

In [1]:

```
import pandas as pd
```

In [2]:

```
df = pd.read_csv('survey.csv')
```

In [3]:

```
df.head()
```

Out[3]:

	Timestamp	Age	Gender	Country	state	self_employed	family_history	treatment	work_interf
0	27-08-2014 11:29	37	Female	United States	IL	NaN	No	Yes	O
1	27-08-2014 11:29	44	M	United States	IN	NaN	No	No	Ra
2	27-08-2014 11:29	32	Male	Canada	NaN	NaN	No	No	Ra
3	27-08-2014 11:29	31	Male	United Kingdom	NaN	NaN	Yes	Yes	O
4	27-08-2014 11:30	31	Male	United States	TX	NaN	No	No	Ne

5 rows × 27 columns

In [4]:

```
df.tail()
```

Out[4]:

	Timestamp	Age	Gender	Country	state	self_employed	family_history	treatment	work_in
1254	12-09-2015 11:17	26	male	United Kingdom	NaN	No	No	Yes	
1255	26-09-2015 01:07	32	Male	United States	IL	No	Yes	Yes	
1256	07-11-2015 12:36	34	male	United States	CA	No	Yes	Yes	Son
1257	30-11-2015 21:25	46	f	United States	NC	No	No	No	
1258	01-02-2016 23:04	25	Male	United States	IL	No	Yes	Yes	Son

5 rows × 27 columns

In [5]:

```
df.shape
```

Out[5]:

```
(1259, 27)
```

In [6]:

```
df.columns
```

Out[6]:

```
Index(['Timestamp', 'Age', 'Gender', 'Country', 'state', 'self_employed',  
      'family_history', 'treatment', 'work_interfere', 'no_employees',  
      'remote_work', 'tech_company', 'benefits', 'care_options',  
      'wellness_program', 'seek_help', 'anonymity', 'leave',  
      'mental_health_consequence', 'phys_health_consequence', 'coworkers',  
      'supervisor', 'mental_health_interview', 'phys_health_interview',  
      'mental_vs_physical', 'obs_consequence', 'comments'],  
      dtype='object')
```

In [7]:

```
df.duplicated().sum()
```

Out[7]:

```
1
```

In [8]:

```
df = df.drop_duplicates()
```

In [9]:

```
df.isnull().sum()
```

Out[9]:

Timestamp	0
Age	0
Gender	0
Country	0
state	514
self_employed	18
family_history	0
treatment	0
work_interfere	264
no_employees	0
remote_work	0
tech_company	0
benefits	0
care_options	0
wellness_program	0
seek_help	0
anonymity	0
leave	0
mental_health_consequence	0
phys_health_consequence	0
coworkers	0
supervisor	0
mental_health_interview	0
phys_health_interview	0
mental_vs_physical	0
obs_consequence	0
comments	1094
dtype:	int64

In [10]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1258 entries, 0 to 1258
Data columns (total 27 columns):
#   Column                                Non-Null Count  Dtype
---  -
0   Timestamp                            1258 non-null   object
1   Age                                  1258 non-null   int64
2   Gender                              1258 non-null   object
3   Country                             1258 non-null   object
4   state                               744 non-null    object
5   self_employed                       1240 non-null   object
6   family_history                      1258 non-null   object
7   treatment                           1258 non-null   object
8   work_interfere                      994 non-null    object
9   no_employees                       1258 non-null   object
10  remote_work                         1258 non-null   object
11  tech_company                       1258 non-null   object
12  benefits                           1258 non-null   object
13  care_options                       1258 non-null   object
14  wellness_program                   1258 non-null   object
15  seek_help                           1258 non-null   object
16  anonymity                           1258 non-null   object
17  leave                               1258 non-null   object
18  mental_health_consequence          1258 non-null   object
19  phys_health_consequence            1258 non-null   object
20  coworkers                          1258 non-null   object
21  supervisor                         1258 non-null   object
22  mental_health_interview            1258 non-null   object
23  phys_health_interview              1258 non-null   object
24  mental_vs_physical                 1258 non-null   object
25  obs_consequence                    1258 non-null   object
26  comments                           164 non-null    object
dtypes: int64(1), object(26)
memory usage: 275.2+ KB
```

In [11]:

```
df.describe()
```

Out[11]:

	Age
count	1.258000e+03
mean	7.949129e+07
std	2.819419e+09
min	-1.726000e+03
25%	2.700000e+01
50%	3.100000e+01
75%	3.600000e+01
max	1.000000e+11

In [12]:

```
df.nunique()
```

Out[12]:

Timestamp	884
Age	53
Gender	49
Country	48
state	45
self_employed	2
family_history	2
treatment	2
work_interfere	4
no_employees	6
remote_work	2
tech_company	2
benefits	3
care_options	3
wellness_program	3
seek_help	3
anonymity	3
leave	5
mental_health_consequence	3
phys_health_consequence	3
coworkers	3
supervisor	3
mental_health_interview	3
phys_health_interview	3
mental_vs_physical	3
obs_consequence	2
comments	160

dtype: int64

In [13]:

```
import matplotlib.pyplot as plt
import seaborn as sns
```

In [14]:

```
import warnings
warnings.filterwarnings('ignore')
```

In [15]:

```
df_cat = df[['self_employed', 'family_history', 'treatment', 'work_interfere',
              'no_employees', 'remote_work', 'tech_company', 'benefits', 'care_options',
              'wellness_program', 'seek_help', 'anonymity', 'leave',
              'mental_health_consequence', 'phys_health_consequence', 'coworkers',
              'supervisor', 'mental_health_interview', 'phys_health_interview',
              'mental_vs_physical', 'obs_consequence']]
```

In [16]:

