

# Beginnings and endings

Exploring the creative possibilities of sound-movement onsets and endings in interactive dance

- project ideas and plans for 2021/22

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# «Two Pandoras»

- Choreographers: Muriel Romero and Jean-Marc Matos
- Dancers: Muriel Romero and Marianne Masson
- Music and sound synthesis: Pablo Palacio



# Observations – «Two Pandoras»

- Relatively direct relationship between intensity of movements and sound
- Movements organized in temporally disjunct phrases
- Pauses between 0.5– 5.7 s. (close to stillness)
- Onsets more salient with longer pause
- Stillness
  - Position gains significance
  - Position can imply different degrees of tension
  - Often small preparatory movements before weight shifts and steps

# *Two pandoras: Phrase onsets and endings vary*

- Dynamics:
  - abrupt, marked, accelerating, soft, jerky, fluid, gradual, «bouncing fade»,
- Body part involvement:
  - starting with one isolated extremity (hand, leg, head)
  - two simultaneous extremities (hand + leg)
  - steps with weight shifts
  - originates in one extremity and gradually involving the whole body
- Size:
  - Very small (hand) -> small (arm + hand) -> medium (torso+legs) -> big (full body)
- Shape/direction:
  - straight, swaying, downward «swirl», «wave»
- Repetitions

# Project aims

Within an interactive dance context:

- Explore the expressive potential of beginnings and endings in the form of transitions between stillness and movement
- Explore the effects of temporally biased interactivity on performers and audience
- Explore how fine temporal variations in multiple parameters in beginnings and endings can be mapped to sound synthesis, processing and spatialization parameters so as to increase their expressive potentials
- Improve the understanding of transitions between stillness and movement

# Background I: Stillness in dance

- E.g Judson Dance Theatre 1960 ->, Cunningham, Steve Paxton's «small dance»
- A dancer has presence when still
- Can highlight micro-movements & breathing
- Can imply effort/tension, but also rest
- Preparation for what comes next (pre-onset)

# Background II

- Stillness vs. movement as productive opposition in interactive dance\*
- Amplification of gesture\*\*
- Dilemma of interactivity:
  - obviousness vs. complexity
  - clarity <-> obscurity of interaction\*\*\*

• Bergsland and Wechsler (2015); Camurri et al. (2016); Candau, Françoise, Alaoui, and Schiphorst (2017); Hsu and Kemper (2015); Hsueh, Alaoui, and Mackay (2019); James et al. (2006)

\*\* Wechsler 2006. One out of three aspects which make interactive art interesting

\*\*\* Alaoui, 2019; Toenjes, 2007; Wechsler et al. 2004

# Background III: Onsets and endings in music

<u>onsets</u>	<u>continuants</u>	<u>terminations</u>
departure	passage	arrival
emergence	transition	disappearance
anacrusis	prolongation	closure
attack	maintenance	release
upbeat	statement	resolution
downbeat		plane

Figure 1. Structural functions (Smalley 1997: 115).

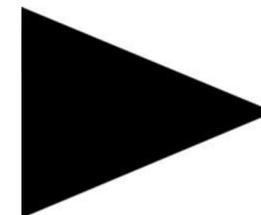


Figure 9. Singular attack.

## Thoresen's spectromorphological notation (2007)

<i>Abrupt ending</i>		<i>Brusque onset</i>	
<i>Sharp ending</i>		<i>Sharp onset</i>	
<i>Marked ending</i>		<i>Marked onset</i>	
<i>Flat ending</i>		<i>Flat onset</i>	
<i>Soft ending</i>		<i>Swelled onset</i>	
<i>Resonating ending</i>		<i>Gradual onset</i>	
<i>Interrupted resonance</i>		<i>No onset</i>	

Figure 12a. Ending genres.

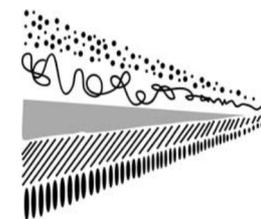


Figure 10. Micro-composite attack.

Blackburn, 2011

Figure 10. Dynamic profile.

