Loading neccecities

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

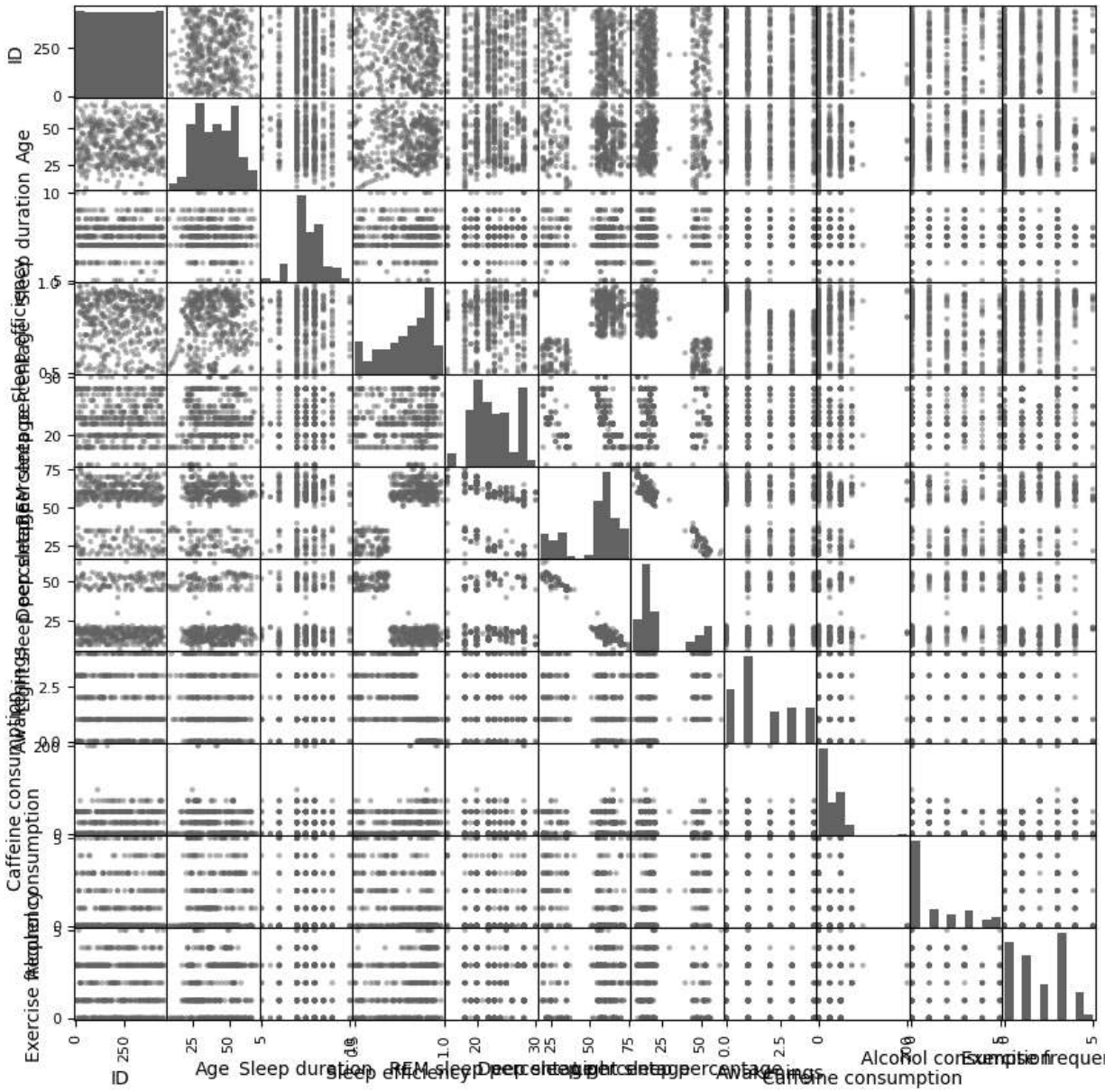
Loading the data

In [2]:
```
file_path = './Sleep_Efficiency.csv'
data_frame = pd.read_csv(file_path)
print(data_frame.tail())
```

```
      ID  Age  Gender              Bedtime          Wakeup time  \
447  448   27  Female  2021-11-13 22:00:00  2021-11-13 05:30:00
448  449   52    Male  2021-03-31 21:00:00  2021-03-31 03:00:00
449  450   40  Female  2021-09-07 23:00:00  2021-09-07 07:30:00
450  451   45    Male  2021-07-29 21:00:00  2021-07-29 04:00:00
451  452   18    Male  2021-03-17 02:30:00  2021-03-17 10:00:00

     Sleep duration  Sleep efficiency  REM sleep percentage  \
447             7.5              0.91                    22
448             6.0              0.74                    28
449             8.5              0.55                    20
450             7.0              0.76                    18
451             7.5              0.63                    22

     Deep sleep percentage  Light sleep percentage  Awakenings  \
447                     57                      21         0.0
448                     57                      15         4.0
449                     32                      48         1.0
450                     72                      10         3.0
451                     23                      55         1.0

     Caffeine consumption  Alcohol consumption Smoking status  \
447                   0.0                  0.0             No
448                  25.0                  0.0             No
449                   NaN                  3.0            Yes
450                   0.0                  0.0             No
451                  50.0                  0.0             No

     Exercise frequency
447                 5.0
448                 3.0
449                 0.0
450                 3.0
451                 1.0
```

