nsnkniaft

April 17, 2025

[2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LinearRegression
from sklearn.metrics import accuracy_score, classification_report,␣
 ↪confusion_matrix
from sklearn.ensemble import RandomForestClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC
from sklearn.naive_bayes import GaussianNB
from sklearn.model_selection import cross_val_score
```

[3]:
```
df = pd.read_csv('/content/EEG.machinelearing_data_BRMH.csv.zip')
df.head()
```

[3]:
```
   no. sex   age    eeg.date  education     IQ       main.disorder  \
0    1   M  57.0   2012.8.30        NaN    NaN  Addictive disorder
1    2   M  37.0    2012.9.6        6.0  120.0  Addictive disorder
2    3   M  32.0   2012.9.10       16.0  113.0  Addictive disorder
3    4   M  35.0   2012.10.8       18.0  126.0  Addictive disorder
4    5   M  36.0  2012.10.18       16.0  112.0  Addictive disorder

      specific.disorder  AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  \
0  Alcohol use disorder         35.998557         21.717375  …
1  Alcohol use disorder         13.425118         11.002916  …
2  Alcohol use disorder         29.941780         27.544684  …
3  Alcohol use disorder         21.496226         21.846832  …
4  Alcohol use disorder         37.775667         33.607679  …

   COH.F.gamma.o.Pz.p.P4  COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  \
```

```
0              55.989192              16.739679              23.452271
1              45.595619              17.510824              26.777368
2              99.475453              70.654171              39.131547
3              59.986561              63.822201              36.478254
4              61.462720              59.166097              51.465531

   COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  \
0              45.678820              30.167520              16.918761
1              28.201062              57.108861              32.375401
2              69.920996              71.063644              38.534505
3              47.117006              84.658376              24.724096
4              58.635415              80.685608              62.138436

   COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
0              48.850427               9.422630              34.507082
1              60.351749              13.900981              57.831848
2              69.908764              27.180532              64.803155
3              50.299349              35.319695              79.822944
4              75.888749              61.003944              87.455509

   COH.F.gamma.r.O1.s.O2
0              28.613029
1              43.463261
2              31.485799
3              41.141873
4              70.531662

[5 rows x 1149 columns]
```

[4]:
```
df.tail(3)
```

[4]:
```
     no. sex   age    eeg.date  education     IQ    main.disorder  \
942  943   M  26.0   2014.9.27       16.0  113.0  Healthy control
943  944   M  24.0   2014.9.20       13.0  107.0  Healthy control
944  945   M  21.0  2015.10.23       13.0  105.0  Healthy control

    specific.disorder  AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  \
942   Healthy control         28.781317         32.369230  …
943   Healthy control         19.929100         25.196375  …
944   Healthy control         65.195346         69.241972  …

     COH.F.gamma.o.Pz.p.P4  COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  \
942              61.040959              27.632209              45.552852
943              99.113664              48.328934              41.248470
944              78.600293              68.255430              70.687410

     COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  \
```

```
942              33.638817              46.690983              19.382928
943              28.192238              48.665743              42.007147
944              74.433908              74.294750              53.254681

     COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
942              41.050717               7.045821              41.962451
943              28.735945              27.176500              27.529522
944              72.755265              47.810386              80.166825

     COH.F.gamma.r.O1.s.O2
942              19.092111
943              20.028446
944              64.380273

[3 rows x 1149 columns]
```

[5]:
```
df.describe()
```

[5]:
```
                no.         age   education          IQ  AB.A.delta.a.FP1  \
count   945.000000  945.000000  930.000000  932.000000        945.000000
mean    473.000000   30.594804   13.438710  101.580472         20.182936
std     272.942302   11.781592    2.550461   17.022414         11.282022
min       1.000000   18.000000    0.000000   49.000000          3.272260
25%     237.000000   21.730000   12.000000   91.000000         12.784872
50%     473.000000   26.150000   13.000000  102.000000         17.065286
75%     709.000000   35.450000   16.000000  114.000000         24.492760
max     945.000000   71.880000   20.000000  145.000000         92.826192

       AB.A.delta.b.FP2  AB.A.delta.c.F7  AB.A.delta.d.F3  AB.A.delta.e.Fz  \
count        945.000000       945.000000       945.000000       945.000000
mean          21.177584        17.749553        18.901698        20.447079
std           12.230662        10.003598         9.079482         9.742912
min            3.244199         3.050507         3.412618         5.066593
25%           13.019269        11.134327        12.460586        13.548645
50%           17.838251        15.541469        16.733004        18.065276
75%           25.654394        21.623961        23.347900        25.573096
max          101.515687        91.373456        82.544167       101.566662

       AB.A.delta.f.F4  …  COH.F.gamma.o.Pz.p.P4  COH.F.gamma.o.Pz.q.T6  \
count       945.000000  …             945.000000             945.000000
mean         19.490329  …              75.889633              55.049113
std           9.252500  …              15.861641              19.541956
min           4.048931  …              12.611954               0.519048
25%          12.637717  …              68.014443              41.607506
50%          17.432568  …              78.647712              55.158858
75%          23.956748  …              87.398387              69.740640
max          77.197502  …              99.678649             100.000000
```

```
       COH.F.gamma.o.Pz.r.O1  COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  \
count             945.000000             945.000000             945.000000
mean               56.959796              60.739169              69.829254
std                18.326785              18.052887              17.725321
min                 6.926792               0.708008               2.421748
25%                43.682444              48.374883              58.937785
50%                56.657348              61.257972              72.298636
75%                70.649245              73.979100              83.066877
max                99.307895             100.000000              99.581629

       COH.F.gamma.p.P4.r.O1  COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  \
count             945.000000             945.000000             945.000000
mean               47.862489              66.832798              39.301406
std                19.685722              17.028701              20.790933
min                 0.036664               1.032207               1.228502
25%                32.581046              55.872070              22.049743
50%                45.719426              68.238375              36.549938
75%                62.081839              79.192418              54.169209
max                98.720067              99.650154              98.413320

       COH.F.gamma.q.T6.s.O2  COH.F.gamma.r.O1.s.O2
count             945.000000             945.000000
mean               66.153213              57.056207
std                18.088548              19.600107
min                 0.363268               3.988805
25%                54.710605              43.955229
50%                67.988937              57.515871
75%                79.527764              71.626382
max               100.000000              99.287092

[8 rows x 1145 columns]
```

[6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 945 entries, 0 to 944
Columns: 1149 entries, no. to COH.F.gamma.r.O1.s.O2
dtypes: float64(1144), int64(1), object(4)
memory usage: 8.3+ MB
```

[7]:
```
df.shape
```

[7]: (945, 1149)

[8]:
```
df.columns
```

[8]:
```
Index(['no.', 'sex', 'age', 'eeg.date', 'education', 'IQ', 'main.disorder',
       'specific.disorder', 'AB.A.delta.a.FP1', 'AB.A.delta.b.FP2',
       …
       'COH.F.gamma.o.Pz.p.P4', 'COH.F.gamma.o.Pz.q.T6',
       'COH.F.gamma.o.Pz.r.O1', 'COH.F.gamma.o.Pz.s.O2',
       'COH.F.gamma.p.P4.q.T6', 'COH.F.gamma.p.P4.r.O1',
       'COH.F.gamma.p.P4.s.O2', 'COH.F.gamma.q.T6.r.O1',
       'COH.F.gamma.q.T6.s.O2', 'COH.F.gamma.r.O1.s.O2'],
      dtype='object', length=1149)
```

[9]:
```
df.drop('no.', axis=1
        )
```

[9]:

	sex	age	eeg.date	education	IQ	main.disorder	\
0	M	57.0	2012.8.30	NaN	NaN	Addictive disorder	
1	M	37.0	2012.9.6	6.0	120.0	Addictive disorder	
2	M	32.0	2012.9.10	16.0	113.0	Addictive disorder	
3	M	35.0	2012.10.8	18.0	126.0	Addictive disorder	
4	M	36.0	2012.10.18	16.0	112.0	Addictive disorder	
..	..	…	…	…	…	…	
940	M	22.0	2014.8.28	13.0	116.0	Healthy control	
941	M	26.0	2014.9.19	13.0	118.0	Healthy control	
942	M	26.0	2014.9.27	16.0	113.0	Healthy control	
943	M	24.0	2014.9.20	13.0	107.0	Healthy control	
944	M	21.0	2015.10.23	13.0	105.0	Healthy control	

	specific.disorder	AB.A.delta.a.FP1	AB.A.delta.b.FP2	\
0	Alcohol use disorder	35.998557	21.717375	
1	Alcohol use disorder	13.425118	11.002916	
2	Alcohol use disorder	29.941780	27.544684	
3	Alcohol use disorder	21.496226	21.846832	
4	Alcohol use disorder	37.775667	33.607679	
..	…	…	…	
940	Healthy control	41.851823	36.771496	
941	Healthy control	18.986856	19.401387	
942	Healthy control	28.781317	32.369230	
943	Healthy control	19.929100	25.196375	
944	Healthy control	65.195346	69.241972	

	AB.A.delta.c.F7	…	COH.F.gamma.o.Pz.p.P4	COH.F.gamma.o.Pz.q.T6	\
0	21.518280	…	55.989192	16.739679	
1	11.942516	…	45.595619	17.510824	
2	17.150159	…	99.475453	70.654171	
3	17.364316	…	59.986561	63.822201	
4	21.865556	…	61.462720	59.166097	
..	…	…	…	…	
940	43.671792	…	82.905657	34.850706	

```
941        27.586436  …              65.917918              66.700117
942        11.717778  …              61.040959              27.632209
943        14.445391  …              99.113664              48.328934
944        35.361363  …              78.600293              68.255430

     COH.F.gamma.o.Pz.r.O1  COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  \
0                23.452271              45.678820              30.167520
1                26.777368              28.201062              57.108861
2                39.131547              69.920996              71.063644
3                36.478254              47.117006              84.658376
4                51.465531              58.635415              80.685608
..                     …                      …                      …
940              63.970519              63.982003              51.244725
941              44.756285              49.787513              98.905995
942              45.552852              33.638817              46.690983
943              41.248470              28.192238              48.665743
944              70.687410              74.433908              74.294750

     COH.F.gamma.p.P4.r.O1  COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  \
0                16.918761              48.850427               9.422630
1                32.375401              60.351749              13.900981
2                38.534505              69.908764              27.180532
3                24.724096              50.299349              35.319695
4                62.138436              75.888749              61.003944
..                     …                      …                      …
940              62.203684              62.062237              31.013031
941              54.021304              93.902401              52.740396
942              19.382928              41.050717               7.045821
943              42.007147              28.735945              27.176500
944              53.254681              72.755265              47.810386

     COH.F.gamma.q.T6.s.O2  COH.F.gamma.r.O1.s.O2
0                34.507082              28.613029
1                57.831848              43.463261
2                64.803155              31.485799
3                79.822944              41.141873
4                87.455509              70.531662
..                     …                      …
940              31.183413              98.325230
941              92.807331              56.320868
942              41.962451              19.092111
943              27.529522              20.028446
944              80.166825              64.380273

[945 rows x 1148 columns]
```

[10]:
```
df.isnull().sum()
```

[10]:
```
no.                        0
sex                        0
age                        0
eeg.date                   0
education                 15
                          ..
COH.F.gamma.p.P4.r.O1      0
COH.F.gamma.p.P4.s.O2      0
COH.F.gamma.q.T6.r.O1      0
COH.F.gamma.q.T6.s.O2      0
COH.F.gamma.r.O1.s.O2      0
Length: 1149, dtype: int64
```

