In [3]:
```
#Packages Import
import pandas as pd
import matplotlib.pyplot as plt
import mapclassify as mc
import seaborn as sns
import numpy as np
import researchpy as rp
from scipy import stats
from scipy.stats import shapiro
from pingouin import kruskal
import scikit_posthocs as sp
import pingouin as pg
import statsmodels.stats.multicomp as mc
```

In [4]:
```
##data upload for climbing assay
df1 = pd.read_csv('climbing_assay.csv', encoding="latin-1")
df1.head()
```

Out[4]:

	Group	N_bot	N_mid	N_top
0	Group I	0	1	9
1	Group I	0	0	10
2	Group I	0	2	8
3	Group I	0	2	8
4	Group II	0	4	6

In [5]:
```
## Calculation of Performance indeces
df1['N_tot'] = (df1['N_top']+ df1['N_mid']+ df1['N_bot'])
df1['PI_'] = 0.5 * ((df1['N_tot'] + df1['N_top'] - df1['N_bot'])/(d
df1.head()
```

Out[5]:

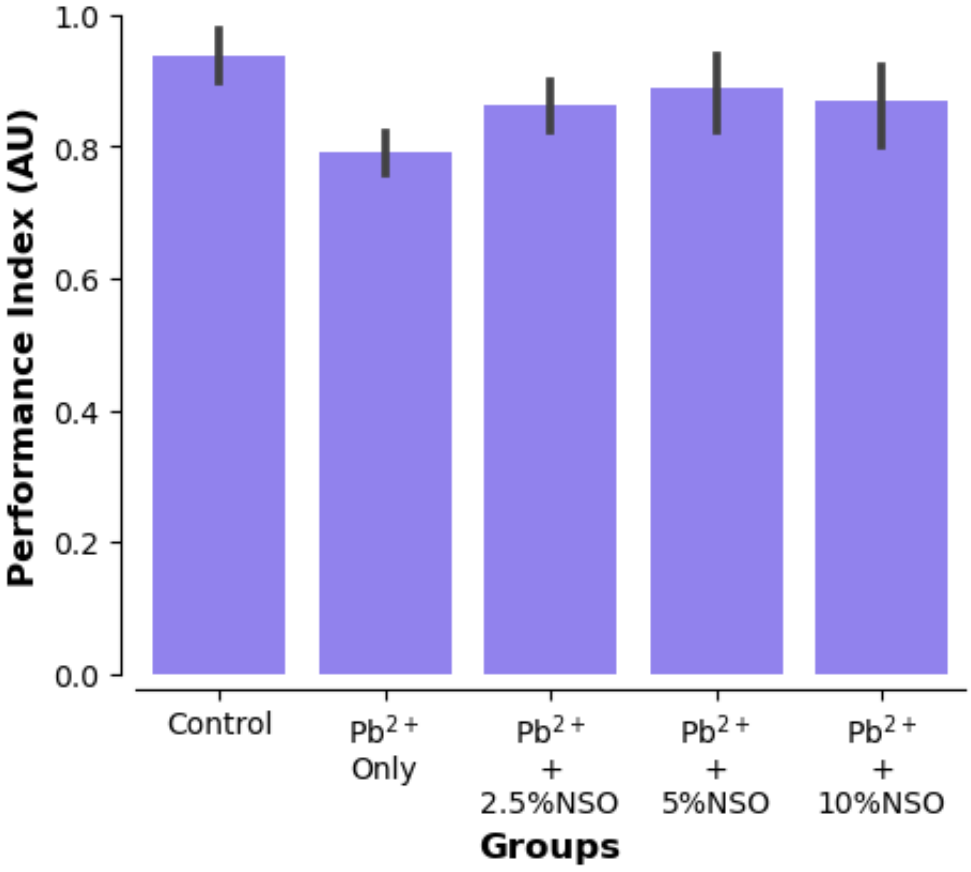
	Group	N_bot	N_mid	N_top	N_tot	PI_
0	Group I	0	1	9	10	0.95
1	Group I	0	0	10	10	1.00
2	Group I	0	2	8	10	0.90
3	Group I	0	2	8	10	0.90
4	Group II	0	4	6	10	0.80

