



**University of Central Florida  
research studies:  
NO and ADHD in college students  
NO and Anxiety in college students**

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## NF and ADHD study (brief overview)

- 11 participants with ADHD
- 16 sessions; no control group
- Assessments: *Conners Adult ADHD Rating Scale, BDI-II; BAI; Self-Efficacy for Learning Form-Abridged*
- Assessment points: pre, mid, post, and four week follow up.
- Friedman ANOVA



## Results for NO and ADHD study

- The results of the current study indicate that there were significant improvements in scores in inattention ( $X^2_{(3)} = 10.268, p = .016$ ), hyperactivity ( $X^2_{(3)} = 10.151, p = .017$ ), self-concept ( $X^2_{(3)} = 11.745, p = .008$ ), depression ( $X^2_{(3)} = 13.165, p = .004$ ), anxiety ( $X^2_{(3)} = 10.078, p = .018$ ), and academic self-efficacy ( $X^2_{(3)} = 18.361, p < .001$ ) over time. A significant difference in scores was not found in the participants' impulsivity scores ( $X^2_{(3)} = 3.284, p = .350$ ).


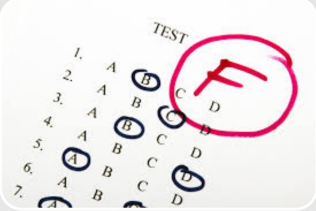



## NO and Anxiety study



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## Statement of the Problem

 <p><b>Increased rates of anxiety, stress, and depression</b></p> <p>Suicide is 2nd highest cause of death for ages 15-29</p>	 <p><b>Impacts mental and physical functioning; decreased academic success</b></p>	 <p><b>Limited availability of MH services; universities are failing to meet the needs of students</b></p>
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Overall, when we think about anxiety, stress, and depression, college students experience heightened rates of these

1. Especially concerning with co-occurring depression and suicidality
2. Impacts overall functioning, Decreased GPA/academic success; Dropout; withdrawal
3. National Survey for Counseling Directors (2001): 85% reported increase in several psychological issues



## Purpose

- Determine whether there is a difference between college students receiving NF training (vs *those who do not*) and anxiety, depression, and stress scores over time
  - *Treatment group*: 16 sessions of NF training
  - *Control group*: assessments/cortisol only; no NF training sessions





## Research Questions

- **Primary Research Question:**
  - Does Neurofeedback (NF) training reduce anxiety, depression, and stress scores over time for the treatment group as compared to the control group? If yes, how much do participants' anxiety, depression, and stress scores decrease over time?
- **Exploratory Research Question 1:**
  - Does NF training reduce anxiety, depression, and stress scores for the treatment group over time? If yes, how much do **treatment group** participants' anxiety, depression, and stress scores decrease over time?
  - Does NF training reduce anxiety, depression, and stress scores for the **control group** over time? If yes, how much do control group participants' anxiety, depression, and stress scores decrease over time?

In order to explore the overall purpose, I sought to answer two main research questions, with three exploratory questions


1. The first question sought to see....
2. The first exploratory research question sought to look at each group individually

- **Exploratory Research Question 2:**
  - Is there a significant difference in mean scores over time between the treatment group and control group depending on specific demographic variables?
- **Secondary Research Question:**
  - Is there a significant difference in cortisol levels over time between the treatment and control groups?
- **Exploratory Research Question 3:**
  - Is there a relationship between treatment group and control group participants' BAI, PSS, BDI-II, and SAT scores and their cortisol scores at each time point?

1. Second exploratory research question sought to determine if there is a sig difference in mean scores over time between the groups when considering specific demographic variables such as age, race, gender, major, and if they are in counseling
2. The secondary research question sought to determine ....
3. The final exploratory question sought to determine if there was a relationship...



