

README _ LARa Version 3

If you have any questions about the dataset, please contact friedrich.niemann@tu-dortmund.de.

How to use the dataset	2
ZIP structure.....	2
Available data.....	4
File names.....	5
Activity classes.....	5
Attributes.....	6
Label description.....	7
Annotation tool.....	7
General information	8
Laboratory set-up.....	8
Logistics scenarios.....	8
Researcher.....	8
Subject overview.....	9
IMU position.....	10
Marker position (OMoCap).....	11
Recording protocol	13
Subject 01.....	13
Subject 02.....	15
Subject 03.....	17
Subject 04.....	19
Subject 05.....	21
Subject 06.....	23
Subject 07.....	25
Subject 08.....	27
Subject 09.....	29
Subject 10.....	31
Subject 11.....	33
Subject 12.....	35
Subject 13.....	37
Subject 14.....	39
Subject 15.....	41
Subject 16.....	43

How to use the dataset

ZIP structure

The dataset includes optical marker-based Motion Capture (OMoCap) and Inertial Measurement Unit (IMU) data of human movements. The ZIPs are subdivided into 16 subjects.

Note that the OMoCap and IMU data is synchronised. The files in the three OMoCap ZIP folders, with the [file names](#), have exactly the same sampling rate (same start and end).

ZIP name	Description
OMoCap data (annotated) _ csv	<p>The annotated ZIP includes the human movements as annotated body segments. The length of each recording is 24,000 samples (2 minutes). There are three files for each recording:</p> <ul style="list-style-type: none"> – labels (csv): The labels file presents the annotation results in the sample by sample. Activities are annotated following a one-hot encoding, and attributes a binary representation, see label description for more information. – norm data (csv): The norm data files contain the subject's segments per sample.
OMoCap data (additional annotated data) _ csv, txt	<p>The additional annotated ZIP includes the human movements as annotated body segments. The length of each recording is 24,000 samples (2 minutes). There are two folders:</p> <ul style="list-style-type: none"> – From Publications <ul style="list-style-type: none"> • Annotations_Manual: Extra annotation files for comparison among different annotators. They were used in the following publication: https://doi.org/10.1109/PerComWorkshops48775.2020.9156170. • Annotations_Retrieval: Annotations files using retrieval for HAR, proposed in "Retrieval-based Annotation of Multi-channelTime-Series Data for HAR", ARDUOUS 2022, workshop in PERCOM. – While elaborating LARa <ul style="list-style-type: none"> • A collection of six versions of the LARa annotations. These are given by the date of their creation, considering corrections of the attribute representation, activities, and expert revisions. • This collection is intended for research considering uncertainty, online learning, and self-learning.
OMoCap data (Markers_Exports)	<p>The raw ZIP includes the human movements as unlabelled on-body marker recordings. These constitute the 3D positions of the markers located on a subject with a global frame exported by the OMoCap system. The length of each recording is 24,000 samples (2 minutes). There is one file for each recording.</p>

OMoCap data (raw) _ csv	The raw ZIP includes the human movements as unlabelled body segments. The length of each recording is 24,000 samples (2 minutes). There is one file for each recording.
OMoCap data (raw) _ c3d	c3d is a standard motion analysis format. The length of each recording is 24,000 samples (2 minutes). There is one file for each recording. The c3d format can be used in Vicon Nexus and simulation environments.
Networks	<p>SARA</p> <ul style="list-style-type: none"> - LARa Attr tCNN-IMU predicting eight classifications based on activity classes and 18 based on attributes. - Kitchen A pretrained Resnet18 on ImageNet and three parallel MLPs, one per recipe for retrieval – Brownie, Sandwich, and Eggs. The output of each MLP consists of a concatenation of a softmax layer for activity classification and a sigmoid layer for attribute predictions. These three MLPs are trained individually per recipe video inputs; the Resnet18 is shared for all the recipes. The network is trained using the training data proposed in the ARDUOUS Challenge 2022 with the following hyperparameters: window length of 30 frames of [256 x 256], batch of \$30\$, with a loss combing the cross- entropy and binary-cross entropy, learning rate of 10^{-3}, and epochs of 90.
IMU data (annotated) _ MbientLab	The files are labelled. The length of each recording is approximately 12,000 samples (2 minutes). These files contain the accelerometer and gyroscope values sampled at 100Hz from five IMUs placed on the body along with the activity label and time stamp. Consists of 30 channels. These files were synchronised manually with the OMoCap data based on the synchronisation activity class per recording. With this, the manual annotations of OMoCap serve as annotations for the MbientLab. A piece-wise spline interpolation is carried out among the sensors with an unique time-stamp. OMoCap data sampling rate is twice that of the MbientLab sampling rate. The sensor interpolation per recording, the annotation (based on the manually synchronisation with the OMoCap) of the entire recordings, the preprocessing for training can be found in: mbientlab dataset preprocessing.py

IMU data (annotated) _ MotionMiners Sensors	<p>The files are labelled. The length of each recording is approximately 12,000 samples (2 minutes). These files contain the accelerometer, gyroscope and magnetometer values from three sensors placed on both wrists and hip of the subject. Consists of 27 channels. Each sensor value in time is along with time stamp and activity label.</p> <p>These files were synchronised manually with the OMoCap data based on the synchronisation activity class. Here, the recording day session of each subject contains all the 30 recordings, created for OMoCap. The 30 recordings are manually identified using the synchronisation activity class. Once the 30 recordings are extracted, they are annotated. Similar to the annotation process of MbientLab, the manual annotations of OMoCap serve as annotations for the MotionMiners. No interpolation is needed among the sensors as the MotionMiners device sets a single recording signal to all the sensors to be sampled with a unique time-stamp. OMoCap data sampling rate is twice that of the MotionMiners sampling rate. The recording extraction from a single recording day session, the annotation (based on the manually synchronisation with the OMoCap) of the entire recordings, the preprocessing for training can be found in: motionminers_preprocessing.py</p>
RGB videos	<p>The RGB videos are divided into approximately 2 min sequences and are available in mp4 format. Please note that the videos are split and named after the OMoCap and the IMU files, but are not fully synchronised. The videos were only used to support the annotation and revision.</p>

Available data

Number of 2-minute recordings available in the dataset

Note: Due to noise, few recordings had to be deleted. Consequently, all subjects do not have 30 recordings for all sensors. Furthermore, IMU sensor set 2 and 3 were not present for the recording of subjects S01-S06 and S15-S16.