Preliminary Plots

In [3]:
```
# Generate scatter plots for all pairs of variables
pd.plotting.scatter_matrix(data_frame, figsize=(10, 10))
plt.show()
```



In [4]:
```
# Description
data_frame.describe()
```

Out[4]:

	ID	Age	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakeni
count	452.000000	452.000000	452.000000	452.000000	452.000000	452.000000	452.000000	432.000
mean	226.500000	40.285398	7.465708	0.788916	22.615044	52.823009	24.561947	1.641
std	130.625419	13.172250	0.866625	0.135237	3.525963	15.654235	15.313665	1.356
min	1.000000	9.000000	5.000000	0.500000	15.000000	18.000000	7.000000	0.000
25%	113.750000	29.000000	7.000000	0.697500	20.000000	48.250000	15.000000	1.000
50%	226.500000	40.000000	7.500000	0.820000	22.000000	58.000000	18.000000	1.000
75%	339.250000	52.000000	8.000000	0.900000	25.000000	63.000000	32.500000	3.000
max	452.000000	69.000000	10.000000	0.990000	30.000000	75.000000	63.000000	4.000

Plotting the correlation matrix

Plotting Failed hence the data is not clean.

STEP 1: *Data Cleaning*

Before proceeding with data analysis, it's crucial to clean and preprocess your data. This involves handling missing values, dealing with outliers, and ensuring data consistency. Cleaning your dataset will help you obtain more accurate and reliable results during analysis.

In [5]:
```
data_frame.head()
```

Out[5]:

	ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Av
0	1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	
1	2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	
2	3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	
3	4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	
4	5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	

Finding null rows using the `isna()` or `isnull()` function

In [6]:
```
na_rows = data_frame[data_frame.isna().any(axis=1)]
print(na_rows)
```

```
      ID  Age  Gender              Bedtime          Wakeup time  \
5      6   36  Female  2021-07-01 21:00:00  2021-07-01 04:30:00
19    20   52    Male  2021-12-03 00:30:00  2021-12-03 07:30:00
20    21   24    Male  2021-05-02 00:00:00  2021-05-02 08:00:00
24    25   24    Male  2021-09-16 00:00:00  2021-09-16 07:00:00
26    27   36  Female  2021-06-18 00:00:00  2021-06-18 07:00:00
..   ...  ...     ...                  ...                  ...
434  435   28  Female  2021-08-11 23:00:00  2021-08-11 07:00:00
440  441   28  Female  2021-02-06 21:00:00  2021-02-06 05:00:00
442  443   27  Female  2021-02-06 01:30:00  2021-02-06 08:30:00
446  447   23    Male  2021-04-21 00:00:00  2021-04-21 07:00:00
449  450   40  Female  2021-09-07 23:00:00  2021-09-07 07:30:00

     Sleep duration  Sleep efficiency  REM sleep percentage  \
5               7.5              0.90                    23
19              7.0              0.89                    28
20              8.0              0.83                    15
24              7.0              0.88                    15
26              7.0              0.95                    28
..              ...               ...                   ...
434             8.0              0.90                    22
440             8.0              0.88                    22
442             7.0              0.68                    23
446             7.0              0.50                    15
449             8.5              0.55                    20

     Deep sleep percentage  Light sleep percentage  Awakenings  \
5                       60                      17         0.0
19                      52                      20         NaN
20                      75                      10         3.0
24                      75                      10         1.0
26                      55                      17         0.0
..                     ...                     ...         ...
434                     63                      15         NaN
440                     63                      15         0.0
442                     22                      55         1.0
446                     40                      45         2.0
449                     32                      48         1.0

     Caffeine consumption  Alcohol consumption Smoking status  \
5                     NaN                  0.0             No
19                   50.0                  0.0            Yes
20                    0.0                  NaN             No
24                    NaN                  5.0             No
26                    NaN                  0.0             No
..                    ...                  ...            ...
434                  75.0                  2.0             No
440                  75.0                  NaN            Yes
442                   NaN                  4.0             No
446                   0.0                  4.0            Yes
449                   NaN                  3.0            Yes

     Exercise frequency
5                   1.0
19                  3.0
20                  2.0
24                  2.0
26                  1.0
..                  ...
434                 4.0
```

```
440                2.0
442                1.0
446                NaN
449                0.0

[64 rows x 15 columns]
```