In order to answer these questions, the research design used was a quasi-experimental, non-equivalent control group design in which participants in the treatment group received 16 NF sessions, with 4 assessment points whereas the WLC group only participated in the 4 assessment points

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## Sampling & Recruitment

- **Convenience sampling**, with inclusionary criteria
  - For example: no hearing impairment; at least part-time; self-report of anxiety/worry/nervousness/stress

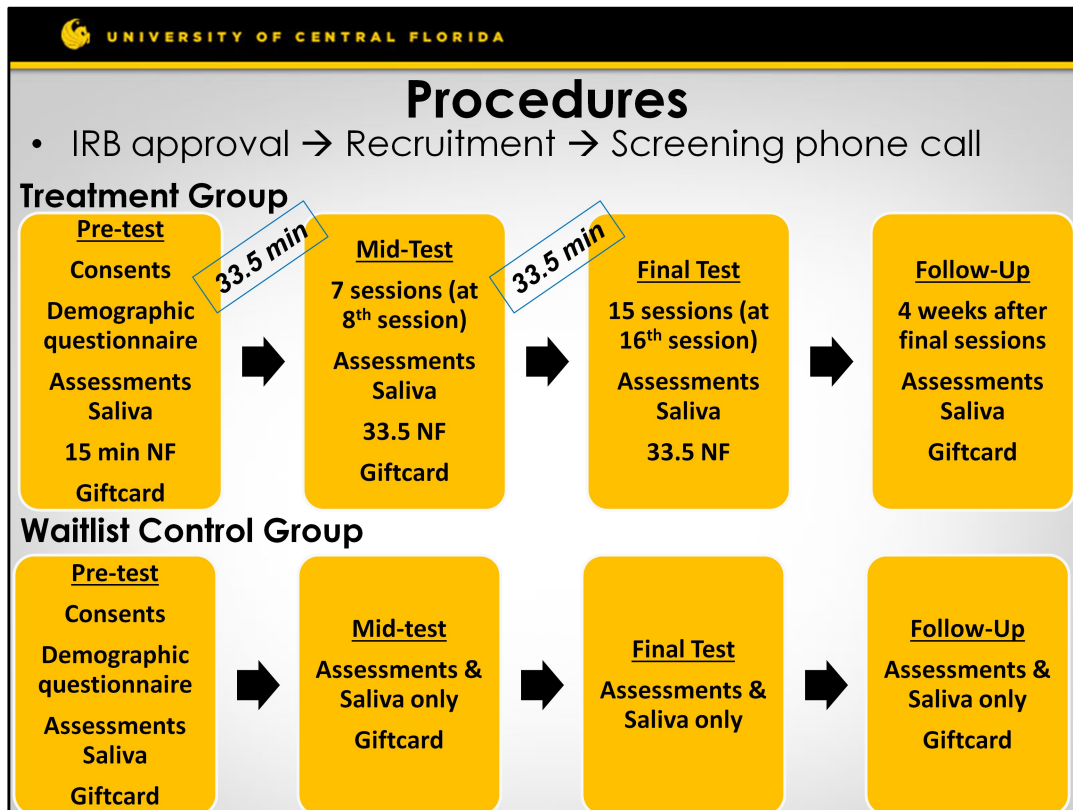
### Recruitment

- **Classrooms**
  - Psychology courses; Engineering & Computer Science; Health Sciences; Career
- **Flyer was created for advertising**
  - SARC, FYAE, Graduate Studies, & bulletin boards
  - Email to faculty and staff members
  - Social media pages for Counselors

### **SAMPLING:**

- The sampling method was convenience sampling, with inclusionary criteria.
- There were 11 criteria:
  - (a) 18 years of age or older;
  - (b) must be enrolled part- or full-time in a university or college in the Central Florida area;
  - (c) cannot be pregnant;
  - (d) must be able to understand, read, and write in English;
  - (e) no hearing impairment;
  - (f) no active psychosis;
  - (g) no severe skin allergies to cosmetics or lotions;
  - (h) no hospitalization, within the last month, due to a mental health or emotional concern;
  - (i) no current suicidal or homicidal ideation (SI/HI) with plan or intent;
  - (j) no pacemaker or any other implanted electronic devices; and
  - (k) **self-report of currently experiencing anxiety, worry, stress, or nervousness.**