Subject	OMoCap data			IMU data		RGB videos
	csv		c3d	MbientLab	MotionMiners Sensors	
	Annotated	Raw		IMU set 2	IMU set 3	
S01	29	30	30	0	0	1
S02	30	30	30	0	0	1
S03	29	30	30	0	0	1
S04	29	30	30	0	0	1
S05	26	30	30	0	0	1
S06	30	30	30	0	0	1
S07	29	28	30	29	29	29
S08	28	30	30	24	28	0
S09	29	30	30	29	20	29

S10	26	29	29	23	27	27
S11	14	14	14	14	14	14
S12	20	20	19	17	20	20
S13	30	30	30	29	30	30
S14	30	30	30	28	30	30
S15	30	30	30	0	0	30
S16	30	30	30	0	0	30
SUM	439	451	452	193	198	245
Minutes	878	902	904	386	396	490

File names

The same recording exists in six ZIPs:

- OMoCap data (annotated) _ csv, txt
- OMoCap data (raw) _ csv
- OMoCap data (raw) _ c3d
- IMU data (annotated) _ MbientLab
- IMU data (annotated) _ MotionMiners Sensors
- RGB videos

Each file in the ZIP is named after scenario, subject and recording. For example, the recording *L02_S09_R04* is available in all six ZIPs. The file name *L02_S09_R04* stands for:

- [logistics scenario](#) 02
- [subject](#) 09
- recording 04

Activity classes

There are eight activity classes in the dataset. You can find a detailed description of the activity classes in the following publication (Page 16, Table 2): "LARa: Creating a Dataset for Human Activity Recognition in Logistics Using Semantic Attributes", Sensors 2020, DOI: <https://doi.org/10.3390/s20154083>

Activity class	Samples		Windows			
	No.	%	No.	%	Min. Length [Samples]	Max. Length [Samples]
Standing	1,181,555	11.21	3,727	13.86	11	15,800
Walking	1,301,950	12.36	1,738	6.46	56	9,980
Cart	1,254,826	11.91	1,062	3.95	40	21,963
Handling (upwards)	822,213	7.80	2,977	11.07	12	2,214
Handling (centred)	4,604,536	43.70	14,080	52.35	11	23,067
Handling (downwards)	734,438	6.97	2,576	9.58	15	3,966
Synchronisation	192,636	1.83	439	1.63	221	2,470
None	443,882	4.21	296	1.10	23	24,000
	10,536,036	100	26,895	100		

Please note that exactly **one** activity class and **several** attributes are labelled per sample and per window. For this reason, the sum of the percentages for the activity classes is 100 %, but for the attributes it is significantly greater than 100 %.

Attributes

There are 18 attributes in the dataset. These are coarse-semantic descriptions of the activities. They are mostly related to the locomotion and the pose when moving. You can find a detailed description of the attributes in the following publication (Page 17, Table 3): "LARa: Creating a Dataset for Human Activity Recognition in Logistics Using Semantic Attributes", Sensors 2020, DOI: <https://doi.org/10.3390/s20154083>

Attribute	Samples		Windows	
	No.	%	No.	%
Gait Cycle	2,677,330	25.41	3,349	12.45
Step	2,715,190	25.77	10,801	40.16
Standing Still	4,699,634	44.61	12,449	46.29
Upwards	1,014,849	9.63	3,416	12.70
Centred	4,604,536	43.70	14,080	52.35
Downwards	734,438	6.97	2,576	9.58
No Intentional Motion	3,738,331	35.48	6,527	24.27
Torso Rotation	305,563	2.90	1,389	5.16
Right Hand	7,324,889	69.52	18,810	69.94
Left Hand	6,399,517	60.74	16,580	61.65
No Hand	1,284,133	12.19	2,717	10.10
Bulky Unit	2,185,266	20.74	6,967	25.90
Handy Unit	2,911,680	27.64	10,510	39.08
Utility-Auxiliary	1,268,459	12.04	2,373	8.82
Cart	1,772,563	16.82	3,112	11.57
Computer	463,147	4.40	411	1.53
No Item	1,495,972	14.20	3,237	12.04
None	443,882	4.21	296	1.10

Label description

The files of the **OMoCap data (annotated) _ csv, txt** ZIP are annotated. Both the **windows** and the **labels** files contain labels.

There are 8 activity classes	There are 18 attributes (+ Error)
<ul style="list-style-type: none"> (1) Standing (2) Walking (3) Cart (4) Handling (upwards) (5) Handling (centred) (6) Handling (downwards) (7) Synchronization (8) None 	<ul style="list-style-type: none"> - Gait Cycle - Step - Standing Still - Upwards - Centred - Downwards - No Intentional Motion - Torso Rotation - Right - Left - No Arms - Bulky Unit - Handy Unit - Utility-Auxiliary - Cart - Computer - No Item - None - Error

annotated file

The annotated files consists of 24000 annotated rows, with the first seven columns corresponding to the activity class in a on-hot encoding format, and the rest 19 columns refers to the attribute representation.

(Activity class, [18 Attributes + Error])

Example:

Standing, Walking, Cart, Handling(upwards), Handling(centred), Handling(downwards), Synchronization, None, GaitCycle, Step, StandingStill, Upwards, Centred, Downwards, NoIntentionalMotion, TorsoRotation, Right, Left, NoArms, BulkyUnit, HandyUnit, UtilityAux, Cart, Computer, NoItem, None, Error
 1,0,0,0,0,0,0,0,0,0,1,0,0,0,1,0,0,0,1,0,0,0,0,0,1,0,0

Activity class = Standing

Attributes = Standing Still, No Intentional Motion, No Arms, No Item

Annotation tool

With the annotation tool, the OMoCap data of the human movements were annotated and then manually reviewed. Note that the files from the **OMoCap data (annotated) _ csv, txt** ZIP can be opened and edited with the annotation tool.

