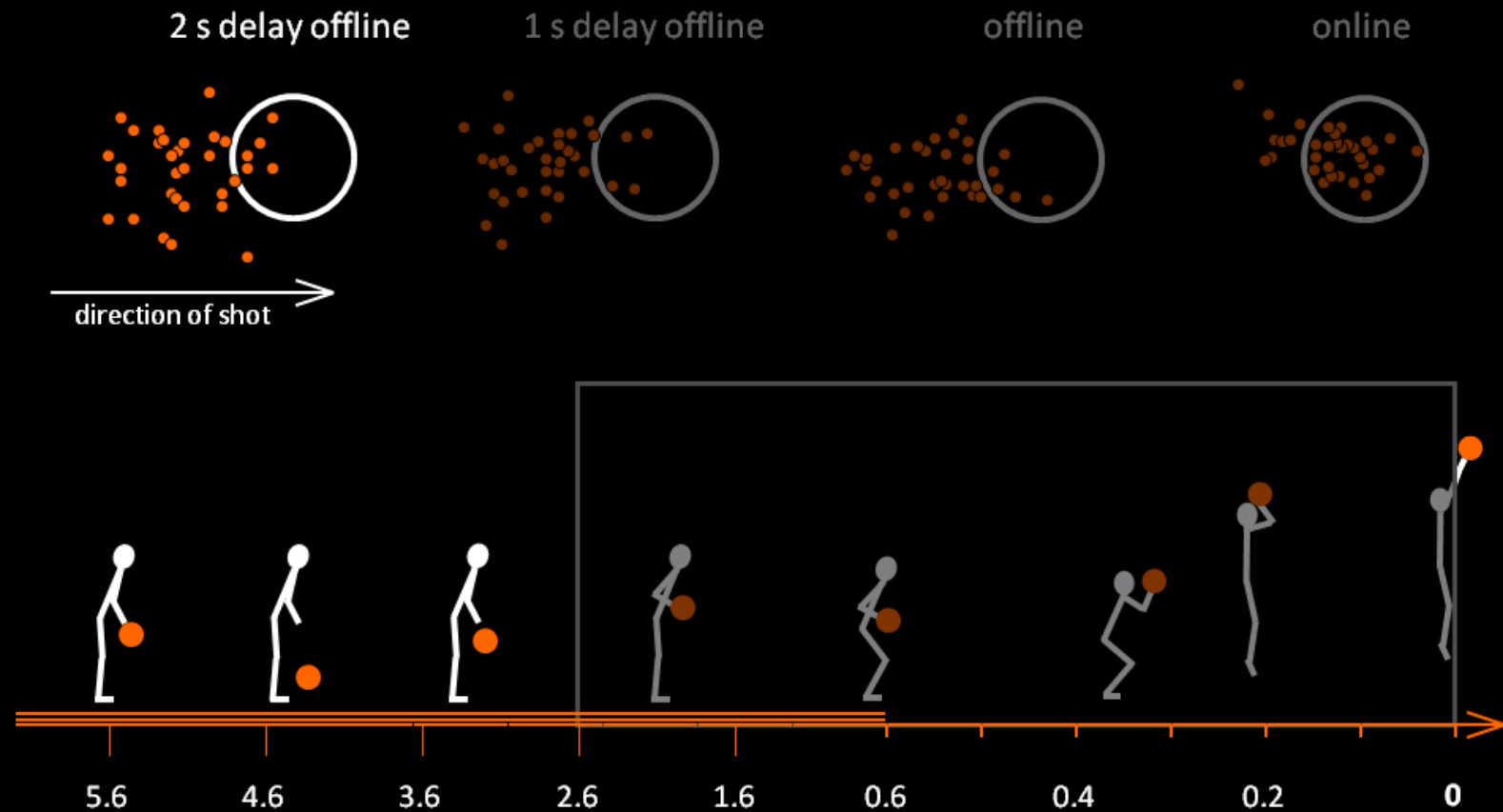
Ball landing positions with visual occlusion during shot

(de Oliveira, Huys, Oudejans, van de Langenberg & Beek, 2007)



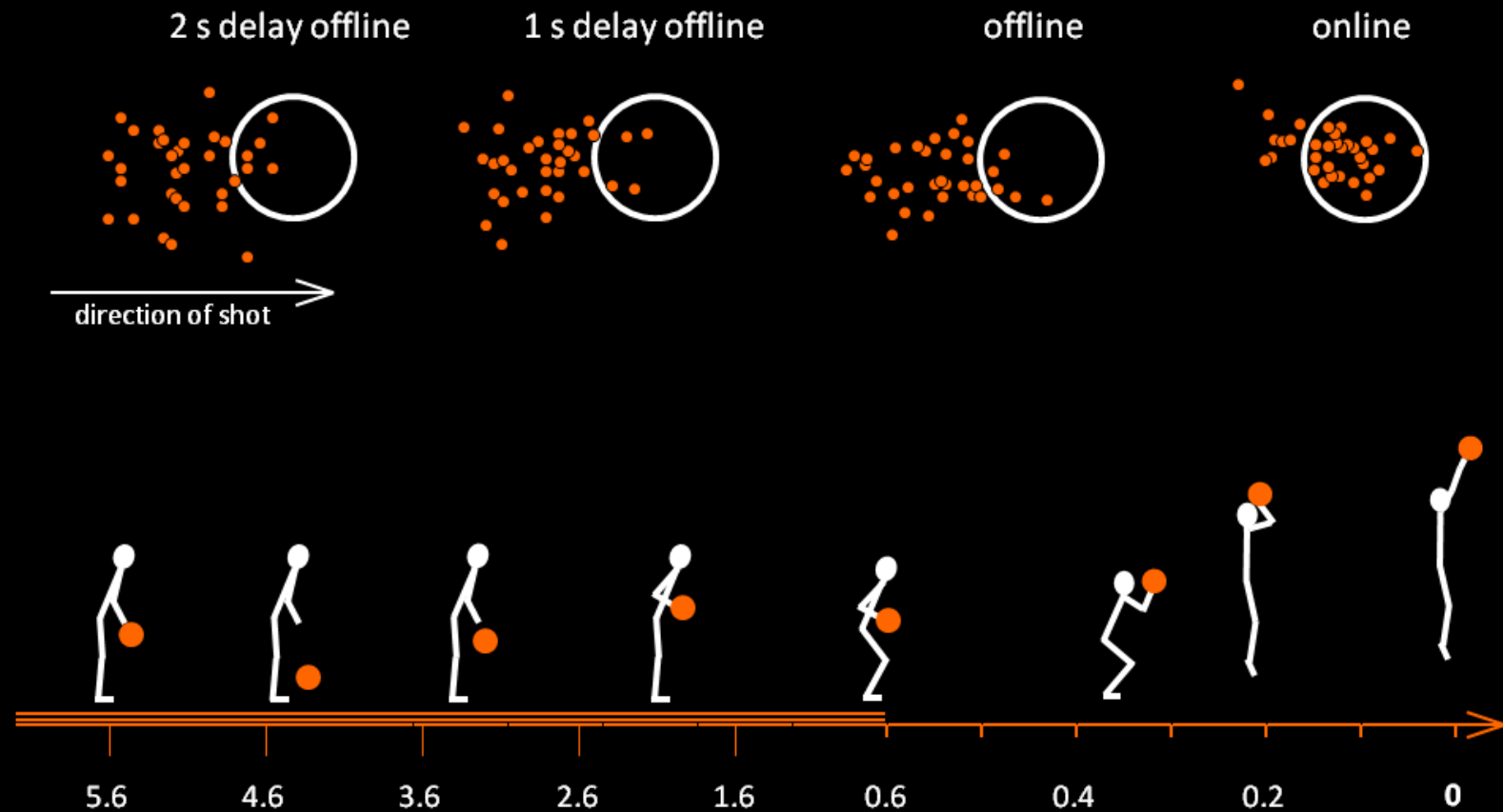
Ball landing positions with visual occlusion 1s before shot

