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# Anxiety Reactivity in Monozygotic Twins Discordant for Major Depression

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## Introduction

Transient anxiety is a healthy response to stress. However, constant anxiety elicits negative responses and threatens an individual's day-to-day living. In the United States, 40 million American adults (ages 18 years or older) are diagnosed with an anxiety disorder. The onset of anxiety disorders, excluding specific phobias, is often childhood to late adolescence.

The National Institute of Mental Health defines major depression as an illness in which the individual feels persistent sadness or helplessness. Although major depression is characterized as a low-energy state unlike anxiety, there is a high comorbidity between anxiety and major depression.

### Study Aims:

- To compare the individual response levels between monozygotic (MZ) twins discordant for major depressive disorder (MDD) during an anxiety-provoking task.
- To evaluate the relationship between self-report measures and physiological responses in adolescent MZ twins discordant for MDD. To identify how physiological responses vary between MZ twins discordant for major depression during a resting baseline and the 7.5% carbon dioxide (CO2) breathing challenge task.

## Methods

### Participants

Participants included 9 MZ twin pairs ages 16 to 20 discordant for history of MDD. Twins were recruited through the VCU, Mid-Atlantic Twin Registry.

### Procedures

**Major Depression Status:** Depression diagnoses were determined using the Composite International Diagnostic Interview (CIDI), Depression section. The CIDI is a standardized questionnaire designed by the World Health Organization used to assess mental disorders and provide diagnoses.

#### 1. Physiological Baseline

The participant rests for a 10-minute period during which skin conductance was measured. SUDS were taken pre-task, during the task and post-task using a 0-100 scale to rate anxiety levels (see scale below).

#### 2. CO2 Breathing Task:

Participants were fitted with a silicone facemask covering the nose and mouth. Subjects sat in a comfortable chair and breathed ambient room air for a 5 minute baseline, followed by 8 minutes of the 7.5% CO2 enriched air, then finished with a 5 minute recovery period. Participants were unaware of when they would breathe the CO2 enriched air (Figure 1).

#### 3. Subjective Anxiety Ratings:

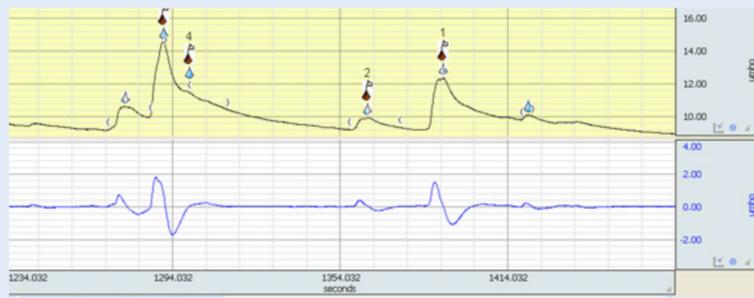
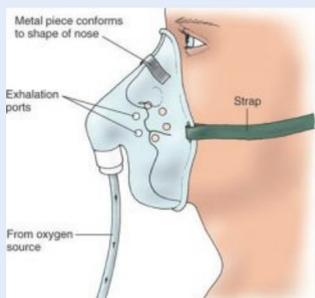
During the 7.5% CO2 breathing task, participants self-reported on their anxiety / distress levels using a 0-100 point scale, where 0=No anxiety and 100=Worst anxiety ever experienced.

#### 4. Skin conductance:

Two disposable electrodes were placed on participants' non-dominant hand. Electrodes contained a conductance paste. Electrodes were attached to a Biopac physiological system and skin conductance data was analyzed using Biopac's Acqknowledge software version 4.3 (Figure 2).

#### 5. Heart Rate Variability:

The vagal and sympathetic activity of heart rate variability was measured and analyzed using Biopac's Acqknowledge software version 4.3.



## Results

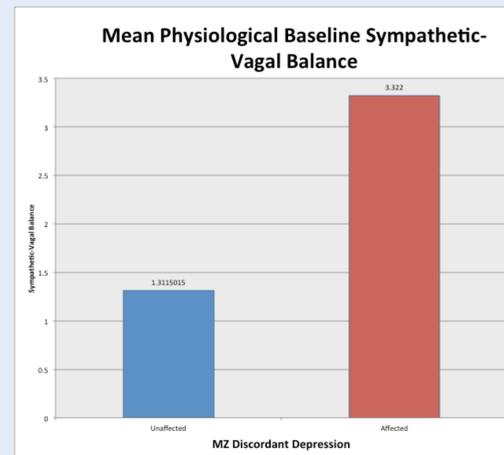


Figure 3. There was a significant increase in the mean sympathetic-vagal balance heart rate variability.

