DEVELOPMENT OF VISUAL NOISE MASKS FOR HUMAN POINT-LIGTH DISPLAYS

Catarina Carvalho Senra, **Master Student (Speaker)**
Adriana Sampaio, **M.D.,Assistant Professor with Habilitation**
Olivia Lapenta, **Research Fellow at CIPsi**

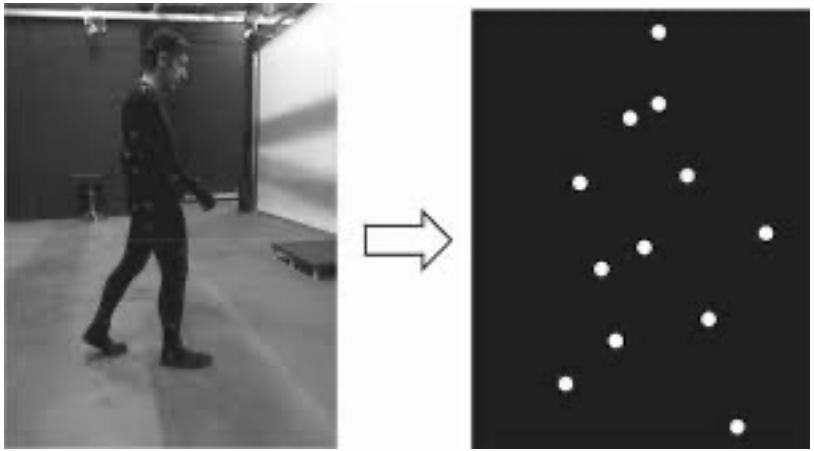
School of Psychology of the University of Minho (Portugal)

May 2022, Greece
16th Annual International Conference on Psychology
ATINER

How can we investigate how humans process and recognize movement?

Point – Light Displays (PLDs)
(Dekeyser et al., 2002)

Johansson (1973)



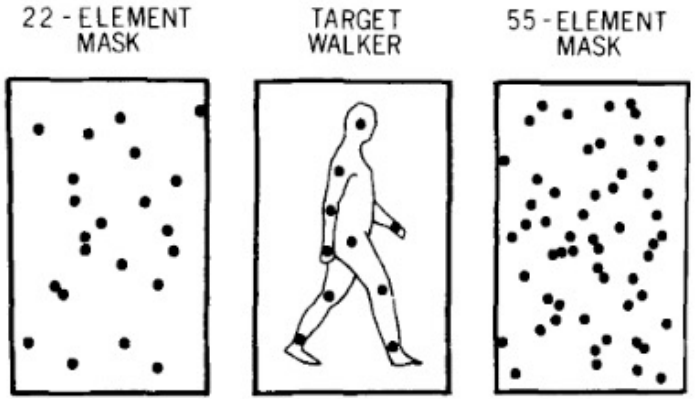
This technique has been highly applied in **BIOMECHANICS** and **MOTOR** and **COGNITIVE NEUROSCIENCE**

(de Lussaret, 2018)

DUE TO THE GREAT HUMAN ABILITY TO RECOGNIZE HUMAN MOTION …

Cutting and colleagues (1998) presented the **NEED TO ADD A VISUAL NOISE**

→ in order to **MASK THE STIMULI** and **INCREASE COMPLEXITY IN HUMAN ACTION TASKS**



ONE EXAMPLE IS …

PLAViMoP

Point Light Action Visualization and Modification Platform

Allows the user to **add** certain types of masks on their PLD sequences

- Windows 64-bit system
- MatLab interface
- Mokka software
- Only accepts C3D format

(Decatoire et al, 2018)

CONSTANT NEED OF DIVERSITY IN SUITABLE STIMULI MATERIAL

Several techniques have been proposed to create point-light displays (PLD) stimuli and masks

HOWEVER, there is a **LACK OF GUIDELINES** on how to construct visual noise to mask biological motion