**RECRUITMENT:** majority of courses were undergraduate courses; did attend a couple graduate courses



- Every other session was 33.5 long, as facilitated by the NF training system, which helps with consistency of delivery of intervention
- For Tx Group: at midtest, received assessments at 8<sup>th</sup> session; however, to mitigate effects of NF training on responses as NF training can produce calming feelings, assessments were completed after receiving 7 total sessions
- Same for Final test (at 16<sup>th</sup>, after having received 15 total sessions)

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Results				
Exploratory RQ1: Treatment Group (RM-MANOVA)				
Multivariate Test (Within-Subjects)				
Wilks' $\lambda$	$F$	$p$	partial $\eta^2$	Obs. Power
.290	$F_{(12, 37)} = 7.53$	< .001	.71	1.00
Univariate Tests (Test)				
Test	$F$	$p$	partial $\eta^2$	Obs. Power
<i>BAI</i>	$F_{(3, 144)} = 21.24$	< .001	.31	1.00
<i>^PSS</i>	$F_{(3, 144)} = 14.66$	< .001	.23	1.00
<i>^BDI-II</i>	$F_{(3, 144)} = 13.55$	< .001	.22	.99
<i>SAT</i>	$F_{(3, 144)} = 40.61$	< .001	.46	1.00

To further explore differences for each group, conducted a RM-MANOVA to look at differences in scores over time per group

Multivariate: sig difference on combined assessment scores over time

- Demonstrated significant change

Univariate: sig difference on each individual assessment over time

.05 arbitrary number ; large sample size, set to lower sig level




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Results				
Exploratory RQ1: Control Group (RM-MANOVA)				
Multivariate Test (Within-Subjects)				
Wilks' $\lambda$	$F$	$p$	partial $\eta^2$	Obs. Power
.404	$F_{(12, 8)} = .985$	.526	.60	.239
Univariate Tests (Test)				
Test	$F$	$p$	partial $\eta^2$	Obs. Power
<i>BAI</i>	$F_{(3, 57)} = .907$	.443	.046	.237
<i>PSS</i>	$F_{(3, 57)} = .778$	.511	.039	.207
<i>^BDI-II</i>	$F_{(3, 57)} = .440$	.667	.023	.120
<i>^SAT</i>	$F_{(3, 57)} = 3.565$	.046	.16	.581

\*\*In your copy of defense, P value was incorrectly type (accurate on here)

Multivariate: no sig difference on combined scores over time


Univariate: sig difference only for SAT over time

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Results					
Exploratory RQ2: Demographics (RM-MANOVA)					
Multivariate Test (Within-Subjects)					
Demo. Variable	Wilks' $\lambda$	$F$	$p$	partial $\eta^2$	Obs. Power
Age	.585	$F_{(24,84)} = 1.075$	.389	.235	.769
Race/Ethnic.	.521	$F_{(24,84)} = 1.374$	.161	.278	.879
Gender	.553	$F_{(24,84)} = 1.207$	.261	.256	.829
Major	.446	$F_{(36,125)} = 1.091$	.353	.236	.894
Counseling	.546	$F_{(48,164)} = .581$	.985	.140	.630

Since one participant identified as genderqueer, they were removed from RM-MANOVA (N = 68)

No sig. difference

No sig. found on univariate tests

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## Limitations

- **Research Design**
  - Quasi-experimental
    - Lack of randomization
  - Different facilitators; pts may have developed rapport
  - Maturation effects (over 12 week period)
  - History effects
    - Hurricane Irma
    - Some pts reported beginning counseling/psychiatric care after beginning study
  - Music plays with audiofeedback; could make pts calm
- **Sampling**
  - Majority of participants from UCF (difficult to generalize)
  - Over 20% receiving current counseling
- **Instrumentation**
  - Social desirability (use self-report assessments)
  - Cortisol collection procedures

Cortisol collection: not collected at same time of day; many external factors occur between samples and can influence levels; did not screen for medication/alcohol usage/caffeine/nicotine which all can increase cortisol levels



# Thank you!

## *Questions?*

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