```
for i in df_cat.columns:
    print(df_cat[i].unique())
```

```
[nan 'Yes' 'No']
['No' 'Yes']
['Yes' 'No']
['Often' 'Rarely' 'Never' 'Sometimes' nan]
['Jun-25' 'More than 1000' '26-100' '100-500' '01-May' '500-1000']
['No' 'Yes']
['Yes' 'No']
['Yes' "Don't know" 'No']
['Not sure' 'No' 'Yes']
['No' "Don't know" 'Yes']
['Yes' "Don't know" 'No']
['Yes' "Don't know" 'No']
['Somewhat easy' "Don't know" 'Somewhat difficult' 'Very difficult'
 'Very easy']
['No' 'Maybe' 'Yes']
['No' 'Yes' 'Maybe']
['Some of them' 'No' 'Yes']
['Yes' 'No' 'Some of them']
['No' 'Yes' 'Maybe']
['Maybe' 'No' 'Yes']
['Yes' "Don't know" 'No']
['No' 'Yes']
```

In [17]:

```
for i in df_cat.columns:  
    print(df_cat[i].value_counts())
```

No	1094
Yes	146
Name: self_employed, dtype: int64	
No	767
Yes	491
Name: family_history, dtype: int64	
Yes	636
No	622
Name: treatment, dtype: int64	
Sometimes	465
Never	213
Rarely	172
Often	144
Name: work_interfere, dtype: int64	
Jun-25	289
26-100	289
More than 1000	282
100-500	176
01-May	162
500-1000	60
Name: no_employees, dtype: int64	
No	882
Yes	376
Name: remote_work, dtype: int64	
Yes	1031
No	227
Name: tech_company, dtype: int64	
Yes	477
Don't know	408
No	373
Name: benefits, dtype: int64	
No	500
Yes	444
Not sure	314
Name: care_options, dtype: int64	
No	841
Yes	229
Don't know	188
Name: wellness_program, dtype: int64	
No	645
Don't know	363
Yes	250
Name: seek_help, dtype: int64	
Don't know	819
Yes	375
No	64
Name: anonymity, dtype: int64	
Don't know	562
Somewhat easy	266
Very easy	206
Somewhat difficult	126
Very difficult	98
Name: leave, dtype: int64	
No	490
Maybe	477
Yes	291
Name: mental_health_consequence, dtype: int64	
No	925
Maybe	272
Yes	61
Name: phys_health_consequence, dtype: int64	
Some of them	773


```

No            260
Yes           225
Name: coworkers, dtype: int64
Yes           516
No            392
Some of them  350
Name: supervisor, dtype: int64
No            1007
Maybe        207
Yes           44
Name: mental_health_interview, dtype: int64
Maybe        557
No            499
Yes           202
Name: phys_health_interview, dtype: int64
Don't know    576
Yes           343
No            339
Name: mental_vs_physical, dtype: int64
No            1074
Yes           184
Name: obs_consequence, dtype: int64

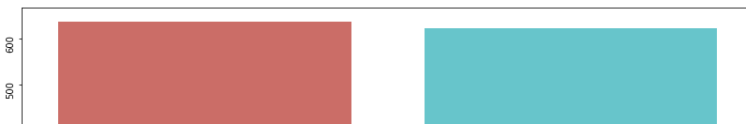
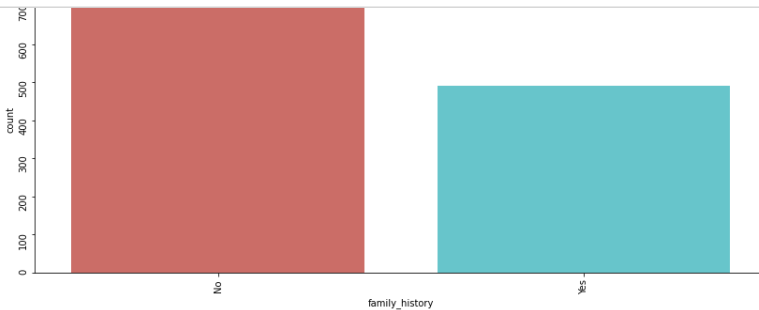
```

In [18]:

```

for i in df_cat.columns:
    plt.figure(figsize = (14,6))
    sns.countplot(df_cat[i],data=df_cat, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.yticks(rotation = 90)
    plt.show()

```



In [19]:

```
print(df['Country'].value_counts())
```

United States	751
United Kingdom	184
Canada	72
Germany	45
Ireland	27
Netherlands	27
Australia	21
France	13
India	10
New Zealand	8
Poland	7
Switzerland	7
Sweden	7
Italy	7
South Africa	6
Belgium	6
Brazil	6
Israel	5
Singapore	4
Bulgaria	4
Austria	3
Finland	3
Mexico	3
Russia	3
Denmark	2
Greece	2
Colombia	2
Croatia	2
Portugal	2
Moldova	1
Georgia	1
Bahamas, The	1
China	1
Thailand	1
Czech Republic	1
Norway	1
Romania	1
Nigeria	1
Japan	1
Hungary	1
Bosnia and Herzegovina	1
Uruguay	1
Spain	1
Zimbabwe	1
Latvia	1
Costa Rica	1
Slovenia	1
Philippines	1

Name: Country, dtype: int64

In [20]:

```
print(df['state'].unique())
```

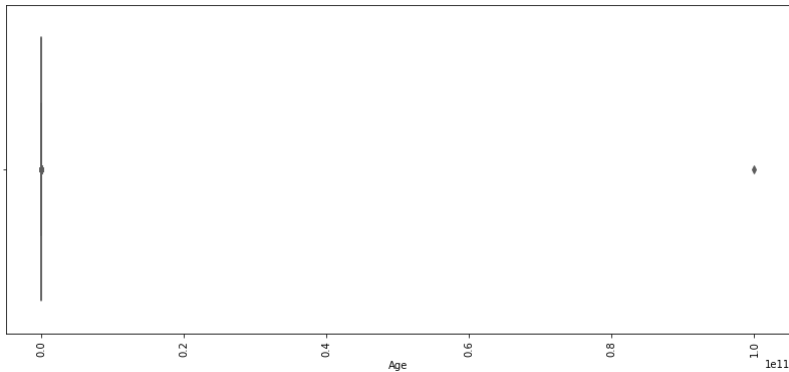
```
['IL' 'IN' nan 'TX' 'TN' 'MI' 'OH' 'CA' 'CT' 'MD' 'NY' 'NC' 'MA' 'IA' 'PA'
 'WA' 'WI' 'UT' 'NM' 'OR' 'FL' 'MN' 'MO' 'AZ' 'CO' 'GA' 'DC' 'NE' 'WV'
 'OK' 'KS' 'VA' 'NH' 'KY' 'AL' 'NV' 'NJ' 'SC' 'VT' 'SD' 'ID' 'MS' 'RI'
 'WY' 'LA' 'ME']
```

In [21]:

```
df.drop(columns=['Timestamp', 'Country', 'state', 'comments'], inplace = True)
```

In [22]:

```
plt.figure(figsize = (14,6))
sns.boxplot(df['Age'],data=df, palette = 'hls')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



In [23]:

```
Q1 = df.quantile(0.25)
Q3 = df.quantile(0.75)
IQR = Q3 - Q1
print(IQR)
```

```
Age      9.0
dtype: float64
```

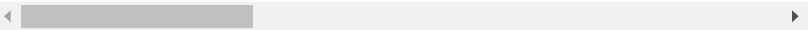
In [24]:

```
df[~((df < (Q1 - 1.5 * IQR)) | (df > (Q3 + 1.5 * IQR))).any(axis=1)]
```

Out[24]:

	Age	Gender	self_employed	family_history	treatment	work_interfere	no_employees	remo
0	37	Female	NaN	No	Yes	Often	Jun-25	
1	44	M	NaN	No	No	Rarely	More than 1000	
2	32	Male	NaN	No	No	Rarely	Jun-25	
3	31	Male	NaN	Yes	Yes	Often	26-100	
4	31	Male	NaN	No	No	Never	100-500	
...	
1254	26	male	No	No	Yes	NaN	26-100	
1255	32	Male	No	Yes	Yes	Often	26-100	
1256	34	male	No	Yes	Yes	Sometimes	More than 1000	
1257	46	f	No	No	No	NaN	100-500	
1258	25	Male	No	Yes	Yes	Sometimes	26-100	

1218 rows × 23 columns



In [25]:

```
df.shape
```

Out[25]:

(1258, 23)

In [26]:

```
df.drop(df[df['Age'] < 0].index, inplace = True)
df.drop(df[df['Age'] > 100].index, inplace = True)
```

In [27]:

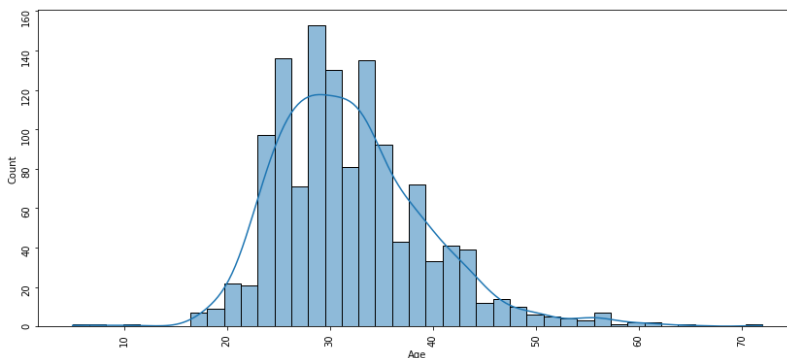
```
df['Age'].unique()
```

Out[27]:

```
array([37, 44, 32, 31, 33, 35, 39, 42, 23, 29, 36, 27, 46, 41, 34, 30, 40,
       38, 50, 24, 18, 28, 26, 22, 19, 25, 45, 21, 43, 56, 60, 54, 55, 48,
       20, 57, 58, 47, 62, 51, 65, 49,  5, 53, 61,  8, 11, 72],
      dtype=int64)
```

In [28]:

```
plt.figure(figsize = (14,6))
sns.histplot(df['Age'], kde = True, palette = 'hls')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



In [29]:

```
df['Gender'].replace(['Male ', 'male', 'M', 'm', 'Male', 'Cis Male',
                    'Man', 'cis male', 'Mail', 'Male-ish', 'Male (CIS)',
                    'Cis Man', 'msle', 'Malr', 'Mal', 'maile', 'Make',], 'Male', inplace =

df['Gender'].replace(['Female ', 'female', 'F', 'f', 'Woman', 'Female',
                    'femal', 'Cis Female', 'cis-female/femme', 'Femake', 'Female (cis)',
                    'woman',], 'Female', inplace = True)

df["Gender"].replace(['Female (trans)', 'queer/she/they', 'non-binary',
                    'fluid', 'queer', 'Androgyne', 'Trans-female', 'male leaning androgynou',
                    'Agender', 'A little about you', 'Nah', 'All',
                    'ostensibly male, unsure what that really means',
                    'Genderqueer', 'Enby', 'p', 'Neuter', 'something kinda male?',
                    'Guy (-ish) ^_^', 'Trans woman',], 'Other', inplace = True)
```

In [30]:

```
df['Gender'].unique()
```

Out[30]:

```
array(['Female', 'Male', 'Other'], dtype=object)
```

In [31]:

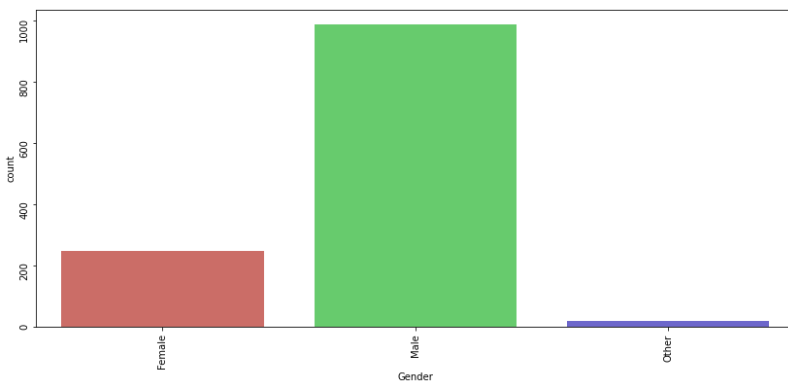
```
df['Gender'].value_counts()
```

Out[31]:

```
Male      987
Female    247
Other      19
Name: Gender, dtype: int64
```

In [32]:

```
plt.figure(figsize = (14,6))
sns.countplot(df['Gender'],data=df, palette = 'hls')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



In [33]:

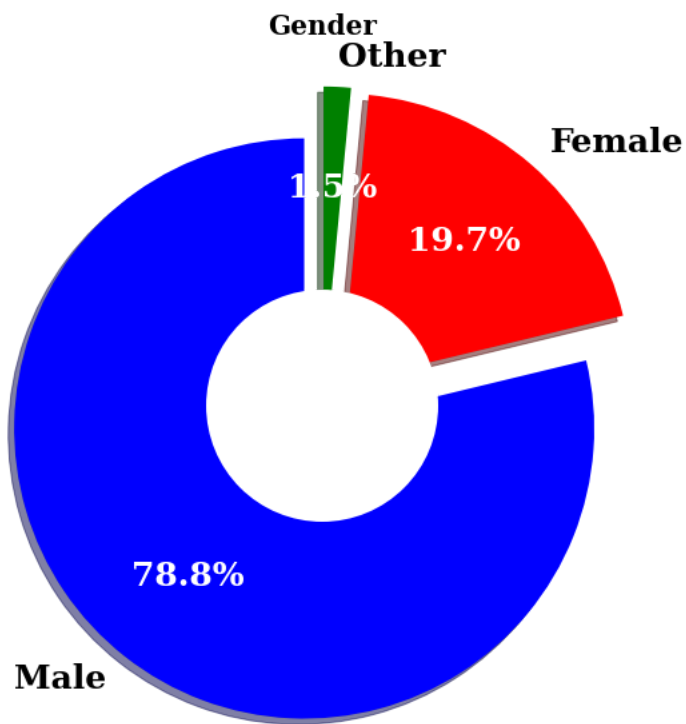
```
gender_data = df['Gender'].value_counts()

explode = (0.1, 0.1, 0.1)
plt.figure(figsize=(14, 10))
patches, texts, pcts = plt.pie(gender_data,
                                labels = gender_data.index,
                                colors = ['blue', 'red', 'green'],
                                pctdistance = 0.65,
                                shadow = True,
                                startangle = 90,
                                explode = explode,
                                autopct = '%1.1f%%',
                                textprops={ 'fontsize': 25,
                                              'color': 'black',
                                              'weight': 'bold',
                                              'family': 'serif' })

plt.setp(pcts, color='white')

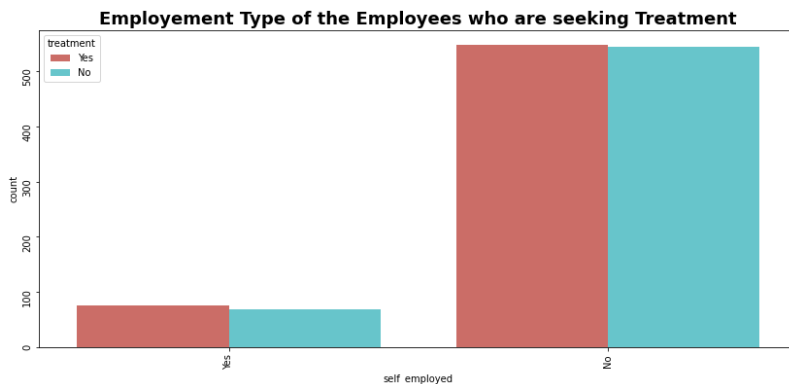
hfont = {'fontname':'serif', 'weight': 'bold'}
plt.title('Gender', size=20, **hfont)

centre_circle = plt.Circle((0,0),0.40,fc='white')
fig = plt.gcf()
fig.gca().add_artist(centre_circle)
plt.show()
```



