Importing data

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

%matplotlib inline


from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
metadata = pd.read_csv('/content/drive/MyDrive/Hamoye/Mobile Health/mhealth_raw_data.csv')
metadata
```

	alx	aly	alz	glx	gly	glz	arx	ary	
0	2.1849	-9.6967	0.63077	0.103900	-0.84053	-0.68762	-8.6499	-4.5781	0.187
1	2.3876	-9.5080	0.68389	0.085343	-0.83865	-0.68369	-8.6275	-4.3198	0.023
2	2.4086	-9.5674	0.68113	0.085343	-0.83865	-0.68369	-8.5055	-4.2772	0.275
3	2.1814	-9.4301	0.55031	0.085343	-0.83865	-0.68369	-8.6279	-4.3163	0.367
4	2.4173	-9.3889	0.71098	0.085343	-0.83865	-0.68369	-8.7008	-4.1459	0.407
...	...	...	...	...	...	...	...	...	
1215740	1.7849	-9.8287	0.29725	-0.341370	-0.90056	-0.61493	-3.7198	-8.9071	0.294
1215741	1.8687	-9.8766	0.46236	-0.341370	-0.90056	-0.61493	-3.7160	-8.7455	0.448
1215742	1.6928	-9.9290	0.16631	-0.341370	-0.90056	-0.61493	-3.8824	-9.1155	0.450
1215743	1.5279	-9.6306	0.30458	-0.341370	-0.90056	-0.61493	-3.5564	-9.1441	0.594
1215744	1.6614	-9.8398	0.18088	-0.332100	-0.90432	-0.61886	-3.9035	-8.9324	0.761

1215745 rows × 14 columns

```
metadata.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1215745 entries, 0 to 1215744
Data columns (total 14 columns):
 #   Column    Non-Null Count    Dtype  
---  ------    --------------    -----  
 0   alx       1215745 non-null  float64
 1   aly       1215745 non-null  float64
 2   alz       1215745 non-null  float64
 3   glx       1215745 non-null  float64
 4   gly       1215745 non-null  float64
 5   glz       1215745 non-null  float64
 6   arx       1215745 non-null  float64
 7   ary       1215745 non-null  float64
 8   arz       1215745 non-null  float64
 9   grx       1215745 non-null  float64
 10  gry       1215745 non-null  float64
```

```
 11  grz       1215745 non-null  float64
 12  Activity  1215745 non-null  int64
 13  subject   1215745 non-null  object
dtypes: float64(12), int64(1), object(1)
memory usage: 129.9+ MB
```

```
metadata.isnull().sum()
```

```
alx         0
aly         0
alz         0
glx         0
gly         0
glz         0
arx         0
ary         0
arz         0
grx         0
gry         0
grz         0
Activity    0
subject     0
dtype: int64
```

```
metadata = metadata.drop(metadata[metadata.duplicated(keep = 'first')].index, axis=0)
```

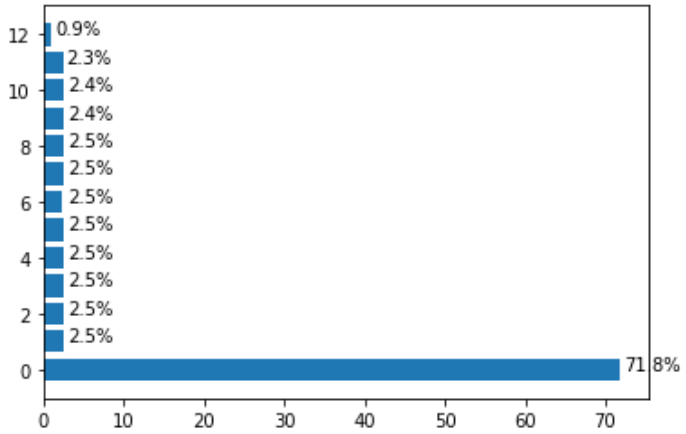
```
metadata.Activity.value_counts()
```

```
0     872550
1      30720
2      30720
3      30720
4      30720
9      30720
10     30720
11     30720
5      30720
7      29441
8      29337
6      28315
12     10342
Name: Activity, dtype: int64
```

```
label_map = {
    0: 'Nothing',
    1: 'Standing still',
    2: 'Sitting and relaxing',
    3: 'Lying down',
    4: 'Walking',
    5: 'Climbing stairs',
    6: 'Waist bends forward',
    7: 'Frontal elevation of arms',
    8: 'Knees bending (crouching)',
    9: 'Cycling',
    10: 'Jogging',
    11: 'Running',
    12: 'Jump front & back'
}
```

```
def comparison(data, metric = 'acceleration'):
```

```
  metric = metric[0].lower()
  data = data

  for i in range(0,13):
    plt.figure(figsize=(16,4))

    plt.subplot(1,2,1)
    plt.plot(data[ data['Activity']==i ].reset_index(drop=True)[metric+'lx'], alpha=.7, label=metric+
    plt.plot(data[ data['Activity']==i ].reset_index(drop=True)[metric+'ly'],color='red', alpha=.7, l
    plt.plot(data[ data['Activity']==i ].reset_index(drop=True)[metric+'lz'],color='green', alpha=.7,
    plt.title(f'{label_map[i]} - left-ankle')
    plt.legend()

    plt.subplot(1,2,2)
    plt.plot(data[ data['Activity']==i ].reset_index(drop=True)[metric+'rx'], alpha=.7, label=metric+
    plt.plot(data[ data['Activity']==i ].reset_index(drop=True)[metric+'ry'],color='red', alpha=.7, l
    plt.plot(data[ data['Activity']==i ].reset_index(drop=True)[metric+'rz'],color='green', alpha=.7,
    plt.title(f'{label_map[i]} - right-lower-arm')
    plt.legend()

    plt.show()
    print()

def category(data,cat):
  array = (data[cat].value_counts().sort_values(ascending=False)/len(data))*100
  plt.barh(array.index, width = array.values)
  for index, value in enumerate(array.values):
      plt.text(value + .5 , index, s= '{:.1f}%'.format(value))
  plt.show()