# Background IV: Perceptual salience in music in the temporal domain

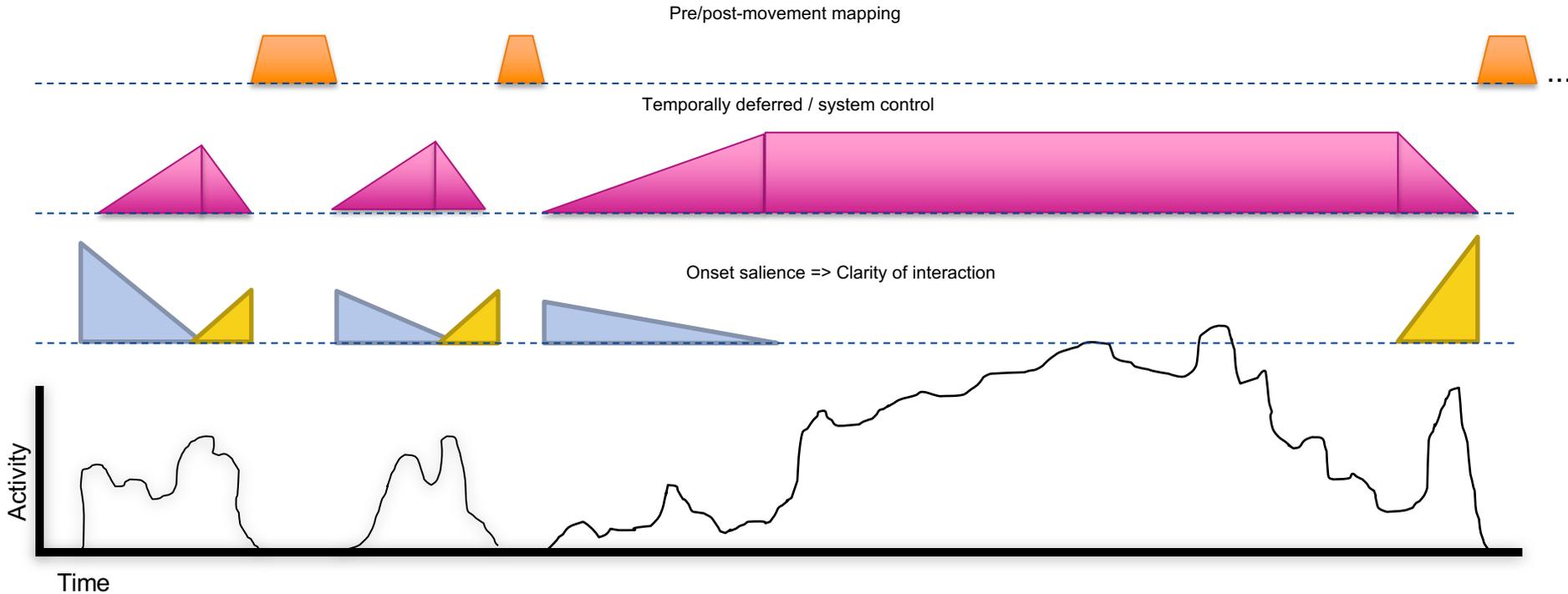
- Based on feature contrast in time
- Loud/abrupt onset after silence => max onset contrast/salience
- Can combine with other features to increase «prägnanz» in music
  - ex. Wishart *Imago* and *Tounges of fire*
- Abrupt contrasts/high salience without silence/stillness could also produce high salience. (However, this could merge ending with beginning)

# How to emphasize onsets and endings?

Ideas so far:

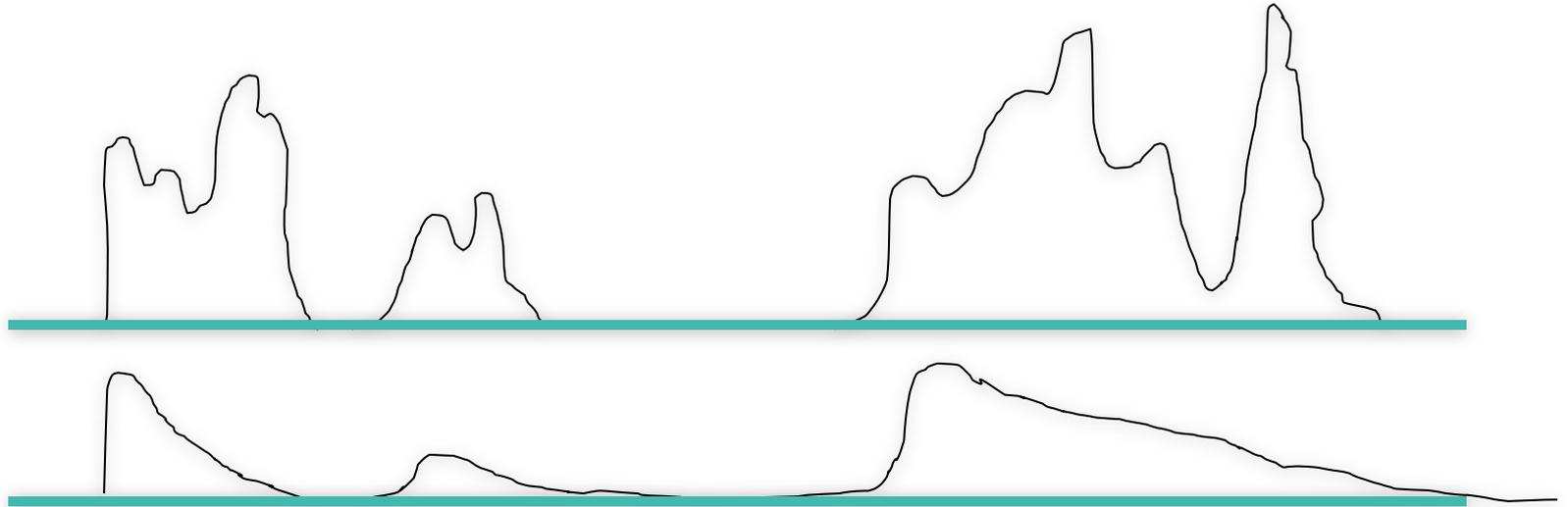
1. Onsets/endings influences what happens at other points in time
2. High sense of causality
3. Expand nuance of expression

# Interaction/control in time (simplified model)



# Onset salience/rarity

- Analyse from activity/intensity parameter (EyesWeb)



Mancas, M., Glowinski, D., Volpe, G., Camurri, A., Bret  ch  , P., Demeyer, J., Ravet, T., & Coletta, P. (2008). Real-time motion attention and expressive gesture interfaces. *Journal on Multimodal User Interfaces*, 2(3), 187-198.

# When is the beginning over?

- Onsets/endings= fuzzy periods
- Onset finished at first peak in movement intensity/activity?
- When a certain time has passed?
- When something else has started
- Multi-event onsets

# Pre-onset

- Preparation:
  - Quality of onset also rests on preparation
  - Accumulate energy & muscle tension (e.g. plosives)
  - Position, angle & posture
  - Attentional focus - presence
  - (If rehearsed): mental imagining/visualization
- Godard (1995): “pre-movement”
  - Attitude towards weight and gravity - determine tension and posture before the attack
  - Largely escapes consciousness and intention
  - Gives the specific expressive color to movement
  - Gesture includes pre-movement

# Endings

- When do an ending begin – and end?
- Endings in dance (going into stillness) often highlight body shapes/poses. That pose will then constitute the beginning of the next phrase, if any (bodily continuity)
- How to know that the performer is performing an ending?
  - Change to direct mapping is needed
  - Some way of signalling to the system to start preparing for ending + switching to other mapping
  - Some feedback from the system to confirm change of mode
- Ending can be marked on multiple levels
  - Phrase, sentence, sub-section, section, piece

# Segmentation

- Beginnings and endings may be relative to segments on different levels:
  - In EAM/classical: Sound object :: Phrase :: Sentence :: Sub-section :: Section\*
  - In dance: Beat/Step/Move(ment)/Gesture :: Movement sequence/Phrase :: Section (??)
  - Many properties can affect segmentation: Not only pauses, but also change in material, repetition of material, changing of external aspects like scenography, lighting, etc.
- Camurri et al. (2010):
  - Duration of how long Quantity of Motion (QoM) is under a given threshold marked movement pauses
  - Subjects only marked pauses if they were longer than 0.4 seconds

\* Thoresen 2009. As he marks, in EAM such levels are often not as clearly defined

# Special cases

- The shorter the gesture/sound, the more beginning and ending merge
- Sparse material, especially single discrete events, makes it difficult to use intensity-related parameters to determine whether something is an ending or beginning.

What we call the beginning is often the end  
And to make an end is to make a beginning.  
The end is where we start from  
(T.S. Eliot, Little Gidding, 1942).