[11]:
```
df.isna().sum()
```

[11]:
```
no.                        0
sex                        0
age                        0
eeg.date                   0
education                 15
                          ..
COH.F.gamma.p.P4.r.O1      0
COH.F.gamma.p.P4.s.O2      0
COH.F.gamma.q.T6.r.O1      0
COH.F.gamma.q.T6.s.O2      0
COH.F.gamma.r.O1.s.O2      0
Length: 1149, dtype: int64
```

[12]:
```
df_n = df.select_dtypes(include=np.number)
df_n.head(3)
```

[12]:

	no.	age	education	IQ	AB.A.delta.a.FP1	AB.A.delta.b.FP2	\
0	1	57.0	NaN	NaN	35.998557	21.717375	
1	2	37.0	6.0	120.0	13.425118	11.002916	
2	3	32.0	16.0	113.0	29.941780	27.544684	

	AB.A.delta.c.F7	AB.A.delta.d.F3	AB.A.delta.e.Fz	AB.A.delta.f.F4	…	\
0	21.518280	26.825048	26.611516	25.732649	…	
1	11.942516	15.272216	14.151570	12.456034	…	
2	17.150159	23.608960	27.087811	13.541237	…	

	COH.F.gamma.o.Pz.p.P4	COH.F.gamma.o.Pz.q.T6	COH.F.gamma.o.Pz.r.O1	\
0	55.989192	16.739679	23.452271	
1	45.595619	17.510824	26.777368	
2	99.475453	70.654171	39.131547	

	COH.F.gamma.o.Pz.s.O2	COH.F.gamma.p.P4.q.T6	COH.F.gamma.p.P4.r.O1	\

```
0              45.678820              30.167520              16.918761
1              28.201062              57.108861              32.375401
2              69.920996              71.063644              38.534505

   COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
0              48.850427               9.422630              34.507082
1              60.351749              13.900981              57.831848
2              69.908764              27.180532              64.803155

   COH.F.gamma.r.O1.s.O2
0              28.613029
1              43.463261
2              31.485799

[3 rows x 1145 columns]
```

[13]:
```
df_n.dropna(inplace=True)
```

[14]:
```
df_n.isna().sum()
```

[14]:
```
no.                      0
age                      0
education                0
IQ                       0
AB.A.delta.a.FP1         0
                        ..
COH.F.gamma.p.P4.r.O1    0
COH.F.gamma.p.P4.s.O2    0
COH.F.gamma.q.T6.r.O1    0
COH.F.gamma.q.T6.s.O2    0
COH.F.gamma.r.O1.s.O2    0
Length: 1145, dtype: int64
```

[15]:
```
len(df.columns)
```

[15]:
```
1149
```

[16]:
```
# select patients iq greater than 120
selected_patients = df[df['IQ']>120]
print(selected_patients)
```

```
     no. sex   age    eeg.date  education     IQ       main.disorder  \
3      4   M  35.0   2012.10.8       18.0  126.0  Addictive disorder
20    21   M  39.0  2013.12.27       12.0  128.0  Addictive disorder
24    25   M  29.0   2014.7.25       13.0  122.0  Addictive disorder
25    26   M  32.0   2014.9.19       16.0  130.0  Addictive disorder
26    27   M  34.0   2014.9.25       13.0  122.0  Addictive disorder
```

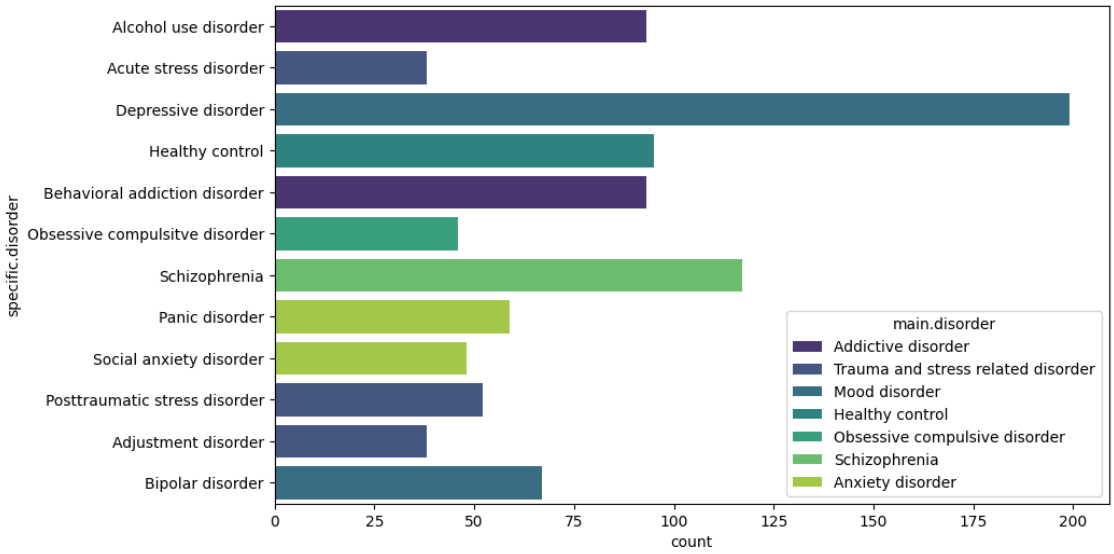
```
..   …  ..   …         …         …    …                 …
934  935   M  23.0   2014.6.26       13.0  131.0     Healthy control
935  936   M  27.0   2014.4.14       16.0  122.0     Healthy control
936  937   M  23.0   2014.4.14       13.0  123.0     Healthy control
937  938   M  26.0   2014.4.18       16.0  127.0     Healthy control
938  939   M  29.0   2014.4.16       18.0  130.0     Healthy control

        specific.disorder  AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  \
3    Alcohol use disorder         21.496226         21.846832  …
20   Alcohol use disorder         18.594568         17.020998  …
24   Alcohol use disorder         28.266495         23.889259  …
25   Alcohol use disorder         23.862238         25.011723  …
26   Alcohol use disorder         35.108163         42.887813  …
..                    …               …               …  …
934       Healthy control         21.125098         23.636749  …
935       Healthy control         11.712786         12.472304  …
936       Healthy control         20.099558         21.491891  …
937       Healthy control          6.327173          6.370860  …
938       Healthy control         15.400413         14.622849  …

     COH.F.gamma.o.Pz.p.P4  COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  \
3                59.986561             63.822201             36.478254
20               66.150793             43.733591             46.345936
24               81.612432             70.077831             75.798940
25               68.531282             21.546621             34.445536
26               88.886854             66.456432             83.580911
..                     …                     …                     …
934              77.427681             48.813793             29.998205
935              67.209548             62.903571             40.954661
936              86.469743             75.043089             79.176554
937              90.923235             82.187666             92.469412
938              97.228784             74.186797             74.739469

     COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  \
3                47.117006             84.658376             24.724096
20               43.451396             68.070934             34.620592
24               79.070644             75.923721             65.461649
25               55.440919             53.185026             30.162870
26               84.729349             83.011406             72.474619
..                     …                     …                     …
934              40.859875             78.314187             12.141051
935              59.450625             85.005252             49.203102
936              76.157824             91.734214             82.315585
937              93.095708             87.672772             93.434081
938              92.709466             80.974238             76.414496

     COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
3                50.299349             35.319695             79.822944
```

```
20                53.303624              26.108450              55.758419
24                80.722845              68.595564              84.772493
25                54.648530               9.405020              36.735498
26                89.339753              54.381208              78.826373
..                      …                      …                      …
934               24.764012               4.857296              19.541452
935               74.887720              50.122329              77.363955
936               89.407846              78.119131              85.188326
937               94.968517              87.684612              89.694546
938               97.041889              62.864379              82.283174

     COH.F.gamma.r.O1.s.O2
3                41.141873
20               41.950959
24               81.399830
25               36.308812
26               78.385065
..                     …
934              37.221202
935              66.167804
936              87.773846
937              99.287092
938              83.674491

[128 rows x 1149 columns]
```

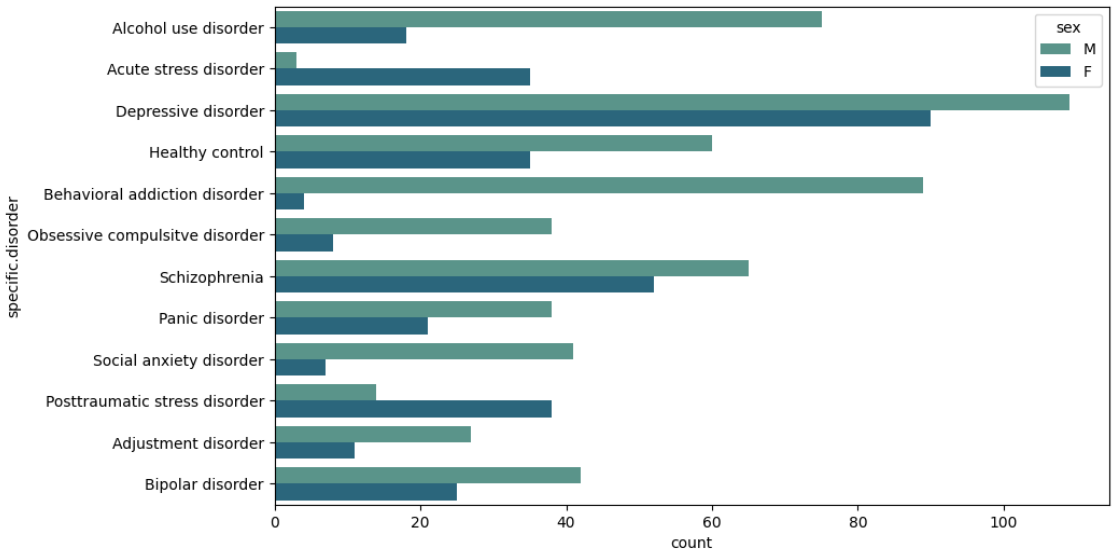
[17]:
```
df_c= df.select_dtypes(include='object')
df_c.head(3)
```

[17]:
```
   sex   eeg.date       main.disorder     specific.disorder
0   M  2012.8.30  Addictive disorder  Alcohol use disorder
1   M   2012.9.6  Addictive disorder  Alcohol use disorder
2   M  2012.9.10  Addictive disorder  Alcohol use disorder
```

[18]:
```
# main disorder and specific disorder // general public
plt.figure(figsize=(10,6))
sns.countplot(y='specific.disorder', hue='main.disorder', data = df_c,␣
 ↪palette='viridis')
plt.show()
```