# plot
category(metadata,'Activity')
```

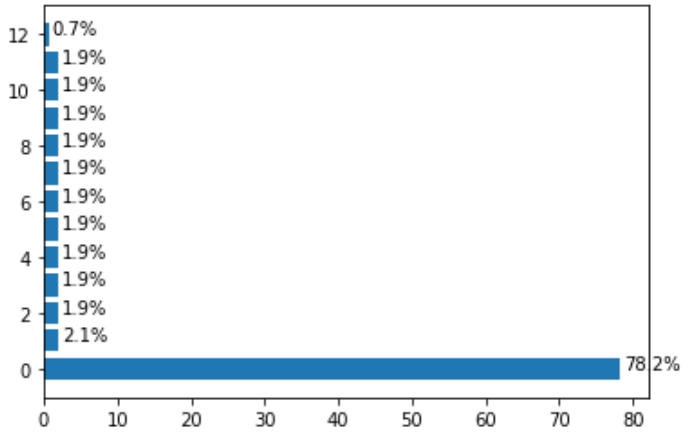



```
# plot
category(metadata,'subject')
```

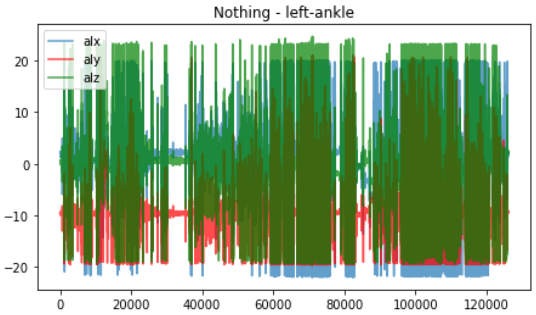

```
metadata1 = metadata[metadata['subject']=='subject1']
metadata1.Activity.value_counts()
```

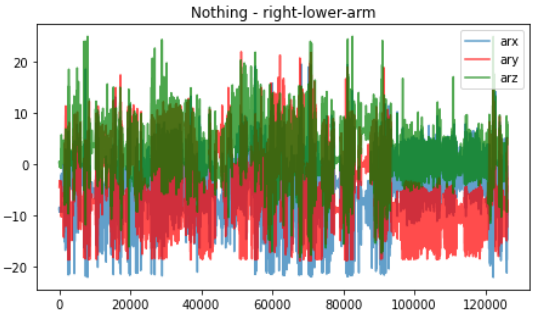
```
0     126106
8       3379
1       3072
2       3072
3       3072
4       3072
6       3072
7       3072
9       3072
10      3072
11      3072
5       3072
12      1075
Name: Activity, dtype: int64
```

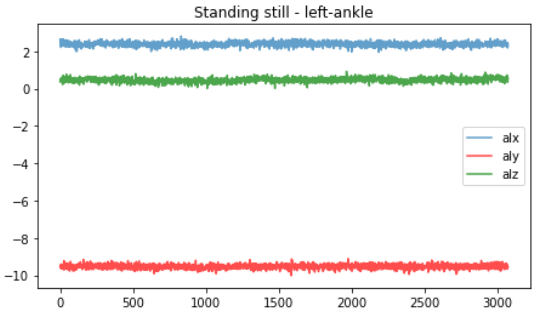
```
# plot
category(metadata1,'Activity')
```

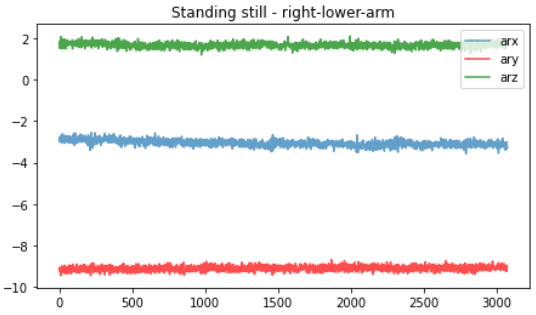


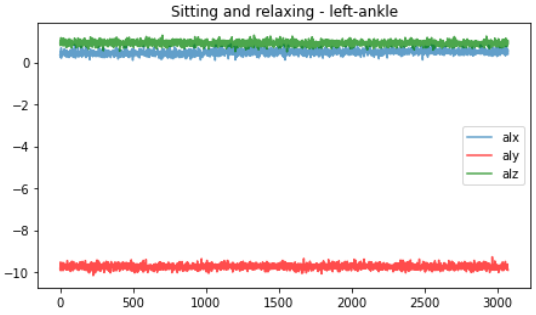

```
# plot
comparison(metadata1,'acceleration')
```

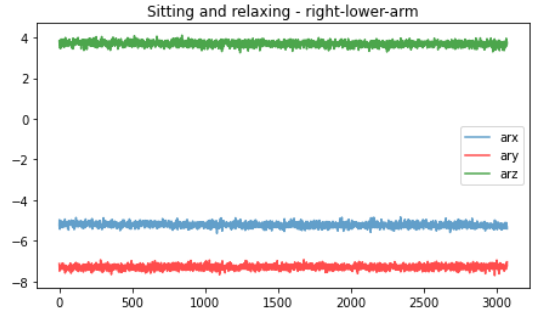

Nothing - left-ankle
alx
aly
alz

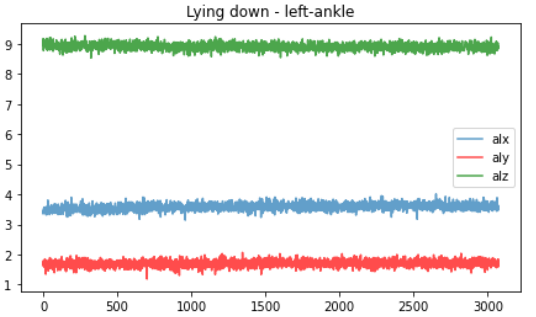

Nothing - right-lower-arm
arx
ary
arz

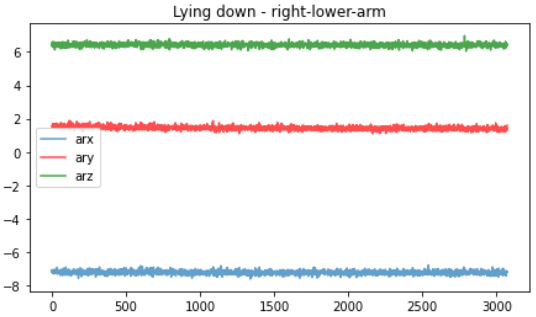

Standing still - left-ankle
alx
aly
alz

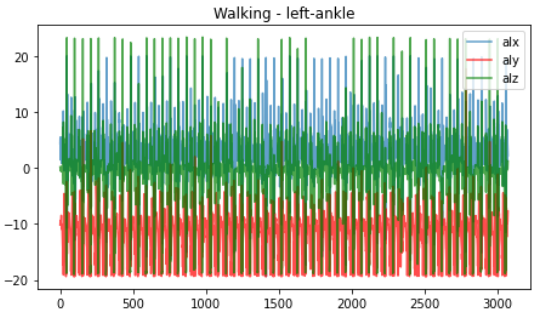

Standing still - right-lower-arm
arx
ary
arz

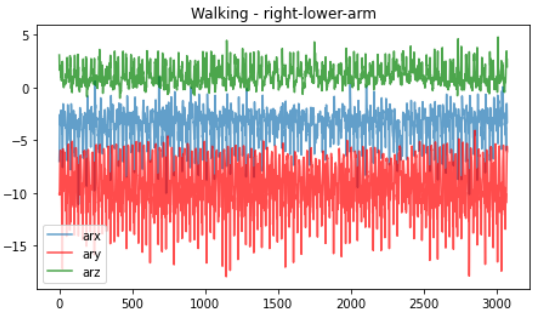

Sitting and relaxing - left-ankle
alx
aly
alz

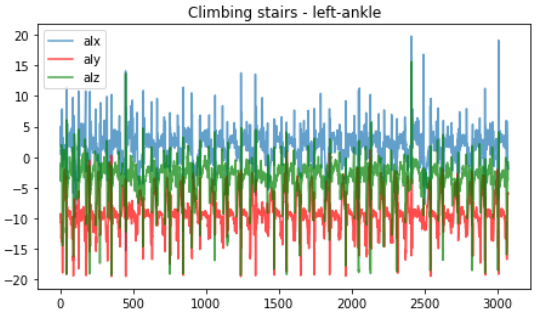

Sitting and relaxing - right-lower-arm
arx
ary
arz

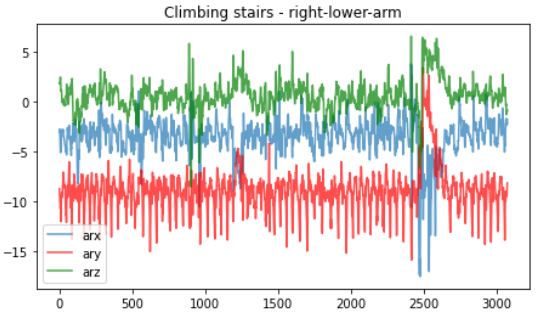

Lying down - left-ankle
alx
aly
alz

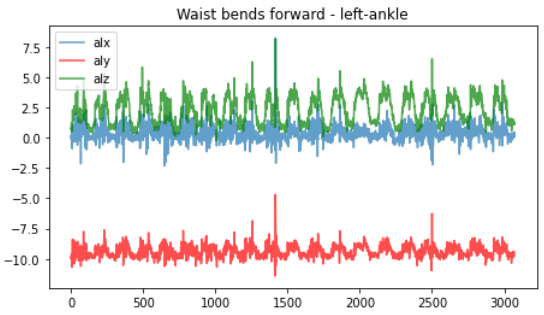

Lying down - right-lower-arm
arx
ary
arz

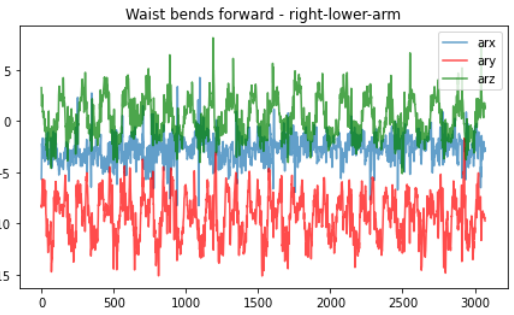

Walking - left-ankle
alx
aly
alz

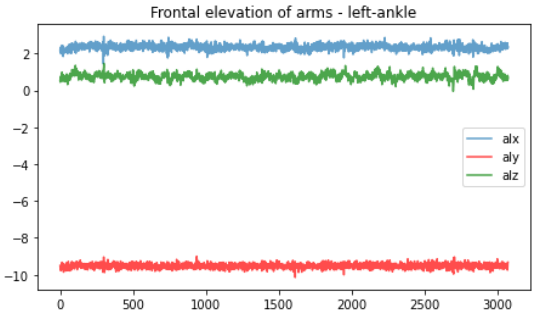

Walking - right-lower-arm
arx
ary
arz

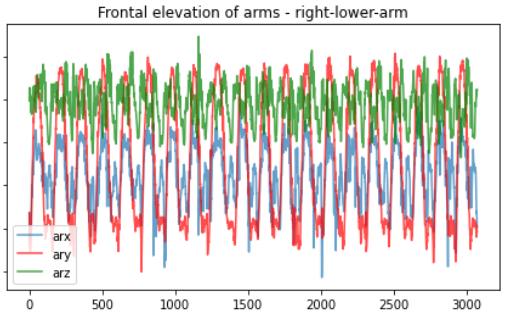

Climbing stairs - left-ankle
alx
aly
alz

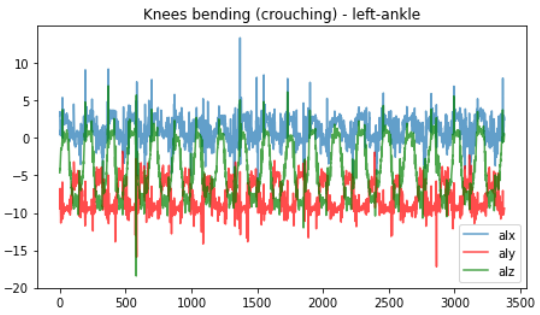

Climbing stairs - right-lower-arm
arx
ary
arz

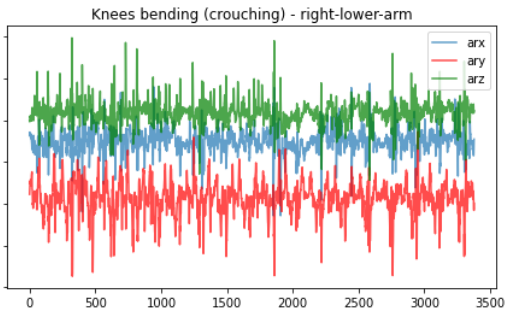