MATERIAL AVAILABLE ON THIS TOPIC

step-by-step explanation

specific and paid software's

very specific file format

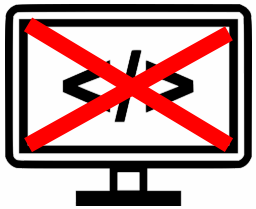
software used

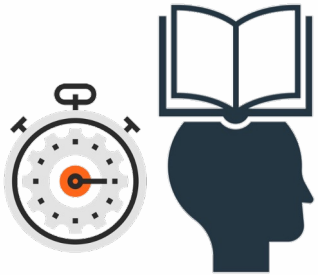
require programming skills

(e.g., Cutting, 1978; Cutting et al., 1978; Decatoire et al, 2018; Dekeyser et al., 2002; Vanrie & Verfaillie, 2004)

THE PRESENT ARTICLE AIMS TO

describe, **STEP-BY-STEP**, how we **CREATED** and **ADAPTED VISUAL NOISE MASK** for PLDs using a **FREE** and **USER-FRIENDLY SOFTWARE**, adjustable to the user needs and that requires **NO EXPERIENCE IN PROGRAMMING** as it can be operated solely by graphical interface





BLENDER SOFTWARE 2.91.2

open and free 2D and 3D creation

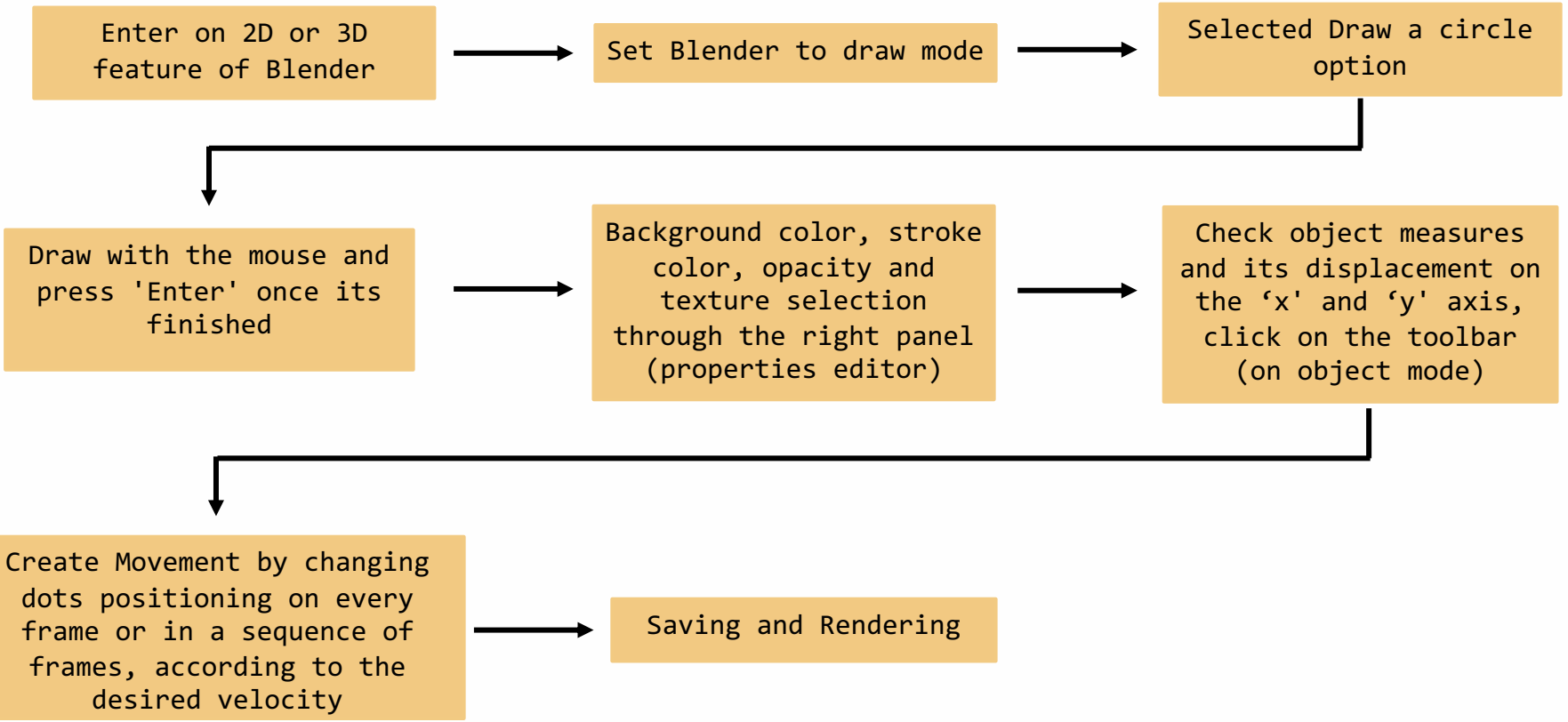
2D animation pipeline:
coloring
animating
adding modifiers
cut out animation
motion graphics
grease pencil

3D pipeline:
Modeling
Rigging
Simulation
Rendering
Composing
motion tracking
video editing

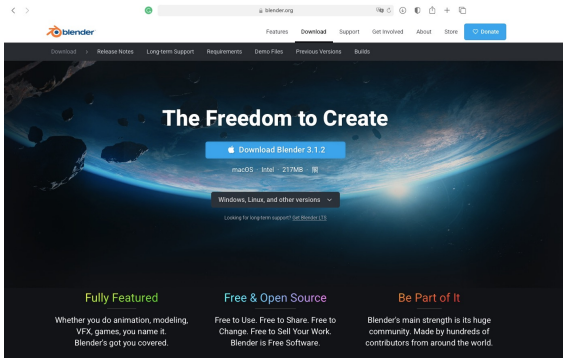
File formats (Imported and Exported):
OBJ
FBX
3DS
PLY

(Community, 2018)

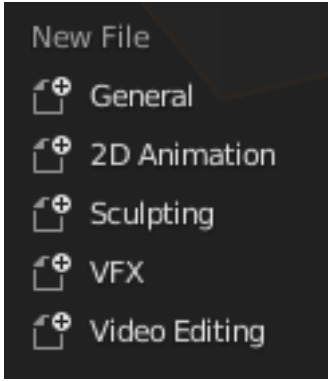
OVERVIEW OF THE STEP – BY – STEP PROCEDURE FOR BUILDING THE NOISE MASK



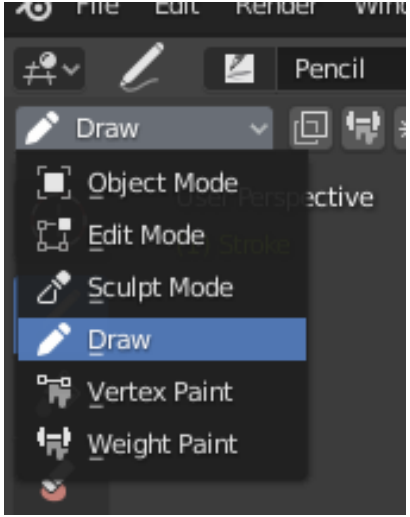
1st STEP : DOWNLOAD BLENDER



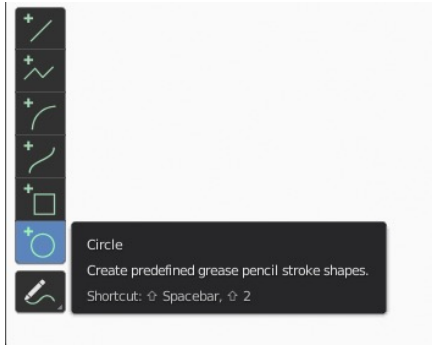
2nd STEP: 2D OR 3D FEATURE OF BLENDER



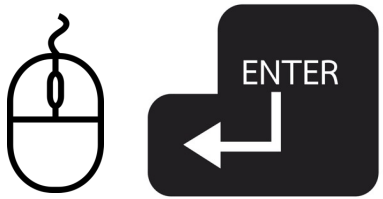
3rd STEP : SET BLENDER TO DRAW MODE



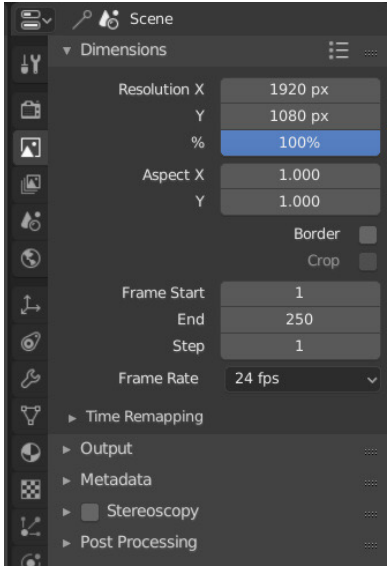
4th STEP:
SELECTED DRAW A CIRCLE OPTION



5TH STEP:
DRAW WITH THE MOUSE AND PRESS 'ENTER' ONCE ITS FINISHED

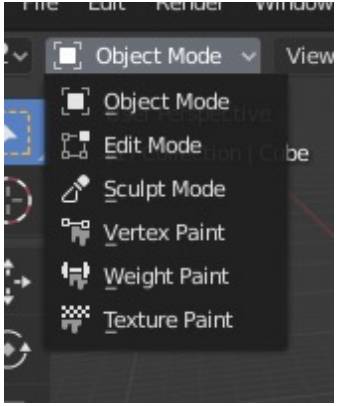


6th STEP:
BACKGROUND COLOR, STROKE COLOR, OPACITY AND TEXTURE SELECTION THROUGH THE RIGHT PANEL (PROPERTIES EDITOR)



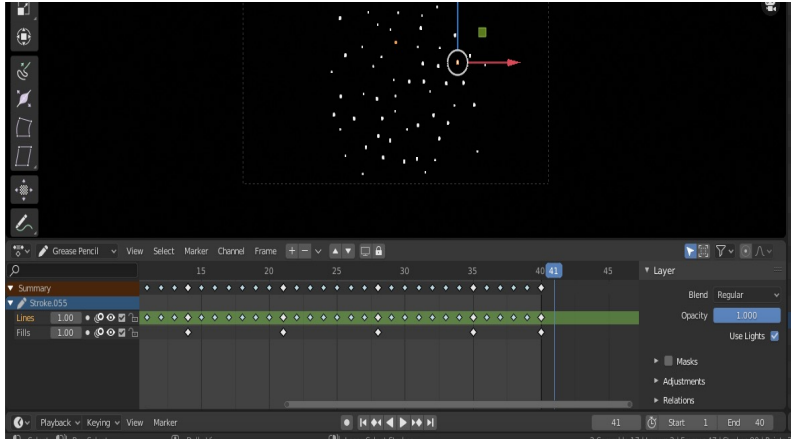
- ✓ Background color black – “ world properties”
- ✓ Stroke color white – “ material properties”
- ✓ Texture solid
- ✓ Opacity - 1

7th STEP :
CHECK OBJECT MEASURES AND ITS DISPLACEMENT ON THE ‘X' AND ‘Y' AXIS, CLICK ON THE TOOLBAR (ON OBJECT MODE)



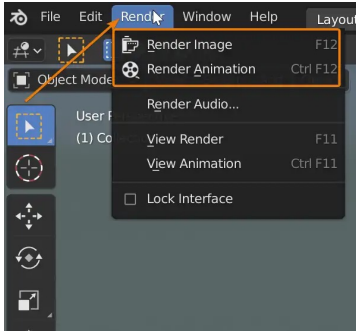
Half of the dots with size 0,100965m and the other half with 0,060999m

8th STEP:
CREATE MOVEMENT BY CHANGING DOTS POSITIONING ON EVERY FRAME OR IN A SEQUENCE OF FRAMES, ACCORDING TO THE DESIRED VELOCITY



Access to the toolbar and select option move. To create movement is mandatory to change the position of the dot each frame/sequence frame (7 frame interval)