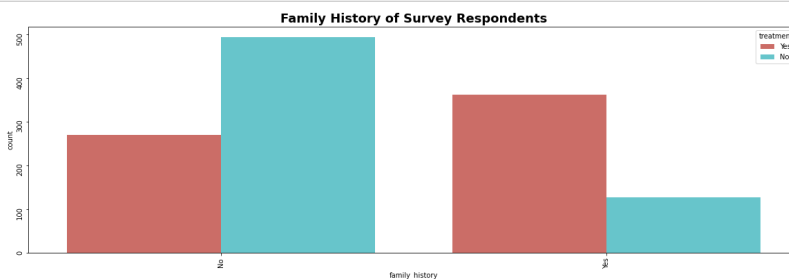
In [34]:

```
plt.figure(figsize = (14,6))
plt.title('Employment Type of the Employees who are seeking Treatment',
          fontsize=18, fontweight='bold')
sns.countplot(df['self_employed'], hue = df['treatment'],data=df,
              palette = 'hls')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



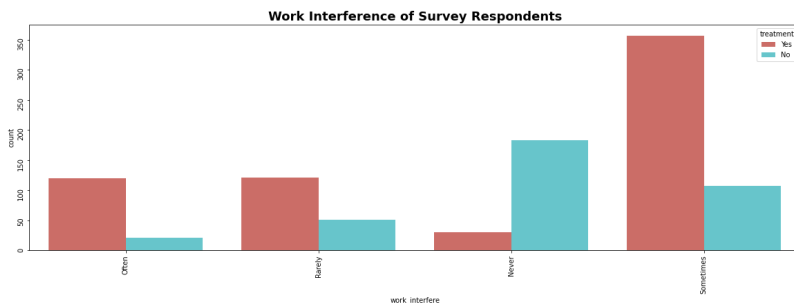
In [35]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['family_history'], hue = df['treatment'], palette='hls')
plt.title('Family History of Survey Respondents', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



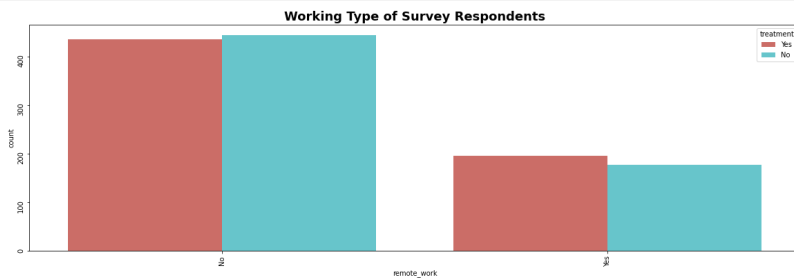
In [36]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['work_interfere'], hue = df['treatment'],
              palette = 'hls')
plt.title('Work Interference of Survey Respondents', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



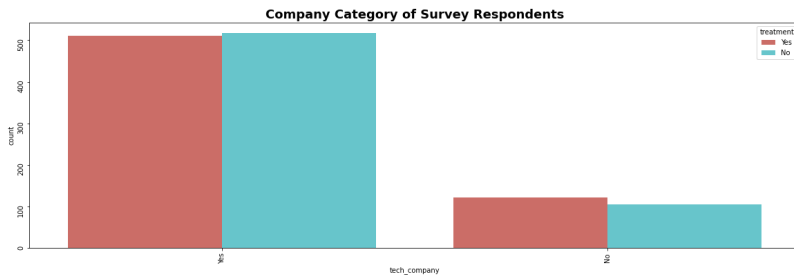
In [37]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['remote_work'], hue = df['treatment'], palette='hls')
plt.title('Working Type of Survey Respondents', fontsize=18, fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



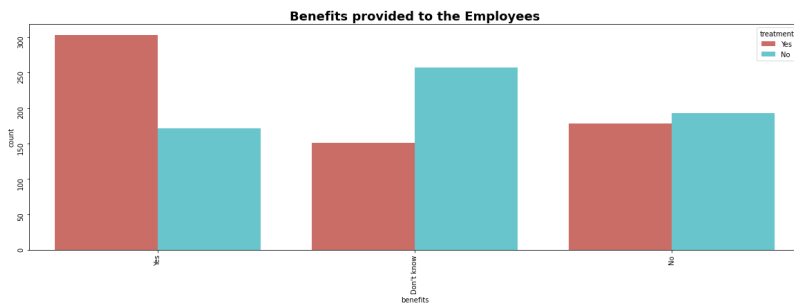
In [38]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['tech_company'], hue = df['treatment'],
              palette='hls')
plt.title('Company Category of Survey Respondents', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



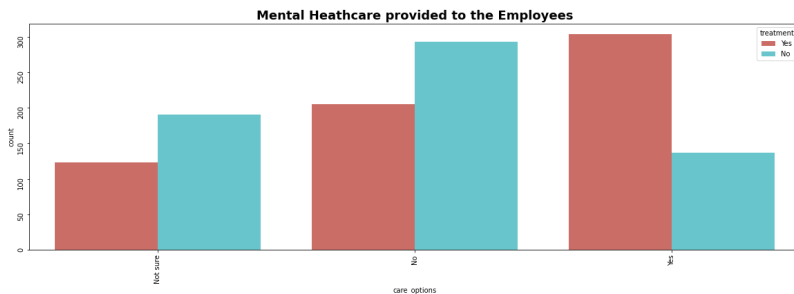
In [39]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['benefits'], hue = df['treatment'], palette='hls')
plt.title('Benefits provided to the Employees', fontsize=18, fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



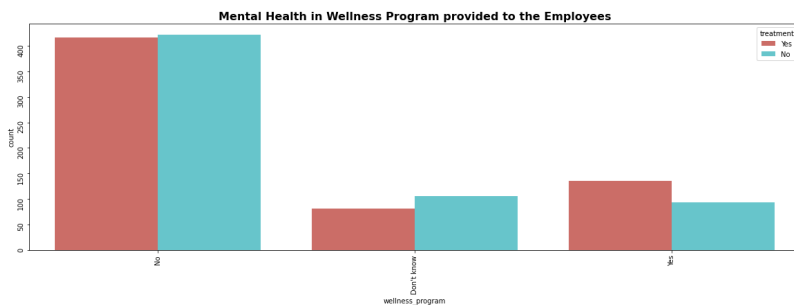
In [40]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['care_options'], hue = df['treatment'], palette='hls')
plt.title('Mental Heathcare provided to the Employees', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



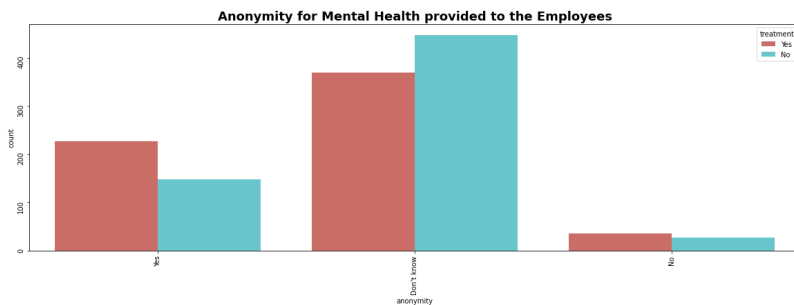
In [41]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['wellness_program'], hue = df['treatment'],
              palette='hls')
plt.title('Mental Health in Wellness Program provided to the Employees',
          fontsize=16, fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



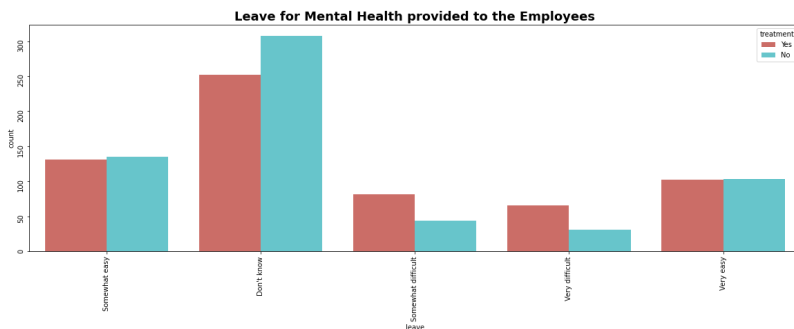
In [42]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['anonymity'], hue = df['treatment'],
              palette='hls')