In [6]:
```
##Descriptive Statistics for the performance index
rp.summary_cont(df1['PI_'].groupby(df1['Group']))
```

Out[6]:

Group	N	Mean	SD	SE	95% Conf.	Interval
Group I	4	0.9375	0.0479	0.0239	0.8613	1.0137
Group II	5	0.7900	0.0418	0.0187	0.7381	0.8419
Group III	4	0.8625	0.0479	0.0239	0.7863	0.9387
Group IV	4	0.8875	0.0629	0.0315	0.7874	0.9876
Group V	5	0.8700	0.0758	0.0339	0.7758	0.9642

In [8]:
```
## Bar plot for the Negetive Geotaxis Assay
sns.barplot(data=df1, y='PI_', x='Group',palette=['#8470FF'])
sns.despine(trim=False,offset=5)
plt.title('', weight='bold', fontsize=12)
plt.ylim(0,1)
plt.ylabel('Performance Index (AU)', weight='bold', fontsize=12)
plt.xlabel('Groups', weight='bold', fontsize=12)
plt.gca().set_xticklabels(['Control', 'Pb$^{2+}$\nOnly','Pb$^{2+}$\
fig = plt.gcf()
fig.set_size_inches(5,4)
plt.savefig("PI_NGTA.PNG", bbox_inches = 'tight', dpi=300)
```



In [9]:
```
##Definition of function for shapiro wilk test for normality
def shapiro_by_group(group):
    shapiro_stat, shapiro_p = shapiro(group)
    return shapiro_stat, shapiro_p
```

In [11]:
```
## Normality test for the performance index
shapiro_results_NGA = df1.groupby('Group')['PI_'].apply(shapiro_by_
shapiro_results_NGA
```

Out[11]:
```
Group
Group I      (0.8633691072463989, 0.27245327830314636)
Group II      (0.8810376524925232, 0.3140396773815155)
Group III    (0.8633691072463989, 0.27245327830314636)
Group IV      (0.8949451446533203, 0.4063870310783386)
Group V       (0.9140781760215759, 0.4924813508987427)
Name: PI_, dtype: object
```

In [12]:
```
## Oneway Anova for the negetive geotaxis Assay
aov = pg.anova(dv='PI_', between='Group', data=df1,
               detailed=True)
aov.round(3)
```

Out[12]:

	Source	SS	DF	MS	F	p-unc	np2
0	Group	0.051	4	0.013	3.92	0.02	0.48
1	Within	0.056	17	0.003	NaN	NaN	NaN

In [14]:
```
## Turkey test(post hoc)
comp = mc.MultiComparison(df1['PI_'], df1['Group'])
post_hoc_res = comp.tukeyhsd()
post_hoc_res.summary()
```

Out[14]:

Multiple Comparison of Means - Tukey HSD, FWER=0.05

group1	group2	meandiff	p-adj	lower	upper	reject
Group I	Group II	-0.1475	0.0099	-0.2642	-0.0308	True
Group I	Group III	-0.075	0.377	-0.1981	0.0481	False
Group I	Group IV	-0.05	0.7313	-0.1731	0.0731	False
Group I	Group V	-0.0675	0.4271	-0.1842	0.0492	False
Group II	Group III	0.0725	0.3594	-0.0442	0.1892	False
Group II	Group IV	0.0975	0.1275	-0.0192	0.2142	False
Group II	Group V	0.08	0.2224	-0.0301	0.1901	False
Group III	Group IV	0.025	0.9702	-0.0981	0.1481	False
Group III	Group V	0.0075	0.9996	-0.1092	0.1242	False
Group IV	Group V	-0.0175	0.9903	-0.1342	0.0992	False

In [ ]: