

Topics

Case Study: Dance

What is Marking?

What we found with super-expert dancers

Why is Marking so effective?

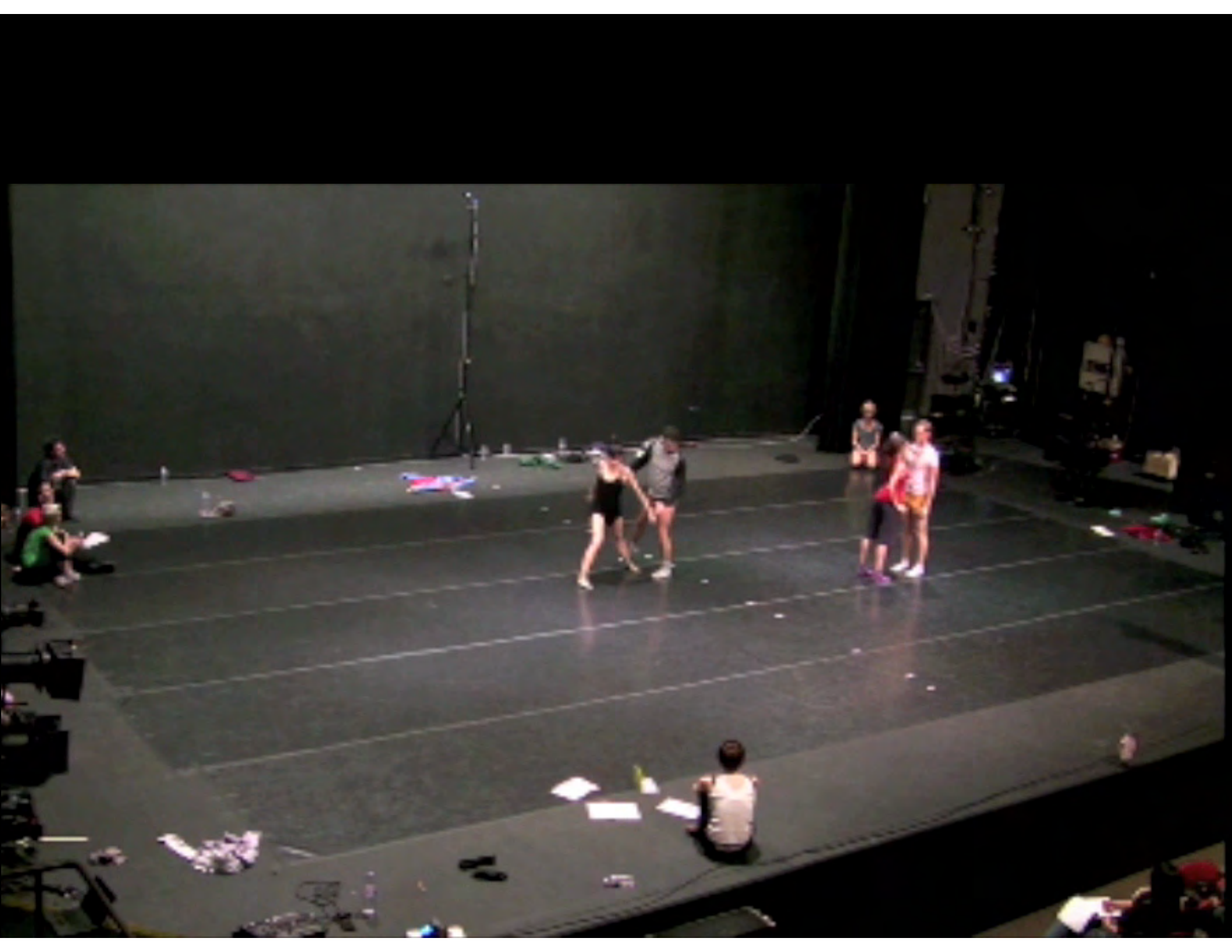
A few Claims about about thinking

Thinking with artifacts

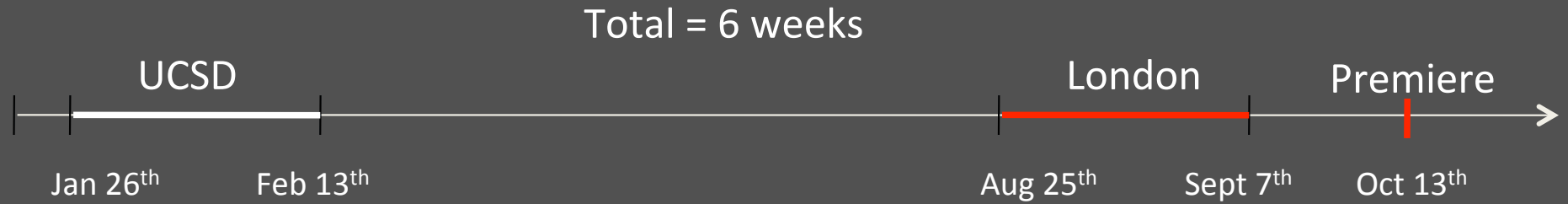


Case study: dance making





Timeline – ‘Dyad’ 2009

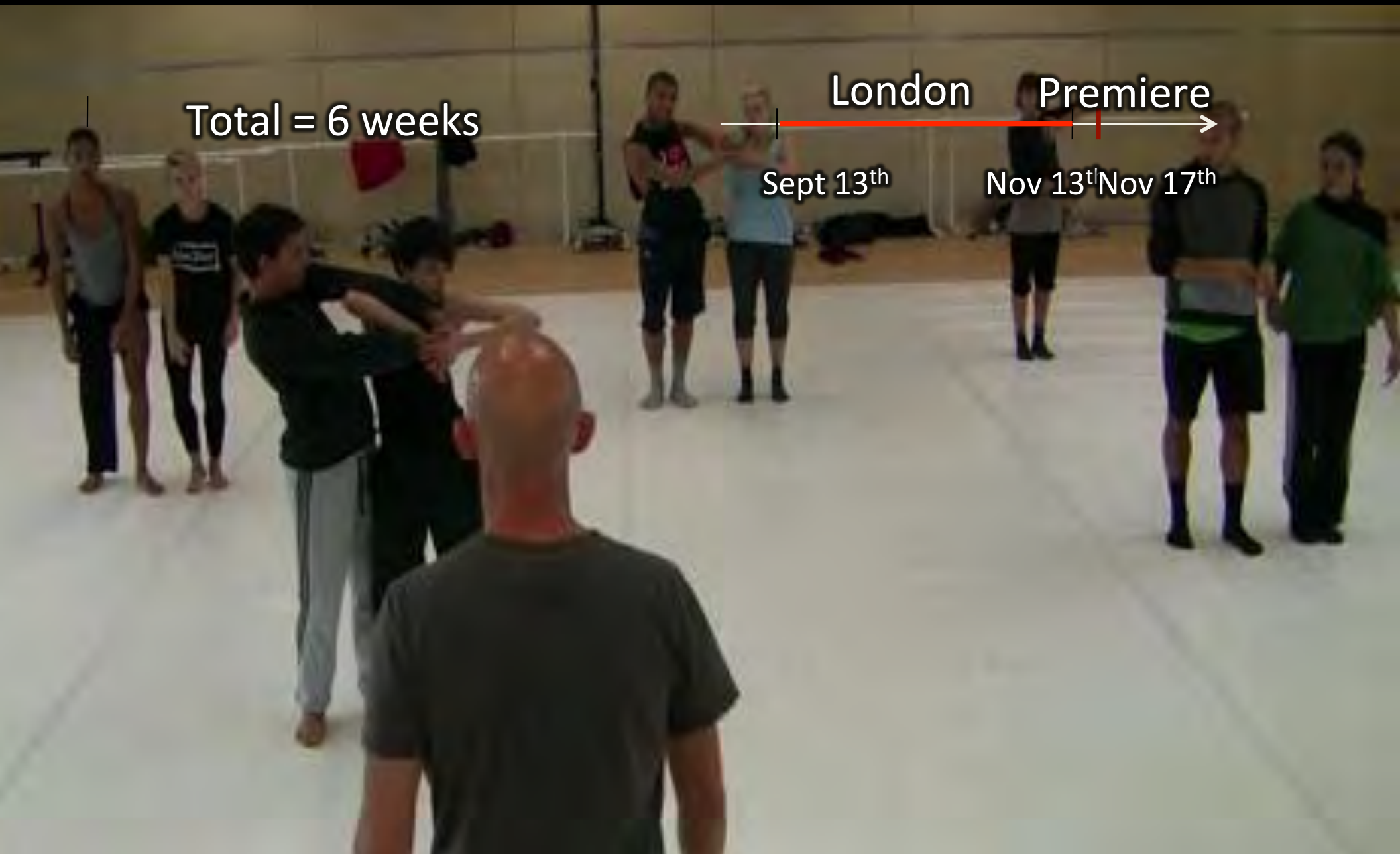


Wayne McGregor



Random Dance

Timeline – ‘Far’ 2010



Total = 6 weeks

London

Premiere

Sept 13th

Nov 13th Nov 17th

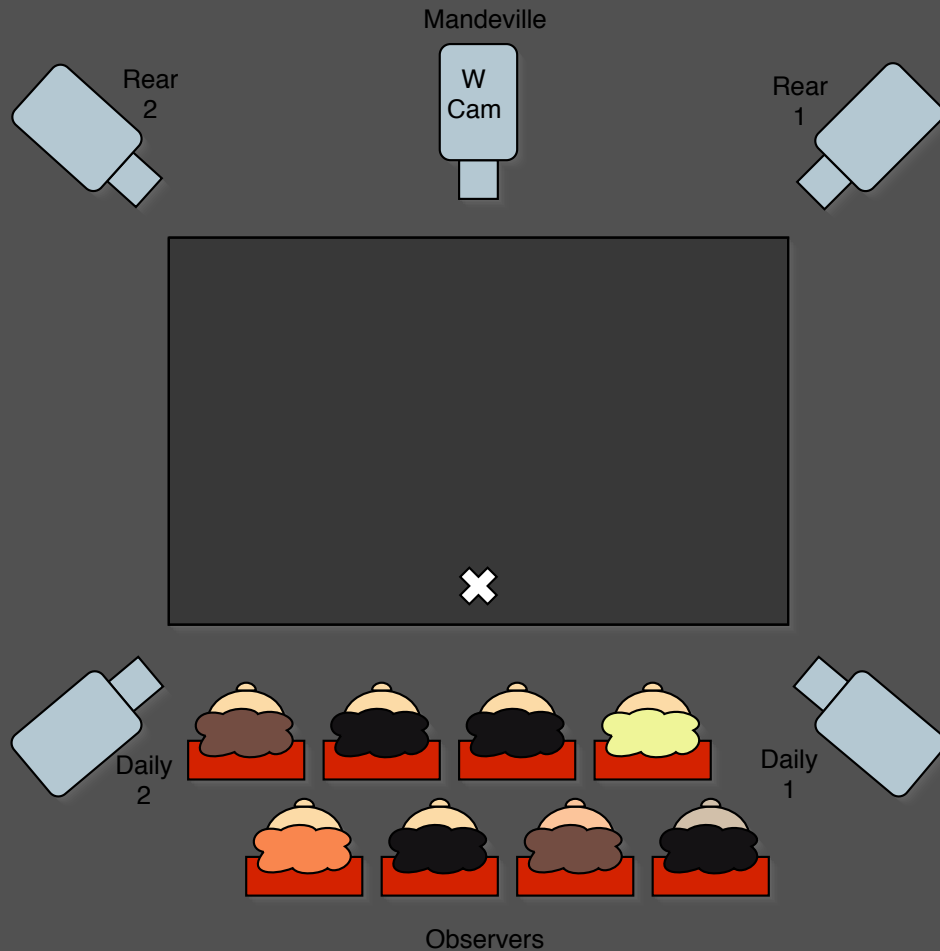
Timeline – ‘Undance’ 2011

Total = 6 weeks

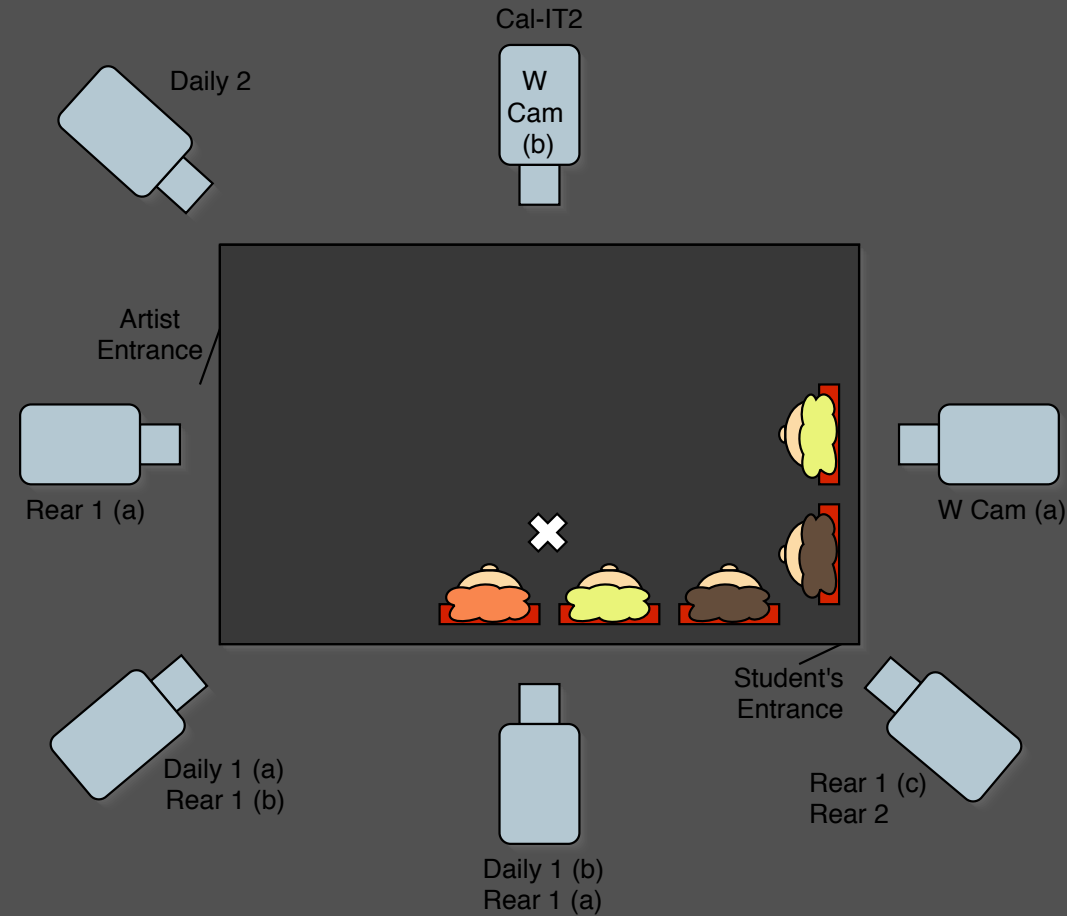


Observation Set-Up - UCSD

■ Mandeville Auditorium



■ Cal-IT2



Dyad UCSD



Field Notes

- Observations for 5 hours/day, for 27 days
 - Online coding of activity in FIELD NOTES
 - Includes: Time of activity, Activity code, and Description of activity

TIME	TYPE	Description	KEY
12:32	R	H works w/ JV rehearsing	
12:33	I	W: "Odette is going to go through them I think" Go through one of the phrases that we didn't get very far in from last week	I W Instruct to anyone
12:34	Start, R, J	H works with PJV in rehearsing mvmt phrase from last week	W W talking personally to X
12:35	Oth	W walks around watching	T X is talking to someone
12:38	R, J, T	HVJP rehearse mvmt, occasionally talk,	J Joint mvmt w/ X
12:39	Tht	Looks like the past-future phrase?	Start X started mvmt in resp. to W
12:39	I	W: "Just let me know when you've gt it"	End X stopped a mvmt
12:40	W	W: talks to HVJP group	Random X doing his own thing
12:40	I	W has them do mvmt one group at a time	TASK from W to dancers
	Oth	MAT group goes first, then CLGN second, and HVJP last	C Copying
12:42	R, J	HVJP do their group phrase	M W making choreo on X
	W	W talks to HVJP inaudibly	O X making choreo his/her own
	I	W looks like he's setting up formations, mvmts, timing	G Group discussion
	I	W has HVJP replace CLGN in positions, then do dance	Cr Creating own mvmts/sequence of mvmts
12:44	W	W: "As soon as you can, get back into your original formations" to HVJP	R X rehearsing/practicing
12:45	I	W: places people in formations, then has different people replace others in positions/formations	Tht Thoughts
12:47	I	W: "OK from the beginning, everyone just clear, clear, clear" to everyone to clear off stage HVJP take stage for their part of the mvmt phrase	
12:49	I	W: "From there, remember this quartet, you want the operation of your quartet to end up there. Go to that formation there, any 4 people, I don't mind...do the same, come forward [to HVJP] and assume the position again W: "Ok, ready and go....3 iterations of the same thing...I want to see the touch before the replacement. This is just a sketch. I'd like to see the 3 ppl come together...a bit more consumption...can you just try again? It's AN organization just so we remember it. I said something about that quartet finishing over there, right? [A: "yes"]	Abbrev
12:50	I		H Hannes
12:51	Oth	W shows M some mvmt in group	Mvmt Movement
12:55	Oth	H writes in journal	W Wayne
12:55	I	W: "Great, can we go over the annotate version, the annotate pedestrian version, and the annotate piston version?"	A+P/P+A Anna + Paolo
12:55	J, R	HC work together, rehearse these phrases	
12:57	Oth	H raises a finger, shakes head	
13:00	J, T, R	HC continue working together in mvmt phrase	DEF
13:00	T	C: "So you just step there?" to H; C talks to H inaudibly	Marking mvmt is done incompletely b/c that mvmt is not the focus, or dancer is doing a quick run through of the phrase, etc
13:05	J, T, R	C continue to rehearse and talk	Full out mvmt is performed fully



Interviews

Before and after session
2 hours per day, for 23 days



Interviews



After session each day usually in two's

Data Collected

- 20 TB of video of dancers and choreographer
- Dozens of interviews with choreographer and dancers
- Still images
- Dancer notes
- Associate choreographer's notes
- Student notes of ongoing
- Music used

Marking and Riffing

TWO PHENOMENA IN DANCE

Thinking with the body

MARKING in dance

Marking - during practice



Marking

A dance phrase is practiced, explored or reviewed in a less energetic manner than doing it 'full-out'.

Marking for time



Small marking







Marking

- Dancer abstracts from full phrase
- Focuses attention on some specific aspect of the movement

Marking: a universal phenomenon

- Tennis swing – by aspect
- Cello – on the arm
- Staged Plays – an Italian run-through
- Imperfect modeling – aspectual – as a learning / practice technique

Aspects to focus on

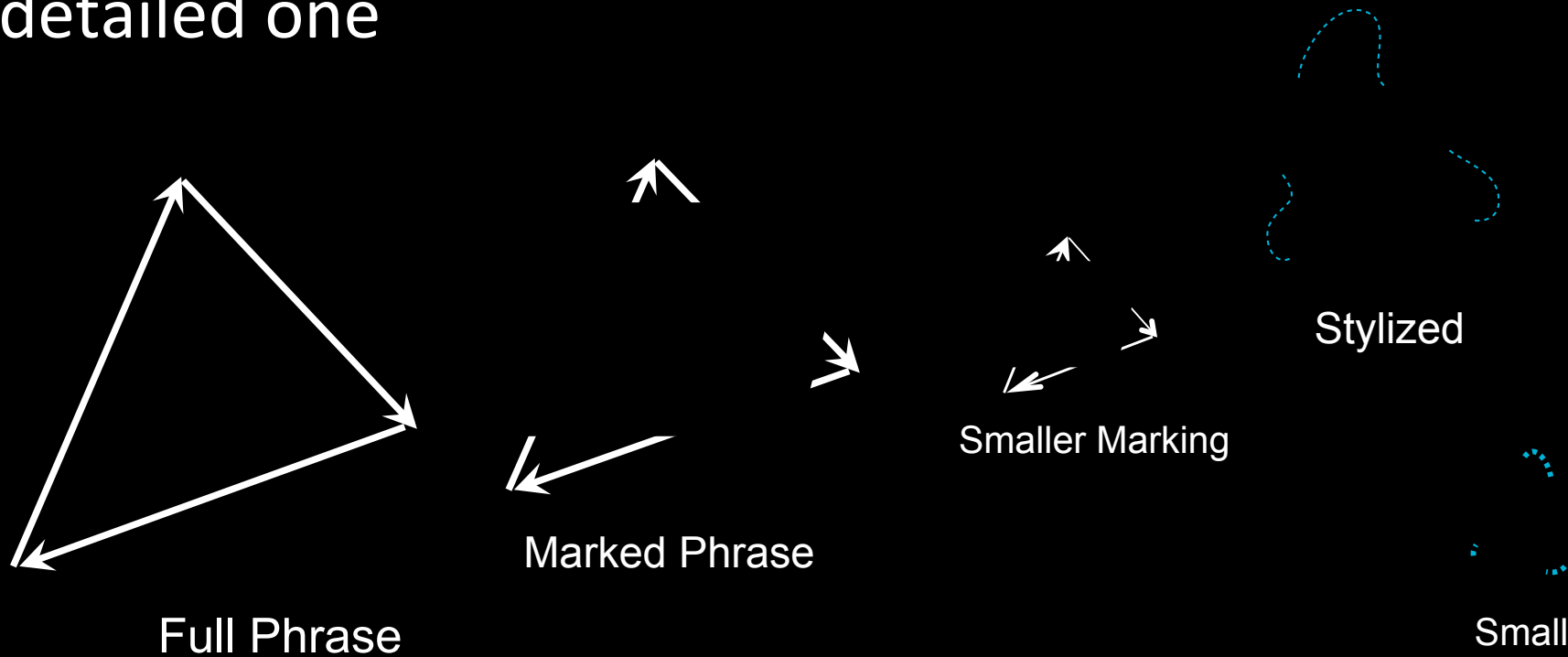


Similar Phenomena

- Planning grips and placements in rock climbing
- Planning a downhill in moghul skiing
- Planning turns in a car race

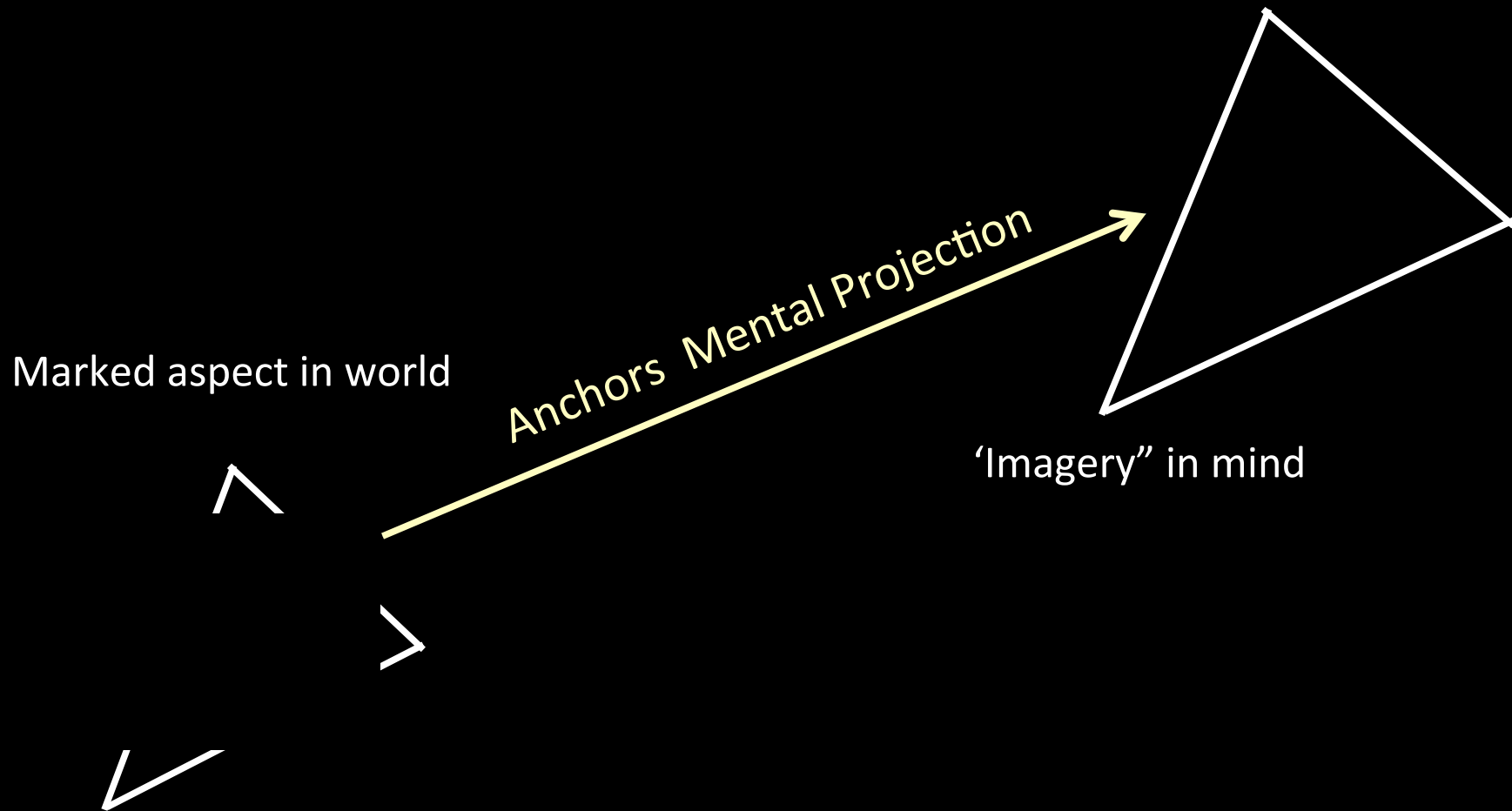
What it is

Represent a full dance phrase by a less energetic, less detailed one



A form of *physical sketching*

Marked aspect anchors projection



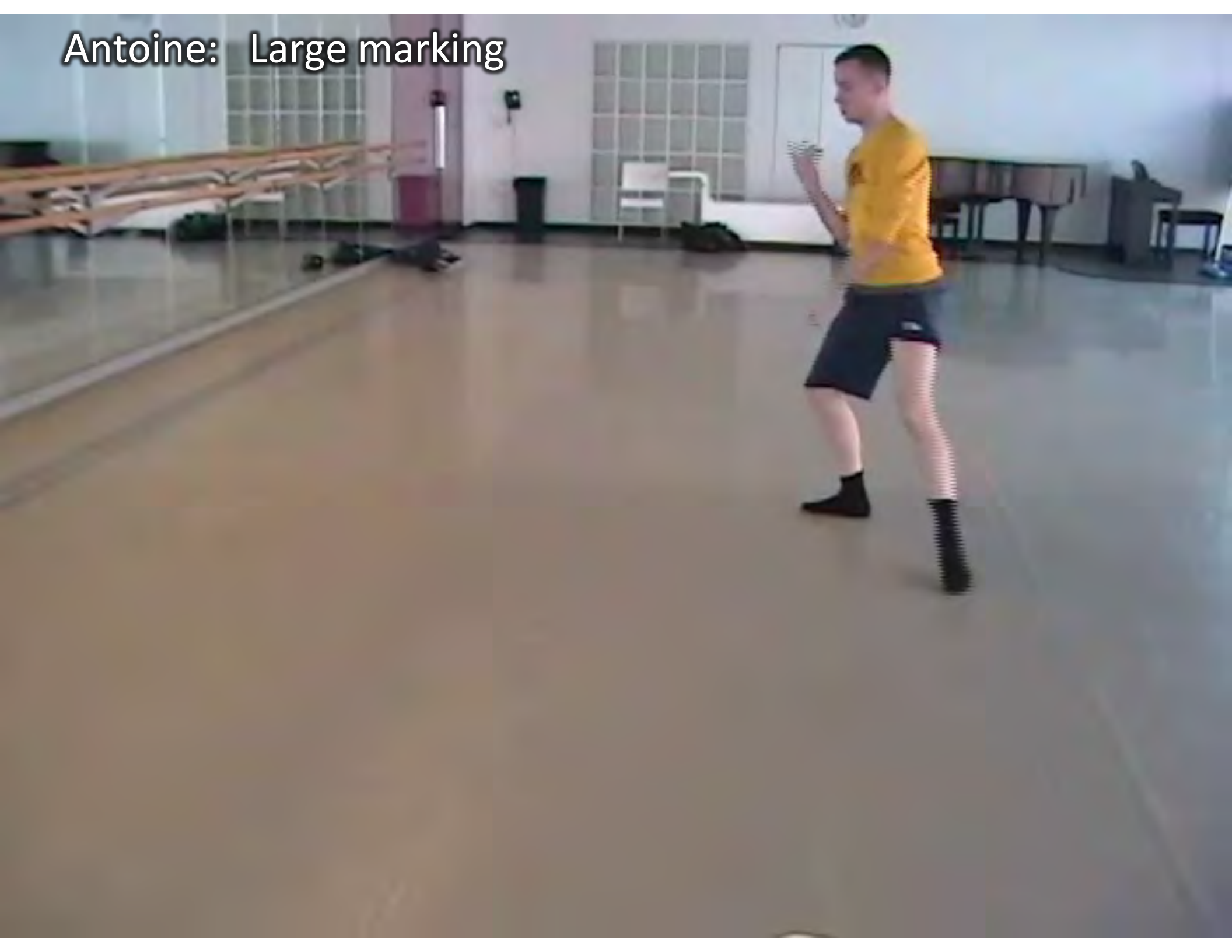
Sketching is a way of exploring designs

- Marking is like sketching with the body
- Dancers can make caricatures
- They can exaggerate
- Focus on specific aspects of a movement
- They may have different sketching styles
- And different objectives when sketching

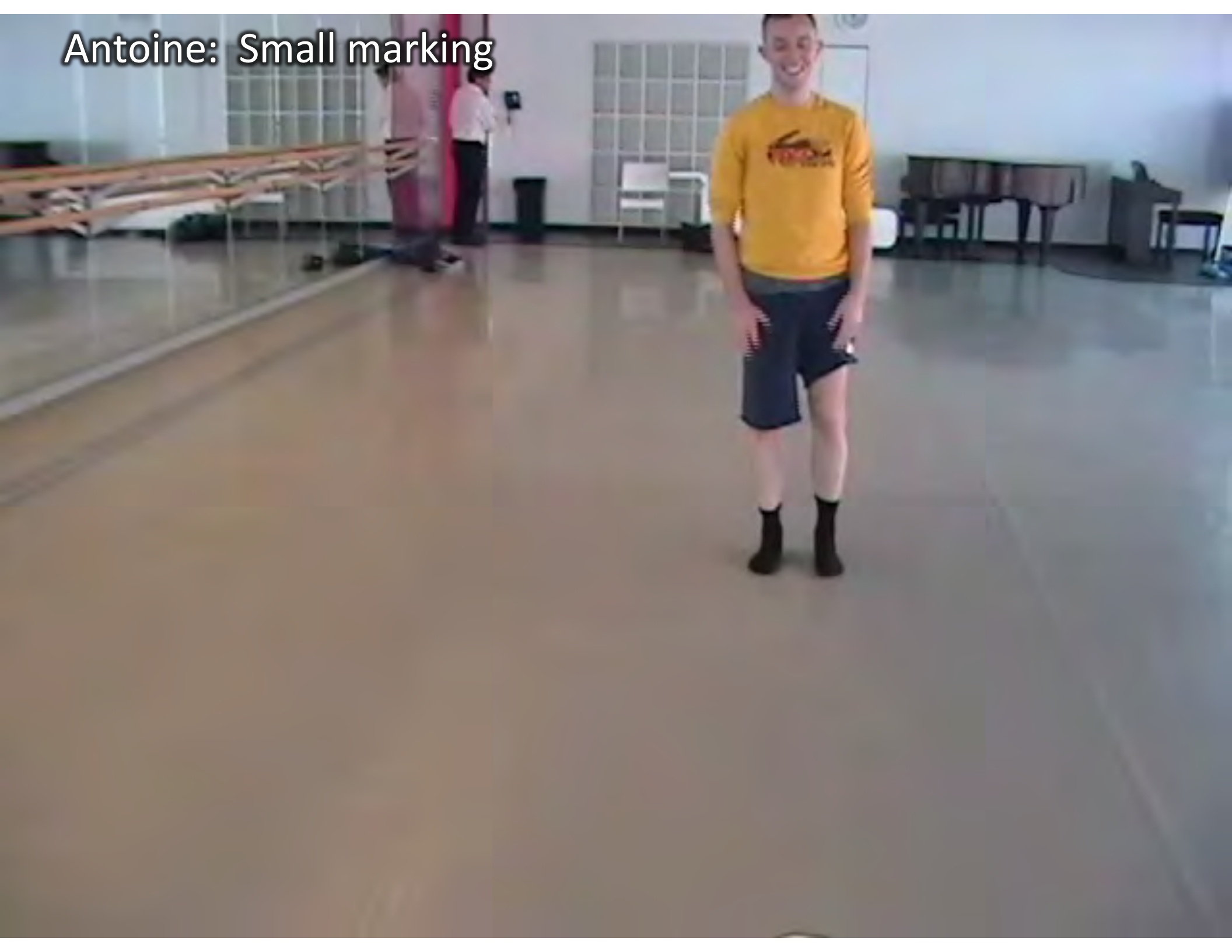
Antoine: Full



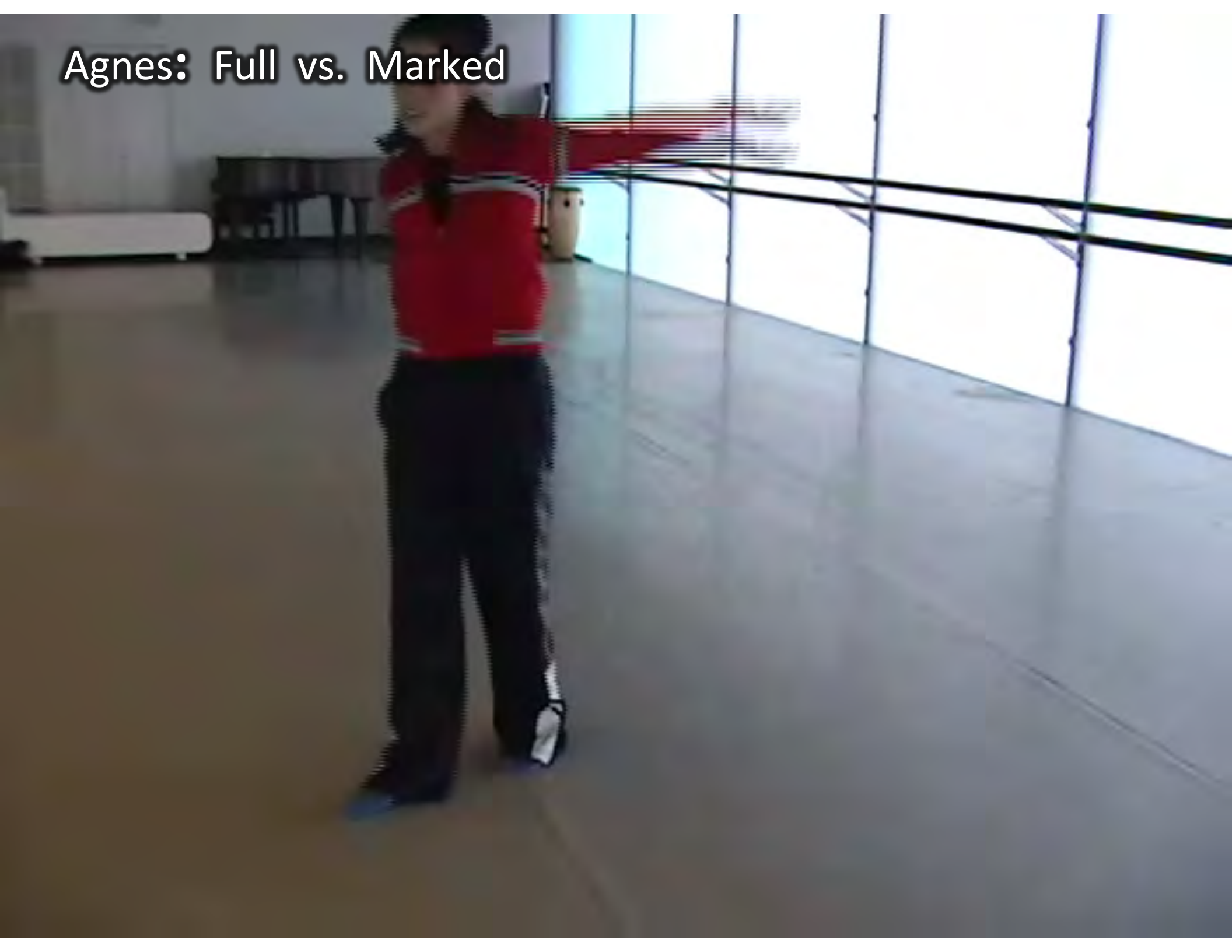
Antoine: Large marking



Antoine: Small marking



Agnes: Full vs. Marked



Agnes: Large vs. Small marking



Experiment to show the power of
marking

Which conditions facilitate learning most?



Full-Out



Mark



Simulate in the head

Experimental Design

Trail One
40 mins

Teach Phrase 1	Baseline Measure	Practice Phrase	Final Measure
10 mins	10 mins	10 mins	10 mins
BREAK 5 mins			

Trail Two
40 mins

Teach Phrase 2	Baseline Measure	Practice Phrase	Final Measure
10 mins	10 mins	10 mins	10 mins
BREAK 5 mins			

Trail Three
40 mins

Teach Phrase 3	Baseline Measure	Practice Phrase	Final Measure
10 mins	10 mins	10 mins	10 mins
BREAK 5 mins			

Performance Measures

1

Technicality

Precision of positions

2

Memory

Completeness of detail

3

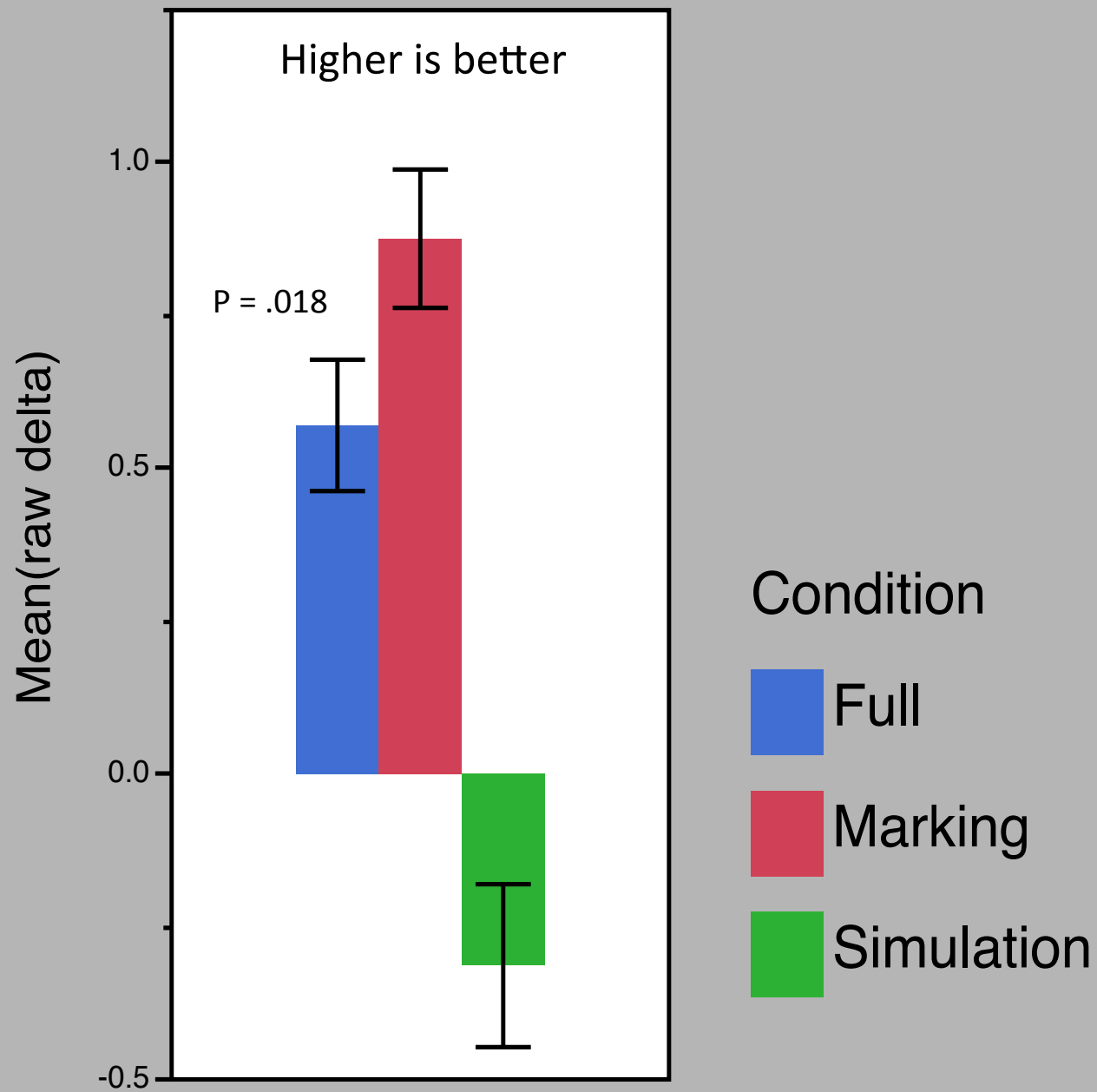
Dynamics

Speed, Force, Acceleration

4

Timing

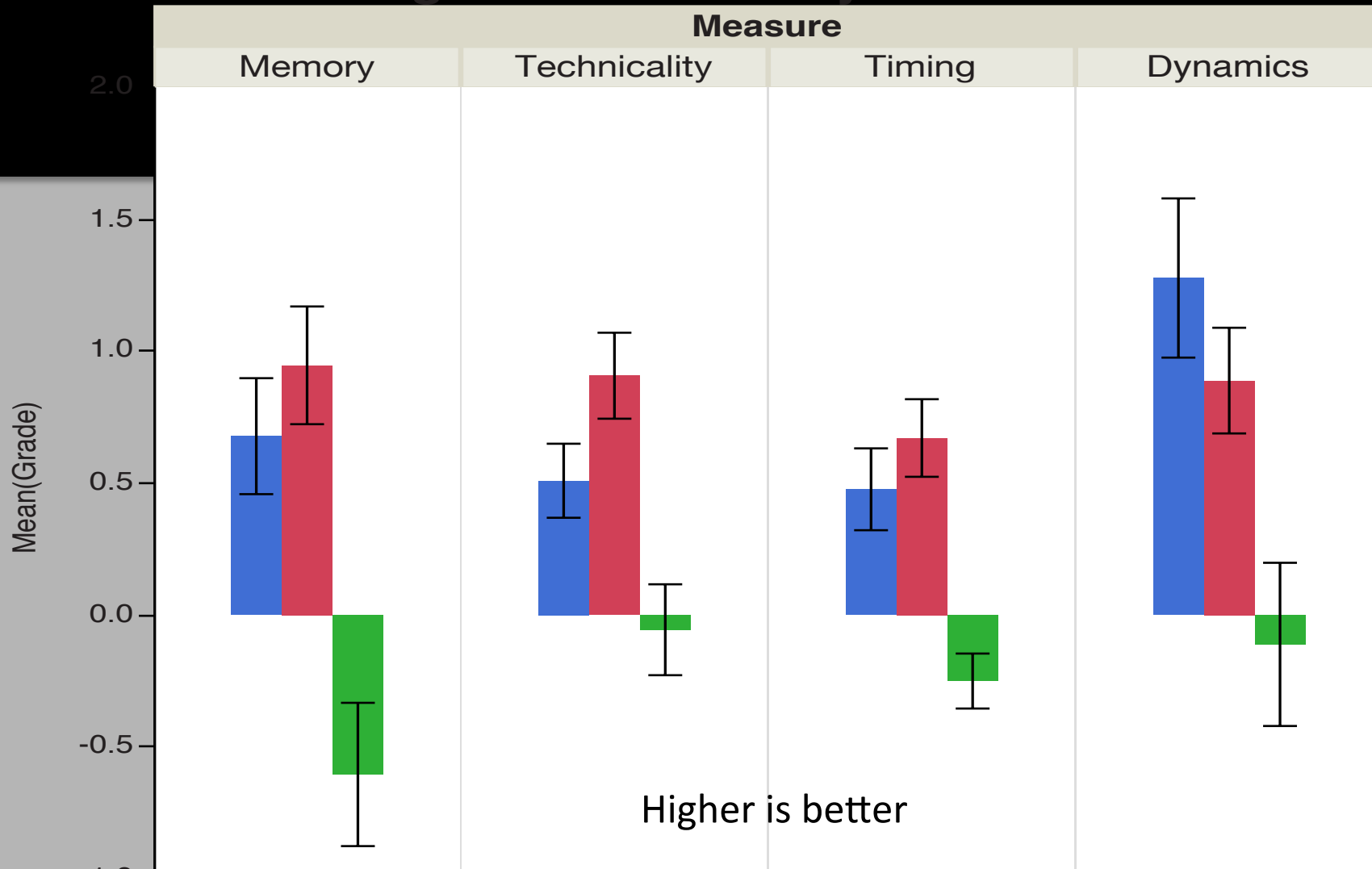
Tempo, duration



Learning broken down by dimension

Condition

- Full
- Marking
- Simulation



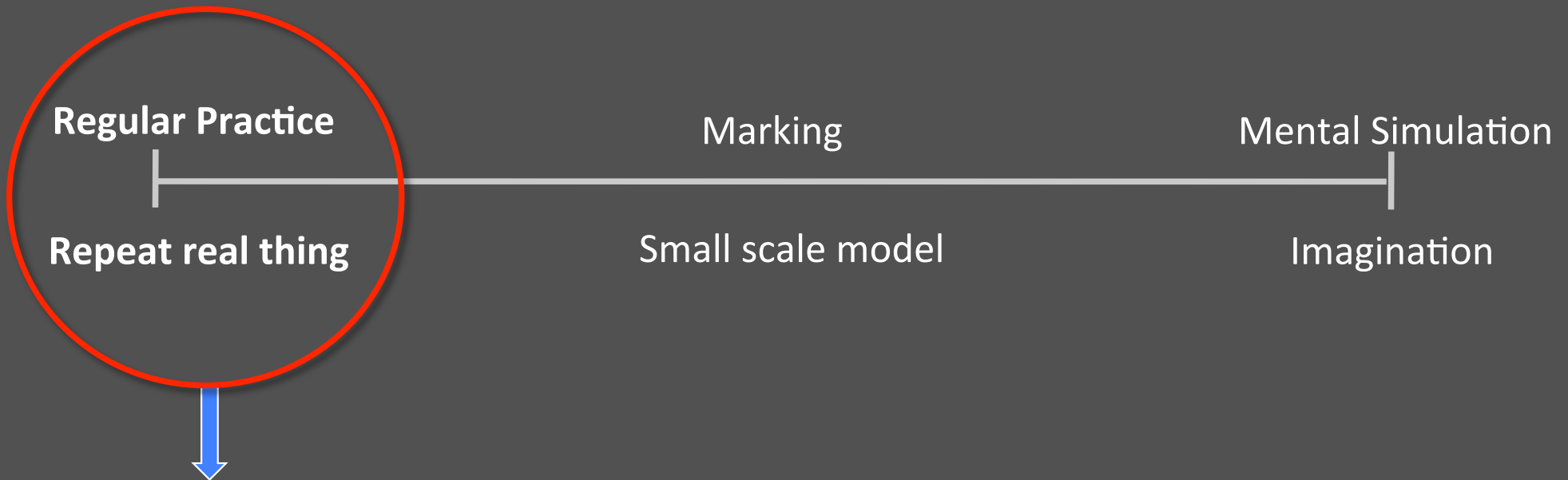
Higher is better

Measure	Mark > Full	Full > Mark	Mark > Sim	Full > Sim
Memory	.7334		<.0001	<.0001
Technicality	.0029		<.0001	.0005
Timing	.0194		<.0001	<.0001
Dynamics	-	.145	.0003	<.0001
Mem, Tech, Timing	.0189	-	<.0001	<.0001

P Values

Why this is interesting

- Three ways of practicing

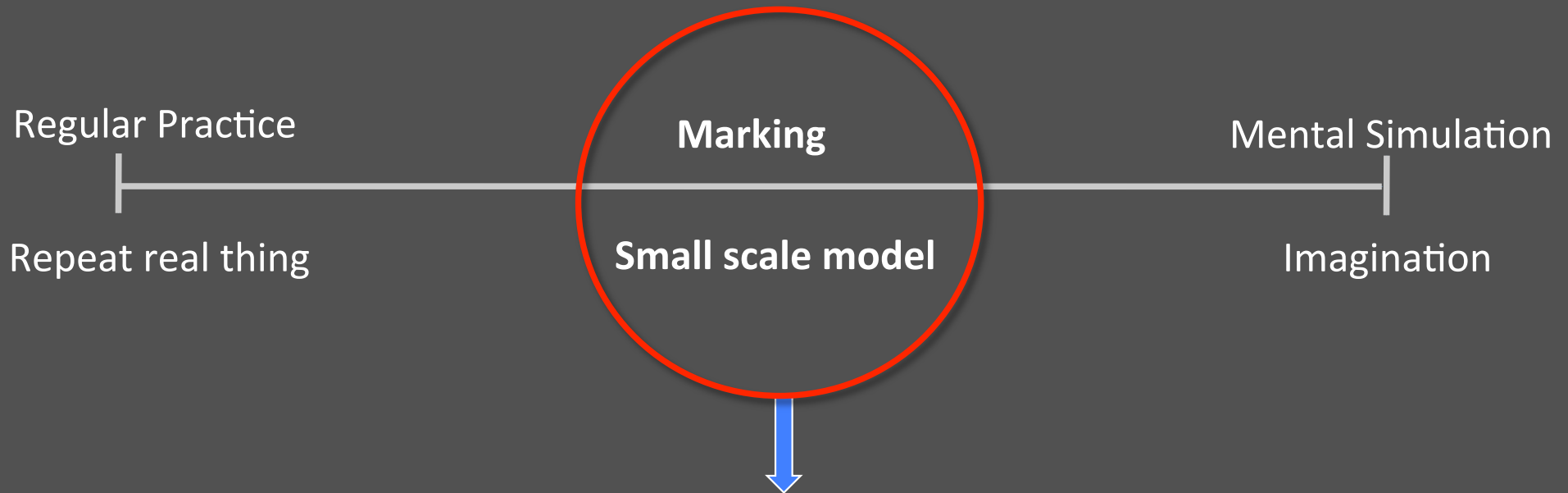


Realistic movements

- Real skiing, tennis games and shots, practice music on violin, dance the real phrase ...

Issue

- Three ways of practicing

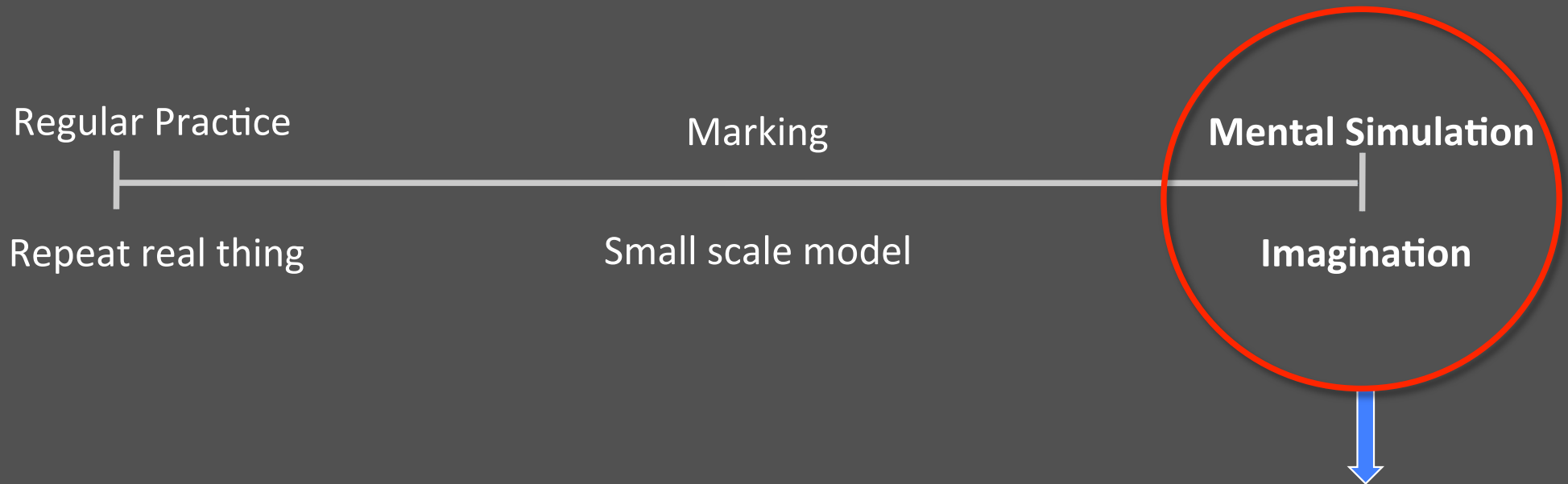


Partial model of real thing

- Italian run-through, Cello on arm, marking in dance, slow practice, aspectival practice, vocalize tabla rhythm

Issue

- Three ways of practicing



Mental simulation

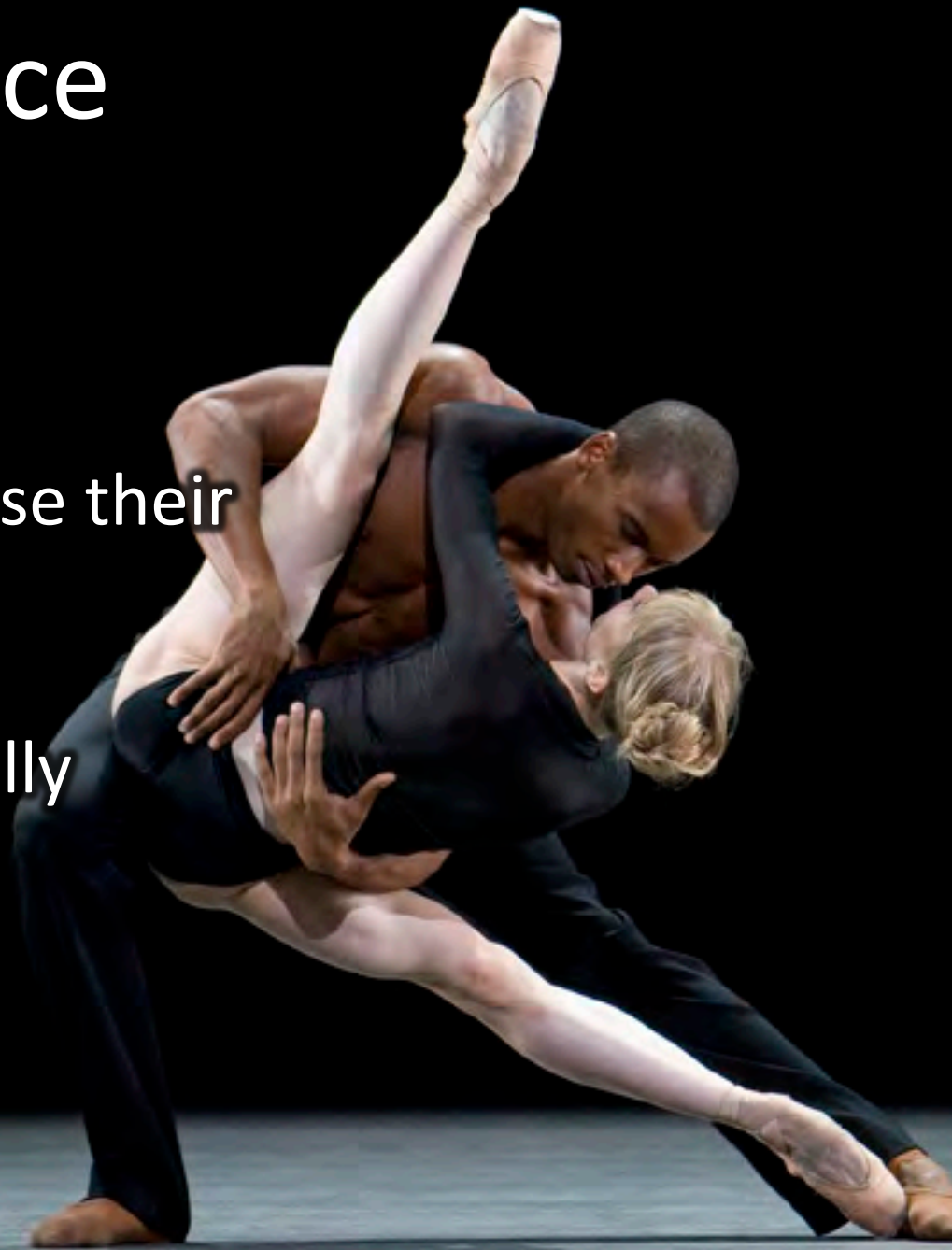
- Cyber skiing, mental run-throughs, imaginary dancing ...

Body thinking in dance

‘Marking’ shows that dancers use their body as simulation engines

They use them representationally

They think with their body



Upshot of marking study

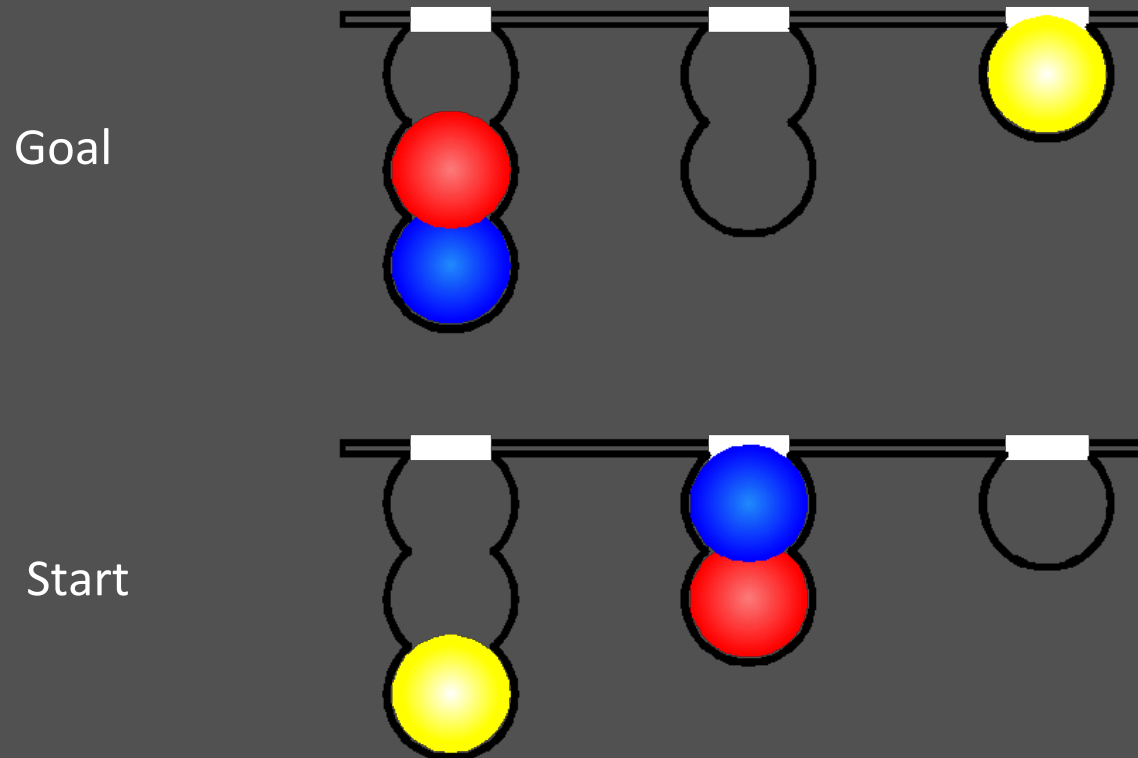
- Marking confers cognitive benefits during the rehearsal process
 - Sometimes people learn faster by producing simplified or distorted models of the real thing
 - E.g. practice getting the notes right at slow speed, or just the rhythm with wrong notes – or saying the rhythm (bols in tabla)
- Marking is a movement reduction system
- Other movement reductions might also facilitate:
 - whispering or subvocalizing
 - Gesturing

CLAIMS ABOUT THINKING

PROJECTION



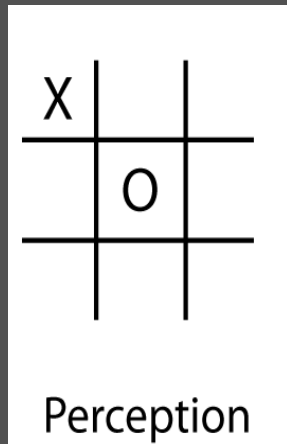
What is Mental Projection?



Move the colored balls, one at a time in a minimum number of moves, from the start state to the goal state.

Projection vs. Imagination

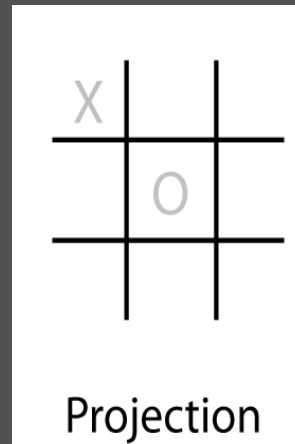
Perception



Reality oriented

See what is present

Projection



Augment reality

Anchored

Imagination



Virtual Reality

No size or location

Projection



Mental Projection is more powerful than mental imagery alone

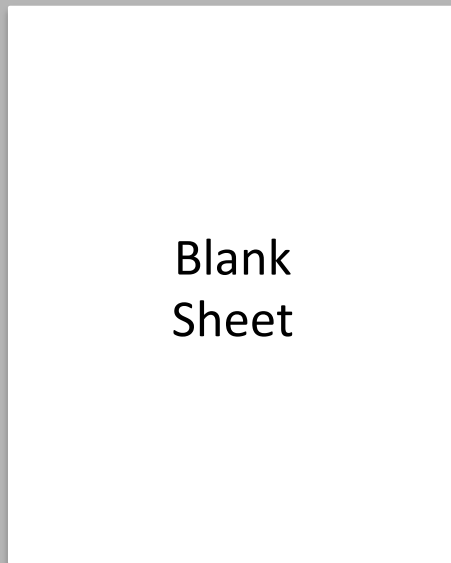
We can project beyond what we can readily imagine.

External structure helps us.

Experiment to explore projection

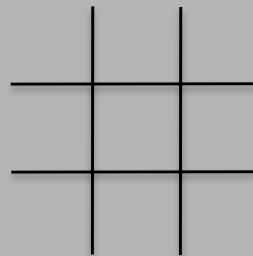
Tic tac toe experiment – 3 by 3

Imagination Condition



Blank

Projection conditions



Table

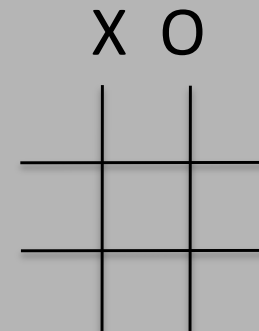
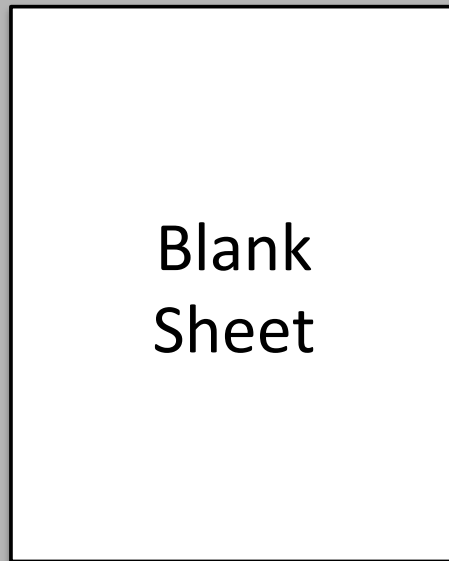


Table + X O

Experimental Conditions

Blank page is unanchored imagination

Imagination Condition

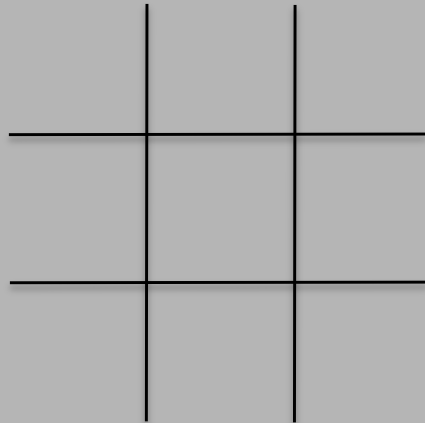


No external structure to help
Projection

Many people closed their eyes:
no projection at all.

Projection \neq Memory Offload of State

No state change in the environment



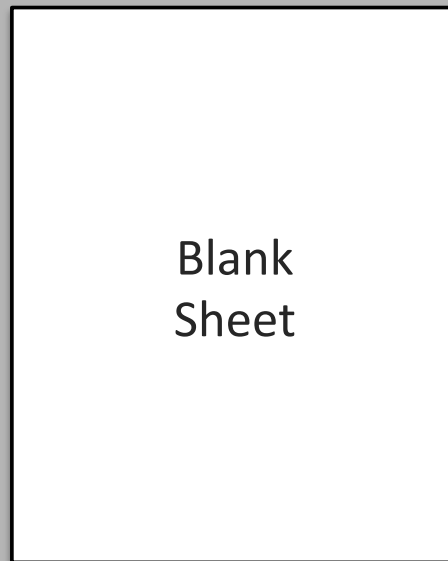
Board remains the same over time

Within Subject, practice first

practice

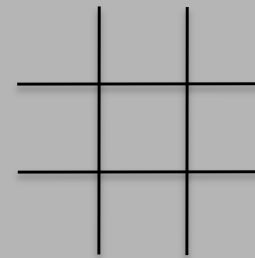
1	2	3
4	5	6
7	8	9

Imagination Condition



Blank

Projection conditions



Table

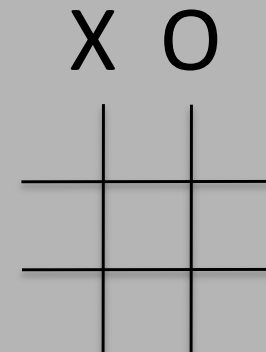
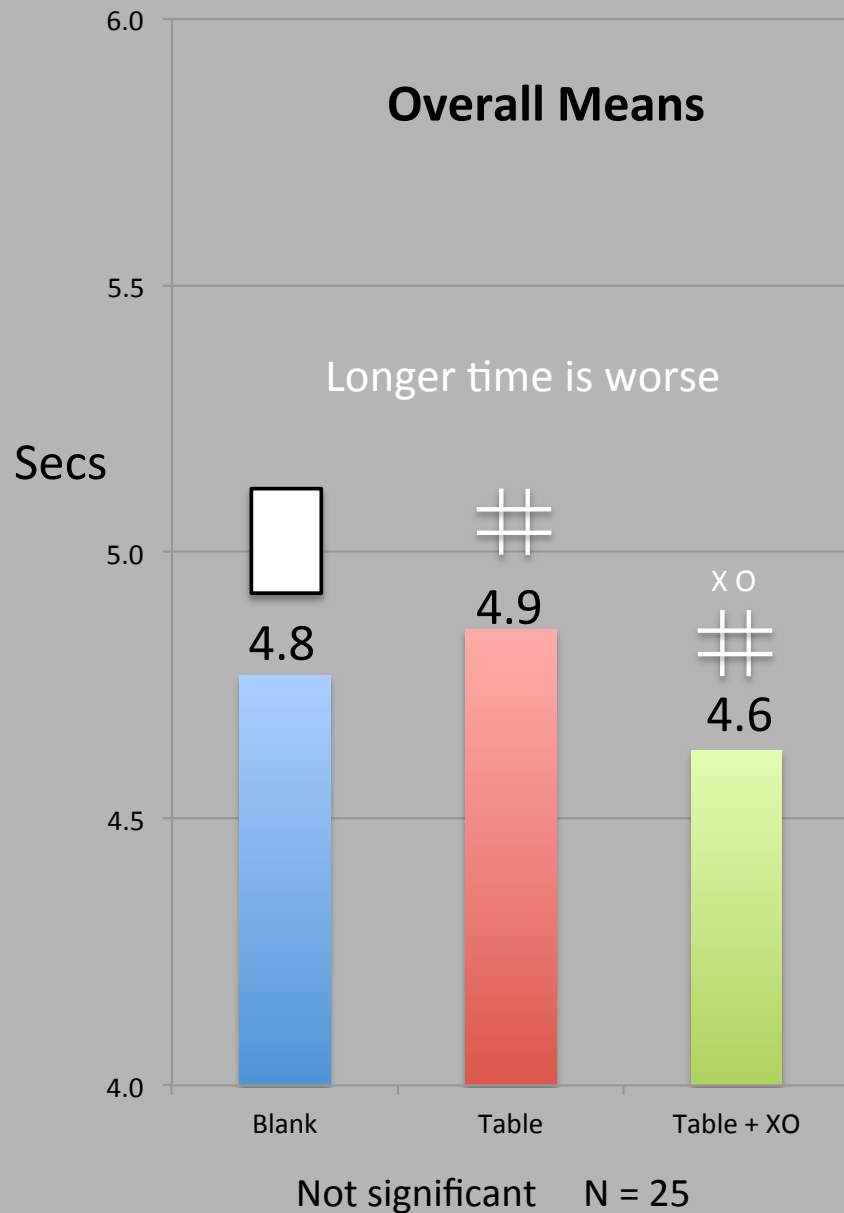
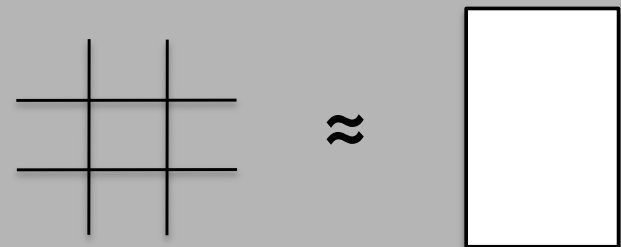


Table + X O

Results 3 by 3



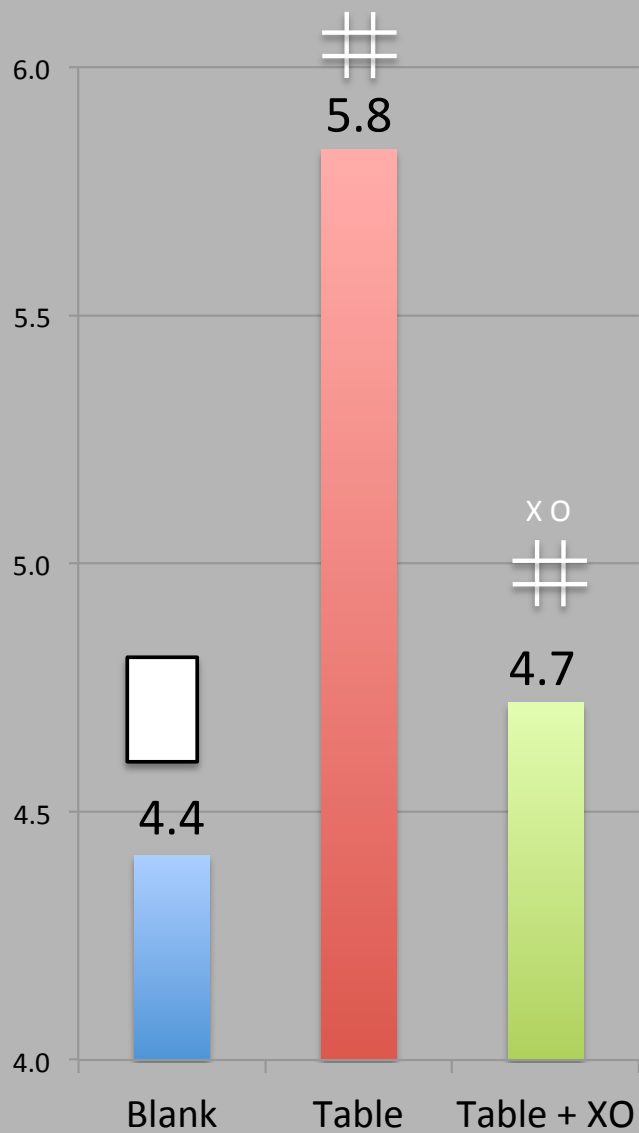
Surprise!



