



**PUPILLARY LIGHT REFLEXES IN POSTURAL TACHYCARDIA SYNDROME (POTS):
AN EXPLORATORY ANALYSIS**

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Introduction

Postural Tachycardia Syndrome (POTS) is a disease of the autonomic nervous system, with a variety of symptoms resulting from an increased heart rate when in an upright position, thought to be a result of excessive sympathetic autonomic drive. Successful diagnosis and treatment of this disease creates difficulties because the pathophysiology remains poorly understood. The goal of this study is to investigate pupillometry data to identify potential biomarkers—measurable indicators of a disease, which are independent of cardiovascular function—to help improve understanding of the disease and advance diagnosis and treatment for POTS patients.

Methods

We used quantitative Pupillary Light Reflex (PLR) testing measures, which record the pupil's sympathetically- (dilation) and parasympathetically- (constriction) mediated responses to a brief light stimulus. Pupil diameter is graphed over five seconds and then analyzed via custom MATLAB script to provide two sets of variables, a standard (i.e. diameter change, onset latency, and constriction velocity; parasympathetic measures) and an exploratory set (i.e. dilation response time and velocity; sympathetic measures). We analyzed clinically gathered PLR data in a POTS population and in a sex- and age-matched healthy control group.

Results

Our analysis includes 29 POTS patients (average age= 34.6, 90% female) and 29 healthy controls (average age= 30.25, 76% female). Results show significant differences between POTS and control groups across multiple variables, including constriction latency onset [$t(56)=2.63$, $p=.01$], maximum pupil diameter [$t(56)=2.58$, $p=.01$], minimum pupil diameter [$t(56)=2.74$, $p=.01$], and dilation velocity for 90% of recovery [$t(56)=2.42$, $p=.02$].

Conclusions

Overall, we found significant, quantifiable differences in pupil function in both parasympathetic and sympathetic PLR measures in POTS patients. This data supports an overall imbalance of autonomic function in POTS patients when compared to healthy individuals. In the future, we hope to expand data collection, allowing for a larger sample size and thus greater power, to facilitate analysis of additional factors involved. Confirmation of our findings may provide novel, non-cardiovascular biomarkers of POTS and advance our understanding of this disease.