Tool: <https://pypi.org/project/annotation-tool/>

Neural networks: part of this dataset

User guide: part of this dataset

General information

Laboratory set-up	
Issue	Recordings of human movements in the context of intralogistics with Optical marker-based Motion Capture (OMoCap) and Inertial Measurement Units (IMU)
Description	<ul style="list-style-type: none"> - Acknowledgments: The work on the recordings was supported by Deutsche Forschungsgemeinschaft (DFG) in the context of the project Fi799/10-2. HO2403/14-2 “Transfer Learning for Human Activity Recognition in Logistics” - Hall: area 220 m², height 6 m - OMoCap system: Suit with 39 markers, >40 infrared cameras (200 fps) - IMU set 1: Texas Instruments Incorporated (10 Hz) - IMU set 2: MbientLab (100 Hz) - IMU set 3: MotionMiners Sensors (100 Hz)
Location	'Innovationlab Hybrid Services in Logistics' at TU Dortmund University

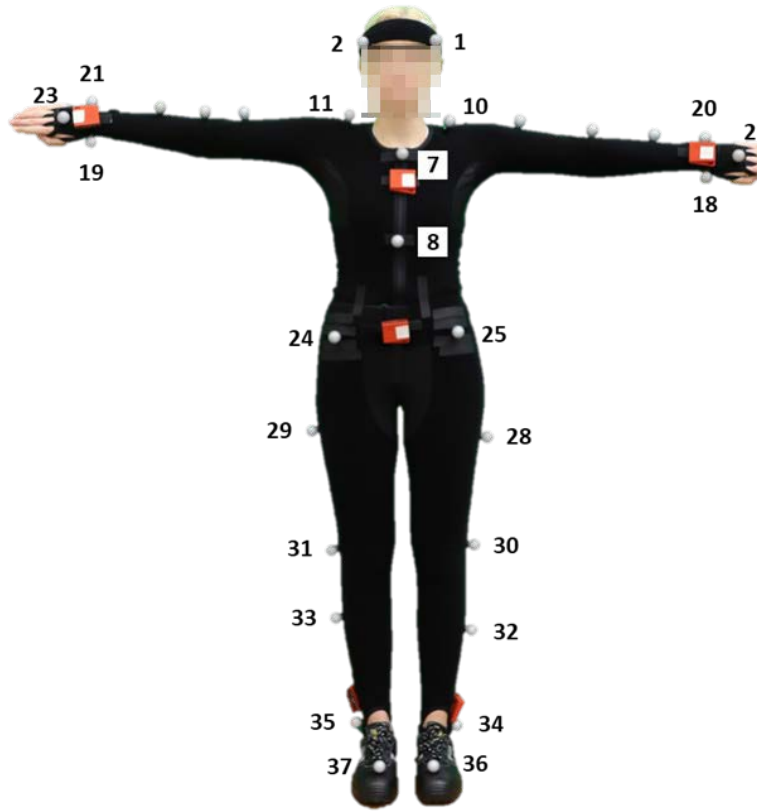
Logistics scenarios
<p>Logistics scenario 1 – Simplified Order Picking System</p> <p>The first scenario is not based on a real warehouse. Nevertheless, this process may exist in reality.</p>
<p>Logistics scenario 2 – Real-World Order Picking and Consolidation System</p> <p>The second scenario is based on a real warehouse. Access to the site and process documentation was granted by industry partners of the chair of Materials Handling and Warehousing. In contrast to Scenario 1, the second scenario takes information technology processes such as scanning barcode labels or pushing buttons for pick confirmation into account.</p>
<p>Logistics scenario 3 – Real-World Packaging Process</p> <p>The third scenario is the packaging process that follows the order picking and consolidation of scenario 2 in the same real-world warehouse. The packaging process serves the dispatch preparation of the picked articles. In general, the consignment size per order does not exceed 5 boxes. Thus, the shipping by pallet is not feasible.</p> <p>You can find a detailed description of the three logistics scenarios in the following publication (Page 5-12, Section 3.2): “LARA: Creating a Dataset for Human Activity Recognition in Logistics Using Semantic Attributes”, Sensors 2020, DOI: https://doi.org/10.3390/s20154083</p>

Researcher		
Last name	First name	Role
Moya	Fernando	IMU expert
Niemann	Friedrich	OMoCap expert. Logistics expert
Reining	Christopher	OMoCap expert. Logistics expert

Subject overview					
ID	Characteristics				
	Sex [F/M]	Age [a]	Weight [kg]	Height [cm]	Left-/ Right-handed [L/R]
S01	M	28	78	175	L
S02	F	24	62	163	L
S03	M	59	71	171	R
S04	F	53	64	165	L
S05	M	28	79	185	R
S06	F	22	52	163	R
S07	M	23	65	177	R
S08	F	51	68	168	R
S09	M	35	100	172	R
S10	M	49	97	181	R
S11	F	47	66	175	R
S12	F	23	48	163	R
S13	F	25	54	163	R
S14	M	54	90	177	R
S15	M	26	79	184	L
S16	F	25	82	159	L

IMU position		
IMU set 1	IMU set 2	IMU set 3
Texas Instruments Incorporated (Not part of the dataset)	MbientLab	MotionMiners Sensors
Number of IMUs: 6	Number of IMUs: 6 IMUs (only 5 IMU information included. The IMU placed on the abdomen was discarded due to noise.) 30 channels 6 axis- Gyroscope and accelerometer (The magnetometer value was zero throughout. Hence not present in the dataset) https://mbientlab.com/store/metamotion/	Number of IMUs: 3 IMUs 27 channels 3 axis- Gyroscope, Accelerometer and Magnetometer (Please contact MotionMiners GmbH for the IMU information)
		
		

Marker position (OMoCap)






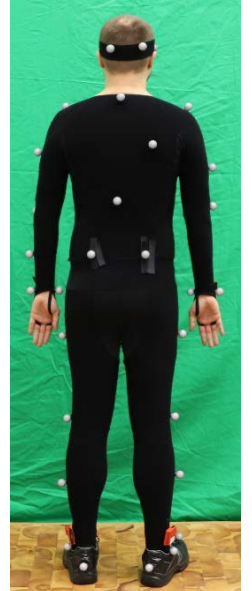




No.	Marker	Abbreviation	Left [L] / Right [R]
Head markers			
1	Front head	LFHD	L
2		RFHD	R
3	Back head	LBHD	L
4		RBHD	R
Torso markers			
5	7th Cervical Vertebrae	C7	
6	10th Thoracic Vertebrae	T10	
7	Clavicle	CLAV	
8	Sternum	STRN	
9	Back (Scapula)	RBAK	R
Arm markers			
10	Shoulder	LSHO	L
11		RSHO	R
12	Upper arm	LUPA	L
13		RUPA	R
14	Elbow	LELB	L
15		RELB	R
16	Forearm	LFRA	L
17		RFRA	R