plt.title('Anonymity for Mental Health provided to the Employees', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



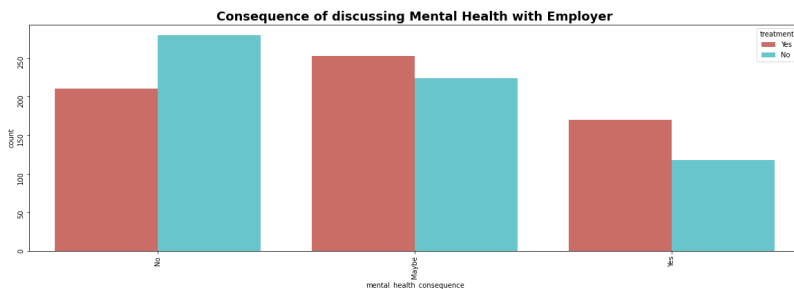
In [43]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['leave'], hue = df['treatment'],
              palette='hls')
plt.title('Leave for Mental Health provided to the Employees', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



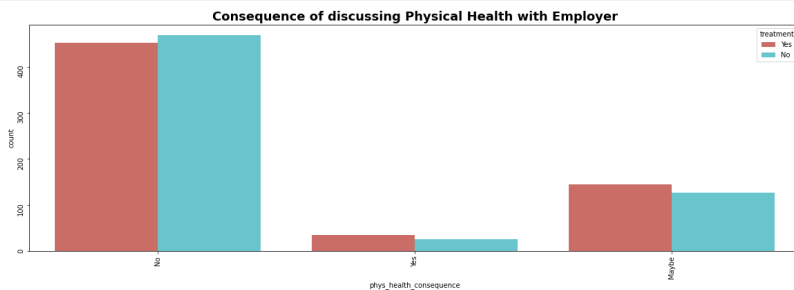
In [44]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['mental_health_consequence'], hue = df['treatment'],
              palette='hls')
plt.title('Consequence of discussing Mental Health with Employer', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



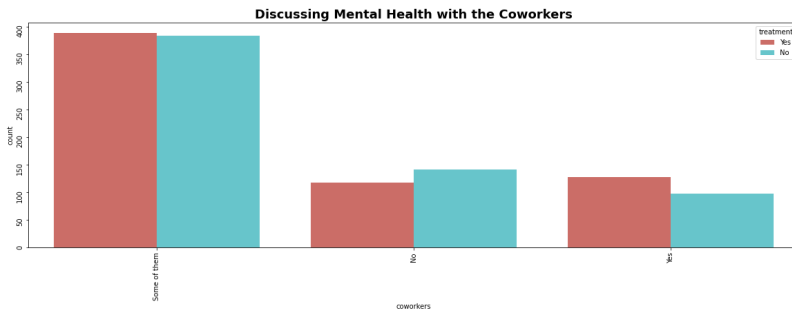
In [45]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['phys_health_consequence'], hue = df['treatment'],
              palette='hls')
plt.title('Consequence of discussing Physical Health with Employer',
          fontsize=18, fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



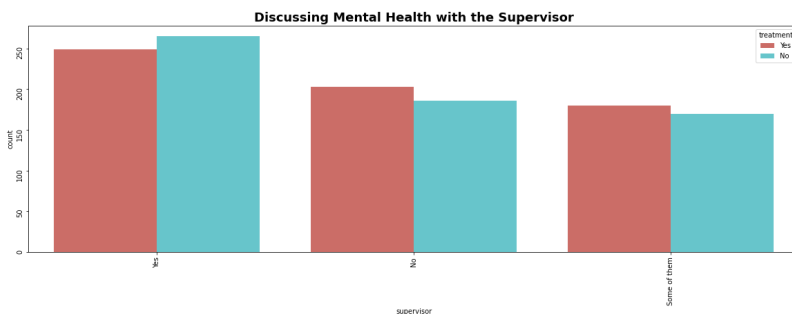
In [46]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['coworkers'], hue = df['treatment'],
              palette='hls')
plt.title('Discussing Mental Health with the Coworkers', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



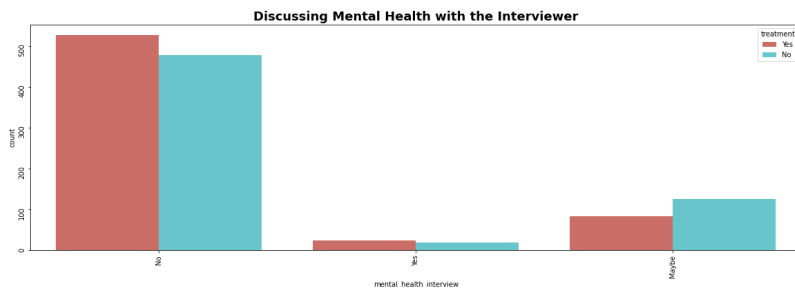
In [47]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['supervisor'], hue = df['treatment'],
              palette='hls')
plt.title('Discussing Mental Health with the Supervisor', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



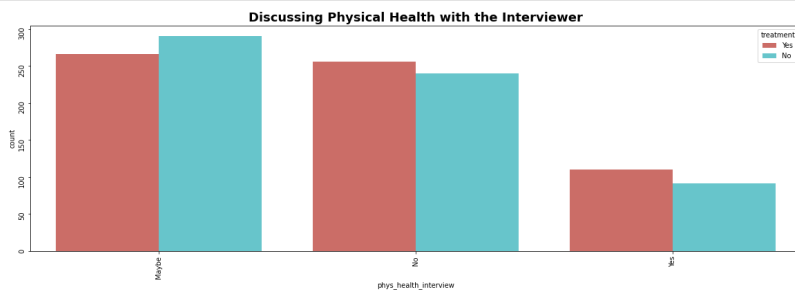
In [48]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['mental_health_interview'], hue = df['treatment'],
              palette='hls')
plt.title('Discussing Mental Health with the Interviewer', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



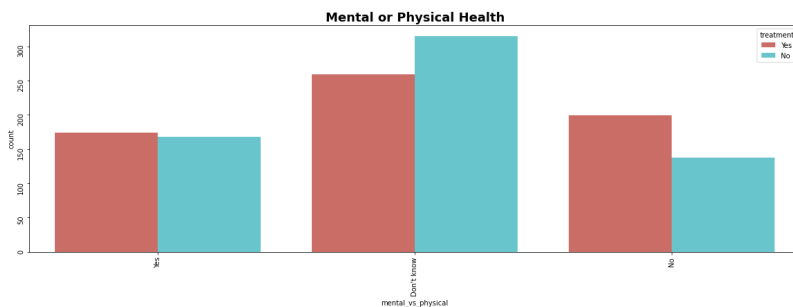
In [49]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['phys_health_interview'], hue = df['treatment'],
              palette='hls')
plt.title('Discussing Physical Health with the Interviewer', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



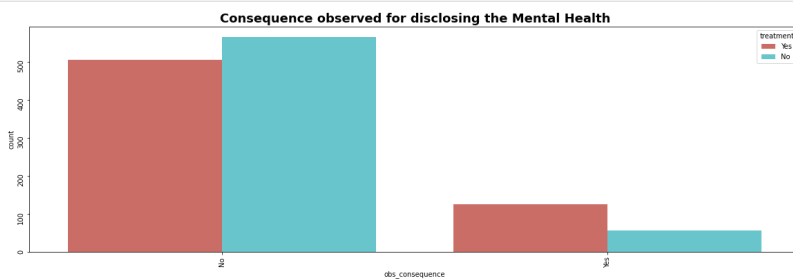
In [50]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['mental_vs_physical'], hue = df['treatment'],
              palette='hls')
plt.title('Mental or Physical Health', fontsize=18, fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



In [51]:

```
plt.figure(figsize = (20,6))
sns.countplot(df['obs_consequence'], hue = df['treatment'],
              palette='hls')
plt.title('Consequence observed for disclosing the Mental Health', fontsize=18,
          fontweight='bold')
plt.xticks(rotation = 90)
plt.yticks(rotation = 90)
plt.show()
```



In [52]:

```
df['work_interfere'] = df['work_interfere'].fillna('Not Avialable' )
```

In [53]:

```
df['self_employed'] = df['self_employed'].fillna('No')
```

In [54]:

```
df.isnull().sum()
```

Out[54]:

```
Age                                0
Gender                             0
self_employed                      0
family_history                     0
treatment                          0
work_interfere                     0
no_employees                       0
remote_work                        0
tech_company                       0
benefits                           0
care_options                       0
wellness_program                   0
seek_help                          0
anonymity                          0
leave                              0
mental_health_consequence          0
phys_health_consequence            0
coworkers                          0
supervisor                         0
mental_health_interview            0
phys_health_interview              0
mental_vs_physical                 0
obs_consequence                    0
dtype: int64
```

In [55]:

```
from sklearn.preprocessing import LabelEncoder
```

In [56]:

```
object_cols = ['Gender', 'self_employed', 'family_history', 'treatment',
               'work_interfere', 'no_employees', 'remote_work', 'tech_company',
               'benefits', 'care_options', 'wellness_program', 'seek_help',
               'anonymity', 'leave', 'mental_health_consequence',
               'phys_health_consequence', 'coworkers', 'supervisor',
               'mental_health_interview', 'phys_health_interview',
               'mental_vs_physical', 'obs_consequence']
```

In [57]:

```
label_encoder = LabelEncoder()
for col in object_cols:
    label_encoder.fit(df[col])
    df[col] = label_encoder.transform(df[col])
```

In [58]:

```
corr = df.corr()
```

```
plt.figure(figsize = (20,10))
sns.heatmap(corr, annot = True)
plt.show()
```



In [61]:

[illegible]

In [62]:

```
key = ['LogisticRegression', 'KNeighborsClassifier', 'DecisionTreeClassifier', 'RandomForestClassifier']
value = [LogisticRegression(), KNeighborsClassifier(n_neighbors = 2, weights = 'uniform'), DecisionTreeClassifier(random_state=10), RandomForestClassifier(n_estimators=60, random_state=0)]
models = dict(zip(key,value))
```

Out[62]:

```
{'LogisticRegression': LogisticRegression(),
 'KNeighborsClassifier': KNeighborsClassifier(n_neighbors=2),
 'DecisionTreeClassifier': DecisionTreeClassifier(random_state=10),
 'RandomForestClassifier': RandomForestClassifier(n_estimators=60, random_state=0),
 'GradientBoostingClassifier': GradientBoostingClassifier(random_state=20),
 'AdaBoostClassifier': AdaBoostClassifier(),
 'XGBClassifier': XGBClassifier(base_score=None, booster='gbtree', callbacks=None,
                                colsample_bylevel=None, colsample_bynode=None,
                                colsample_bytree=None, early_stopping_rounds=None,
                                enable_categorical=False, eval_metric=None, gamma=None,
                                gpu_id=None, grow_policy=None, importance_type=None,
                                interaction_constraints=None, learning_rate=None, max_bin=None,
                                max_cat_to_onehot=None, max_delta_step=None, max_depth=None,
                                max_leaves=None, min_child_weight=None, missing=None,
                                monotone_constraints=None, n_estimators=100, n_jobs=None,
                                num_parallel_tree=None, predictor=None, random_state=0,
                                reg_alpha=None, reg_lambda=None, ...)}
```

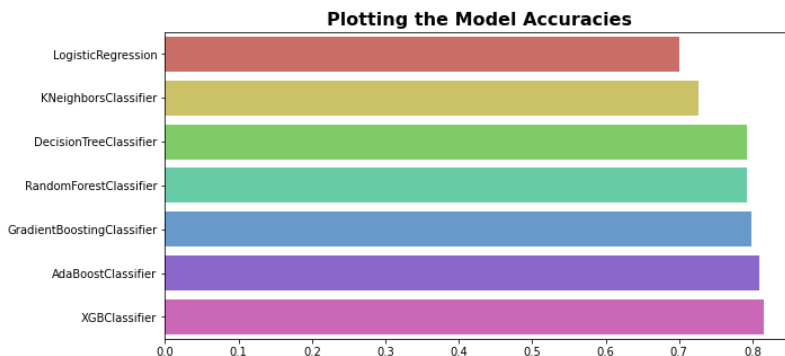
In [63]:

```
predicted = []
for name, algo in models.items():
    model = algo
    model.fit(X_train, y_train)
    predict = model.predict(X_test)
    acc = accuracy_score(y_test, predict)
    predicted.append(acc)
    print(name, acc)
```

```
LogisticRegression 0.7929936305732485
KNeighborsClassifier 0.7006369426751592
DecisionTreeClassifier 0.7261146496815286
RandomForestClassifier 0.8152866242038217
GradientBoostingClassifier 0.8089171974522293
AdaBoostClassifier 0.7929936305732485
XGBClassifier 0.7993630573248408
```

In [64]:

```
plt.figure(figsize = (10,5))
ax = sns.barplot(x = predicted, y = key, palette='hls', order=predicted.sort())
plt.title("Plotting the Model Accuracies", fontsize=16, fontweight="bold")
plt.show()
```



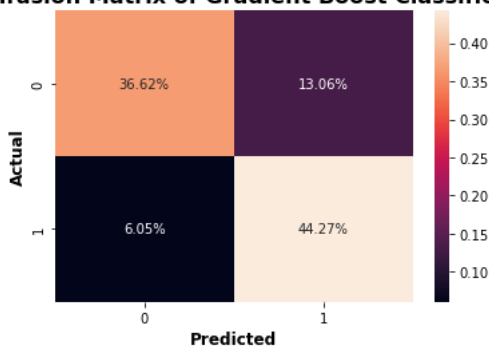
In [65]:

```
import numpy as np
```

In [66]:

```
gbc = GradientBoostingClassifier()
gbc.fit(X_train,y_train)
pred = gbc.predict(X_test)
cf_matrix = confusion_matrix(y_test, pred)
sns.heatmap(cf_matrix/np.sum(cf_matrix), annot=True,
            fmt='.2%')
plt.title('Confusion Matrix of Gradient Boost Classifier', fontweight='bold', fontsize=16)
plt.xlabel('Predicted', fontweight='bold', fontsize=12)
plt.ylabel('Actual', fontweight='bold', fontsize=12)
plt.show()
```

Confusion Matrix of Gradient Boost Classifier



In [67]:

```
fpr, tpr, thresholds = metrics.roc_curve(y_test, pred)
plt.figure(figsize=(8,8))
roc_auc = metrics.auc(fpr, tpr)
plt.plot(fpr, tpr, color='darkorange', label='ROC curve (area = %0.2f)' % roc_auc)
plt.plot([0, 1], [0, 1], color='navy', linestyle='--')
plt.xlim([0.0, 1.0])
plt.ylim([0.0, 1.0])
plt.rcParams['font.size'] = 12
plt.title('ROC Curve', fontweight = 'bold', fontsize=16)
plt.xlabel('False Positive Rate (1 - Specificity)', fontweight = 'bold', fontsize=14)
plt.ylabel('True Positive Rate (Sensitivity)', fontweight = 'bold', fontsize=14)
plt.legend(loc="lower right")
plt.show()
metrics.roc_curve(y_test, pred)
plt.show()
```