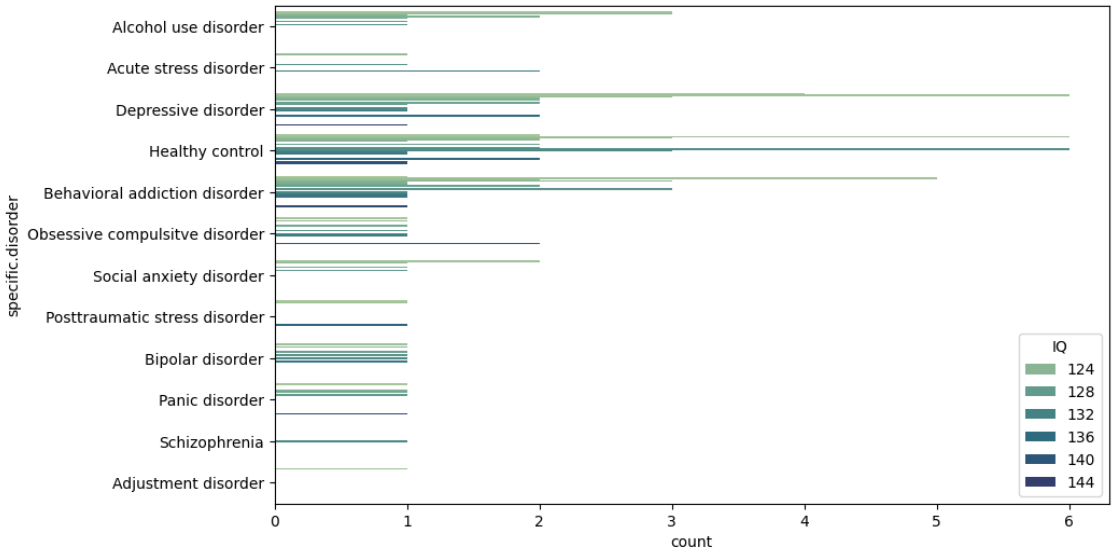


[19]:
```
# according to sex  // general public

plt.figure(figsize=(10,6))
sns.countplot(y='specific.disorder', hue='sex', data=df_c, palette='crest')
plt.show()
```



[20]:
```
# specific disorders // with over 120 iq

plt.figure(figsize=(10,6))
```

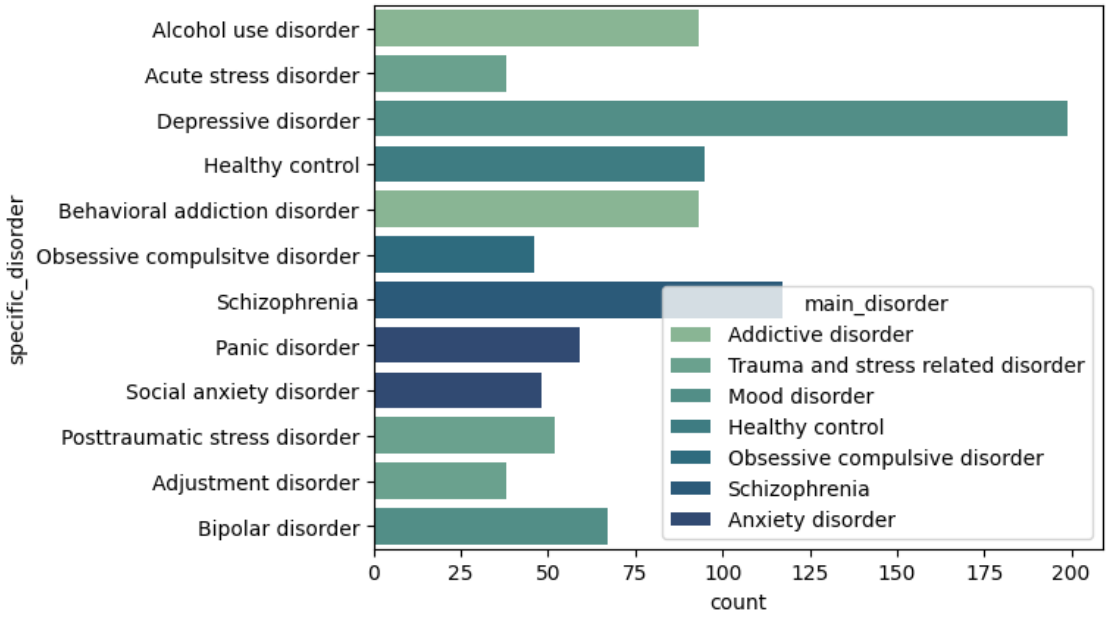
```
sns.countplot(y='specific.disorder', hue='IQ', data=selected_patients,␣
 ↪palette='crest')
plt.show()
```



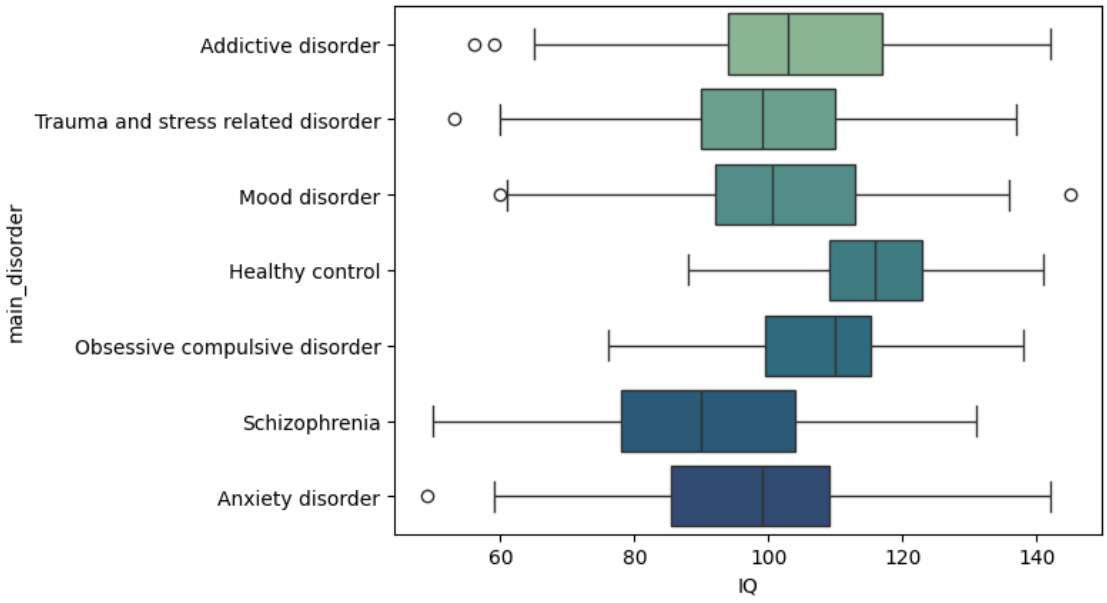
[21]:
```
df = df.rename(columns={'main.disorder': 'main_disorder', 'specific.disorder':␣
 ↪'specific_disorder'})
df['specific_disorder'].head()
```

[21]:
```
0    Alcohol use disorder
1    Alcohol use disorder
2    Alcohol use disorder
3    Alcohol use disorder
4    Alcohol use disorder
Name: specific_disorder, dtype: object
```

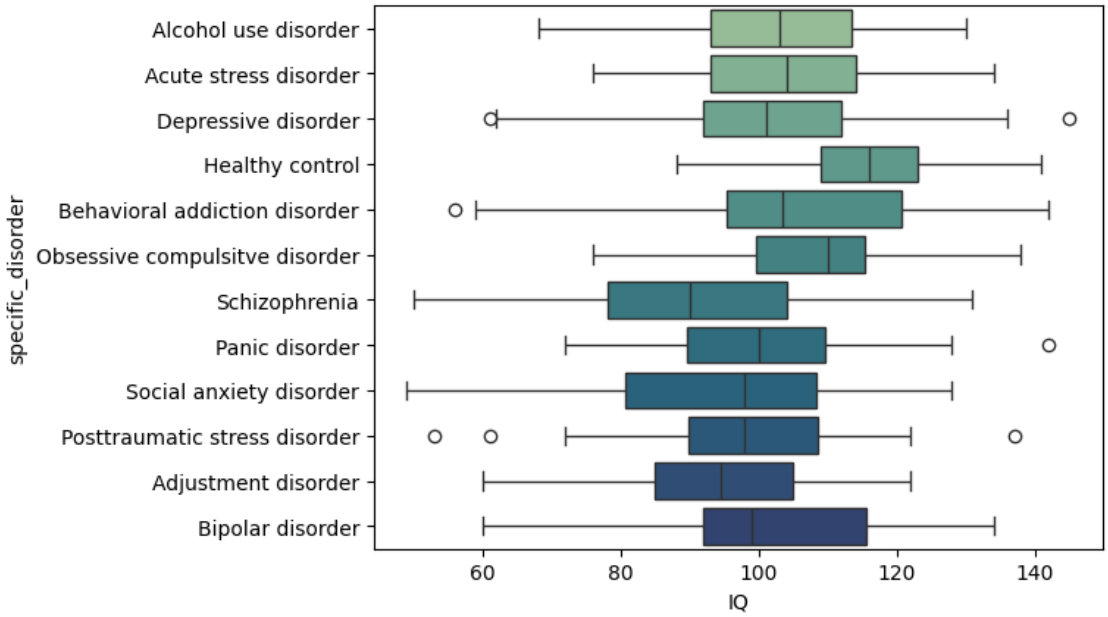
[22]:
```
# for patients with iq greater than 120
sns.countplot(y='specific_disorder', hue='main_disorder', data=df,␣
 ↪palette='crest')
plt.show()
```



[23]:
```
sns.boxplot(x='IQ', y='main_disorder', data=df, palette='crest')
plt.show()
```



[24]:
```
sns.boxplot(x='IQ', y='specific_disorder', data=df, palette='crest')
plt.show()
```



[25]:
```
alcoholic_patients = df[df['specific_disorder'] == 'Alcohol use disorder']
alcoholic_patients.sample(50
                          )
```

[25]:

	no.	sex	age	eeg.date	education	IQ	main_disorder	\
301	302	M	30.99	2011.11.28	13.0	107.0	Addictive disorder	
67	68	M	34.00	2016.8.10	16.0	107.0	Addictive disorder	
1	2	M	37.00	2012.9.6	6.0	120.0	Addictive disorder	
82	83	F	31.00	2016.1.20	16.0	90.0	Addictive disorder	
6	7	F	26.00	2012.12.3	16.0	103.0	Addictive disorder	
10	11	M	34.00	2013.2.18	13.0	91.0	Addictive disorder	
13	14	M	28.00	2013.4.15	14.0	118.0	Addictive disorder	
14	15	M	23.00	2013.4.11	13.0	116.0	Addictive disorder	
88	89	F	25.00	2017.7.12	14.0	105.0	Addictive disorder	
682	683	M	31.78	2018.2.6	16.0	85.0	Addictive disorder	
25	26	M	32.00	2014.9.19	16.0	130.0	Addictive disorder	
87	88	F	34.00	2017.6.20	12.0	83.0	Addictive disorder	
81	82	F	37.00	2016.2.25	12.0	96.0	Addictive disorder	
349	350	M	54.97	2012.1.19	14.0	109.0	Addictive disorder	
0	1	M	57.00	2012.8.30	NaN	NaN	Addictive disorder	
80	81	M	28.00	2018.10.30	16.0	117.0	Addictive disorder	
66	67	M	34.00	2016.6.23	14.0	99.0	Addictive disorder	
27	28	M	26.00	2014.12.18	17.0	108.0	Addictive disorder	
75	76	M	25.00	2017.5.24	12.0	99.0	Addictive disorder	
894	895	F	49.01	2011.7.27	10.0	106.0	Addictive disorder	
23	24	M	23.00	2014.7.25	12.0	104.0	Addictive disorder	

```
876  877   F  54.52   2018.6.22       6.0   68.0  Addictive disorder
85    86   F  20.00   2017.2.21      13.0  124.0  Addictive disorder
16    17   M  26.00   2013.8.29      12.0  107.0  Addictive disorder
83    84   F  19.00    2016.9.7      13.0   91.0  Addictive disorder
861  862   M  37.54   2011.12.2      16.0  111.0  Addictive disorder
12    13   M  20.00   2013.2.20      13.0  105.0  Addictive disorder
20    21   M  39.00  2013.12.27      12.0  128.0  Addictive disorder
442  443   M  57.93   2017.5.30       1.0   90.0  Addictive disorder
670  671   M  27.73  2017.11.17      12.0   83.0  Addictive disorder
7      8   M  23.00   2013.1.17      12.0  104.0  Addictive disorder
64    65   M  23.00   2016.5.26      16.0  101.0  Addictive disorder
909  910   M  22.33   2015.4.15      13.0   76.0  Addictive disorder
22    23   M  30.00    2014.7.7      16.0  102.0  Addictive disorder
5      6   F  24.00  2012.11.21      14.0  105.0  Addictive disorder
17    18   M  30.00   2013.9.27       NaN   86.0  Addictive disorder
819  820   M  46.89   2011.6.29      16.0  123.0  Addictive disorder
300  301   M  23.52   2011.7.25      15.0   88.0  Addictive disorder
348  349   M  24.40    2011.9.5      13.0   96.0  Addictive disorder
455  456   F  33.70    2014.3.4      13.0   96.0  Addictive disorder
84    85   F  20.00  2016.12.16      13.0   91.0  Addictive disorder
65    66   M  33.00    2016.6.4      13.0   93.0  Addictive disorder
71    72   M  34.00   2017.1.19      16.0  107.0  Addictive disorder
405  406   M  40.95   2012.7.10      16.0  123.0  Addictive disorder
560  561   M  46.21   2016.2.19      12.0  123.0  Addictive disorder
390  391   M  54.37   2012.3.22      10.0  114.0  Addictive disorder
62    63   M  23.00   2016.4.30      13.0   97.0  Addictive disorder
11    12   M  32.00    2013.3.8      12.0   93.0  Addictive disorder
77    78   M  22.00  2017.11.27      13.0   82.0  Addictive disorder
60    61   M  34.00   2016.3.10      12.0    NaN  Addictive disorder

        specific_disorder  AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  \
301  Alcohol use disorder         22.673611         18.851455  …
67   Alcohol use disorder         26.280731         21.654879  …
1    Alcohol use disorder         13.425118         11.002916  …
82   Alcohol use disorder         11.118658         12.152308  …
6    Alcohol use disorder         21.780747         26.655328  …
10   Alcohol use disorder         37.148686         43.505954  …
13   Alcohol use disorder         15.839578         29.317361  …
14   Alcohol use disorder         16.085436         15.888002  …
88   Alcohol use disorder         14.614688         14.341742  …
682  Alcohol use disorder          7.714905          7.678257  …
25   Alcohol use disorder         23.862238         25.011723  …
87   Alcohol use disorder          7.498297         11.361613  …
81   Alcohol use disorder         18.919873         19.605953  …
349  Alcohol use disorder         21.984909         24.891501  …
0    Alcohol use disorder         35.998557         21.717375  …
80   Alcohol use disorder         22.555002         27.200451  …
```

```
66   Alcohol use disorder         17.065286         20.027043  …
27   Alcohol use disorder         16.084295         19.080538  …
75   Alcohol use disorder         14.838166         16.509008  …
894  Alcohol use disorder         16.224258         14.015313  …
23   Alcohol use disorder         18.801811         17.189632  …
876  Alcohol use disorder         17.581980         17.776402  …
85   Alcohol use disorder         15.272855         12.830650  …
16   Alcohol use disorder         16.338257         17.716162  …
83   Alcohol use disorder         12.029194         12.751139  …
861  Alcohol use disorder         12.887892         12.811554  …
12   Alcohol use disorder         30.398862         32.378603  …
20   Alcohol use disorder         18.594568         17.020998  …
442  Alcohol use disorder          9.922907         11.831574  …
670  Alcohol use disorder         12.894573         12.524952  …
7    Alcohol use disorder         11.704212         10.600361  …
64   Alcohol use disorder         14.177352         13.939398  …
909  Alcohol use disorder         47.686866         47.886870  …
22   Alcohol use disorder         31.038585         22.106863  …
5    Alcohol use disorder         13.482096         14.095855  …
17   Alcohol use disorder         12.443237         12.503703  …
819  Alcohol use disorder         30.809466         25.871575  …
300  Alcohol use disorder          6.467275          6.550252  …
348  Alcohol use disorder         14.089863         15.899611  …
455  Alcohol use disorder         22.721720         23.322754  …
84   Alcohol use disorder          7.104149          5.323974  …
65   Alcohol use disorder         37.334489         45.513278  …
71   Alcohol use disorder         13.357842         12.379480  …
405  Alcohol use disorder         11.585707         12.693576  …
560  Alcohol use disorder          8.877583          8.232280  …
390  Alcohol use disorder         45.272044         24.361653  …
62   Alcohol use disorder         11.293319         12.258857  …
11   Alcohol use disorder         26.103685         26.800251  …
77   Alcohol use disorder         14.618810         13.783166  …
60   Alcohol use disorder         24.662682         26.633415  …

     COH.F.gamma.o.Pz.p.P4  COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  \
301               49.390753              76.120406              61.548068
67                88.138867              65.537281              60.685651
1                 45.595619              17.510824              26.777368
82                84.825697              62.094883              49.639937
6                 73.017845              50.593309              56.250644
10                70.170758              45.126013              55.914579
13                85.243783              68.695620              40.025221
14                82.573925              83.454627              85.557930
88                45.017023              43.473443              53.042331
682               70.057391              41.137684              53.964320
25                68.531282              21.546621              34.445536
```

87	82.339470	59.173842	62.650658
81	79.562306	34.317402	36.764725
349	82.445149	61.483474	69.193476
0	55.989192	16.739679	23.452271
80	89.076343	62.866037	71.872855
66	69.178880	28.629190	30.048341
27	69.464929	64.353574	59.280807
75	51.292403	25.954840	30.097940
894	76.020507	30.140302	38.413929
23	97.793319	91.142287	96.921661
876	77.398455	48.282117	73.185133
85	89.692658	54.274851	60.789694
16	68.183641	47.030523	73.424824
83	21.183430	26.105229	9.493163
861	91.791357	59.890110	60.006472
12	92.355787	70.628076	76.911547
20	66.150793	43.733591	46.345936
442	76.976719	45.649085	47.377828
670	79.142092	51.164307	56.541607
7	91.645799	63.962652	58.120225
64	72.168070	59.235392	68.060937
909	57.006587	34.718710	34.084473
22	86.339471	50.377154	88.515835
5	92.841723	82.302355	83.938567
17	85.080600	53.533875	62.817411
819	89.856949	56.430752	71.150372
300	66.199980	34.178296	37.536187
348	76.125124	49.983971	47.291112
455	87.727331	54.979820	81.987264
84	69.176918	45.119814	56.686578
65	82.247792	87.584324	64.015634
71	52.212412	34.864661	39.983137
405	82.234690	39.263800	47.093449
560	89.230885	68.833990	71.078765
390	93.110676	76.897910	81.006395
62	53.871904	36.780647	40.489615
11	90.440081	72.276539	76.953847
77	21.707884	12.661076	10.749855
60	97.604816	95.104526	97.025922

	COH.F.gamma.o.Pz.s.O2	COH.F.gamma.p.P4.q.T6	COH.F.gamma.p.P4.r.O1	\
301	70.168012	53.711601	41.115865	
67	73.673104	73.276730	53.334313	
1	28.201062	57.108861	32.375401	
82	61.347225	81.630630	39.464753	
6	46.572808	69.617082	51.808149	
10	50.152218	71.432998	37.572163	

13	57.379976	83.597852	29.598081
14	87.400680	89.664202	80.320301
88	84.701287	34.149126	23.170459
682	63.513926	56.456364	32.440379
25	55.440919	53.185026	30.162870
87	60.135772	76.513270	47.052214
81	42.045754	59.033333	37.401100
349	71.842925	75.189843	57.160185
0	45.678820	30.167520	16.918761
80	72.954244	75.377511	62.201226
66	31.640764	57.602896	19.857412
27	63.454471	77.621193	58.674138
75	35.924008	65.452535	14.164692
894	66.371912	60.563340	21.307001
23	96.265641	95.226613	97.129973
876	66.742485	49.466312	59.270167
85	69.561827	70.339738	50.588009
16	72.641229	42.725536	53.852002
83	16.996185	34.284862	4.672354
861	76.000963	76.940229	51.995874
12	70.122238	82.583636	75.606185
20	43.451396	68.070934	34.620592
442	49.430914	68.724785	35.627919
670	66.237559	69.000918	34.915975
7	69.767127	80.165627	58.648915
64	59.584957	71.261016	59.390737
909	37.717071	62.169600	28.857060
22	85.445020	63.853514	75.637308
5	88.213886	90.972026	77.443894
17	68.040950	71.834549	48.779049
819	61.084744	68.413078	63.467402
300	30.739003	57.183414	23.648564
348	41.846379	73.184747	48.014617
455	88.628318	66.455585	66.486936
84	59.244349	66.922586	57.673531
65	69.176069	95.392062	51.476474
71	42.729773	53.772834	40.914238
405	54.178456	61.574283	36.567879
560	76.028078	78.501426	65.516916
390	79.168606	87.468118	78.518536
62	40.376618	60.181089	49.353955
11	74.134910	85.531664	69.081987
77	11.209594	21.703373	13.457362
60	97.052166	98.271856	95.450499

	COH.F.gamma.p.P4.s.O2	COH.F.gamma.q.T6.r.O1	COH.F.gamma.q.T6.s.O2	\
301	48.131848	66.125444	79.135269	

67	69.946598	38.232518	57.519483
1	60.351749	13.900981	57.831848
82	72.168580	30.893891	74.038603
6	56.495169	52.526873	62.801103
10	62.854243	25.826367	63.988911
13	62.147945	22.581017	61.807832
14	88.873568	85.545665	95.517283
88	63.803155	27.437383	62.218730
682	58.916532	23.123327	62.753962
25	54.648530	9.405020	36.735498
87	68.780315	36.348038	65.033239
81	59.385030	31.549557	70.824295
349	80.077069	51.880041	81.643916
0	48.850427	9.422630	34.507082
80	79.192418	48.034932	82.685602
66	43.591837	10.803227	53.267521
27	71.153569	57.200711	77.398159
75	46.608077	8.066409	51.373129
894	84.886865	9.804814	63.434182
23	97.807254	90.029086	93.887174
876	66.639938	40.297206	55.547526
85	75.275265	43.897477	78.079657
16	63.786830	43.858619	54.839180
83	17.636781	5.860376	37.360103
861	83.445173	29.867826	64.298916
12	75.750899	64.954108	72.029697
20	53.303624	26.108450	55.758419
442	59.771883	29.662428	70.677161
670	62.855194	22.351374	61.772871
7	79.533814	35.510554	45.811328
64	65.879927	53.848733	77.390550
909	58.361650	12.907714	72.474137
22	85.706494	47.723478	69.634970
5	89.545596	72.579530	89.462863
17	80.516443	22.049743	76.277261
819	68.443197	43.278102	61.356820
300	38.254316	19.588721	46.810038
348	70.296711	46.591304	53.179660
455	83.386597	41.805748	69.200769
84	74.853986	45.027921	67.134456
65	77.265656	58.582392	80.236869
71	57.513073	32.132096	60.872408
405	63.405922	24.806135	64.411668
560	75.794378	56.713973	68.716195
390	84.187145	74.973511	86.870502
62	59.325770	36.912417	50.327513
11	82.244258	59.842449	79.882000

77	16.715751	11.050278	15.004535
60	98.409254	92.471287	97.838293

	COH.F.gamma.r.01.s.02
301	63.046728
67	75.058783
1	43.463261
82	51.237679
6	56.710212
10	47.229300
13	30.880683
14	91.522935
88	66.756214
682	49.747184
25	36.308812
87	44.962903
81	54.036431
349	68.495207
0	28.613029
80	65.159778
66	39.030876
27	62.201374
75	30.754972
894	33.162128
23	97.775301
876	63.630547
85	60.430207
16	69.820884
83	8.967481
861	61.308432
12	85.218801
20	41.950959
442	49.864709
670	52.980003
7	60.417464
64	61.077926
909	22.491821
22	88.670648
5	86.127823
17	45.629506
819	47.681708
300	25.900504
348	25.434233
455	74.109527
84	71.391069
65	65.433131
71	57.256823

```
405              63.367484
560              64.171776
390              81.271084
62               51.038371
11               74.887129
77               16.004621
60               96.528896

[50 rows x 1149 columns]
```

[26]:
```
df['specific_disorder'].value_counts()
```

[26]:
```
specific_disorder
Depressive disorder                199
Schizophrenia                      117
Healthy control                     95
Alcohol use disorder                93
Behavioral addiction disorder       93
Bipolar disorder                    67
Panic disorder                      59
Posttraumatic stress disorder       52
Social anxiety disorder             48
Obsessive compulsitve disorder      46
Acute stress disorder               38
Adjustment disorder                 38
Name: count, dtype: int64
```

[27]:
```
addictive_disorder = df[df['main_disorder'] == 'Addictive disorder']
addictive = addictive_disorder.sample(50)
addictive.head()
```

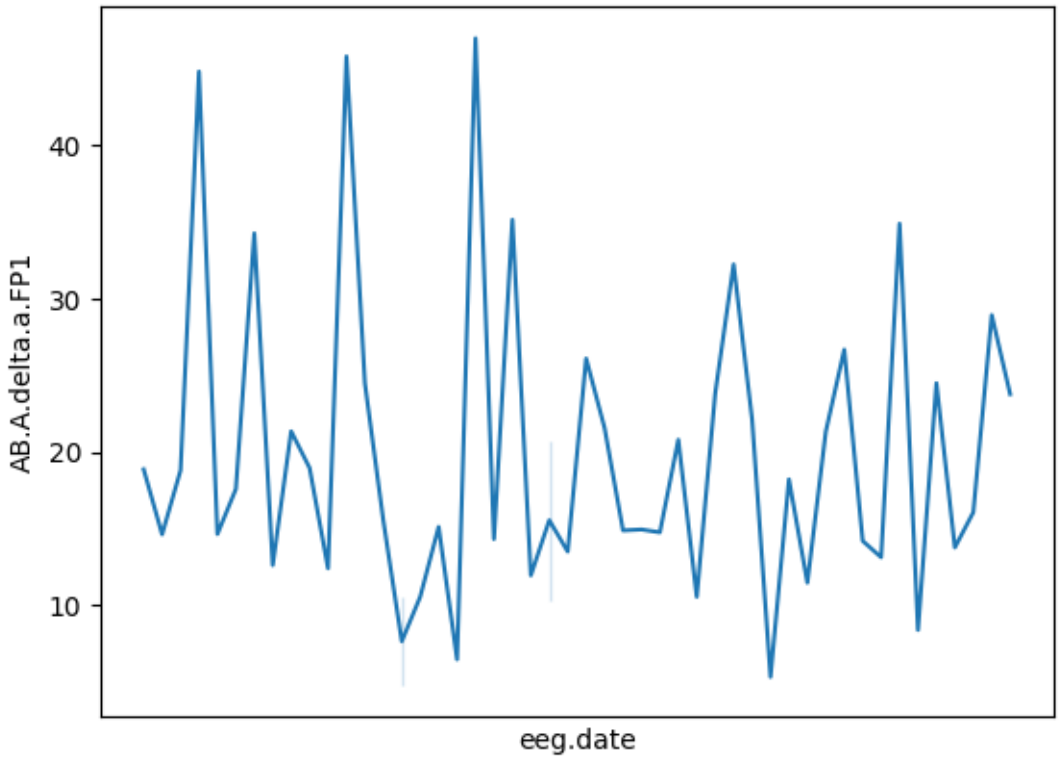
[27]:
```
     no. sex   age    eeg.date  education     IQ       main_disorder  \
150  151   M  19.0   2013.6.18       12.0  107.0  Addictive disorder
260  261   F  23.0  2018.10.11       16.0   96.0  Addictive disorder
71    72   M  34.0   2017.1.19       16.0  107.0  Addictive disorder
151  152   M  27.0   2013.6.24       12.0  105.0  Addictive disorder
257  258   M  21.0   2019.2.23       13.0  102.0  Addictive disorder

                 specific_disorder  AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  \
150  Behavioral addiction disorder         27.938391         31.482511  …
260  Behavioral addiction disorder         10.963699         12.376115  …
71           Alcohol use disorder         13.357842         12.379480  …
151  Behavioral addiction disorder         15.782449         15.520606  …
257  Behavioral addiction disorder         11.147312          9.069540  …

     COH.F.gamma.o.Pz.p.P4  COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  \
150              95.495126              92.513337              74.533559
```

```
260              77.828581              61.782518              68.094618
71               52.212412              34.864661              39.983137
151              53.713087              34.100863              44.180541
257              78.298910              41.735530              70.149718

     COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  \
150              91.565183              95.724800              71.576803
260              66.663328              78.273538              64.793949
71               42.729773              53.772834              40.914238
151              35.978178              50.757185              39.750076
257              57.306248              46.356969              56.412868

     COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
150              93.577678              71.642963              97.157928
260              78.558786              55.037308              74.845026
71               57.513073              32.132096              60.872408
151              43.579180              29.551684              40.574563
257              53.403973              33.841508              37.189887

     COH.F.gamma.r.O1.s.O2
150              74.915605
260              72.426081
71               57.256823
151              42.123992
257              56.846657

[5 rows x 1149 columns]
```

[28]:
```
df_c.columns
```

[28]:
```
Index(['sex', 'eeg.date', 'main.disorder', 'specific.disorder'], dtype='object')
```

[29]:
```
df2 = df.sample(50)
sns.lineplot(x='eeg.date', y='AB.A.delta.a.FP1', data=df2, palette='crest')
plt.xticks([])
plt.show()
```



[30]:
```
schizophrenia = df[df['main_disorder'] == 'Schizophrenia']
schizophrenia.head()
```

[30]:

	no.	sex	age	eeg.date	education	IQ	main_disorder	\
283	284	M	29.22	2012.1.11	16.0	102.0	Schizophrenia	
290	291	M	18.77	2013.4.22	12.0	95.0	Schizophrenia	
291	292	M	24.53	2011.1.17	15.0	114.0	Schizophrenia	
292	293	F	23.28	2011.1.10	16.0	94.0	Schizophrenia	
298	299	M	56.51	2011.2.14	12.0	97.0	Schizophrenia	

	specific_disorder	AB.A.delta.a.FP1	AB.A.delta.b.FP2	…	\
283	Schizophrenia	13.533164	14.711985	…	
290	Schizophrenia	7.970252	7.266967	…	
291	Schizophrenia	8.269064	10.083543	…	
292	Schizophrenia	24.920269	23.793912	…	
298	Schizophrenia	22.115575	19.107165	…	

	COH.F.gamma.o.Pz.p.P4	COH.F.gamma.o.Pz.q.T6	COH.F.gamma.o.Pz.r.O1	\
283	66.019853	43.970020	46.364561	
290	64.171960	70.035610	60.114549	
291	62.572653	41.940265	34.265888	
292	75.048447	36.701346	40.122985	

```
298              70.981709              38.617658              31.883457

     COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  \
283              51.988403              58.615577              36.998060
290              56.457333              62.986150              44.837748
291              51.330723              63.553482              24.377419
292              51.511086              40.950687              45.449571
298              37.845721              53.874866              33.885331

     COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
283              55.852831              30.335654              54.374133
290              51.857004              53.691281              62.306837
291              59.216170              11.659469              62.701330
292              63.396844              17.737763              29.802046
298              47.987555              24.885383              50.268147

     COH.F.gamma.r.O1.s.O2
283              47.250159
290              48.211705
291              28.049332
292              49.315534
298              48.232344

[5 rows x 1149 columns]
```

[31]:
```
depression = df[df['specific_disorder'] == 'Depressive disorder']
depression.head()
```

[31]:
```
    no. sex    age    eeg.date  education     IQ  main_disorder  \
89   90   F  32.87   2015.9.21       16.0  108.0  Mood disorder
90   91   F  20.24   2016.12.9       12.0  127.0  Mood disorder
91   92   F  19.89  2015.10.21       13.0  113.0  Mood disorder
92   93   F  39.18    2017.3.3       16.0    NaN  Mood disorder
93   94   F  28.42   2017.3.20        9.0    NaN  Mood disorder

      specific_disorder  AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  \
89  Depressive disorder         12.159137         13.113503  …
90  Depressive disorder         12.404484          9.737819  …
91  Depressive disorder         16.573145         15.586708  …
92  Depressive disorder         26.650019         22.823161  …
93  Depressive disorder         14.624474         14.277301  …

    COH.F.gamma.o.Pz.p.P4  COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  \
89              65.408894              59.590594              77.310851
90              84.366954              53.402639              60.535899
91              62.681353              20.062716              36.041763
92              86.582363              83.045735              85.752150
```

```
93              85.309981              58.218838              61.211830

    COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  \
89              75.280467              57.311188              48.015594
90              73.838548              72.298636              43.330485
91              36.436509              47.491240              20.875426
92              85.875624              86.286859              79.520327
93              65.038486              76.899037              49.849540

    COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
89              59.579033              68.503920              82.885151
90              71.298037              23.109295              62.098128
91              53.747615               8.009907              50.202188
92              84.541455              82.452224              86.950905
93              71.791429              39.910653              82.739819

    COH.F.gamma.r.O1.s.O2
89              86.986191
90              67.749204
91              33.647889
92              87.384296
93              62.285969

[5 rows x 1149 columns]
```

[32]:
```
ptsd = df[df['specific_disorder'] == 'Posttraumatic stress disorder']
ptsd.head()
```

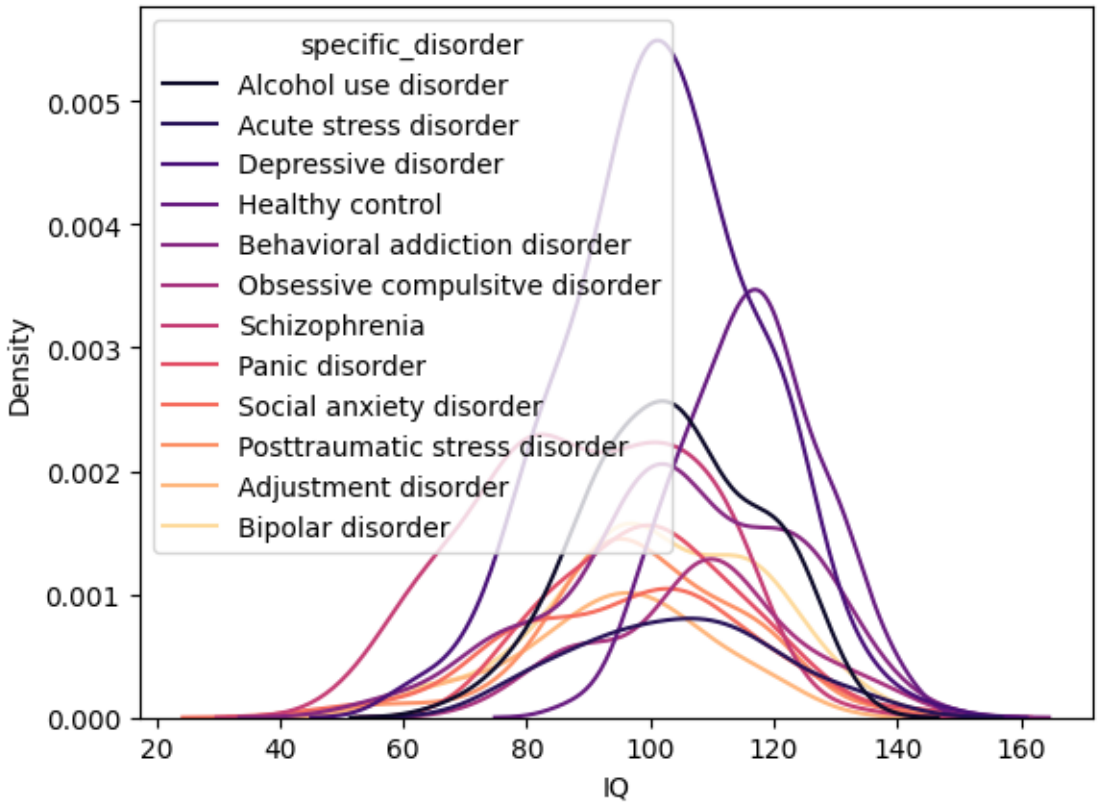
[32]:
```
     no. sex    age   eeg.date  education     IQ  \
297  298   F  36.62  2011.1.28       12.0   99.0
309  310   F  55.21   2012.4.9       16.0  120.0
310  311   F  26.93  2011.3.24       16.0  116.0
315  316   M  26.71   2012.7.3       17.0  137.0
318  319   F  23.45   2014.6.2       12.0   89.0

                         main_disorder              specific_disorder  \
297  Trauma and stress related disorder  Posttraumatic stress disorder
309  Trauma and stress related disorder  Posttraumatic stress disorder
310  Trauma and stress related disorder  Posttraumatic stress disorder
315  Trauma and stress related disorder  Posttraumatic stress disorder
318  Trauma and stress related disorder  Posttraumatic stress disorder

     AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  COH.F.gamma.o.Pz.p.P4  \
297         17.603385         17.243334  …              94.727123
309         21.714048         19.579805  …              83.821476
310         13.371076         14.028142  …              70.585726
315         30.473244         13.954586  …              87.768539
```

```
318         18.488575         19.603144  …              70.188502

     COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  COH.F.gamma.o.Pz.s.O2  \
297              73.994841              75.159075              72.479599
309              61.617403              63.964423              73.096645
310              63.864062              46.127953              65.675414
315              71.799769              65.845016              67.734909
318              27.698816              24.181746              34.445899

     COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  COH.F.gamma.p.P4.s.O2  \
297              81.756815              74.578657              78.980627
309              74.161249              50.432291              77.440228
310              62.455949              33.114945              56.163998
315              78.328065              58.141474              68.113967
318              47.797466              20.737129              47.210870

     COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  COH.F.gamma.r.O1.s.O2
297              60.508215              65.113378              69.238767
309              35.794362              70.592405              48.283439
310              37.477109              72.732968              46.665464
315              53.391012              71.111448              67.598506
318              11.104500              50.442443              36.952529

[5 rows x 1149 columns]
```

[33]:
```
df_c.columns
```

[33]:
```
Index(['sex', 'eeg.date', 'main.disorder', 'specific.disorder'], dtype='object')
```

[34]:
```
sns.kdeplot(x='IQ', hue='specific_disorder', data=df, palette='magma')
plt.show()
```



[35]:
```
iq = df[df['IQ']>120]
iq.head()
```

[35]:

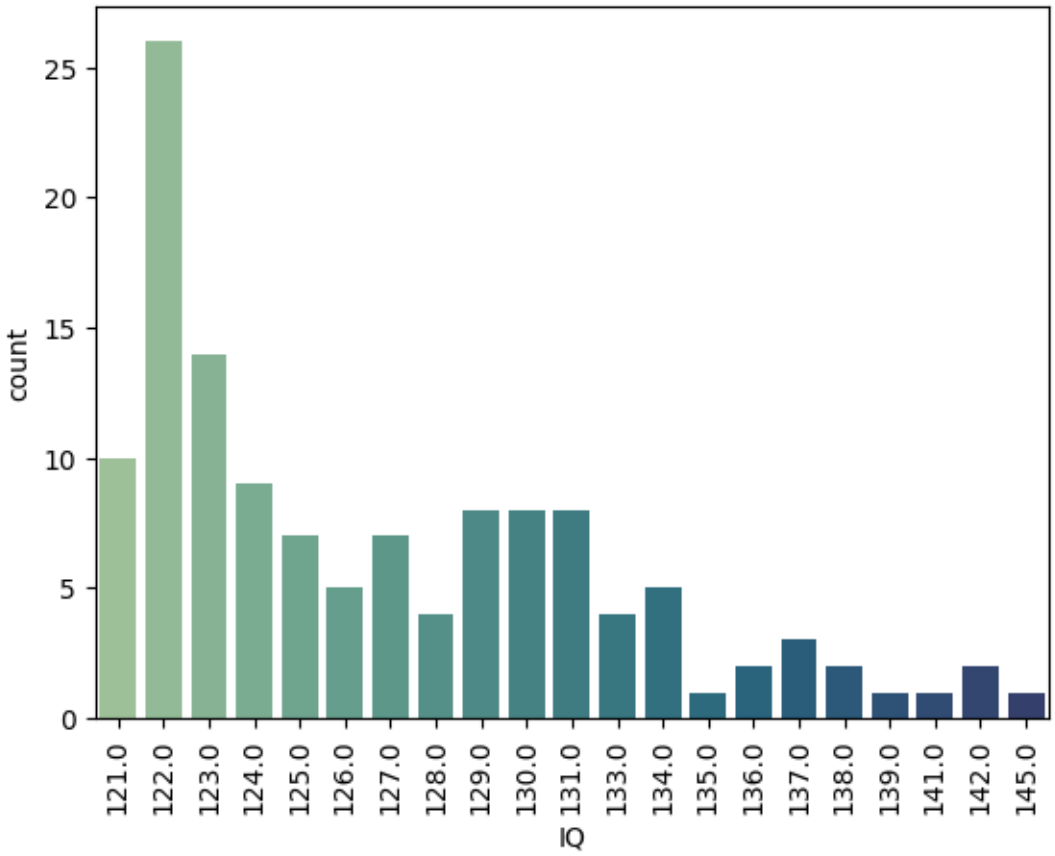
	no.	sex	age	eeg.date	education	IQ	main_disorder	\
3	4	M	35.0	2012.10.8	18.0	126.0	Addictive disorder	
20	21	M	39.0	2013.12.27	12.0	128.0	Addictive disorder	
24	25	M	29.0	2014.7.25	13.0	122.0	Addictive disorder	
25	26	M	32.0	2014.9.19	16.0	130.0	Addictive disorder	
26	27	M	34.0	2014.9.25	13.0	122.0	Addictive disorder	

	specific_disorder	AB.A.delta.a.FP1	AB.A.delta.b.FP2	…	\
3	Alcohol use disorder	21.496226	21.846832	…	
20	Alcohol use disorder	18.594568	17.020998	…	
24	Alcohol use disorder	28.266495	23.889259	…	
25	Alcohol use disorder	23.862238	25.011723	…	
26	Alcohol use disorder	35.108163	42.887813	…	

	COH.F.gamma.o.Pz.p.P4	COH.F.gamma.o.Pz.q.T6	COH.F.gamma.o.Pz.r.O1	\
3	59.986561	63.822201	36.478254	
20	66.150793	43.733591	46.345936	
24	81.612432	70.077831	75.798940	

```
25              68.531282              21.546621              34.445536
26              88.886854              66.456432              83.580911

    COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  \
3               47.117006              84.658376              24.724096
20              43.451396              68.070934              34.620592
24              79.070644              75.923721              65.461649
25              55.440919              53.185026              30.162870
26              84.729349              83.011406              72.474619

    COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
3               50.299349              35.319695              79.822944
20              53.303624              26.108450              55.758419
24              80.722845              68.595564              84.772493
25              54.648530               9.405020              36.735498
26              89.339753              54.381208              78.826373

    COH.F.gamma.r.O1.s.O2
3               41.141873
20              41.950959
24              81.399830
25              36.308812
26              78.385065

[5 rows x 1149 columns]
```

[36]:
```
sns.countplot(x='IQ', data=iq, palette='crest')
plt.xticks(rotation=90)
plt.show()
```



[37]:
```
# depression and ptsd
depression.head(
)
```

[37]:
```
    no. sex    age    eeg.date  education     IQ  main_disorder  \
89   90   F  32.87   2015.9.21       16.0  108.0  Mood disorder
90   91   F  20.24   2016.12.9       12.0  127.0  Mood disorder
91   92   F  19.89  2015.10.21       13.0  113.0  Mood disorder
92   93   F  39.18    2017.3.3       16.0    NaN  Mood disorder
93   94   F  28.42   2017.3.20        9.0    NaN  Mood disorder

      specific_disorder  AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  \
89  Depressive disorder         12.159137         13.113503  …
90  Depressive disorder         12.404484          9.737819  …
91  Depressive disorder         16.573145         15.586708  …
92  Depressive disorder         26.650019         22.823161  …
93  Depressive disorder         14.624474         14.277301  …

    COH.F.gamma.o.Pz.p.P4  COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  \
89              65.408894              59.590594              77.310851
```

```
90              84.366954              53.402639              60.535899
91              62.681353              20.062716              36.041763
92              86.582363              83.045735              85.752150
93              85.309981              58.218838              61.211830

    COH.F.gamma.o.Pz.s.O2  COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  \
89              75.280467              57.311188              48.015594
90              73.838548              72.298636              43.330485
91              36.436509              47.491240              20.875426
92              85.875624              86.286859              79.520327
93              65.038486              76.899037              49.849540

    COH.F.gamma.p.P4.s.O2  COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  \
89              59.579033              68.503920              82.885151
90              71.298037              23.109295              62.098128
91              53.747615               8.009907              50.202188
92              84.541455              82.452224              86.950905
93              71.791429              39.910653              82.739819

    COH.F.gamma.r.O1.s.O2
89              86.986191
90              67.749204
91              33.647889
92              87.384296
93              62.285969

[5 rows x 1149 columns]
```

[38]:
```
ptsd.head()
```

[38]:
```
     no. sex    age   eeg.date  education     IQ  \
297  298   F  36.62  2011.1.28       12.0   99.0
309  310   F  55.21   2012.4.9       16.0  120.0
310  311   F  26.93  2011.3.24       16.0  116.0
315  316   M  26.71   2012.7.3       17.0  137.0
318  319   F  23.45   2014.6.2       12.0   89.0

                         main_disorder             specific_disorder  \
297  Trauma and stress related disorder  Posttraumatic stress disorder
309  Trauma and stress related disorder  Posttraumatic stress disorder
310  Trauma and stress related disorder  Posttraumatic stress disorder
315  Trauma and stress related disorder  Posttraumatic stress disorder
318  Trauma and stress related disorder  Posttraumatic stress disorder

     AB.A.delta.a.FP1  AB.A.delta.b.FP2  …  COH.F.gamma.o.Pz.p.P4  \
297         17.603385         17.243334  …              94.727123
309         21.714048         19.579805  …              83.821476
```

```
310         13.371076         14.028142  …             70.585726
315         30.473244         13.954586  …             87.768539
318         18.488575         19.603144  …             70.188502

     COH.F.gamma.o.Pz.q.T6  COH.F.gamma.o.Pz.r.O1  COH.F.gamma.o.Pz.s.O2  \
297              73.994841              75.159075              72.479599
309              61.617403              63.964423              73.096645
310              63.864062              46.127953              65.675414
315              71.799769              65.845016              67.734909
318              27.698816              24.181746              34.445899

     COH.F.gamma.p.P4.q.T6  COH.F.gamma.p.P4.r.O1  COH.F.gamma.p.P4.s.O2  \
297              81.756815              74.578657              78.980627
309              74.161249              50.432291              77.440228
310              62.455949              33.114945              56.163998
315              78.328065              58.141474              68.113967
318              47.797466              20.737129              47.210870

     COH.F.gamma.q.T6.r.O1  COH.F.gamma.q.T6.s.O2  COH.F.gamma.r.O1.s.O2
297              60.508215              65.113378              69.238767
309              35.794362              70.592405              48.283439
310              37.477109              72.732968              46.665464
315              53.391012              71.111448              67.598506
318              11.104500              50.442443              36.952529

[5 rows x 1149 columns]
```