18	Wrist A	LWRA	L
19		RWRA	R
20	Wrist B	LWRB	L
21		RWRB	R
22	Finger	LFIN	L
23		RFIN	R
Pelvis markers			
24	Anterior superior iliac spine (ASIS)	LASI	L
25		RASI	R
26	Posterior superior iliac spine (PSIS)	LPSI	L
27		RPSI	R
Leg markers			
28	Thigh	LTHI	L
29		RTHI	R
30	Knee	LKNE	L
31		RKNE	R
32	Tibial wand	LTIB	L
33		RTIB	R
34	Ankel	LANK	L
35		RANK	R
Foot markers			
36	Toe	LTOE	L
37		RTOE	R
38	Heel	LHEE	L
39		RHEE	R

Recording protocol


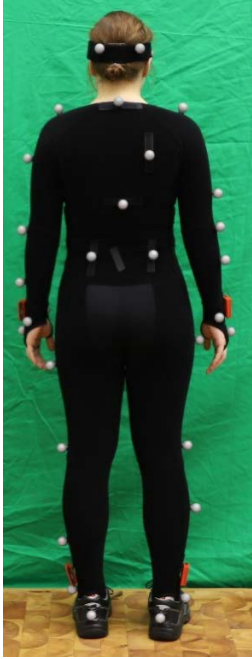



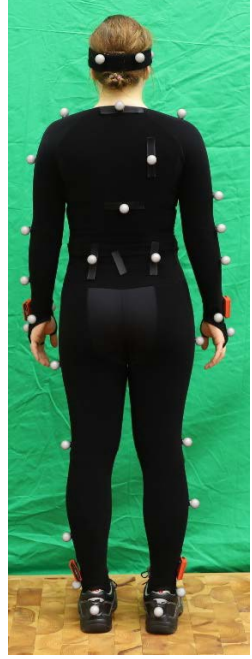


Subject 01

Overview of the session				
Date	01.11.2018			
Time	10:00 – 14:20			
Room temperature	At 10:00 – 21.5°C At 14:20 – 22.9°C			
Size of the Suit / Shoes				
Top	S			
Trousers	S			
Shoes	43 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				

Use of velcro









	Knee	Elbow	Waistband front	Waistband back															
Velcro used?	yes no	yes no	yes (8 pieces) no	yes (2 pieces) no															
More velcro?	yes no																		
Recordings																			
Scenario	1																		
IMU set	1																		
Number	30																		
Length	120 sec. per recording																		
Video	yes																		
	<table border="1"> <thead> <tr> <th>ID</th> <th>Recording Number</th> <th>Length</th> </tr> </thead> <tbody> <tr> <td>L01_S01_R07-11</td> <td>7 - 11</td> <td>10 min 33 sec</td> </tr> <tr> <td>L01_S01_R12-16</td> <td>12 - 16</td> <td>12 min 31 sec</td> </tr> <tr> <td>L01_S01_R16</td> <td>16</td> <td>1 min 56 sec</td> </tr> <tr> <td>L01_S01_R22</td> <td>22</td> <td>2 min 14 sec</td> </tr> </tbody> </table>				ID	Recording Number	Length	L01_S01_R07-11	7 - 11	10 min 33 sec	L01_S01_R12-16	12 - 16	12 min 31 sec	L01_S01_R16	16	1 min 56 sec	L01_S01_R22	22	2 min 14 sec
ID	Recording Number	Length																	
L01_S01_R07-11	7 - 11	10 min 33 sec																	
L01_S01_R12-16	12 - 16	12 min 31 sec																	
L01_S01_R16	16	1 min 56 sec																	
L01_S01_R22	22	2 min 14 sec																	
	no																		
Pictures available	yes																		
	<ul style="list-style-type: none"> - 5 pictures: before recording - 221 pictures: during recording - 5 pictures: after recording 																		
	no																		
Incident	yes																		
	<ul style="list-style-type: none"> - Marker lost: left heel (LHEE) → recording deleted and new recording - Marker lost: right finger (RFIN) → recording deleted and new recording - Error IMU 																		
	no																		
Remarks	<ul style="list-style-type: none"> - First Subject & first recording (Detailed attempts before the actual recordings started) - Testing and designation of the gesture to begin with - Break after 16 recordings 																		

Subject 02

Overview of the session				
Date	01.11.2018			
Time	14:40 – 16:00			
Room temperature	At 14:40 – 22.9°C At 16:00 – 22.5°C			
Size of the Suit / Shoes				
Top	XS			
Trousers	XS			
Shoes	40 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
<u>before</u> the session				
<u>after</u> the session				









Use of velcro													
	Knee	Elbow	Waistband front	Waistband back									
Velcro used?	yes no	yes no	yes (11 pieces) no	yes (1 pieces) no									
More velcro?	yes no												
Recordings													
Scenario	1												
IMU set	1												
Number	30												
Length	120 sec. per recording												
Video	yes												
	<table border="1"> <thead> <tr> <th>ID</th> <th>Recording Number</th> <th>Length</th> </tr> </thead> <tbody> <tr> <td>L01_S02_R17</td> <td>17</td> <td>2 min 15 sec</td> </tr> <tr> <td>L01_S02_R18-21</td> <td>18 - 21</td> <td>7 min 58 sec</td> </tr> </tbody> </table>				ID	Recording Number	Length	L01_S02_R17	17	2 min 15 sec	L01_S02_R18-21	18 - 21	7 min 58 sec
ID	Recording Number	Length											
L01_S02_R17	17	2 min 15 sec											
L01_S02_R18-21	18 - 21	7 min 58 sec											
	no												
Pictures available	yes												
	<ul style="list-style-type: none"> - 10 pictures: before recording - 64 pictures: during recording - 10 pictures: after recording 												
	no												
Incident	yes												
	<ul style="list-style-type: none"> - Marker lost: right finger (RFIN) → during a break 												
	no												
Remarks	<ul style="list-style-type: none"> - Break after 15 recordings 												