(de Oliveira, Huys, Oudejans, van de Langenberg & Beek, 2007)



Ball landing positions with visual occlusion 2 s before shot

(de Oliveira, Huys, Oudejans, van de Langenberg & Beek, 2007)



Performance decrements in all of the offline conditions

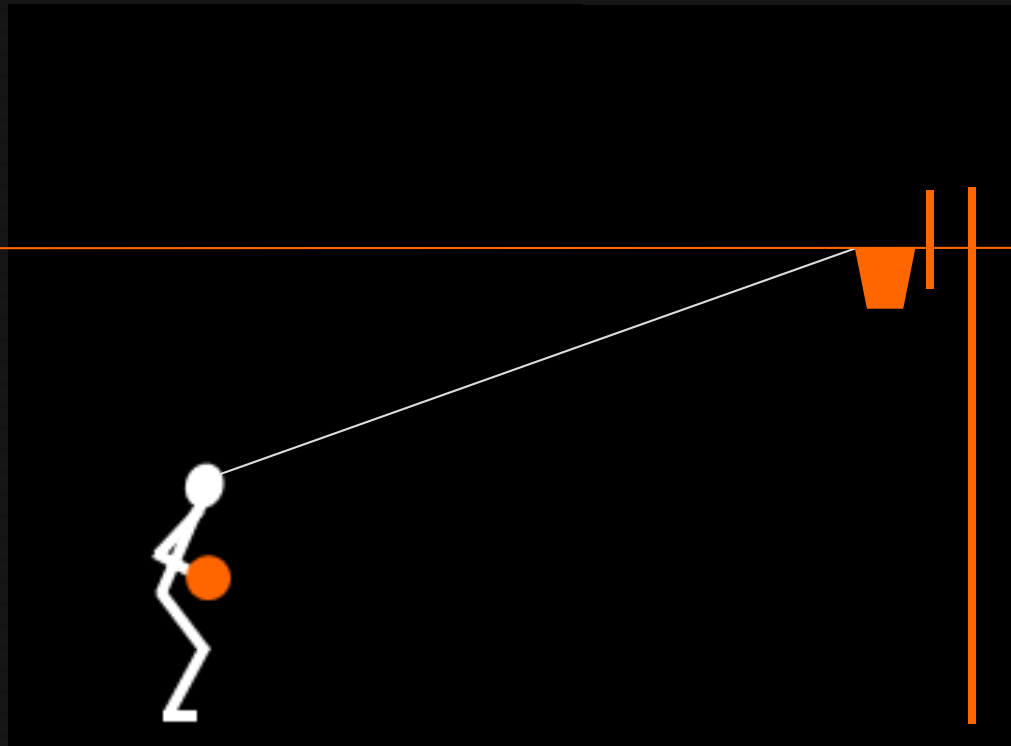
(de Oliveira, Huys, Oudejans, van de Langenberg & Beek, 2007)



What do players need to look at the basket for?

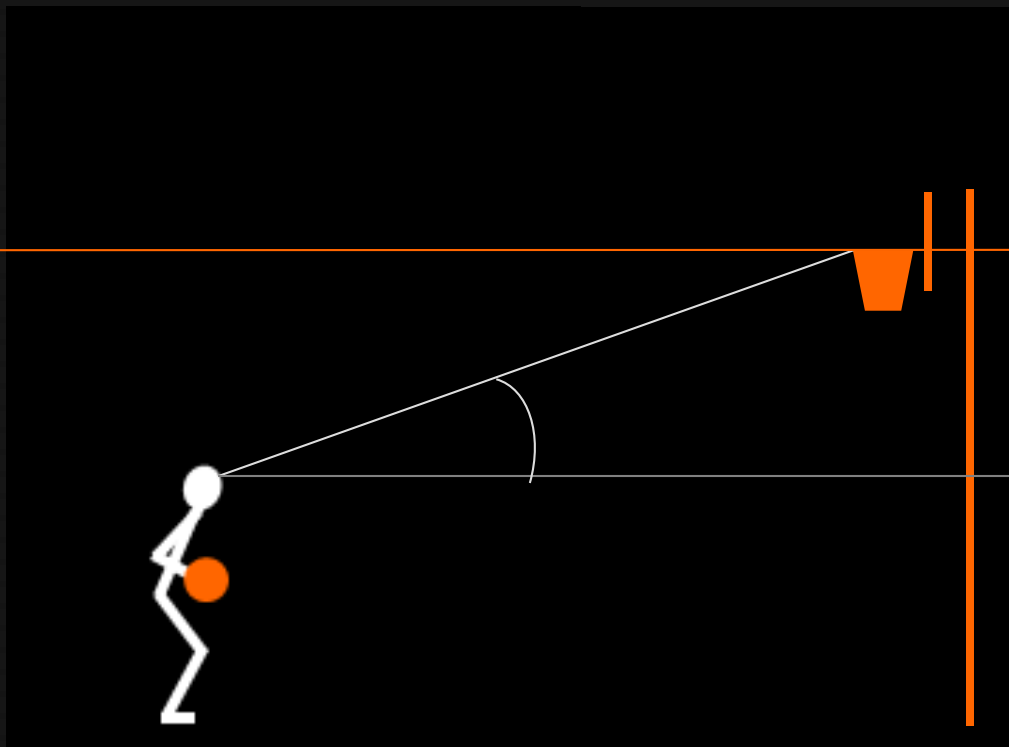
(de Oliveira, Oudejans & Beek, 2009)

Pic from <http://corporate.olympics.com.au/athlete/lauren-jackson>



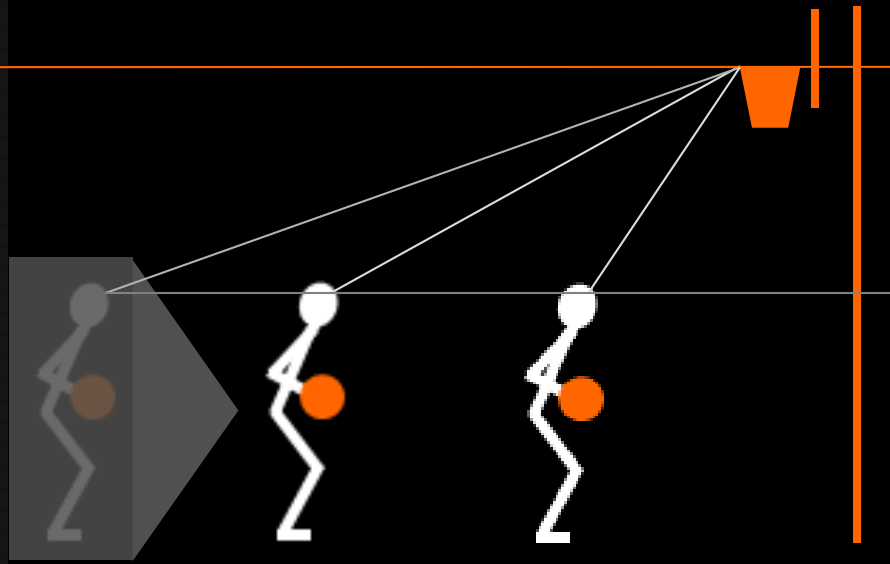
Player looking at the basket forms an angle of elevation