9th STEP :
SAVING AND RENDERING



On each step save the work using “save as” option

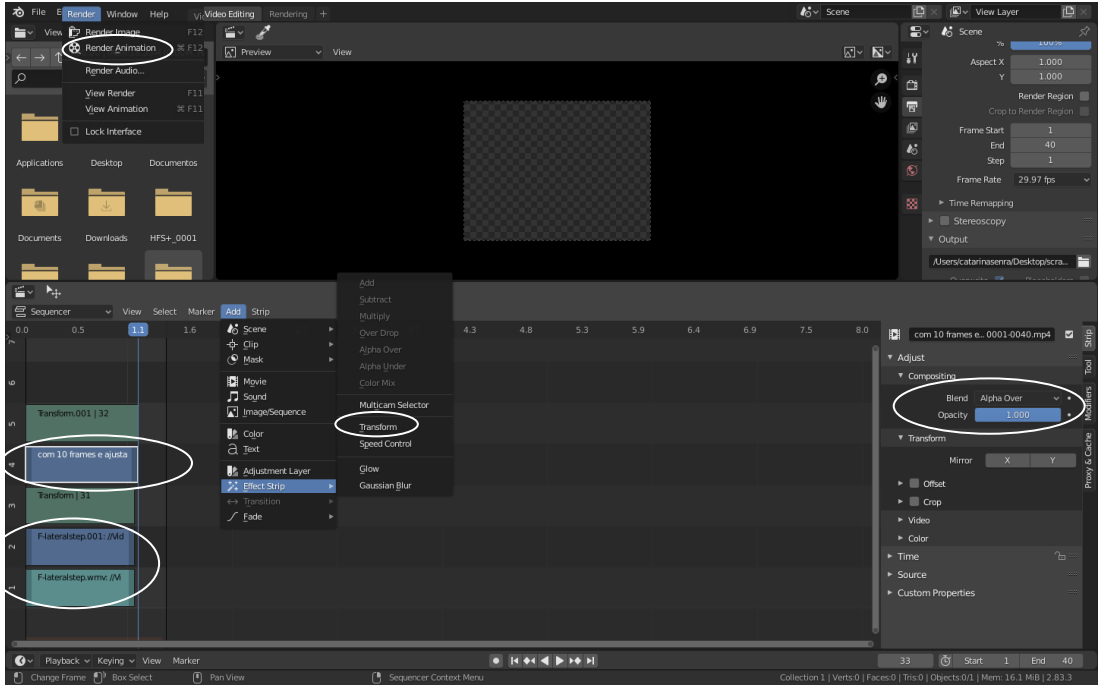
COMBINING VIDEOS WITH THE MASK

1. Drag video plus the mask video to the **editor panel**

2. Select each video and then **add an effect strip** (transform option)

3. Select **composing option** and define **“blender”** and **“opacity”** parameters (stimuli videos – “add” – opacity 1) (mask videos – “alpha over” – opacity 1)

4. **Render** the video



WE PROPOSED AND EXPLAINED

USER-FRIENDLY APPROACH TO BUILD VISUAL NOISE MASKS FOR PLD´S

BLENDER ALLOWS TO :

construct and modify videos

build stimuli from scratch or edit previously recorded motion data/or their masks

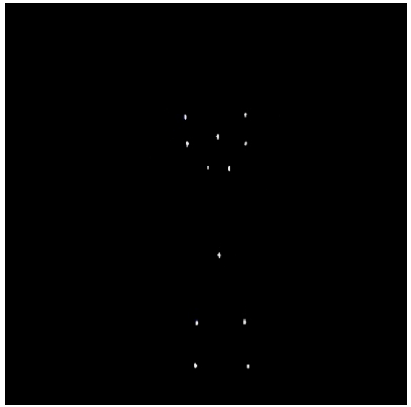
possibility to choose between 3D and 2D

built-in video editing feature

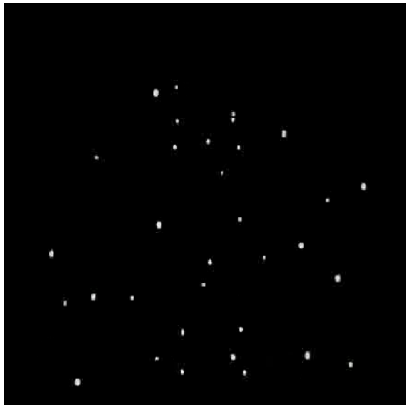
flexibility to edit body kinematic recorded with motion capture system, such as Vicon (and adapt noise mask for those)

WE SUCCESSFULLY BUILT OUR NOISE MASK FOR THE PLDS AVAILABLE IN A VALIDATE DATABASE - LAPENTA ET AL., 2017

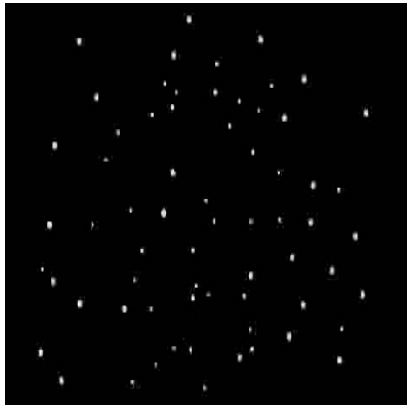
A



B



C



We **DESCRIBE** the **METHODS APPLIED** in order to **GUIDE RESEARCHERS ON THE PRODUCTION OF SIMILAR STIMULI**

MASKS AND BLENDER PROJECT AVAILABLE

OUR BLENDER PROJECT

1. Set a different amount of frames per seconds to each of the dots (trajectory and speed)

2. Change the number of dots in our project by either copying or deleting

MAIN ADVANTAGES PRESENTED METHODOLOGY

- ✓ **NON-EXPENSIVENESS**
- ✓ **NO NEED OF PROGRAMMING EXPERIENCE**
- ✓ **NO PRE-REQUISITES TO BE APPLIED**

THIS STEP-BY-STEP GUIDE MIGHT BE **APPEALING TO STUDENTS ENGAGED IN THIS RESEARCH TOPIC BUT WHO ARE STILL NOVICE IN PROGRAMMING** WHICH IS USUALY REQUIRED TO BUILD VISUAL DOT NOISE MASKS, SUCH AS ALGORITHMS.

(Cutting et al., 1998; Decatoire et al., 2018)

WE ENCOURAGE OTHER RESEARCHERS AND ANIMATORS TO **FURTHER EXPLORE THIS PLATFORM**

IN ORDER TO EXTEND THE BOUNDARIES OF THE GIVEN GUIDELINES

which are limited to a **PARTICULAR TYPE OF STIMULI.**

However, there are **MANY OTHER POSSIBILITIES TO GENERATE VISUAL STIMULI** focused on PERCEPTION EXPERIMENTS.

Community, B. O. (2018). Blender - a 3D modelling and rendering package. Stichting Blender Foundation, Amsterdam. Retrieved from http://www.blender.org

Cutting J. E. (1978). Generation of synthetic male and female walkers through manipulation of a biomechanical invariant. *Perception, 7*(4), 393–405. https://doi.org/10.1068/p070393

Cutting, J. E., Moore, C., & Morrison, R. (1988). Masking the motions of human gait. *Perception & Psychophysics*, *44*(4), 339–347. https://doi.org/10.3758/BF03210415

Cutting, J. E., Proffitt, D. R., & Kozlowski, L. T. (1978). A biomechanical invariant for gait perception. *Journal of experimental psychology. Human perception and performance, 4*(3), 357–372. https://doi.org/10.1037//0096-1523.4.3.357

de Lussanet, M. H. E. (2018). Point Light Displays. In J. Vonk & T. Shackelford (Eds.), *Encyclopedia of Animal Cognition and Behavior* (pp. 1–4). https://doi.org/10.1007/978-3-319-47829-6_663-1

Decatoire, A., Beauprez, S. A., Pylouster, J., Lacouture, P., Blandin, Y., & Bidet-Ildei, C. (2018). PLAViMoP: How to standardize and simplify the use of point-light displays. *Behavior Research Methods*, *51*(6), 2573–2596. https://doi.org/10.3758/s13428-018-1112-x

Dekeyser, M., Verfaillie, K., & Vanrie, J. (2002). Creating stimuli for the study of biological-motion perception. *Behavior Research Methods, Instruments, and Computers*, *34*(3), 375–382. https://doi.org/10.3758/bf03195465

Johansson, G. (1973). Visual perception of biological motion and a model for its analysis. *Perception & Psychophysics, 14*, 195–204.

Lapenta, O. M., Xavier, A. P., Côrrea, S. C., & Boggio, P. S. (2017). Human biological and nonbiological point-light movements: Creation and validation of the dataset. *Behavior Research Methods*, *49*(6), 2083–2092. https://doi.org/10.3758/s13428-016-0843-9

APA Style – 7th edition

THANK YOU FOR YOUR ATTENTION !