Subject 03

Overview of the session				
Date	02.11.2018			
Time	10:00 – 12:15			
Room temperature	At 10:00 – 22.5°C At 12:15 – 22.1°C			
Size of the Suit / Shoes				
Top	M			
Trousers	S			
Shoes	43 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				







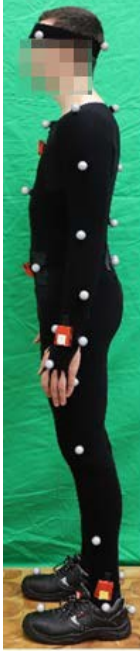

Use of velcro																		
	Knee	Elbow	Waistband front	Waistband back														
Velcro used?	yes (2 pieces)	yes (4 pieces)	yes (10 pieces)	yes (3 pieces)														
	no	no	no	no														
More velcro?	yes no																	
Recordings																		
Scenario	1																	
IMU set	1																	
Number	30																	
Length	120 sec. per recording																	
Video	yes																	
	<table border="1"> <thead> <tr> <th>ID</th> <th>Recording Number</th> <th>Length</th> </tr> </thead> <tbody> <tr> <td>L01_S03_R13</td> <td>13</td> <td>2 min 9 sec</td> </tr> <tr> <td>L01_S03_R16-21</td> <td>16 - 21</td> <td>12 min 31 sec</td> </tr> <tr> <td>L01_S03_R21-27</td> <td>21 - 27</td> <td>12 min 29 sec</td> </tr> <tr> <td>L01_S03_R27-30</td> <td>27 - 30</td> <td>7 min 12 sec</td> </tr> </tbody> </table>				ID	Recording Number	Length	L01_S03_R13	13	2 min 9 sec	L01_S03_R16-21	16 - 21	12 min 31 sec	L01_S03_R21-27	21 - 27	12 min 29 sec	L01_S03_R27-30	27 - 30
ID	Recording Number	Length																
L01_S03_R13	13	2 min 9 sec																
L01_S03_R16-21	16 - 21	12 min 31 sec																
L01_S03_R21-27	21 - 27	12 min 29 sec																
L01_S03_R27-30	27 - 30	7 min 12 sec																
	no																	
Pictures available	yes																	
	<ul style="list-style-type: none"> - 10 pictures: before recording - 84 pictures: during recording - 10 pictures: after recording 																	
	no																	
Incident	yes																	
	no																	
Remarks	<ul style="list-style-type: none"> - Break after 15 recordings - Injured at the right hand → Frequent use of the left hand 																	

Subject 04

Overview of the session				
Date	02.11.2018			
Time	12:45 – 14:45			
Room temperature	At 12:45 – 22.8°C At 15:00 – 22.8°C			
Size of the Suit / Shoes				
Top	S			
Trousers	XS			
Shoes	40 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				


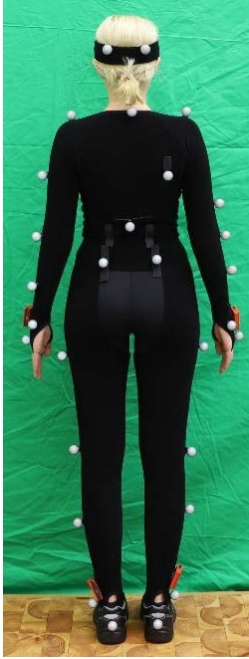



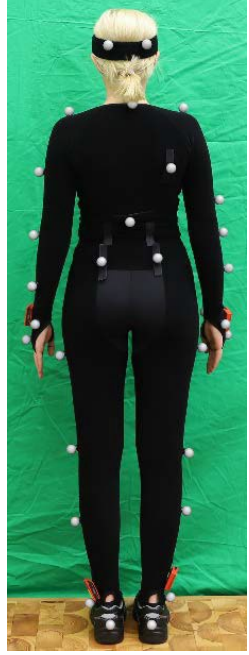


Use of velcro																						
	Knee	Elbow	Waistband front	Waistband back																		
Velcro used?	yes no	yes no	yes (12 pieces) no	yes (2 pieces) no																		
More velcro?	yes no																					
Recordings																						
Scenario	1																					
IMU set	1																					
Number	30																					
Length	120 sec. per recording																					
Video	yes																					
	<table border="1"> <thead> <tr> <th>ID</th> <th>Recording Number</th> <th>Length</th> </tr> </thead> <tbody> <tr> <td>L01_S04_R09</td> <td>9</td> <td>2 min 7 sec</td> </tr> <tr> <td>L01_S04_R10-15</td> <td>10 - 15</td> <td>12 min 31 sec</td> </tr> <tr> <td>L01_S04_R15-21</td> <td>15 - 21</td> <td>12 min 29 sec</td> </tr> <tr> <td>L01_S04_R21-27</td> <td>21 - 27</td> <td>12 min 28 sec</td> </tr> <tr> <td>L01_S04_R27-29</td> <td>27 - 29</td> <td>6 min 2 sec</td> </tr> </tbody> </table>				ID	Recording Number	Length	L01_S04_R09	9	2 min 7 sec	L01_S04_R10-15	10 - 15	12 min 31 sec	L01_S04_R15-21	15 - 21	12 min 29 sec	L01_S04_R21-27	21 - 27	12 min 28 sec	L01_S04_R27-29	27 - 29	6 min 2 sec
ID	Recording Number	Length																				
L01_S04_R09	9	2 min 7 sec																				
L01_S04_R10-15	10 - 15	12 min 31 sec																				
L01_S04_R15-21	15 - 21	12 min 29 sec																				
L01_S04_R21-27	21 - 27	12 min 28 sec																				
L01_S04_R27-29	27 - 29	6 min 2 sec																				
	no																					
Pictures available	yes																					
	<ul style="list-style-type: none"> - 10 pictures: before recording - 37 pictures: during recording - 10 pictures: after recording 																					
	no																					
Incident	yes																					
	<ul style="list-style-type: none"> - Marker lost: right elbow (RELB) → recording deleted and new recording - Marker lost: right finger (RFIN) → recording deleted and new recording 																					
	no																					
Remarks	- No break																					

Subject 05

Overview of the session				
Date	03.11.2018			
Time	11:45 – 13:30			
Room temperature	At 11:45 – 22 °C At 13:30 – 22.9 °C			
Size of the Suit / Shoes				
Top	S			
Trousers	S			
Shoes	44 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				