de Oliveira, Oudejans & Beek, 2009



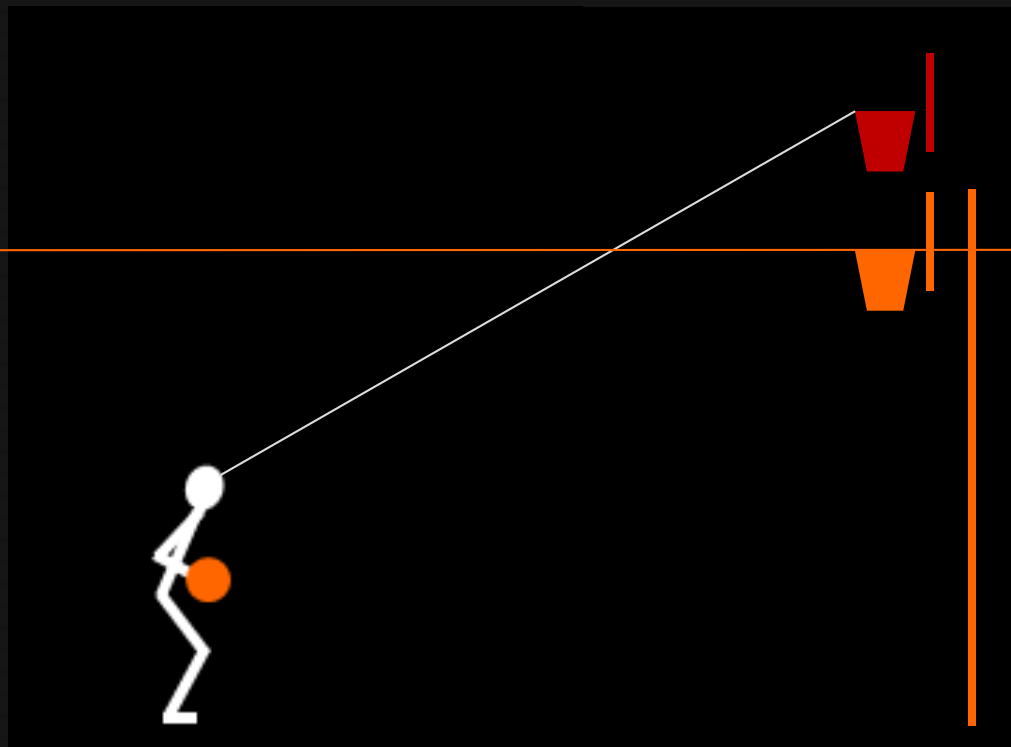
Angle of elevation is calibrated to eye-height (constant)

de Oliveira, Oudejans & Beek, 2009



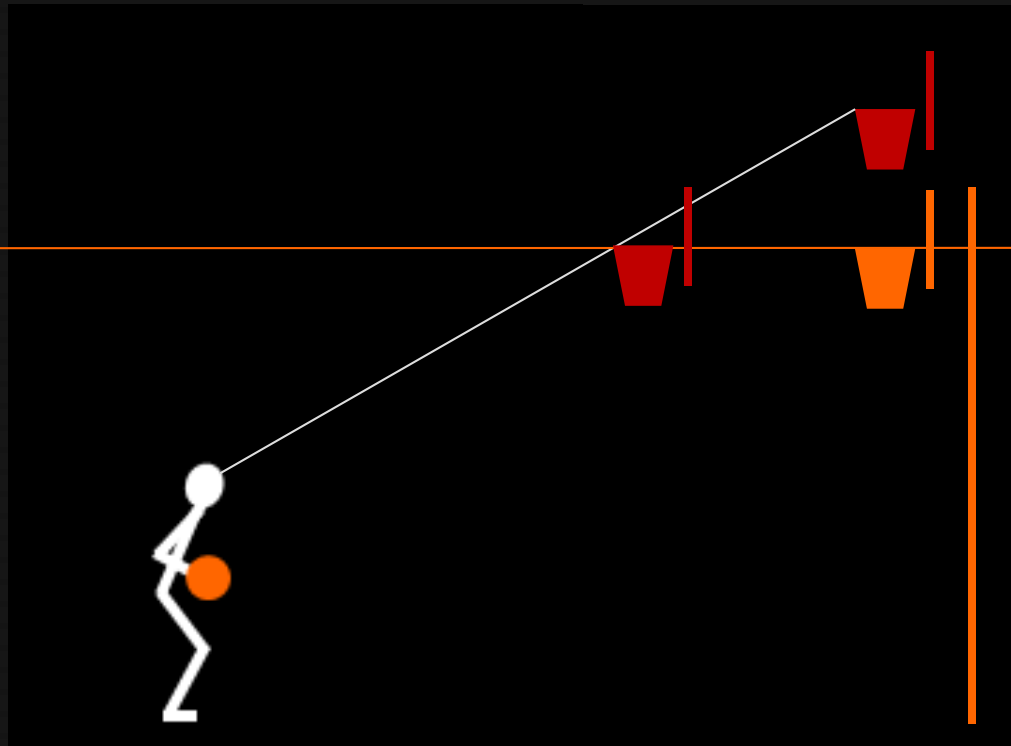
Angle of elevation increases with proximity to basket

de Oliveira, Oudejans & Beek, 2009



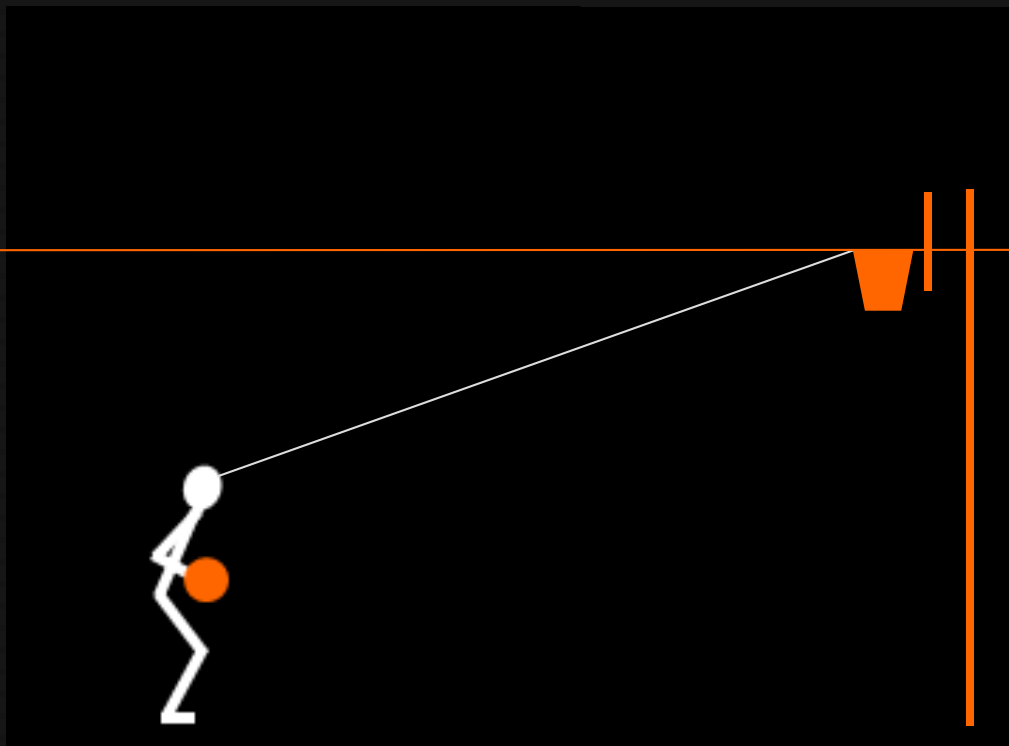
If the basket is higher the angle also increases

de Oliveira, Oudejans & Beek, 2009



Increased angle is perceived as a closer basket

de Oliveira, Oudejans & Beek, 2009



Angle of elevation is an important **information source**

de Oliveira, Oudejans & Beek, 2009

“Davids and Araujo rightly ask what causes elite performers to eventually select one location, out of the number of different locations that they could fixate. And why does this emerge as a characteristic of expertise?

We don’t know why this occurs.”

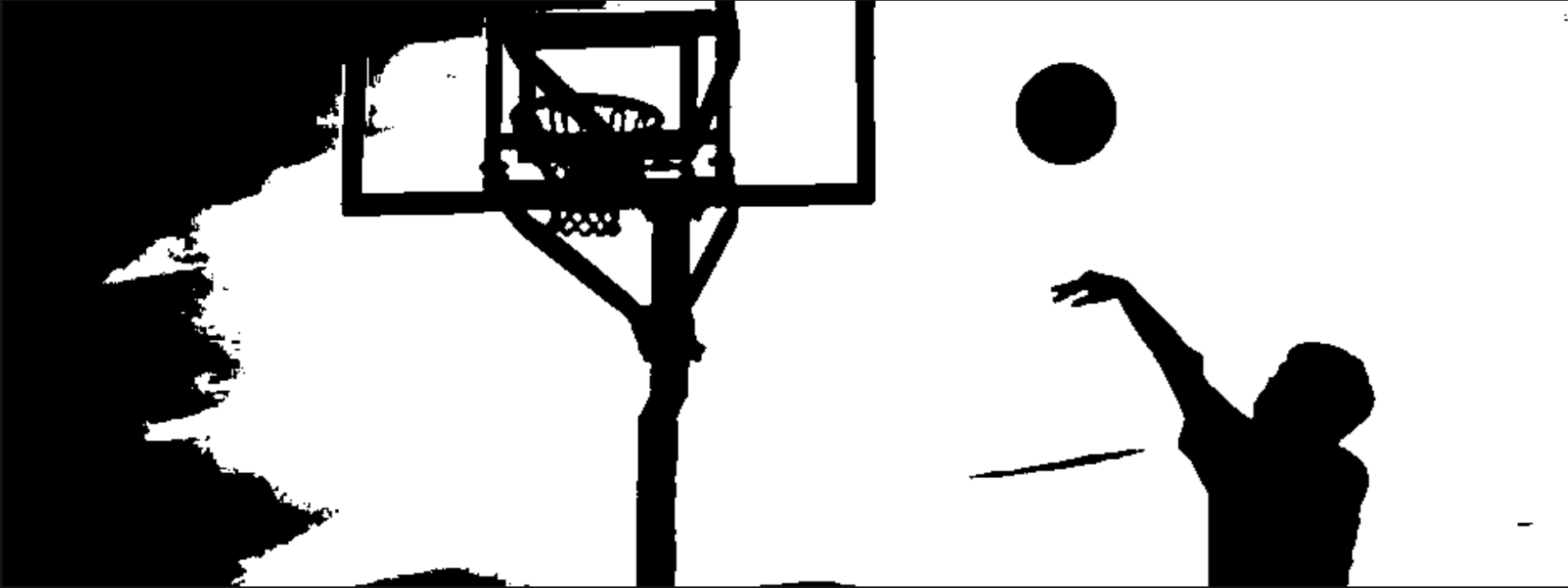
...[it is because of practice]

Vickers 2016, Quiet eye research – Vickers on target

Davids & Araujo, 2016 What could an ecological dynamics rationale offer Quiet Eye research? Comment on Vickers