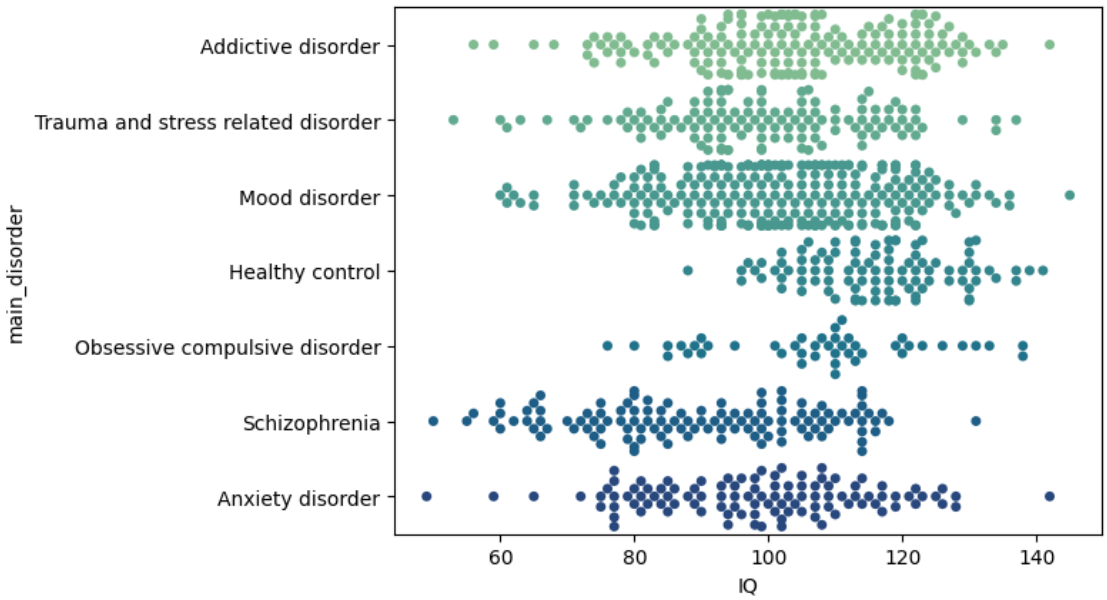
[39]:
```
df_c.columns
```

[39]:
```
Index(['sex', 'eeg.date', 'main.disorder', 'specific.disorder'], dtype='object')
```

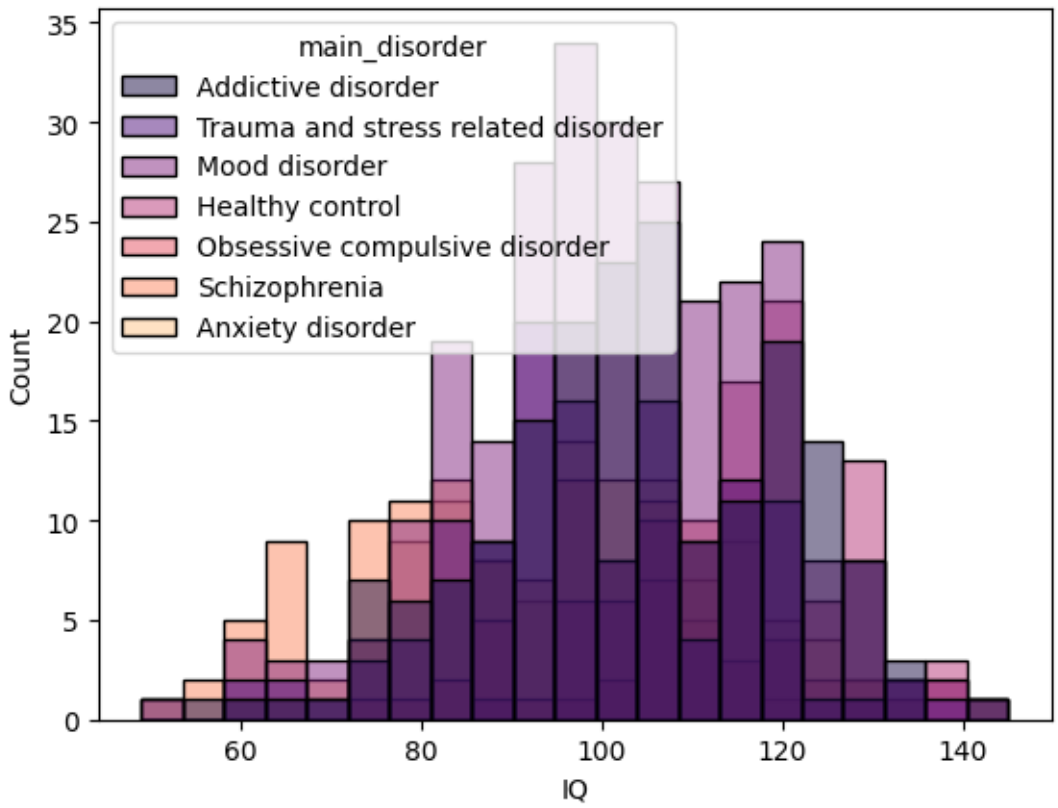
[40]:
```
df_n.columns
```

[40]:
```
Index(['no.', 'age', 'education', 'IQ', 'AB.A.delta.a.FP1', 'AB.A.delta.b.FP2',
       'AB.A.delta.c.F7', 'AB.A.delta.d.F3', 'AB.A.delta.e.Fz',
       'AB.A.delta.f.F4',
       …
       'COH.F.gamma.o.Pz.p.P4', 'COH.F.gamma.o.Pz.q.T6',
       'COH.F.gamma.o.Pz.r.O1', 'COH.F.gamma.o.Pz.s.O2',
       'COH.F.gamma.p.P4.q.T6', 'COH.F.gamma.p.P4.r.O1',
       'COH.F.gamma.p.P4.s.O2', 'COH.F.gamma.q.T6.r.O1',
       'COH.F.gamma.q.T6.s.O2', 'COH.F.gamma.r.O1.s.O2'],
      dtype='object', length=1145)
```

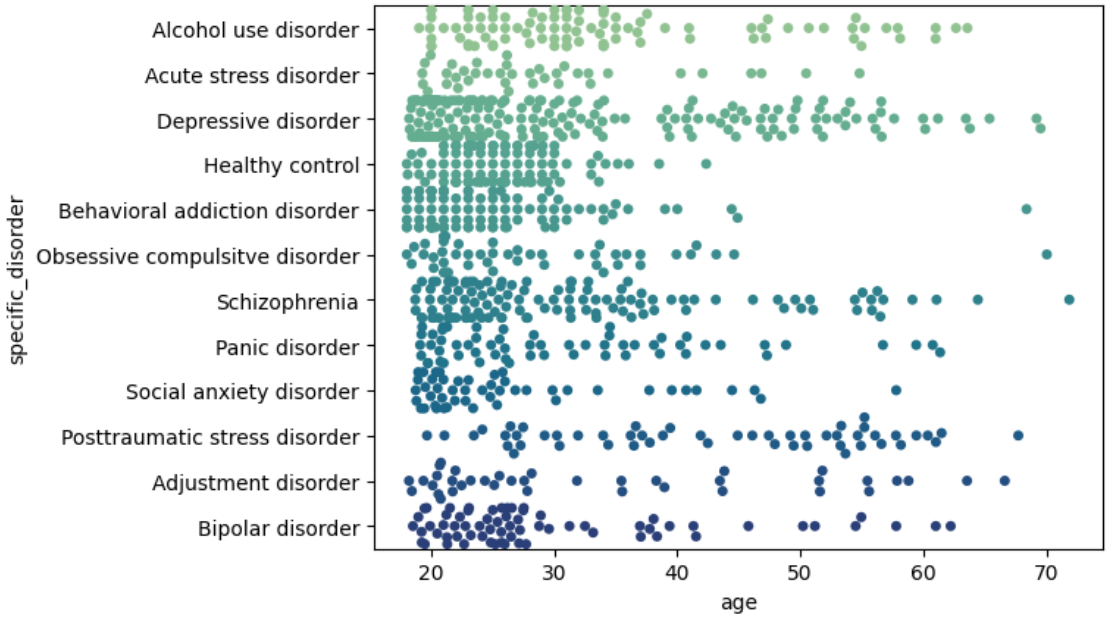
[41]:
```
sns.swarmplot(x='IQ', y='main_disorder', data=df, palette='crest')
plt.show()
```



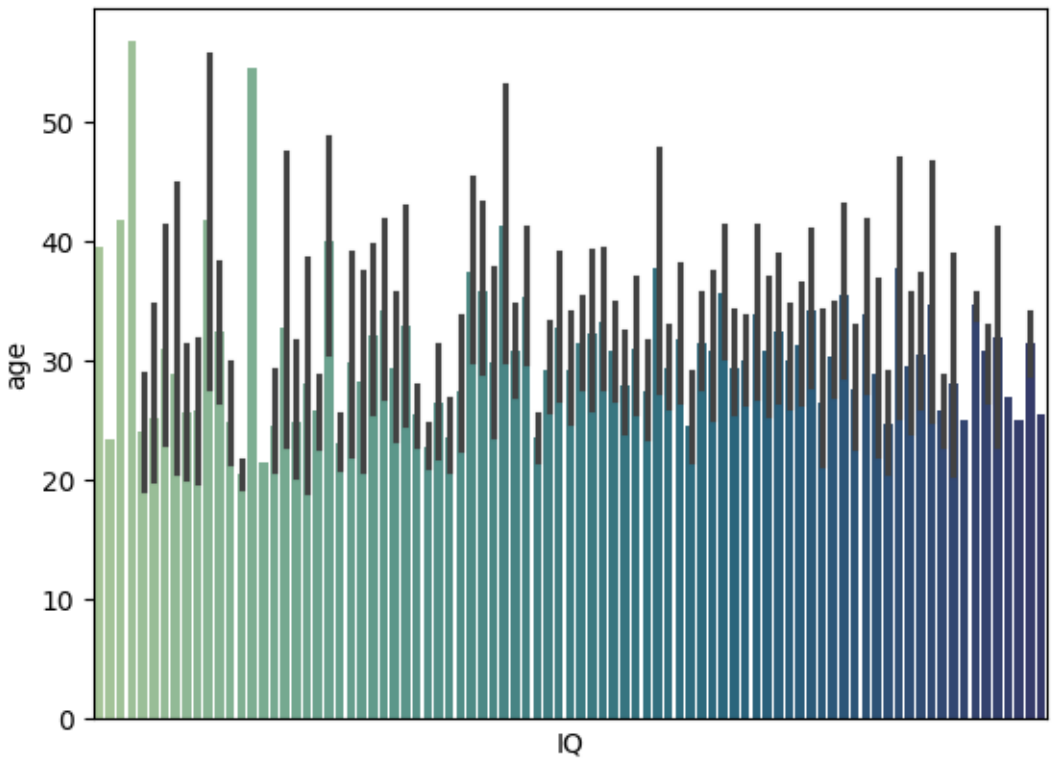
[42]:
```
sns.histplot(x='IQ', hue='main_disorder', data=df, palette='magma')
plt.show()
```