Use of velcro										
	Knee	Elbow	Waistband front	Waistband back						
Velcro used?	yes (2 pieces) no	yes no	yes (10 pieces) no	yes (2 pieces) no						
More velcro?	yes no									
Recordings										
Scenario	1									
IMU set	1									
Number	30									
Length	120 sec per recording									
Video	yes									
	<table border="1"> <thead> <tr> <th>ID</th> <th>Recording Number</th> <th>Length</th> </tr> </thead> <tbody> <tr> <td>L01_S05_R11</td> <td>11</td> <td>2 min 7 sec</td> </tr> </tbody> </table>				ID	Recording Number	Length	L01_S05_R11	11	2 min 7 sec
ID	Recording Number	Length								
L01_S05_R11	11	2 min 7 sec								
	no									
Pictures available	yes									
	<ul style="list-style-type: none"> - 20 pictures: before recording - 17 pictures: during recording - 11 pictures: after recording 									
	no									
Incident	yes									
	<ul style="list-style-type: none"> - Marker lost: right elbow RELB → recording deleted and new recording - Marker lost: right toe RTOE → newly sticked → recording deleted and new recording - Marker lost: left toe LTOE → newly sticked → recording deleted and new recording 									
	no									
Remarks	<ul style="list-style-type: none"> - No break - During records: drinking and talking to the parties concerned (persons involved) 									

Subject 06

Overview of the session				
Date	03.11.2018			
Time	13:45 – 15:30			
Room temperature	At 13:45 – 22.9 °C At 15:30 – 23.1 °C			
Size of the Suit / Shoes				
Top	XS			
Trousers	XS			
Shoes	36 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				









Use of velcro																
	Knee	Elbow	Waistband front	Waistband back												
Velcro used?	yes no	yes no	yes (10 pieces) no	yes (2 pieces) no												
More velcro?	yes no															
Recordings																
Scenario	1															
IMU set	1															
Number	30															
Length	120 sec per recording															
Video	yes															
	<table border="1"> <thead> <tr> <th>ID</th> <th>Recording Number</th> <th>Length</th> </tr> </thead> <tbody> <tr> <td>L01_S06_R07</td> <td>7</td> <td>2 min 13 sec</td> </tr> <tr> <td>L01_S06_Rec08-14</td> <td>8 - 14</td> <td>12 min 31 sec</td> </tr> <tr> <td>L01_S06_Rec15</td> <td>15</td> <td>2 min 26 sec</td> </tr> </tbody> </table>				ID	Recording Number	Length	L01_S06_R07	7	2 min 13 sec	L01_S06_Rec08-14	8 - 14	12 min 31 sec	L01_S06_Rec15	15	2 min 26 sec
ID	Recording Number	Length														
L01_S06_R07	7	2 min 13 sec														
L01_S06_Rec08-14	8 - 14	12 min 31 sec														
L01_S06_Rec15	15	2 min 26 sec														
	no															
Pictures available	yes															
	<ul style="list-style-type: none"> - 10 pictures: before recording - 38 pictures: during recording - 10 pictures: after recording 															
	no															
Incident	yes															
	<ul style="list-style-type: none"> - Marker lost: left heel (LHEE) → recording deleted and new recording 															
	no															
Remarks	<ul style="list-style-type: none"> - Break after 15 recordings 															

Subject 07

Overview of the session				
Date	02.08.2018			
Time	10:15 – 12:25			
Room temperature	At 10:15 – 25.7 °C At 12:25 – 27.1 °C			
Size of the Suit / Shoes				
Top	S			
Trousers	S			
Shoes	42 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				









Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (2 pieces) no	yes (2 pieces) no	yes (2 pieces) no	yes (2 pieces) no
More velcro?	yes no			
Recordings				
Scenario		Scenario	Record	
		1	1-2	
		2	3-16	
		3	17-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes <ul style="list-style-type: none"> - 12 pictures: before recording - 60 pictures: during recording - 5 pictures: after recording no			
Incident	yes <ul style="list-style-type: none"> - Recording 17 take 1 deleted → Take 2 no			
Remarks	- First Subject for Scenario 1.2. 2 and 3 & first recording (Detailed attempts before the actual recordings started)			

Subject 08

Overview of the session				
Date	02.08.2018			
Time	15:15 – 17:40			
Room temperature	At 15:15 – 28.8 °C At 17:40 – 28.8 °C			
Size of the Suit / Shoes				
Top	S			
Trousers	S			
Shoes	40 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				


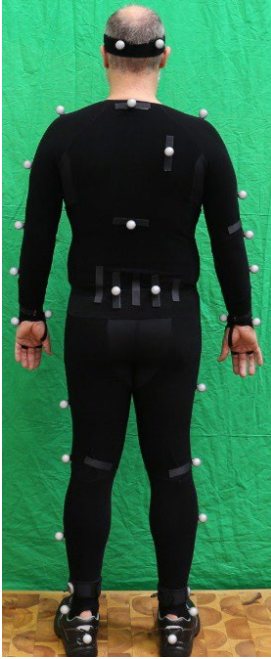






Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (2 pieces) no	yes (2 pieces) no	yes (2 pieces) no	yes (3 pieces) no
More velcro?	yes (waist side 2 pieces) no			
Recordings				
Scenario		Scenario	Record	
		1	1-2	
		2	3-16	
		3	17-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes <ul style="list-style-type: none"> - 5 pictures: before recording - 0 pictures: during recording - 5 pictures: after recording no			
Incident	yes <ul style="list-style-type: none"> - Recording 9 marker lost: right finger (RFIN) → recording deleted and new recording - Between recording 10 and 13 marker lost: right finger (RFIN) - During recording 14 Nexus crashed → reboot (therefore recording 14 take 3) - Recording Take 1: video camera was off → therefore take 2 no			
Remarks				

Subject 09

Overview of the session				
Date	03.08.2018			
Time	09:25 – 12:10			
Room temperature	At 09:25 – 24.7 °C At 12:10 – 26.0 °C			
Size of the Suit / Shoes				
Top	M			
Trousers	S			
Shoes	43 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				