# Project time plan

When	What	Where
August	<ul style="list-style-type: none"> <li>• Prepare and do empirical study in collaboration with NTNU Dance studies.</li> <li>• Prepare and test technical setup.</li> <li>• Preparing sound instruments.</li> </ul>	Trondheim
Sept-Nov	<ul style="list-style-type: none"> <li>• Testing expression analysis parameters</li> <li>• Developing and testing instruments and mappings</li> <li>• Organizing valuable material with artistic intention</li> <li>• November: Present study #1.</li> <li>• Performance and audience evaluation</li> </ul>	ZHdK
December	<ul style="list-style-type: none"> <li>• Reflect and analyze evaluation materials</li> <li>• Write 1<sup>st</sup> conference paper (on empirical study)</li> </ul>	Trondheim
Jan-June	<ul style="list-style-type: none"> <li>• Expand expression analysis</li> <li>• Expand instruments and mappings</li> <li>• Test spatializations of musical layers</li> <li>• Organizing valuable material with artistic intention</li> <li>• Write 2<sup>nd</sup> conference paper (on experiences from study #1).</li> <li>• March: Present study #2. .</li> <li>• May: Present “piece”.</li> <li>• June: Write journal article.</li> </ul>	UTS (Alternatively Infomus, Genoa or ESMAE, Porto)

# Phase 1: Empirical study (NTNU, august)

- Record dance phrases separated by stillness and executed with different movement qualities and degrees of abruptness
- Task: Generate dance phrases (ca. 8-15 seconds) with movement onsets and endings (to/from stillness) with different qualities
  - Follow short musical phrases from the EAM repertoire
- Aims:
  - identifying particularly salient differences between movement onset and ending qualities
  - identify similarities and differences in qualities for onsets and offsets.
- Mainly quantitative data analysis but might also include a qualitative analysis of the recorded material (interview) in collaboration with other researchers.
- Decide on which features to focus on in subsequent phases



# Phase 2: Build system bare bones



NGIMU



...



Myo



...



Kinect 2



Computer 1 (PC):  
EyesWebXMI  
Max/MuBu  
Simulation software  
Osc4py3.py



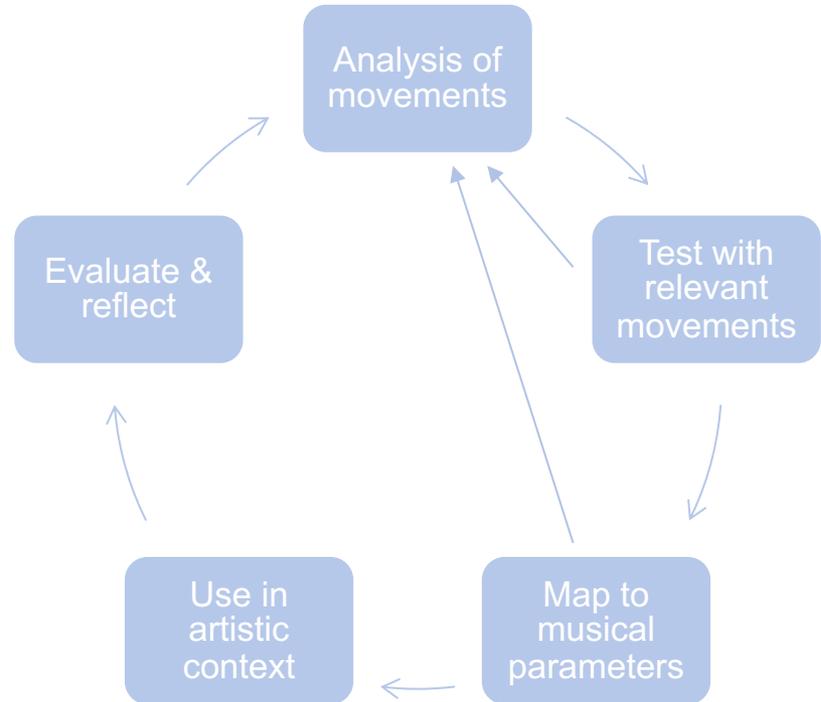
Computer 2 (mac):  
Reaper w/plugins  
Cabbage/Csound  
IEM/Sparta/ICST



...

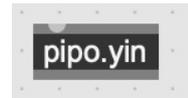
# Phases 3 - 6

- Iterative cycle
- Hopefully in collaboration with local dancer(s)
- Open to input from ZHdK staff



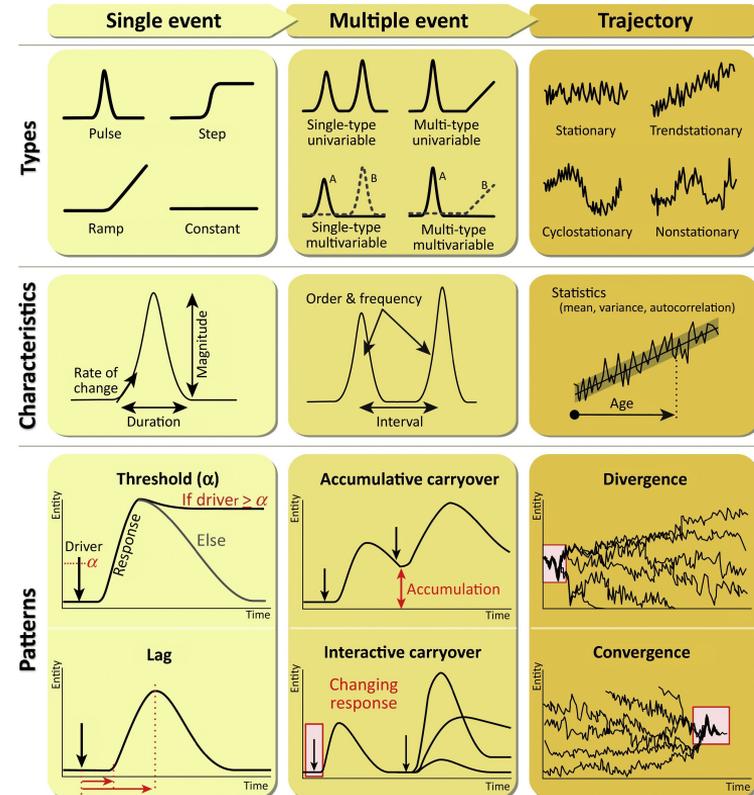
# Phase 3: Expression analysis parameters (EyesWeb/MuBu)

- Activity
- Shape (Baricenter, area, bounding rectangle)
- Contraction – density
- Fluidity – jerkiness
- Symmetry
- Periodicity (index, frequency)
- FFT
- Impulsivity



# Phase 3 (cont.):

- Temporal dynamics:
  - Multi-threshold onsets
  - Statistics (mean, variance, etc.)
  - Slope analysis (linear/higher order regression)
  - Peaks and valleys
  - Complexity
  - Convergence/divergence
  - Directness Index



Ryo, M., Aguilar-Trigueros, C. A., Pinek, L., Muller, L. A., & Rillig, M. C. (2019)  
 Camurri, A., Mazzarino, B., & Volpe, G. (2003).

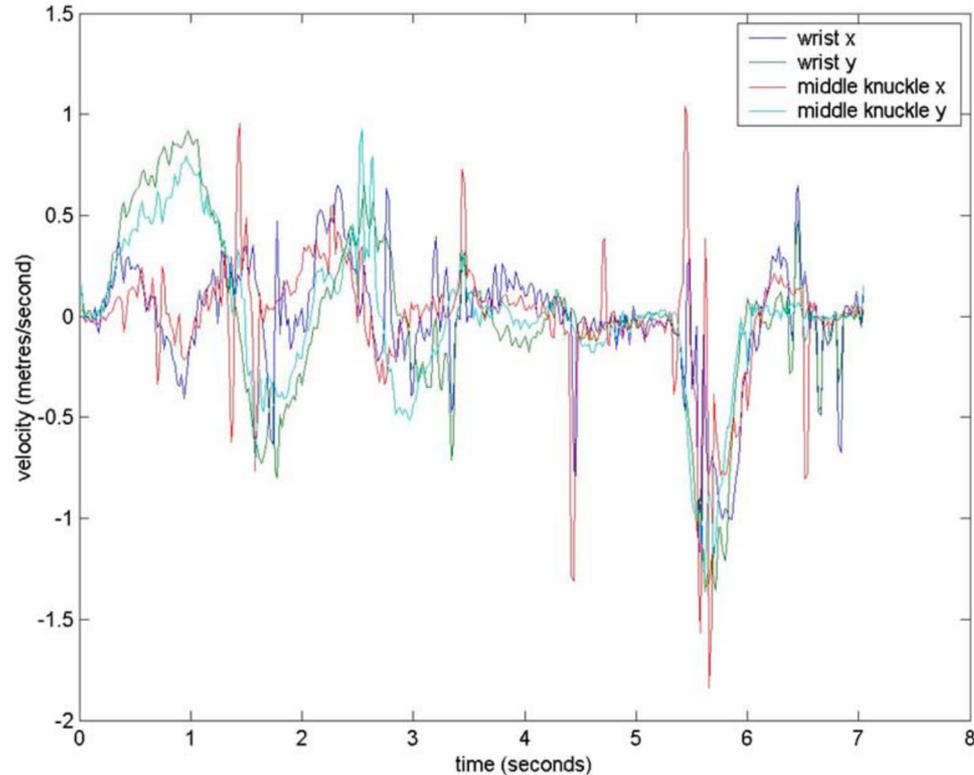
# Phase 4: Linking movement w/sound

- Corpus-based approach: Samples are pre-existing basic units
  - a) Pre-organized
  - b) Extracting portions based on analysis properties
- Granular engine for playback & processing (csound: partikkel)
- Layered composition (Foreground A&B, middleground, background)
- Additional effects
  - FFT-based (pvs-opcodes and friends)
  - Convolution (liveconv-opcode)
  - Others
- Spatialization
  - IEM, Sparta, ICST ambisonics plugin packs
  - 360 pan suite (incl. ambisonic reverbs)

# 4a: Mapping to real-time analysis data

Plot of velocity recorded in the x and y dimensions of two points on a dancer's right arm (wrist, middle knuckle). The dancer had been asked to generate a new phrase of movement in response to the spoken concept 'freedom'

From



## 4b: «indirect» control of sound parameters

- Sensor data from beginnings/endings stored in buffers
- Applied with different types of manipulations
  - Temporal expansion/contraction
  - Scaling
  - Merged (e.g. w/simple math operations)
  - Sequenced (e.g. loops or combinations)
  - Change slope
- Extract temporally salient points (peaks, valleys)
  - Applied as rhythmic material

# 4b: «indirect» control of sound parameters

- Simulations/algorithms (using/adapting pre-existing ones)
  - Flocking (e.g. ISO Flock)
  - Physics (e.g. jit.phys)
  - CoVid-simulations  
([https://github.com/paulvangentcom/python\\_corona\\_simulation](https://github.com/paulvangentcom/python_corona_simulation))
- Non-linear systems
  - Reversed mode-locking: linear => non-linear

# Phase 5: Testing & evaluating mappings

- Performer perspectives:
  - How does this kind of interaction affect how dancers perform?
- Audience perspectives:
  - How is this perceived by the audience?
- Mixed qualitative methods
  - Free text response
  - Survey
  - Short interviews

# Phase 6: Artistic output

Study #1. Mid-Late November. Probably solo. (ZHdK)

Study #2. Early March. Duet/trio (UTS)

«Piece». Late May/early June. Duet/trio (UTS)

# Academic output

- 2 conference papers (e.g. NIME, MOCO, ICMC, SMC or ICLI)
- 1 journal article (level 2, e.g. Organised Sound, CMJ)at

# References

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# Video

- Alegria Contemporary Ballet Company: Stillness: <https://www.youtube.com/watch?v=Nj3rAkasMq0>
- Dai Matsuoka, Hijikata Three Chapters: <https://www.youtube.com/watch?v=unfO-zP0mBg>
- Tate McRae: *Porcelain* (<https://www.youtube.com/watch?v=504Nu03bLgw>), Stillness ([https://www.youtube.com/watch?v=j\\_RQt1e5e7E](https://www.youtube.com/watch?v=j_RQt1e5e7E))
- Merce Cunningham Dance Company at Bam: *Second Hand* (<https://www.youtube.com/watch?v=-FwiMIDQ7rI>)

## Interactive

- Francoise et al.: *Still, moving*: <https://vimeo.com/216512908>
- Borissov/Weeks: *Between an arrow and a fall* [https://www.youtube.com/watch?v=l1kks\\_OqaF4](https://www.youtube.com/watch?v=l1kks_OqaF4)
- Bergsland & Wechsler: *Jeu de Modes*: <https://www.youtube.com/watch?v=UBYZjVfiQCU>
- Matos, Romero & Palacio: *Two Pandoras*: <https://vimeo.com/313552129>