Waist bends forward - left-ankle
alx
aly
alz

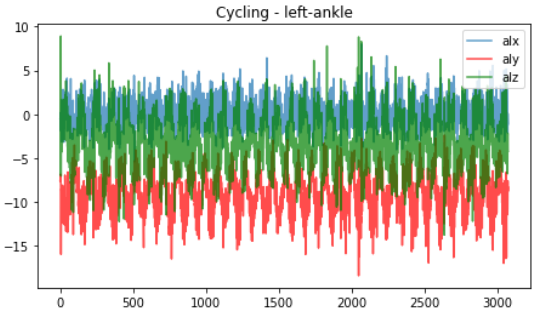

Waist bends forward - right-lower-arm
arx
ary
arz

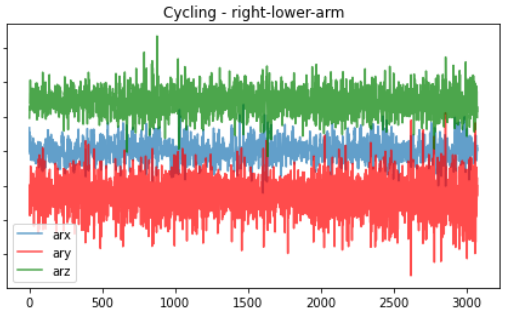

Frontal elevation of arms - left-ankle
alx
aly
alz

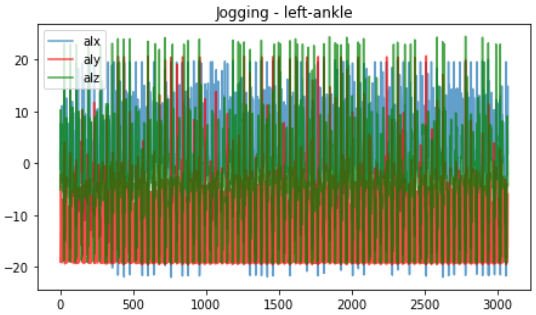

Frontal elevation of arms - right-lower-arm
arx
ary
arz

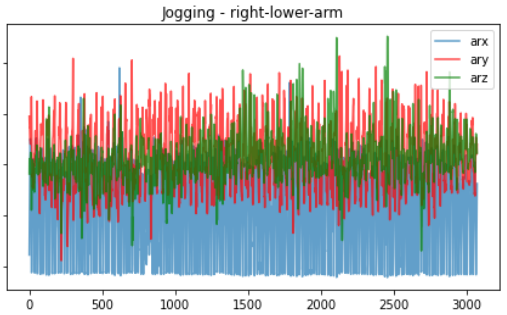

Knees bending (crouching) - left-ankle
alx
aly
alz

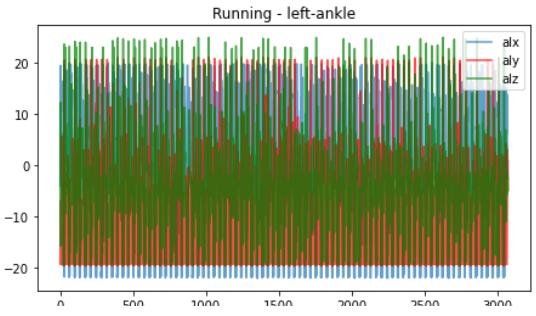

Knees bending (crouching) - right-lower-arm
arx
ary
arz

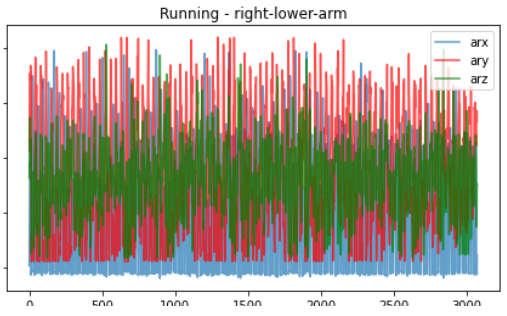

Cycling - left-ankle
alx
aly
alz

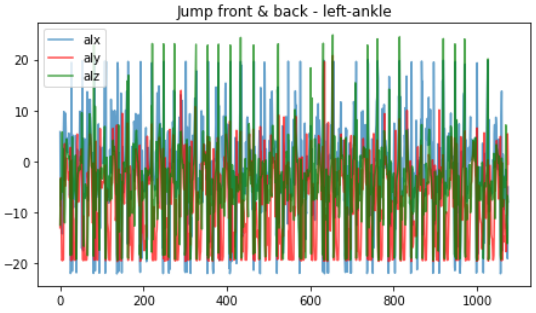

Cycling - right-lower-arm
arx
ary
arz

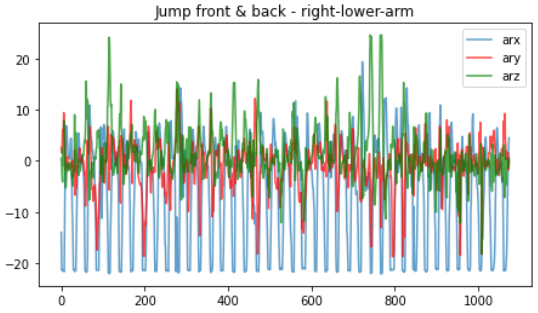

Jogging - left-ankle
alx
aly
alz


Jogging - right-lower-arm
arx
ary
arz

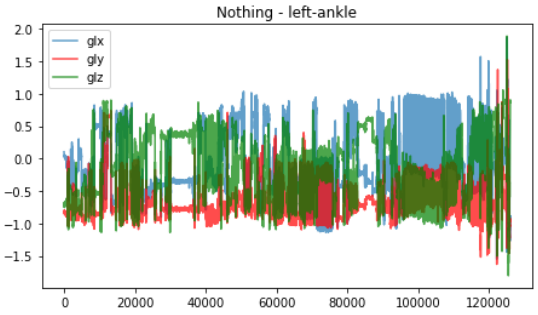

Running - left-ankle
alx
aly
alz

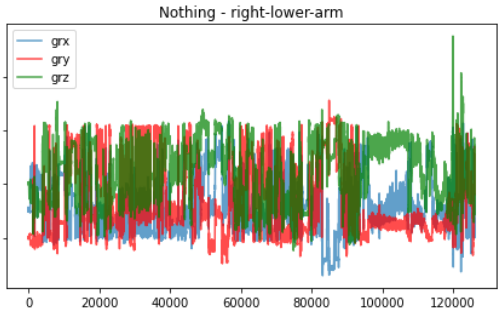

Running - right-lower-arm
arx
ary
arz

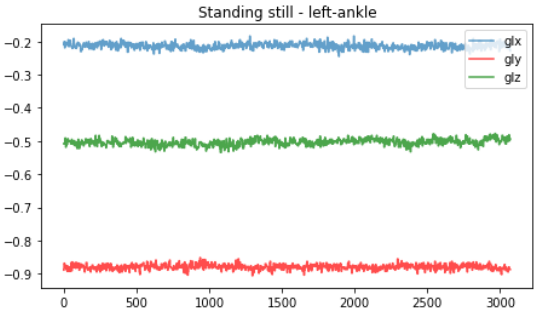


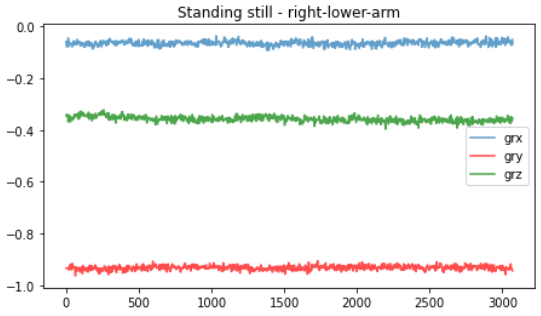


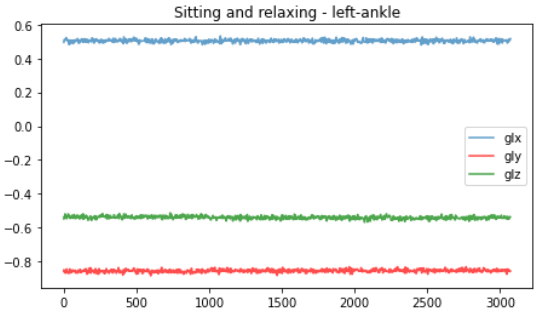