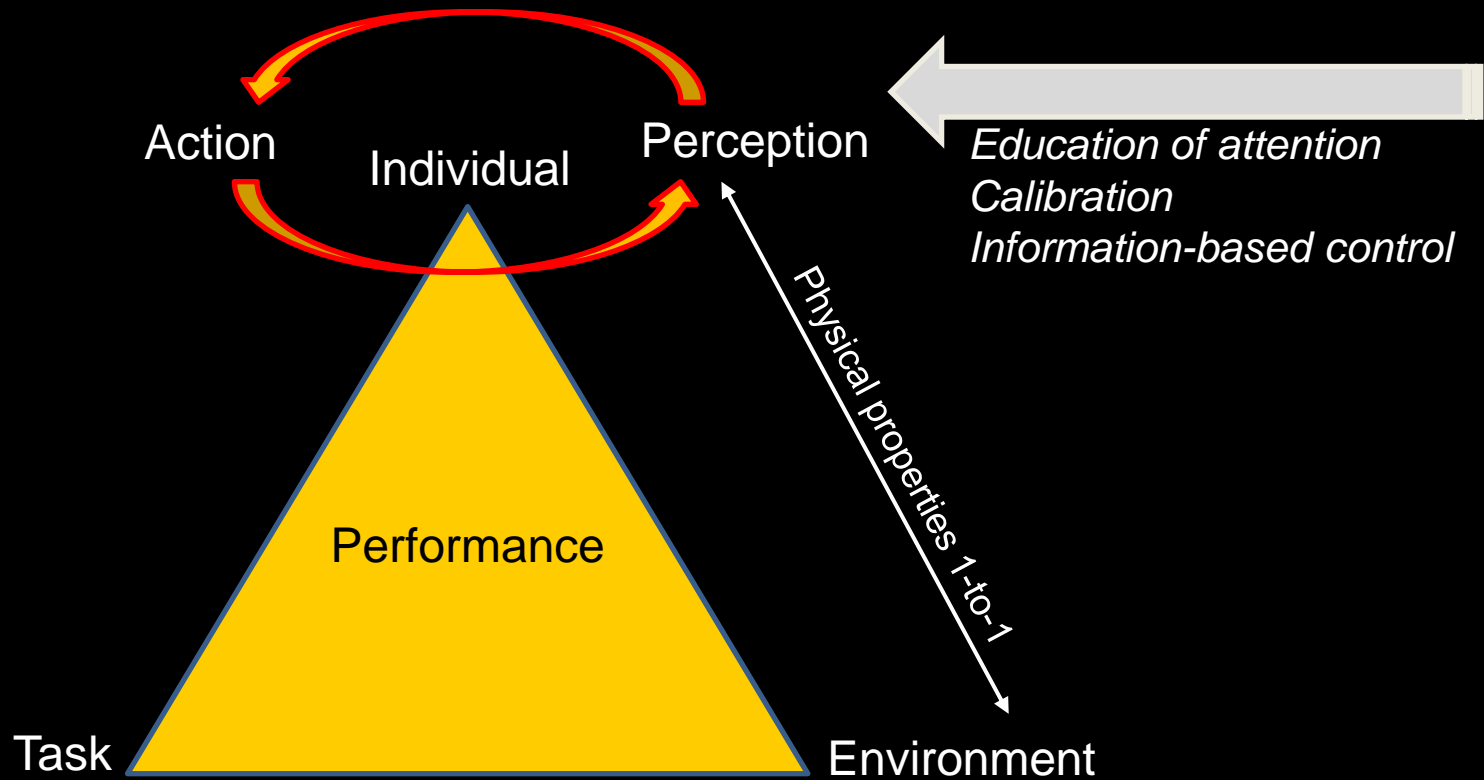
Mechanism

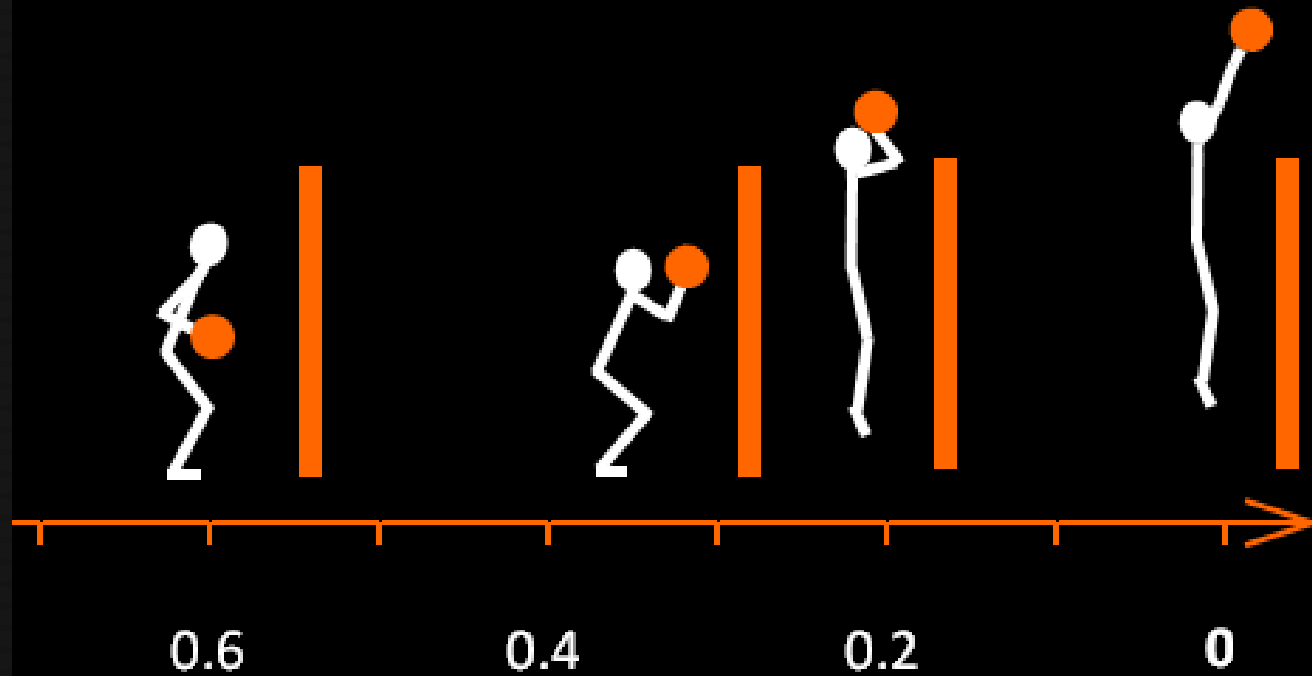
Training perception-action in basketball shooting



Training methods: LC goggles, Screen, Eye-tracker
(Oudejans et al., 2005, 2012a, 2012b, 2018)

ECOLOGICAL DYNAMICS APPROACH





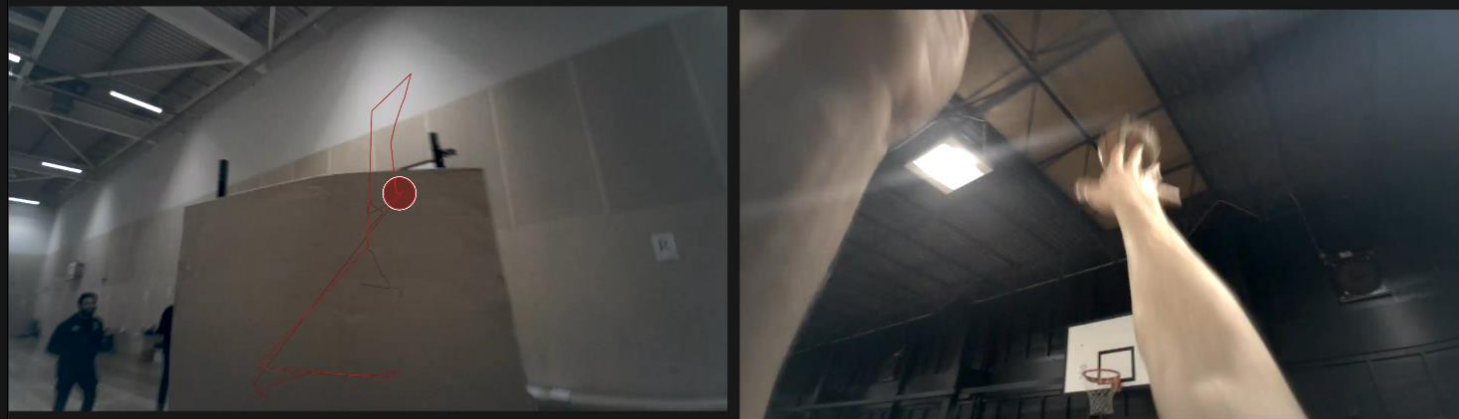
Use of constraints during basketball shooting training

Screen: The player can only see the basket once they jump above the screen for their shot



1. Start

Recording 22



Recording information

Recording: Recording 22

Participant: kris

Duration: 00:02:35.280

Date & Time: 27/01/2022 20:50

Resolution: 1920 x 1080

Gaze data

Settings | Snapshots

Gaze Filter: Raw

Fill color: [Red]

Contrast color: [White]

Opacity: 58 %

Size: 42 %

Fading duration: 2 sec

Maximal size: 76 %

1/4x | 00:00:57.987 | 38% | [Fullscreen] | [Zoom]

Time zoom: [Slider]

Charts: [Dropdown]

Timeline preview: [Timeline with video thumbnails and time markers]

Eye movements frame: [Timeline with green vertical bars]

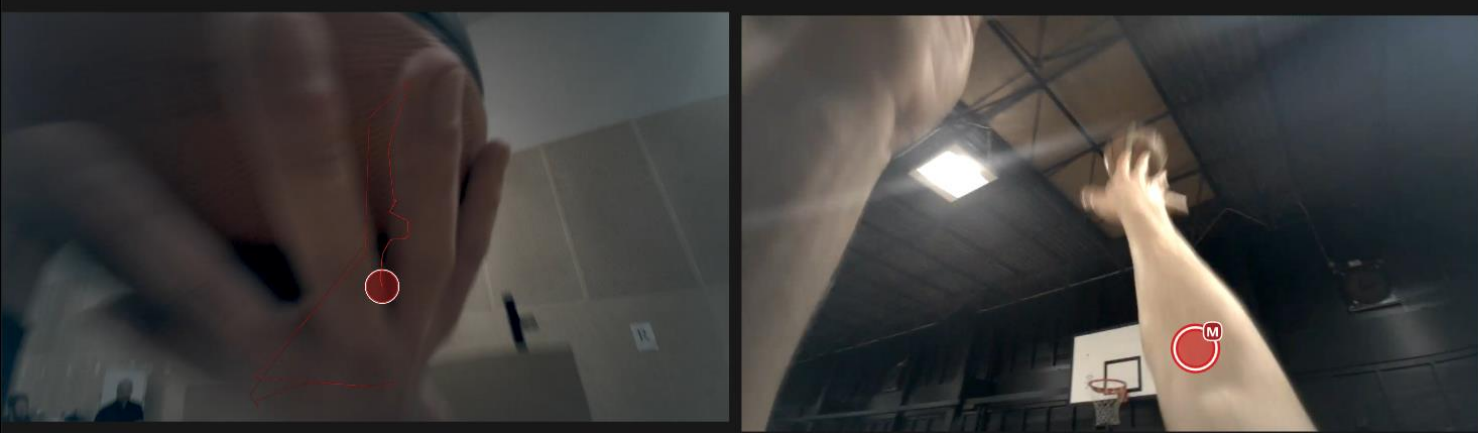
Times of Interest

Events

Event Types: [Dropdown]

Events List

- Recording Events
- Custom Events
- Logged live Events
- Sync Events
- Snapshot mapping Events