4.8 ≈ 4.9

Table is no better than blank

Results 3 by 3

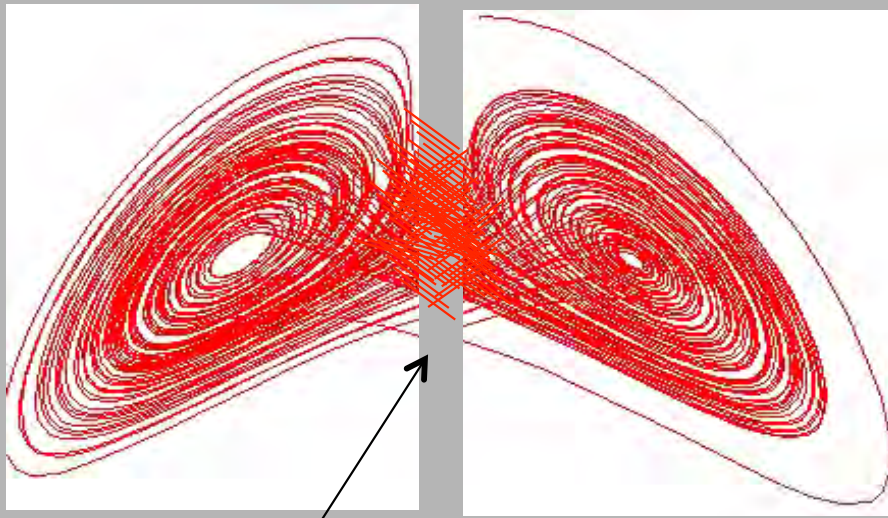


**More than half were
better using
imagination alone**

Significant $p = .002$

You must factor in Anchoring Costs

- Cost of anchoring process must be factored in. Cost of coupling with the world.
- The tighter the coupling the lower the mediating cost of 'anchoring'
- Gestures, registration and other processes are often involved as we situate ourselves – help us couple.



Anchoring processes

Can we find cases where benefits
always overcome anchoring costs?

Conjecture:

if the imagery task is hard enough everyone will benefit.

4 by 4 Experiment: harder imagery task

Practice

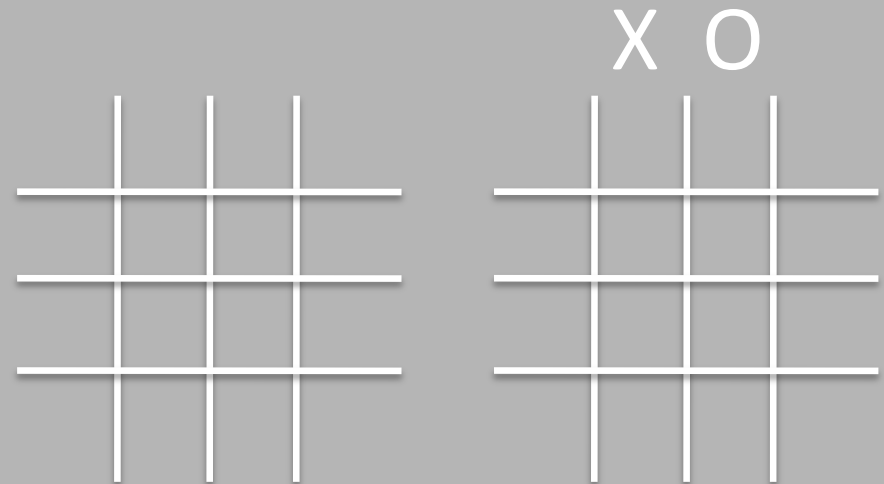
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Imagination



Blank

Projection



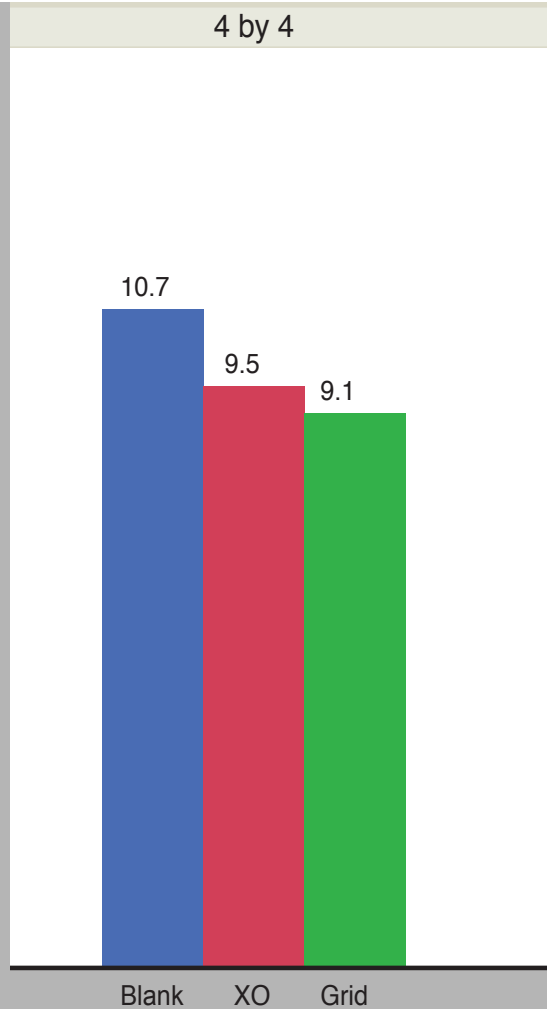
Table

Table + X O

3 Conditions

Results 4 by 4

4 by 4 Mean Time per move



N = 25

Implication:

Once task is hard enough

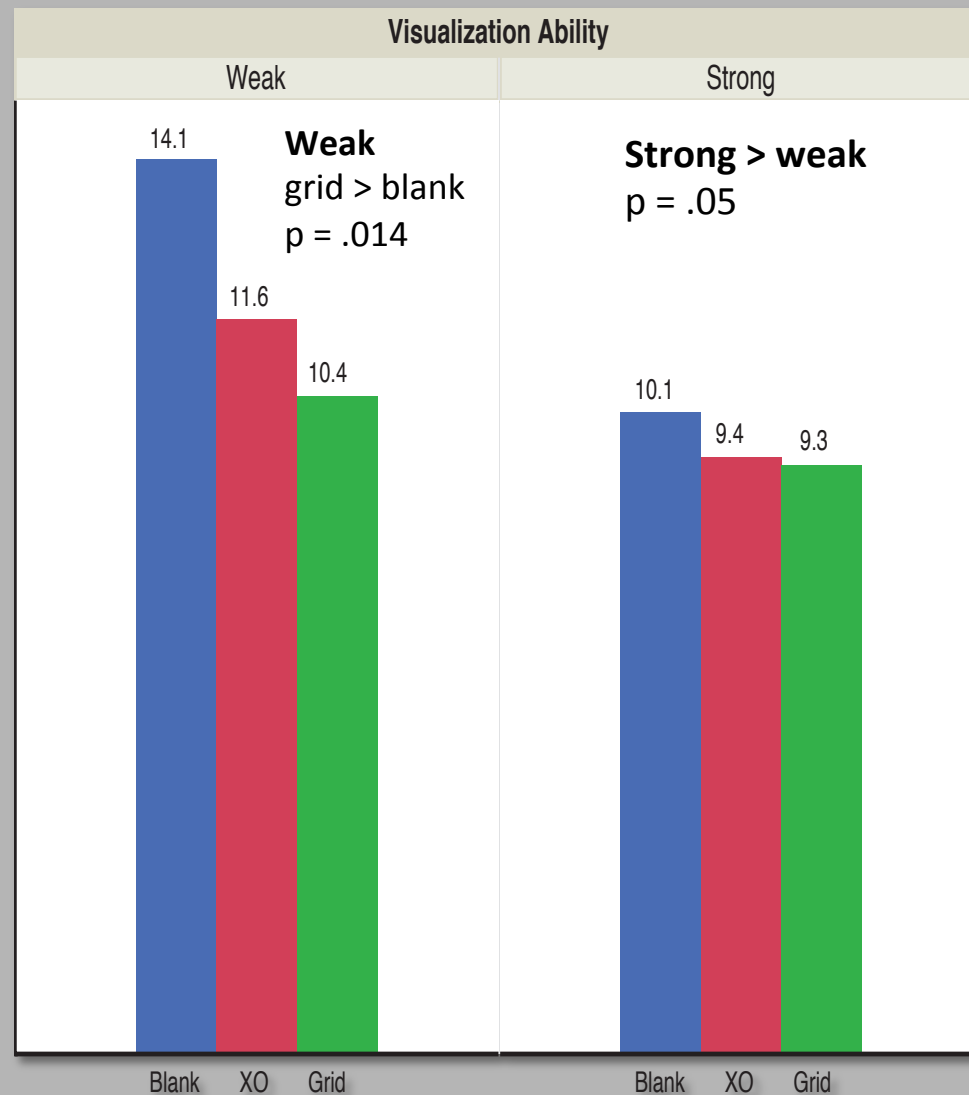
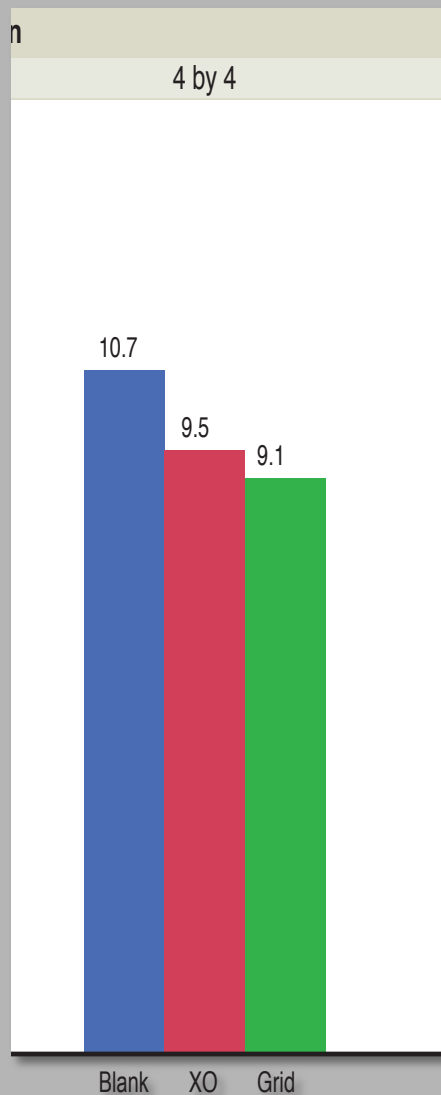
Table is worth the
cost of coordination

Table faster than Blank
mean difference 1.6s,
 $p = .002$

Table faster than XO $p = .01$

Is it better for everyone

Bad visualizers are helped much more!



- Projection is a real process distinct from perception and imagination
- As problems get harder we cannot easily imagine the answer so we rely on projection more
 - Imagination has memory limitations that are partly overcome by external supports
- Projection and imagination are driven by the actions you are familiar with
 - Different people will be able to project different outcomes

Conclusions

- Marking shows that an external simulation can be used as constituent in thinking as well as an internal simulation
 - Externalizing provides a physical understructure that supports projection
 - Simplifying the simulation focuses attention on aspectual elements enabling better practice

Conclusions

- The principles at play are:
 1. Thinking can be pushed forward by physical movement
 2. Projection onto external structures or processes is a method of visual thinking
 3. Projection is part of an extendable interactive method of thinking – Project ◊ Create ◊ Project
 4. Projection needs to be anchored and gestures are sometimes used to foster anchoring
 5. Modality translation is powerful when the explicitness landscape of modalities differs