Removing the NaN rows

In [8]:
```
data_frame.dropna(inplace = True)
print(data_frame)
```

```
      ID  Age  Gender              Bedtime          Wakeup time  \
0      1   65  Female  2021-03-06 01:00:00  2021-03-06 07:00:00
1      2   69    Male  2021-12-05 02:00:00  2021-12-05 09:00:00
2      3   40  Female  2021-05-25 21:30:00  2021-05-25 05:30:00
3      4   40  Female  2021-11-03 02:30:00  2021-11-03 08:30:00
4      5   57    Male  2021-03-13 01:00:00  2021-03-13 09:00:00
..   ...  ...     ...                  ...                  ...
445  446   30  Female  2021-11-16 23:00:00  2021-11-16 06:30:00
447  448   27  Female  2021-11-13 22:00:00  2021-11-13 05:30:00
448  449   52    Male  2021-03-31 21:00:00  2021-03-31 03:00:00
450  451   45    Male  2021-07-29 21:00:00  2021-07-29 04:00:00
451  452   18    Male  2021-03-17 02:30:00  2021-03-17 10:00:00

     Sleep duration  Sleep efficiency  REM sleep percentage  \
0               6.0              0.88                    18
1               7.0              0.66                    19
2               8.0              0.89                    20
3               6.0              0.51                    23
4               8.0              0.76                    27
..              ...               ...                   ...
445             7.5              0.53                    28
447             7.5              0.91                    22
448             6.0              0.74                    28
450             7.0              0.76                    18
451             7.5              0.63                    22

     Deep sleep percentage  Light sleep percentage  Awakenings  \
0                       70                      12         0.0
1                       28                      53         3.0
2                       70                      10         1.0
3                       25                      52         3.0
4                       55                      18         3.0
..                     ...                     ...         ...
445                     20                      52         4.0
447                     57                      21         0.0
448                     57                      15         4.0
450                     72                      10         3.0
451                     23                      55         1.0

     Caffeine consumption  Alcohol consumption Smoking status  \
0                     0.0                  0.0            Yes
1                     0.0                  3.0            Yes
2                     0.0                  0.0             No
3                    50.0                  5.0            Yes
4                     0.0                  3.0             No
..                    ...                  ...            ...
445                  50.0                  2.0            Yes
447                   0.0                  0.0             No
448                  25.0                  0.0             No
450                   0.0                  0.0             No
451                  50.0                  0.0             No

     Exercise frequency
0                   3.0
1                   3.0
2                   3.0
3                   1.0
4                   3.0
..                  ...
445                 1.0
```

```
447                5.0
448                3.0
450                3.0
451                1.0

[388 rows x 15 columns]
```

In [9]:
```
data_frame.corr()
```

```
C:\Users\dell\AppData\Local\Temp\ipykernel_13716\3812265915.py:1: FutureWarning: The
default value of numeric_only in DataFrame.corr is deprecated. In a future version, i
t will default to False. Select only valid columns or specify the value of numeric_on
ly to silence this warning.
  data_frame.corr()
```

Out[9]:

	ID	Age	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awaker
ID	1.000000	0.012011	0.030504	0.025931	0.086319	-0.015469	-0.003608	-0.08
Age	0.012011	1.000000	-0.065951	0.124093	0.015449	0.058156	-0.062613	-0.00
Sleep duration	0.030504	-0.065951	1.000000	-0.019164	-0.015408	-0.035477	0.039536	-0.00
Sleep efficiency	0.025931	0.124093	-0.019164	1.000000	0.064038	0.789087	-0.816934	-0.56
REM sleep percentage	0.086319	0.015449	-0.015408	0.064038	1.000000	-0.185850	-0.035046	-0.02
Deep sleep percentage	-0.015469	0.058156	-0.035477	0.789087	-0.185850	1.000000	-0.975461	-0.32
Light sleep percentage	-0.003608	-0.062613	0.039536	-0.816934	-0.035046	-0.975461	1.000000	0.33
Awakenings	-0.084746	-0.004006	-0.009162	-0.567885	-0.024608	-0.327284	0.338397	1.00
Caffeine consumption	-0.056247	-0.169057	-0.030922	0.070804	0.113965	-0.024522	-0.000596	-0.11
Alcohol consumption	0.089620	0.069295	-0.048436	-0.397012	-0.039597	-0.374614	0.389895	0.21
Exercise frequency	0.009799	0.071241	-0.046671	0.266050	0.044200	0.171841	-0.184684	-0.23