Recording information

Recording Recording 22

Participant kris

Duration 00:02:35.280

Date & Time 27/01/2022 20:50

Resolution 1920 x 1080

Gaze data Settings Snapshots

Gaze Filter Raw

Fill color ■

Contrast color ■

Opacity 58 %

Size 42 %

Fading duration 2 sec

Maximal size 76 %

1/4x 00:00:58.360

Navigation icons: back, play, forward, zoom, search, full screen

Time zoom

Charts

Timeline preview

Eye movements

frame

Times of Interest

Events

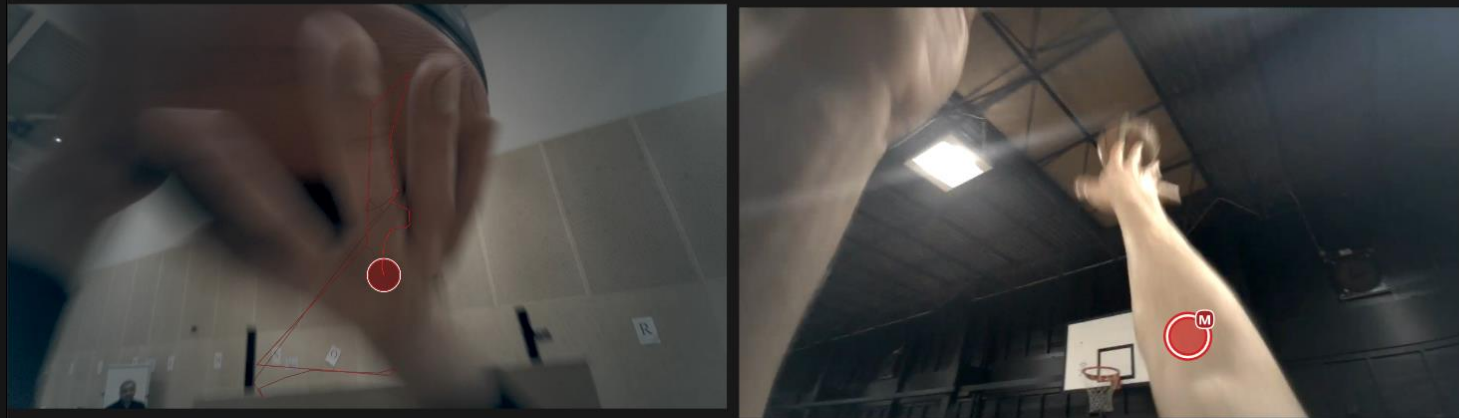
Event Types

Events List

Recording Events Custom Events

Logged live Events Sync Events

Snapshot mapping Events



Recording information

Recording: Recording 22
Participant: kris
Duration: 00:02:35.280
Date & Time: 27/01/2022 20:50
Resolution: 1920 x 1080

Gaze data

Settings | Snapshots

Gaze Filter: Raw

Fill color: [Red]

Contrast color: [White]

Opacity: 58 %

Size: 42 %

Fading duration: 2 sec

Maximal size: 76 %

Times of Interest

Events

Event Types

Events List

- Recording Events
- Custom Events
- Logged live Events
- Sync Events
- Snapshot mapping Events

1/4x 00:00:58.344

Time zoom: [Slider]

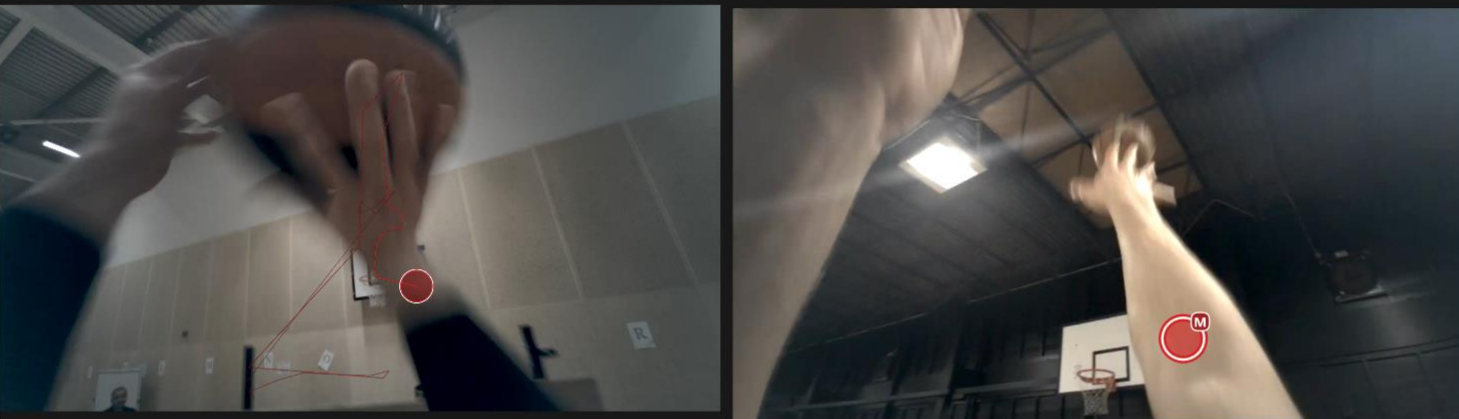
Charts

Timeline preview

Eye movements

frame

A timeline visualization showing video thumbnails and eye movement data. The timeline has markers at 00:00:54.000, 00:01:00.000, 00:01:06.000, 00:01:12.000, 00:01:18.000, 00:01:24.000, 00:01:30.000, and 00:01:36.000. Below the timeline, a series of green vertical bars represent eye movement data across the video frames.



1/4x 00:00:58.384 38%

Time zoom

Charts

Timeline preview

Eye movements

frame

Recording information

Recording Recording 22

Participant kris

Duration 00:02:35.280

Date & Time 27/01/2022 20:50

Resolution 1920 x 1080

Gaze data

Settings Snapshots

Gaze Filter Raw

Fill color

Contrast color

Opacity 58 %

Size 42 %

Fading duration 2 sec

Maximal size 76 %

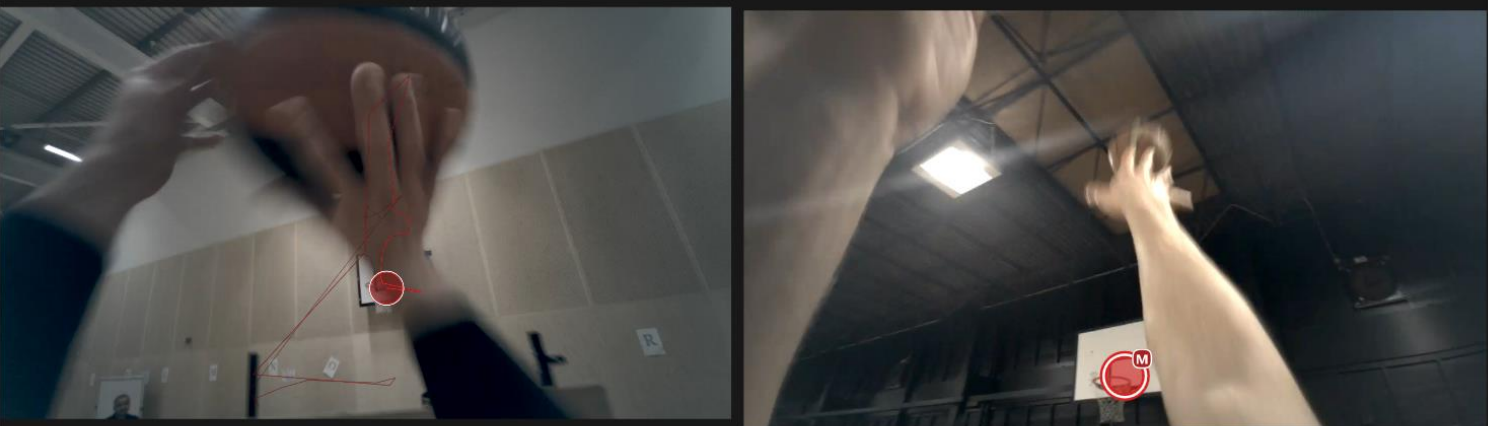
Times of Interest

Events

Event Types

Events List

- Recording Events
- Custom Events
- Logged live Events
- Sync Events
- Snapshot mapping Events