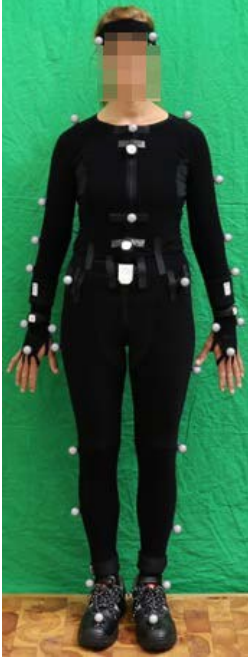







Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (2 pieces) no	yes (2 pieces) no	yes (10 pieces) no	yes (3 pieces) no
More velcro?	yes (4 pieces um die Armband-IMUs zu fixieren) no			
Recordings				
Scenario		Scenario	Record	
		1	1-2	
		2	3-16	
		3	17-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes <ul style="list-style-type: none"> - 12 pictures: before recording - 0 pictures: during recording - 6 pictures: after recording no			
Incident	yes <ul style="list-style-type: none"> - Before recording 3 marker loose but not lost: left heel (LHEE) - Recording 9 marker lost: left wrist (LWRB) → recording deleted and new recording - Recording 21 - lost connection to the IMU - Recording 21 take 2 and take 3 are alright → 31 recording available - Recording 30 without video no			
Remarks	<ul style="list-style-type: none"> - After recording 2 4 more velcros at the front of the hips - Recording 4 and 5 are labeled as take 2 in the video. although there are no second recordings 			

Subject 10

Overview of the session				
Date	03.08.2018			
Time	13:50 – 16:50			
Room temperature	At 13:50 – 26.5 °C At 16:50 – 27.7 °C			
Size of the Suit / Shoes				
Top	M			
Trousers	S			
Shoes	43 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				









Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (2 pieces) no	yes (2 pieces) no	yes (10 pieces) no	yes (3 pieces) no
More velcro?	yes no			
Recordings				
Scenario		Scenario	Record	
		1	1-2	
		2	3-16	
		3	17-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes <ul style="list-style-type: none"> - 5 pictures: before recording - 0 pictures: during recording - 5 pictures: after recording no			
Incident	yes <ul style="list-style-type: none"> - Before recording 3 connection problems with IMUs - During recording 11 marker lost: left finger (LFIN) → recording continued - Recording 24 connection problems with IMUs → from recording 24 to 30 no IMU recordings from set 2 - During recording 30 marker lost: left finger (LFIN) → recording continued no			
Remarks	- Break after recording 16			

Subject 11

Overview of the session				
Date	04.08.2018			
Time	09:30 – 12:00			
Room temperature	At 09:30 – 24.4 °C At 12:00 – 27.0 °C			
Size of the Suit / Shoes				
Top	S			
Trousers	S			
Shoes	41 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				


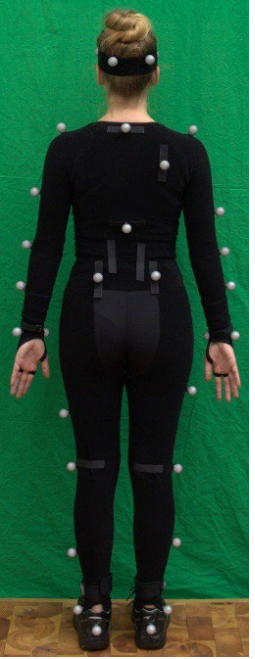






Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (0 pieces) no	yes (0 pieces) no	yes (12 pieces) no	yes (2 pieces) no
More velcro?	yes no			
Recordings				
Scenario		Scenario	Record	
		1	1-2	
		2	3-16	
		3	17-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes <ul style="list-style-type: none"> - 12 pictures: before recording - 0 pictures: during recording - 5 pictures: after recording no			
Incident	yes <ul style="list-style-type: none"> - After recording 21 connection problems with IMUs - After the recording 27 it was noticed that the marker of the left finger (LFIN) slipped. When exactly it happened is unclear. - After the recording 30 it was noticed that the marker of the right ankle (RANK) was lost. When exactly it happened is unclear. no			
Remarks	- Between recording 16 and recording 17 one break due to recording by a student (for the thesis)			

Subject 12

Overview of the session				
Date	04.08.2018			
Time	14:50 – 17:10			
Room temperature	At 14:50 – 29.5 °C At 17:10 – 30.5 °C			
Size of the Suit / Shoes				
Top	XS			
Trousers	XS			
Shoes	37 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
<u>before</u> the session				
<u>after</u> the session				






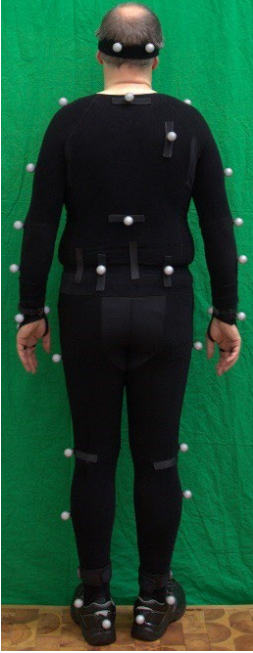


Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (0 pieces) no	yes (2 pieces) no	yes (10 pieces) no	yes (2 pieces) no
More velcro?	yes no			
Recordings				
Scenario		Scenario	Record	
		1	1-2	
		2	3-16	
		3	17-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes <ul style="list-style-type: none"> - 5 pictures: before recording - 116 pictures: during recording - 5 pictures: after recording no			
Incident	yes <ul style="list-style-type: none"> - After recording 17 Nexus crashed → reboot no			
Remarks	<ul style="list-style-type: none"> - System was recalibrated before recording (due to noise) - The headband was removed several times during the recording 			

Subject 13

Overview of the session				
Date	05.08.2018			
Time	09:30 – 11:45			
Room temperature	At 09:30 – 26.4 °C At 11:45 – 28.7 °C			
Size of the Suit / Shoes				
Top	XS			
Trousers	XS			
Shoes	38 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				