```
# plot
comparison(metadata1,'gyroscope')
```

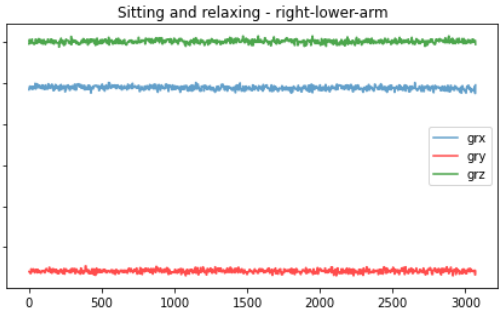

Nothing - left-ankle
glx
gly
glz

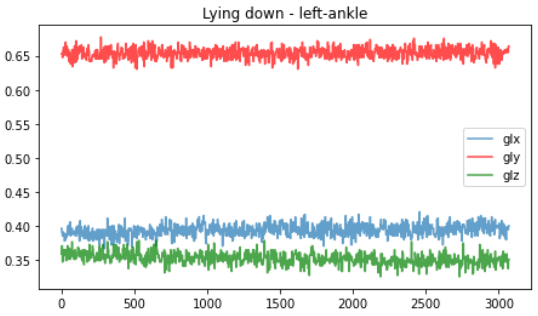

Nothing - right-lower-arm
grx
gry
grz

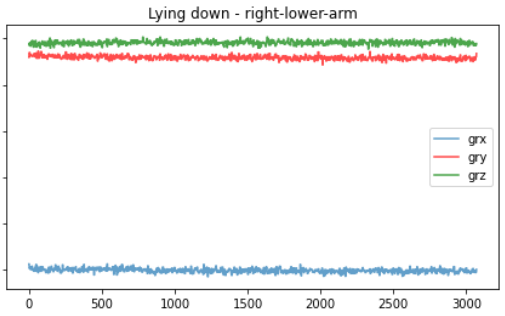

Standing still - left-ankle
glx
gly
glz

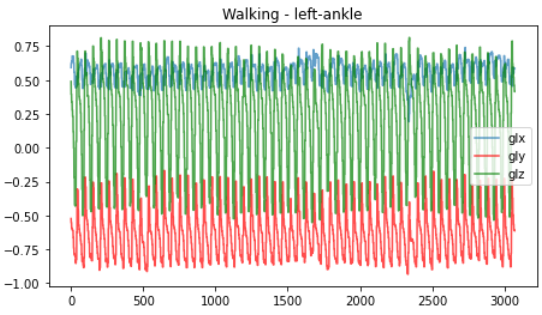

Standing still - right-lower-arm
grx
gry
grz

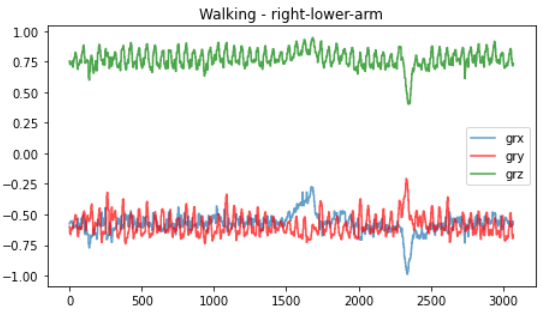

Sitting and relaxing - left-ankle
glx
gly
glz

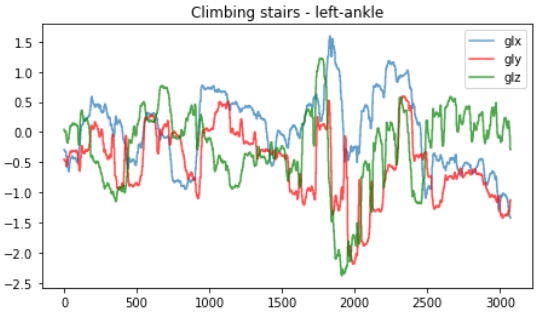

Sitting and relaxing - right-lower-arm
grx
gry
grz

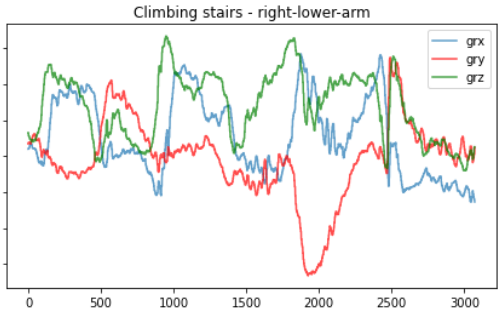

Lying down - left-ankle
glx
gly
glz

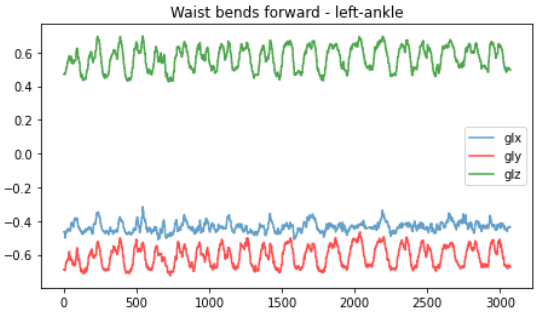

Lying down - right-lower-arm
grx
gry
grz

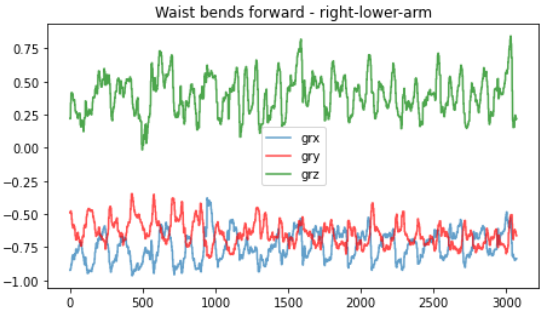

Walking - left-ankle
glx
gly
glz

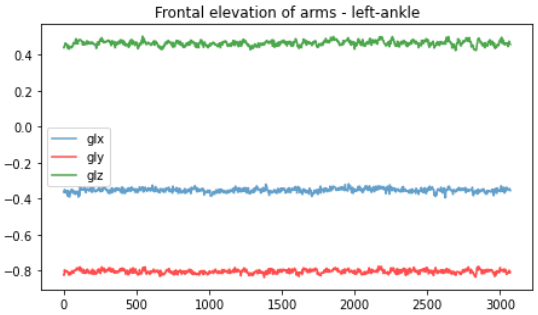

Walking - right-lower-arm
grx
gry
grz

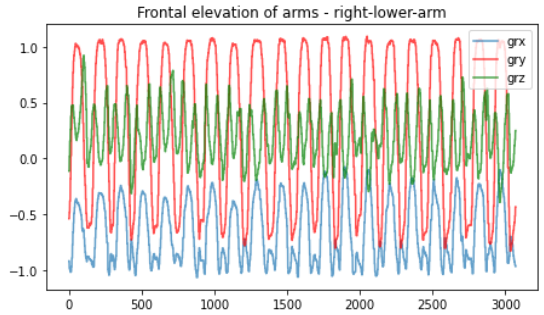

Climbing stairs - left-ankle
glx
gly
glz

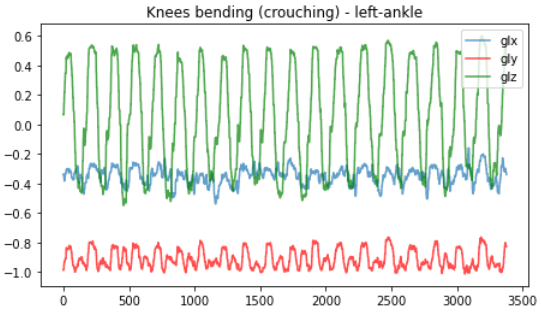

Climbing stairs - right-lower-arm
grx
gry
grz

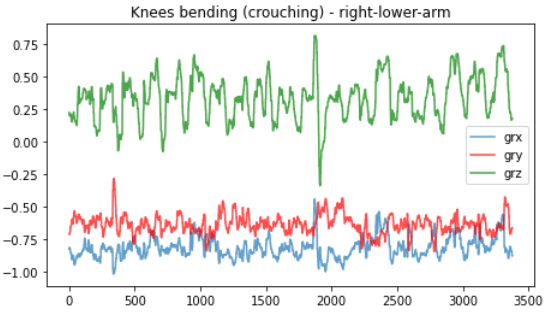

Waist bends forward - left-ankle
glx
gly
glz

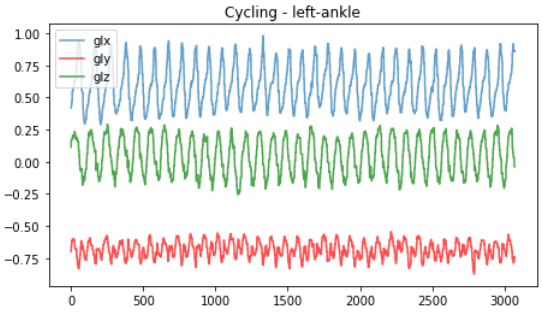

Waist bends forward - right-lower-arm
grx
gry
grz

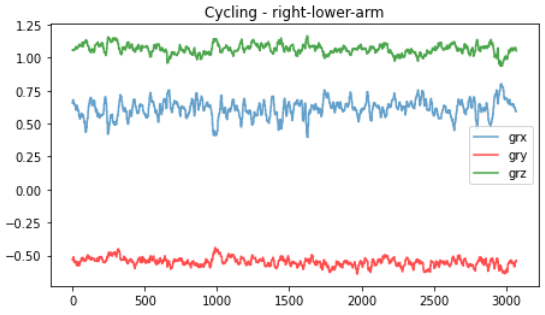

Frontal elevation of arms - left-ankle
glx
gly
glz

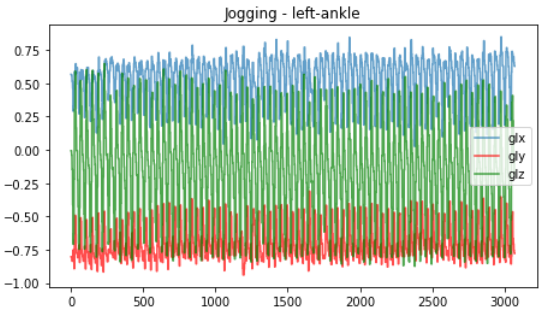

Frontal elevation of arms - right-lower-arm
grx
gry
grz

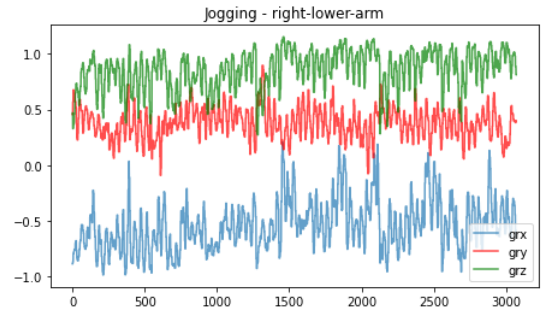

Knees bending (crouching) - left-ankle
glx
gly
glz

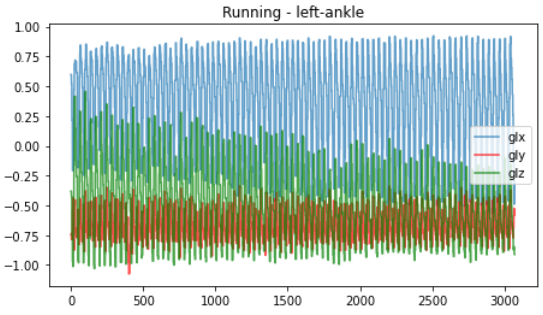

Knees bending (crouching) - right-lower-arm
grx
gry
grz

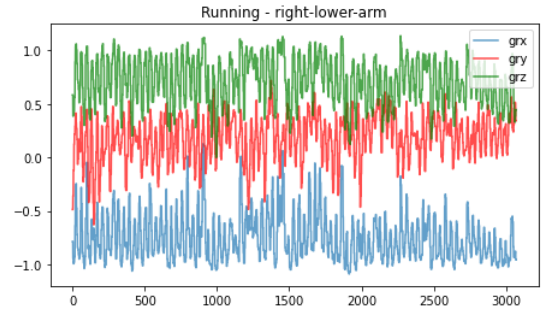

Cycling - left-ankle
glx
gly
glz

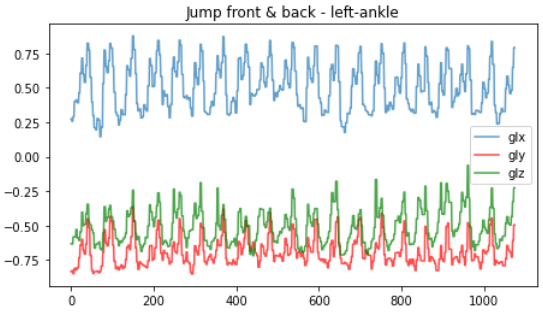

Cycling - right-lower-arm
grx
gry
grz

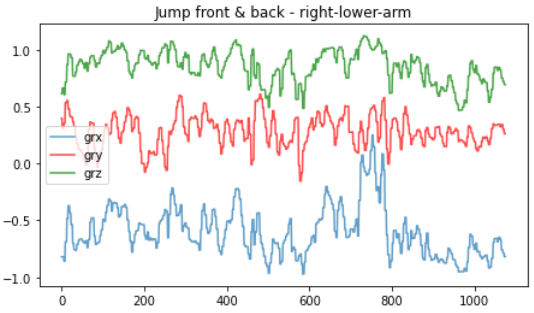

Jogging - left-ankle
glx
gly
glz


Jogging - right-lower-arm
grx
gry
grz


Running - left-ankle
glx
gly
glz


Running - right-lower-arm
grx
gry
grz


Jump front & back - left-ankle
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
0
200
400
600
800
1000
glx
gly
glz


Jump front & back - right-lower-arm
1.0
0.5
0.0
−0.5
−1.0
0
200
400
600
800
1000
grx
gry
grz

```
# plot complete data
comparison(metadata)
```

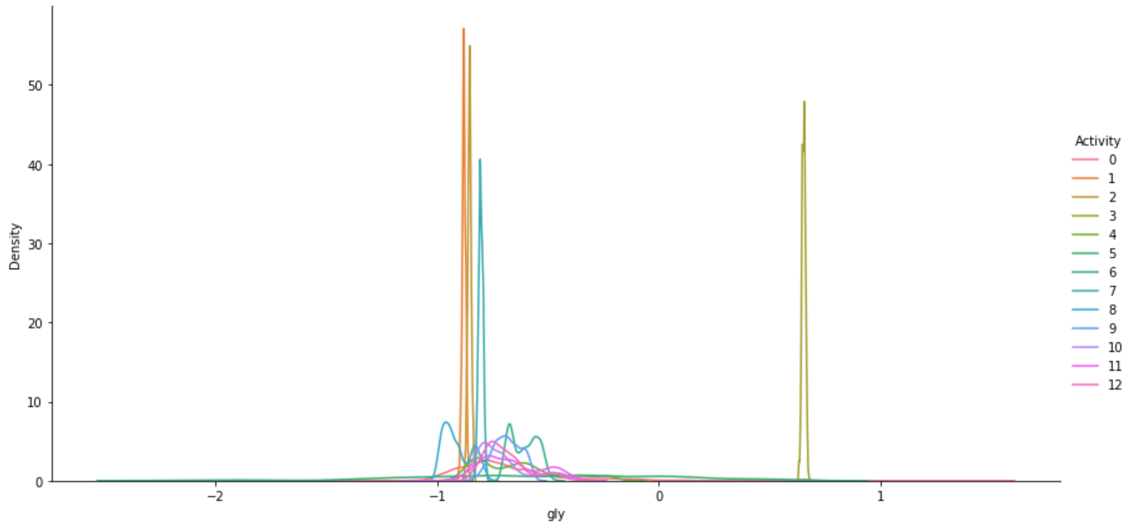
```
/usr/local/lib/python3.7/dist-packages/IPython/core/pylabtools.py:128: UserWarning
```