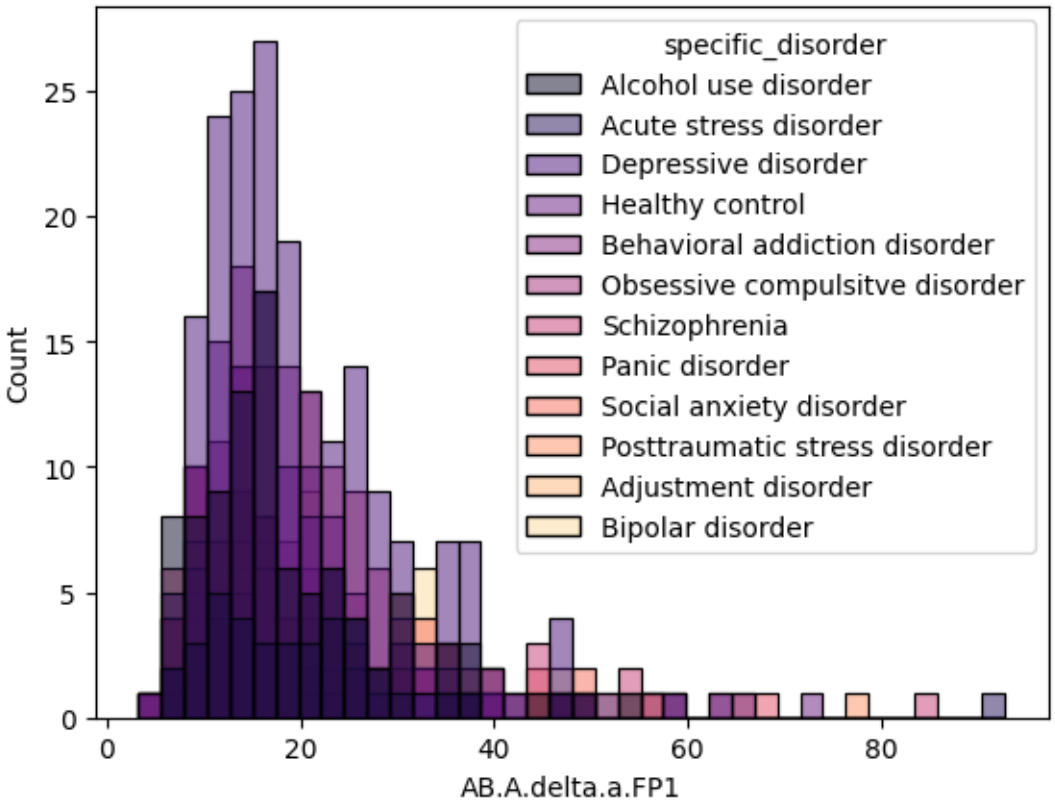
[43]:
```
sns.swarmplot(x='age', y='specific_disorder', data=df, palette='crest')
plt.show()
```



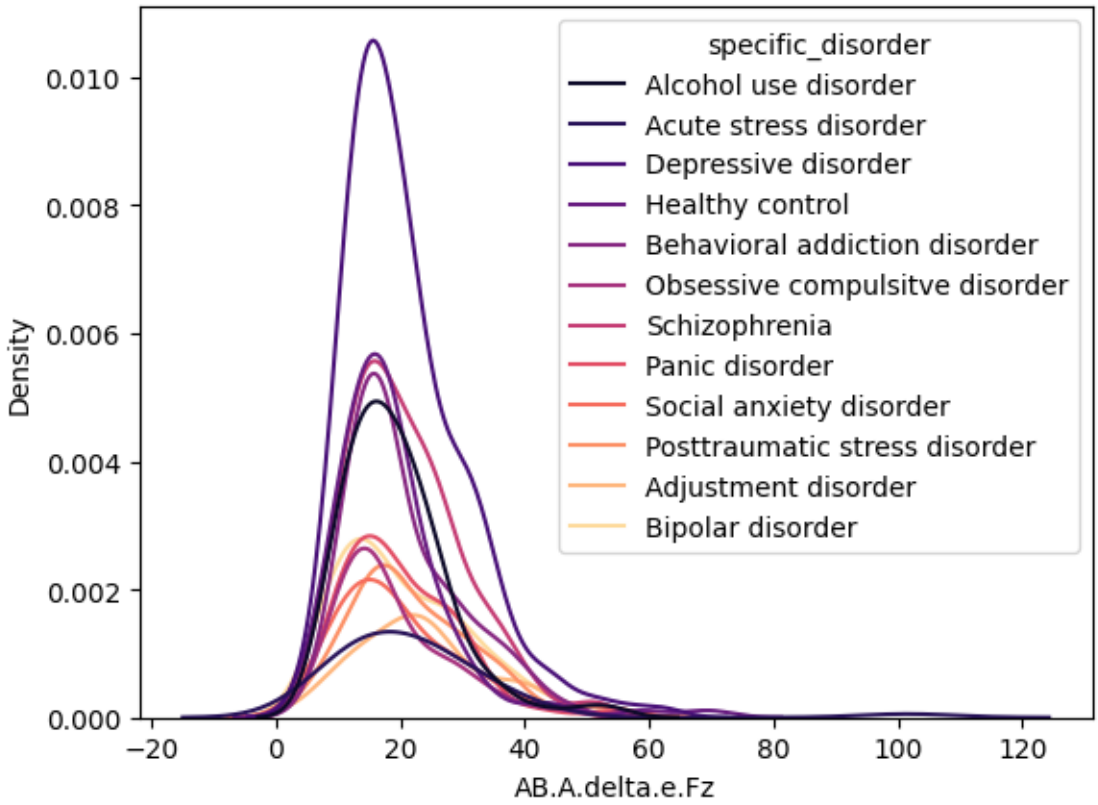
[44]:
```
sns.barplot(y='age', x='IQ', data=df, palette='crest')
plt.xticks([])
plt.show()
```



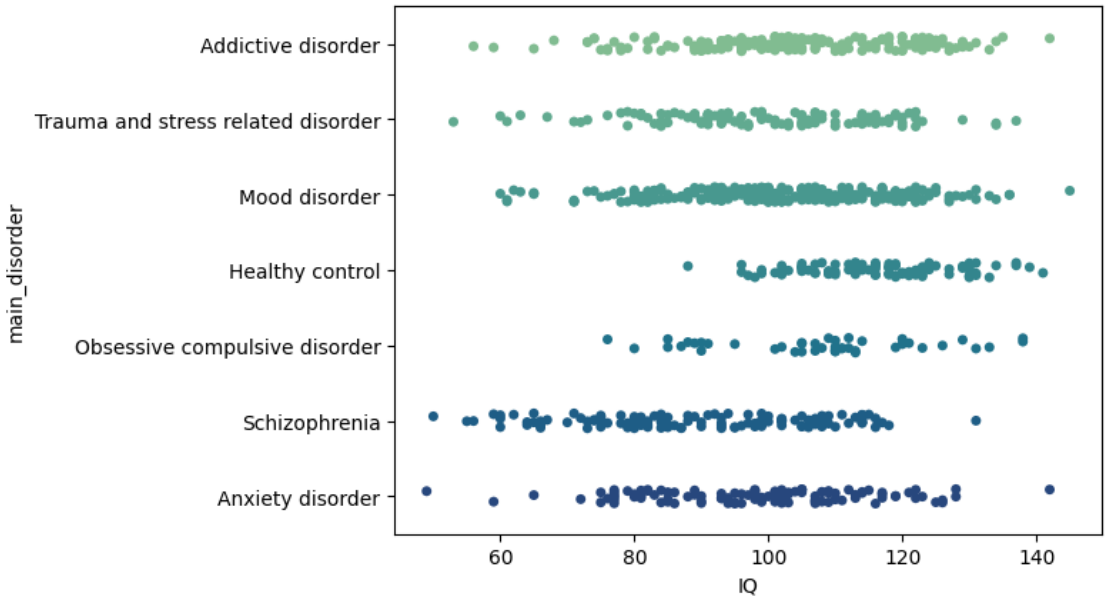
[45]:
```
sns.histplot(x='AB.A.delta.a.FP1', hue = 'specific_disorder', data=df,␣
  ↪palette='magma')
plt.show()
```



[46]:
```
sns.kdeplot(x='AB.A.delta.e.Fz', hue='specific_disorder', data=df,␣
  ↪palette='magma')
plt.show()
```



[47]:
```
sns.stripplot(x='IQ', y='main_disorder', data=df, palette='crest')
plt.show()
```



[49]:
```
df = pd.read_csv('/content/EEG.machinelearing_data_BRMH.csv.zip')
df.head()
```

[49]:

	no.	sex	age	eeg.date	education	IQ	main.disorder	\
0	1	M	57.0	2012.8.30	NaN	NaN	Addictive disorder	
1	2	M	37.0	2012.9.6	6.0	120.0	Addictive disorder	
2	3	M	32.0	2012.9.10	16.0	113.0	Addictive disorder	
3	4	M	35.0	2012.10.8	18.0	126.0	Addictive disorder	
4	5	M	36.0	2012.10.18	16.0	112.0	Addictive disorder	

	specific.disorder	AB.A.delta.a.FP1	AB.A.delta.b.FP2	…	\
0	Alcohol use disorder	35.998557	21.717375	…	
1	Alcohol use disorder	13.425118	11.002916	…	
2	Alcohol use disorder	29.941780	27.544684	…	
3	Alcohol use disorder	21.496226	21.846832	…	
4	Alcohol use disorder	37.775667	33.607679	…	

	COH.F.gamma.o.Pz.p.P4	COH.F.gamma.o.Pz.q.T6	COH.F.gamma.o.Pz.r.O1	\
0	55.989192	16.739679	23.452271	
1	45.595619	17.510824	26.777368	
2	99.475453	70.654171	39.131547	
3	59.986561	63.822201	36.478254	
4	61.462720	59.166097	51.465531	

	COH.F.gamma.o.Pz.s.O2	COH.F.gamma.p.P4.q.T6	COH.F.gamma.p.P4.r.O1	\
0	45.678820	30.167520	16.918761	
1	28.201062	57.108861	32.375401	
2	69.920996	71.063644	38.534505	
3	47.117006	84.658376	24.724096	
4	58.635415	80.685608	62.138436	

	COH.F.gamma.p.P4.s.O2	COH.F.gamma.q.T6.r.O1	COH.F.gamma.q.T6.s.O2	\
0	48.850427	9.422630	34.507082	
1	60.351749	13.900981	57.831848	
2	69.908764	27.180532	64.803155	
3	50.299349	35.319695	79.822944	
4	75.888749	61.003944	87.455509	

	COH.F.gamma.r.O1.s.O2
0	28.613029
1	43.463261
2	31.485799
3	41.141873
4	70.531662

[5 rows x 1149 columns]

[55]:
```
df.dropna(inplace=True)
```

[52]:
```
df_n2 = df.select_dtypes(include=np.number)
```

[57]:
```
corr = df_n2.corr()
corr.style.background_gradient(cmap='coolwarm')
```

[57]:
```
<pandas.io.formats.style.Styler at 0x7d66fd93fdd0>
```

[ ]:
```

```