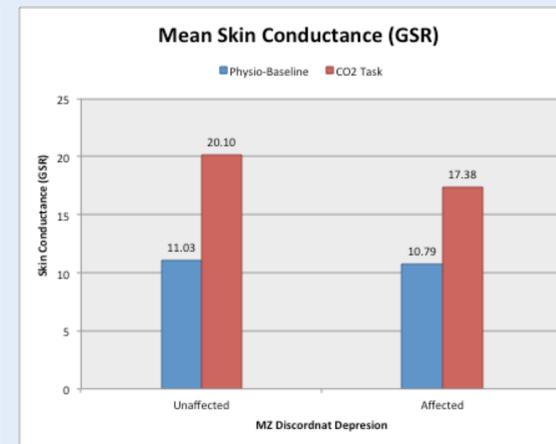


Figure 4. MDD affected twins demonstrated a reduced skin conductance response during the anxiety provoking task.

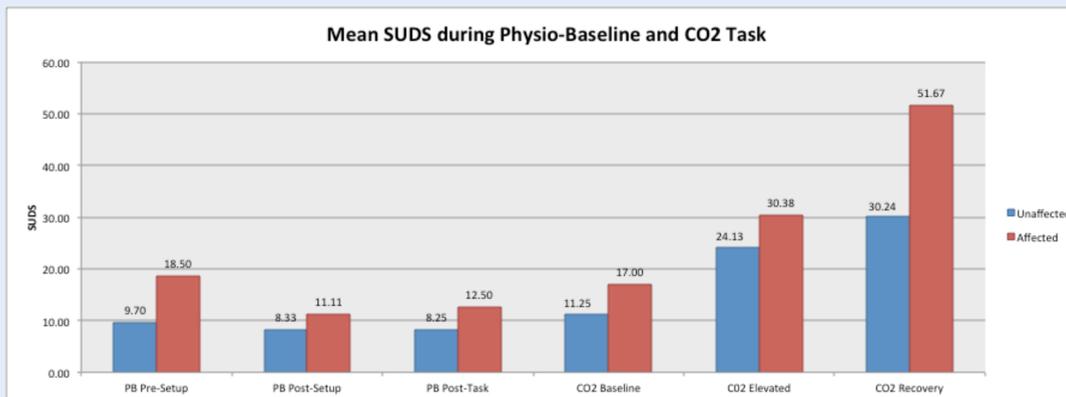


Figure 5. MDD affected twins reported higher levels of distress during the recovery period compared to their MDD unaffected co-twin.

Variable	t	p
Baseline_SUDS	-1.784	.108
Post_PB_Setup_SUDS	-.491	.637
Post_PB_SUDS	-.577	.582
PB_Skin_Conductance_Mean	.078	.940
CO2_Skin_Conductance_Mean	1.348	.215
CO2_Bsln_SUDS_Mean	-.878	.403
CO2_SUDS_Mean	-.784	.453
CO2_Rec_SUDS_Mean	-1.308	.239
CO2_Sym	-.062	.952
CO2_Vag	.062	.952
CO2_SymVagBal	.477	.645
Post_Sym	-2.149	.069
Post_Vag	1.347	.220
Post_SymVagBal	-3.115	.017

Figure 6. Paired Sample T-Test including the t-value and p-value.

## Conclusions

We expected that MDD affected twins would self-report greater distress in response to an anxiety provoking laboratory challenge and exhibit reduced physiological arousal. MDD affected twins demonstrated a somewhat reduced skin conductance response during the anxiety provoking task, suggesting blunted physiological response, which is consistent with other biological markers such as cortisol (Figure 4).

There was a significant increase in sympathetic-vagal heart variability rate during the physiological baseline for the MDD affected twins (Figure 3).

Although we did not observe any statistically significant differences for SUDS ratings assessed during baseline or inhalation of 7.5% CO2 enriched air, MDD affected twins reported higher levels of distress during the recovery period compared to their MDD unaffected co-twin (Figure 5).

## Limitations

- This study included a small sample of twins discordant for MDD
- Our sample included only Caucasian twins. Thus, our results may not generalize to other races or ethnicities.
- Our sample is based on Caucasian twins only. Thus, our results may not generalize to other races or ethnicities.

## Acknowledgements

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