```
# plot
comparison(metadata,'gyroscope')
```

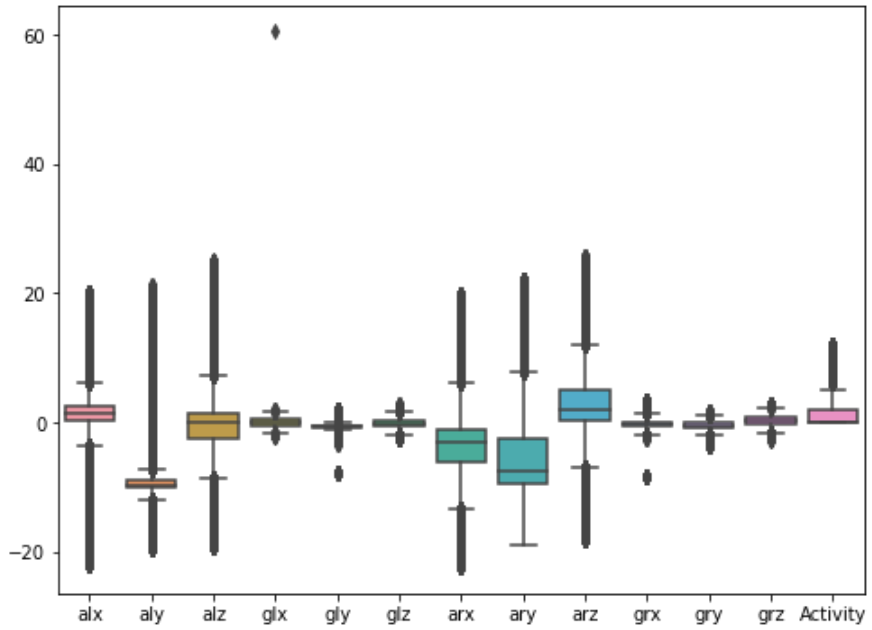
```
plt.figure(figsize=(8,6))
facetgrid = sns.FacetGrid(metadata1, hue='Activity', height=6, aspect=2)
```

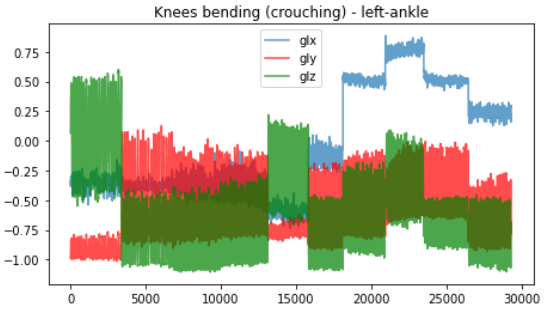
```
facetgrid.map(sns.distplot,'gly', hist=False).add_legend()
#sns.distplot('gly', hist=False, hue='Activity', data=df)
plt.show()
```

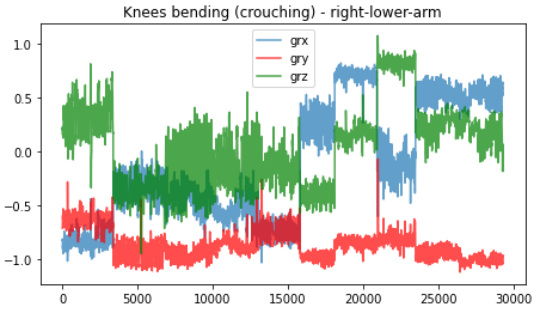
```
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
/usr/local/lib/python3.7/dist-packages/seaborn/distributions.py:2619: FutureWarnin
  warnings.warn(msg, FutureWarning)
<Figure size 576x432 with 0 Axes>
```

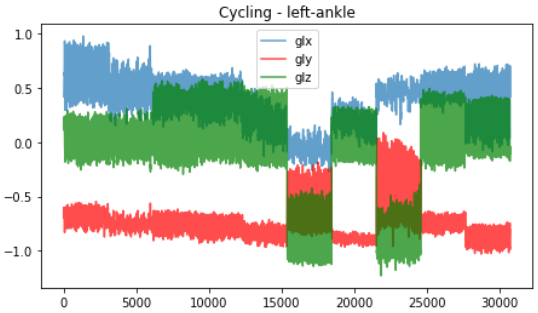


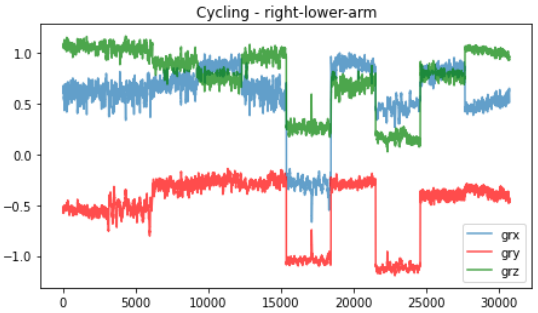
```
plt.figure(figsize=(8,6))
sns.boxplot(data=metadata)
plt.show()
```


60
40
20
0
−20
alx
aly
alz
glx
gly
glz
arx
ary
arz
grx
gry
grz
Activity


Knees bending (crouching) - left-ankle
glx
gly
glz
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5000
10000
15000
20000
25000
30000


Knees bending (crouching) - right-lower-arm
grx
gry
grz
1.0
0.5
0.0
−0.5
−1.0
0
5000
10000
15000
20000
25000
30000


Cycling - left-ankle
glx
gly
glz
1.0
0.5
0.0
−0.5
−1.0
0
5000
10000
15000
20000
25000
30000


Cycling - right-lower-arm
grx
gry
grz
1.0
0.5
0.0
−0.5
−1.0
0
5000
10000
15000
20000
25000
30000