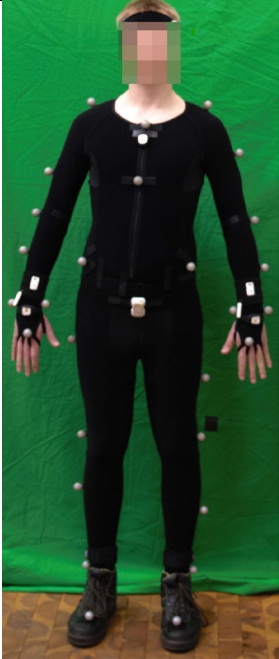
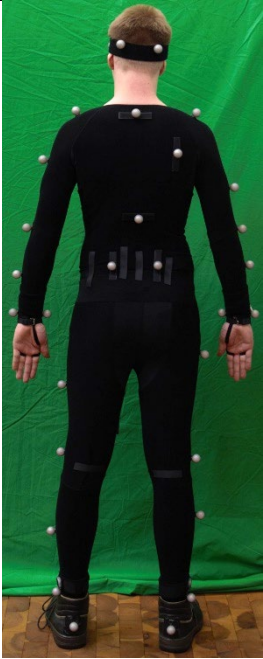


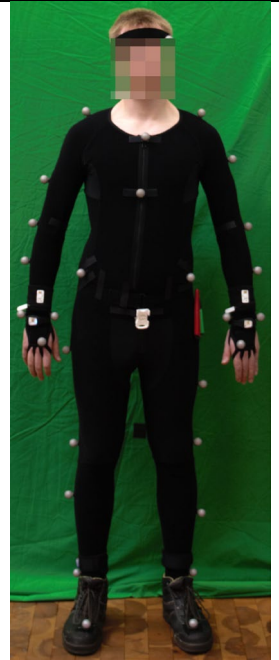
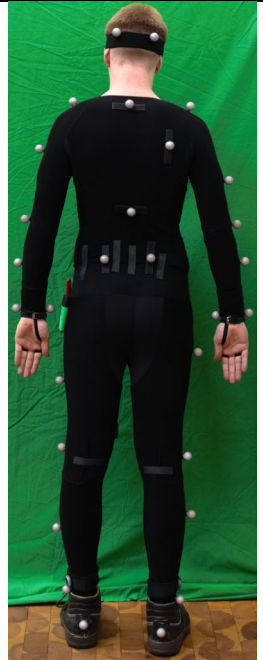

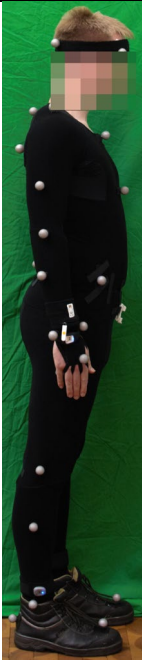
Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (2 pieces)	yes (2 pieces)	yes (10 pieces)	yes (2 pieces)
	no	no	no	no
More velcro?	yes no			
Recordings				
Scenario		Scenario	Record	
		1	1-2	
		2	3-16	
		3	17-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes <ul style="list-style-type: none"> - 5 pictures: before recording - 120 pictures: during recording - 8 pictures: after recording no			
Incident	yes <ul style="list-style-type: none"> - Recording 12 interrupted and repeated for video recording - After the last recording 30 it was noticed that: <ul style="list-style-type: none"> o Marker slipped: right hand (RFIN) o Marker lost: left wrist inside (LWRA) o The lost marker (LWRA) was noticed on the left side of the rib cage When exactly it happened is unclear. no			
Remarks				

Subject 14

Overview of the session				
Date	05.08.2018			
Time	14:20 – 16:10			
Room temperature	At 14:20 – 29.1 °C At 16:10 – 30.5 °C			
Size of the Suit / Shoes				
Top	S			
Trousers	S			
Shoes	43 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
before the session				
after the session				






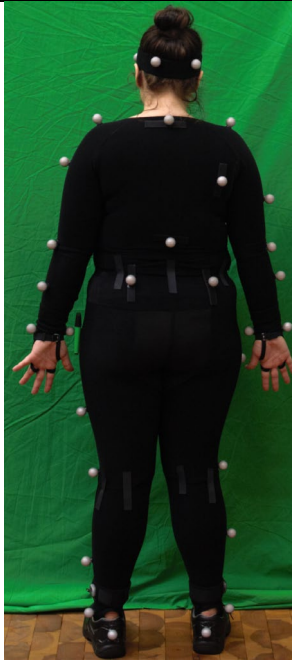


Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (2 pieces) no	yes (2 pieces) no	yes (10 pieces) no	yes (2 pieces) no
More velcro?	yes no			
Recordings				
Scenario		Scenario	Record	
		1.2	1-2	
		2	3-16	
		3	17-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes <ul style="list-style-type: none"> - 5 pictures: before recording - - 96 pictures: during recording - - 7 pictures: after recording no			
Incident	yes <ul style="list-style-type: none"> - After recording 15 it was noticed that the marker of the right forearm (RFRA) sticks to the leg. When exactly it happened is unclear. - - After recording 17 Nexus crashed → reboot no			
Remarks				

Subject 15

Overview of the session				
Date	04.07.2020			
Time	09:30 – 11:30			
Size of the Suit / Shoes				
Top	S			
Trousers	S			
Shoes	45 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
<u>before</u> the session				
<u>after</u> the session				

Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (2 pieces)	yes (2 pieces)	yes (7 pieces)	yes (4 pieces)
	no	no	no	no
More velcro?	yes no			
Recordings				
Scenario		Scenario	Record	
		2	1-15	
		3	16-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes no			
Incident	yes Markers have frequently fallen off: - Back of the hand (left). - Back of the hand (right). - Front of the hip. - ... no			
Remarks				

Subject 16

Overview of the session				
Date	04.07.2020			
Time	12:30 – 14:30			
Size of the Suit / Shoes				
Top	S			
Trousers	S			
Shoes	37 (EU/DE)			
Pictures of marker position and IMU position				
	Front	Back	Side left	Side right
<u>before</u> the session				
<u>after</u> the session				

Use of velcro				
	Knee	Elbow	Waistband front	Waistband back
Velcro used?	yes (4 pieces) no	yes (2 pieces) no	yes (6 pieces) no	yes (3 pieces) no
More velcro?	yes no			
Recordings				
Scenario		Scenario	Record	
		2	1-15	
		3	16-30	
IMU set	2 and 3			
Number	30			
Length	120 sec. per recording			
Video	yes – all 30 recordings no			
Pictures available	yes no			
Incident	yes no			
Remarks	Recording 27: Computer while walking			