Recording information

Recording Recording 22

Participant kris

Duration 00:02:35.280

Date & Time 27/01/2022 20:50

Resolution 1920 x 1080

Gaze data Settings Snapshots

Gaze Filter Raw

Fill color

Contrast color

Opacity 58 %

Size 42 %

Fading duration 2 sec

Maximal size 76 %

1/4x 00:00:58.404

Time zoom

Charts ▾

Timeline preview

Eye movements frame

Times of Interest

Events

Event Types ▾

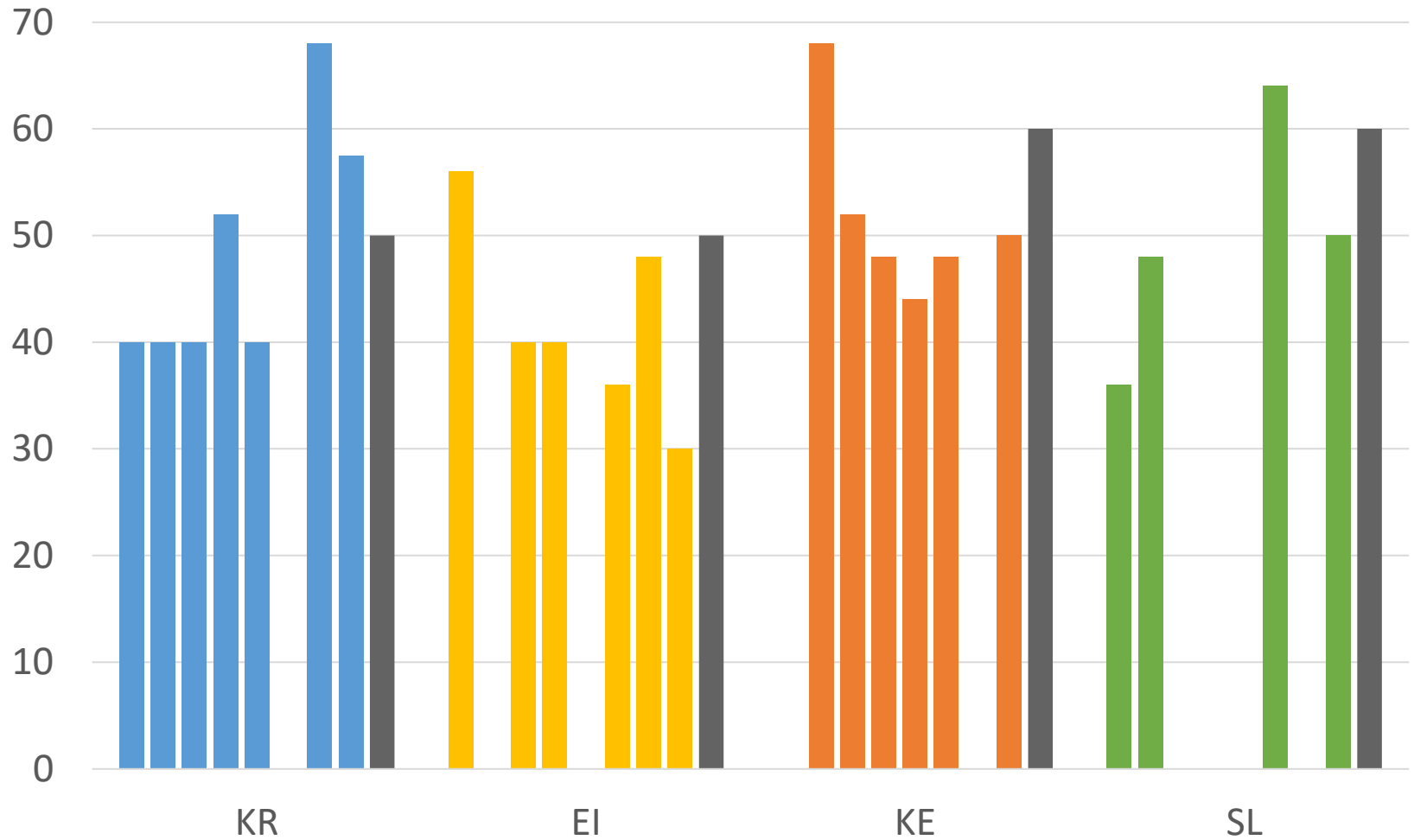
Events List ▾

Recording Events Custom Events

Logged live Events Sync Events

Snapshot mapping Events

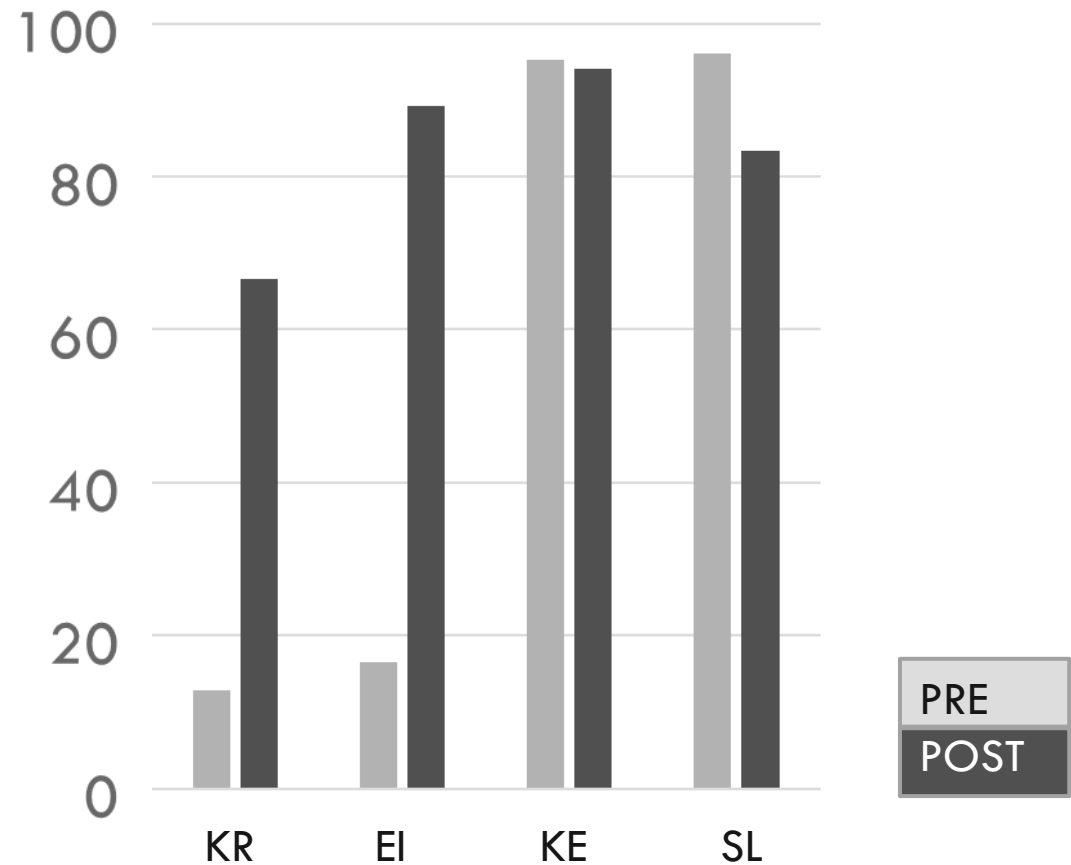
Shooting percentages in a 8-week intervention with a screen



In grey: Shooting percentage at post-test without screen

Percentage of effective gaze behaviour

Operationalised as:
The duration of looking
at the target when the
target was visible



[plot by Taylor Date]

Visual gaze as an anchor

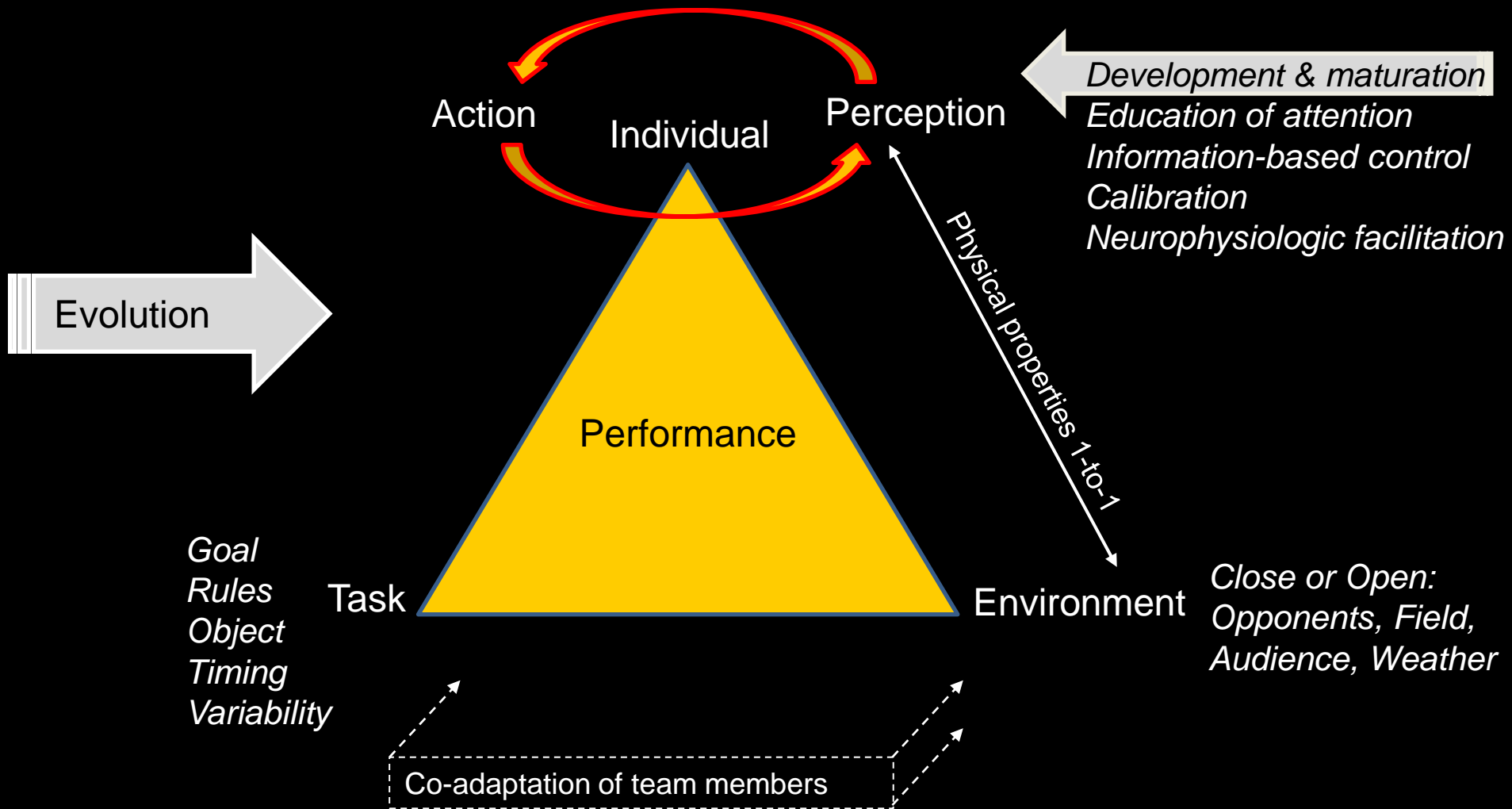
- Angle of elevation is an information source because it specifies distance to the basket
- Gaze fixation allows for the pick-up and use of angle of elevation information
- Online control of movement means the continuous use of information to guide the action



Visual fixation guides movement through anchoring

Pic by TIO, Portuguese trampolinist Bruno Ferraz

ECOLOGICAL DYNAMICS APPROACH





Svetlana Khorkina, Russia (Sydney Olympics, 2000)

https://www.youtube.com/watch?v=K-TzEF6v_8

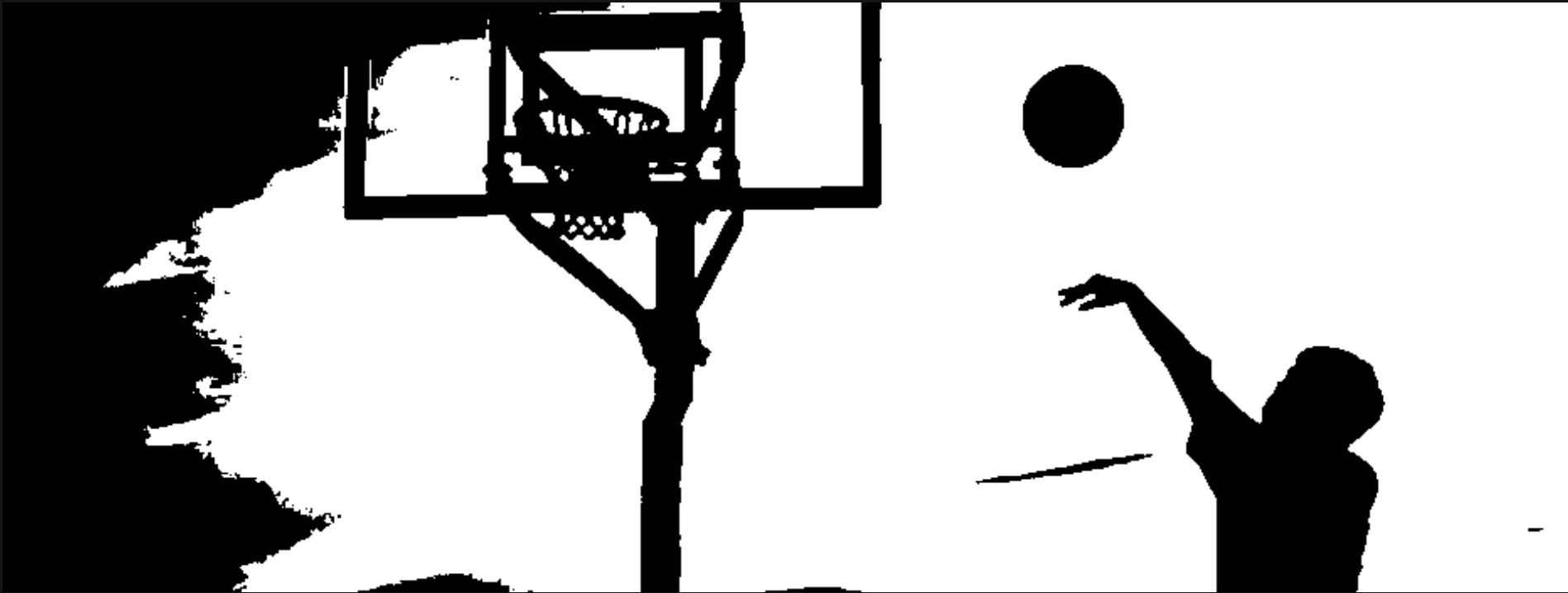
Take home (or eat in) message

- An athlete is a complex system that includes eyes-head-trunk-legs system and brain
- Athletes are fine-tuned to their environment and information therein
- We must recognise candidate information sources and vary them in training (as well calibration constants and leave them constant)

EST 1892

LSBU

OBRIGADA!
PERGUNTAS



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FREYA BAYNE, HASSAM JAMIL,
TAYLOR DATE, CAMERON RUSSEL,
MILOU BRAND, DEEB MURALITHARAN

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