

Introduction

- ❖ Physical activity is known to improve many aspects of health, including physical and psychological well-being, such as anxiety and perceived stress^{1,2,3}.
- ❖ Psychological health benefits have been attributed to performing physical activity in an outdoor environment^{2,3}.
- ❖ Recommendations for physical activity have been studied and synthesized by organizations such as the U.S. Department of Health and Human Services based on reports by the Physical Activity Guidelines Advisory Committee¹.
- ❖ Outdoor physical activity has not been included in such recommendations due to a gap in the literature and lack of standard objective assessment methodology.
- ❖ Validated independent cut-off points have been developed for distinguishing outdoor vs indoor environments via objective light measurement, as well as physical activity from sedentary behavior, independent of each other via accelerometry^{4,5}.
- ❖ Despite potential benefit of physical activity in an outdoor environment, methodology for defining and collecting data on outdoor physical activity bouts has not previously been proposed in a single study within an adult population.
- ❖ **Purpose:** The purpose of this study is to objectively define and measure bouts of outdoor physical activity and investigate correlations between this activity and subjectively reported psychological stress and anxiety.

Methods

- ❖ Eligible participants (N = 7):
 - ❖ Ithaca College students > 18 years old, with an understanding of the English language, and without a past history of mental health diagnosis or mobility restriction.
- ❖ 30 minute baseline assessments include:
 - ❖ Demographic information.
 - ❖ The Perceived Stress Scale (PSS).
 - ❖ The State Trait Anxiety Inventory (STAI).
 - ❖ Education on the use of the ActiGraph device.
- ❖ 10 day wear period:
 - ❖ Daily evening online survey (5pm – 12am).
 - ❖ Reported non-wear times or times where device was under clothing, time interval and reason.
- ❖ 5 minute follow up meeting:
 - ❖ \$10 grocery store gift card with the return of the ActiGraph device.

Table. 1 Participant characteristics.

Participant	Age	Gender	Trait Anxiety (STAI)	Perceived Stress (PSS)
1	24	M	29	12
2	23	F	33	7
3	23	F	33	9
4	23	M	26	6
5	21	F	42	16
6	21	F	27	12
7	23	M	33	7

Data Collection & Analysis

Figure. 1 Orientation of ActiGraph on the non-dominant hip.



- ❖ The ActiGraph GT3X placed on the participant's non-dominant hip. Utilized accelerometry and optics sensor to collect physical activity data (activity counts) and light data (lux).
- ❖ Wear time of the device was assessed using a validated algorithm. Only days with greater than 10 hours of wear time were included in the analysis⁸.
 - ❖ Data was collected at 90 Hz and averaged into 1 sec epochs⁸.
 - ❖ Moderate-to-vigorous physical activity (MVPA) was defined as > 2690 activity counts/min⁴.
 - ❖ A physical activity bout (PA bout) was defined as a period of at least 10 min in MVPA.
 - ❖ The end of a PA bout was defined as a period of > 2 min below MVPA.
 - ❖ An outdoor physical activity bout (OPA bout) was defined as a PA bout with an average light value of 240 lux⁵.
- ❖ Using these definitions, the following variables were calculated using ActiLife software:
 - ❖ Valid wear days and total wear time.
 - ❖ Total time spent in MVPA (min and % total wear time).
 - ❖ Number of PA bouts and time spent in PA bouts (as a % total MVPA).
 - ❖ Number of OPA bouts and time spent in OPA bouts (as a % total MVPA).

- ❖ Non-parametric correlations were calculated between the physical activity variables and the STAI and PSS using R statistical package (R Development Core Team, Vienna, Austria).

Figure. 2 Graphic representation of a PA bouts.

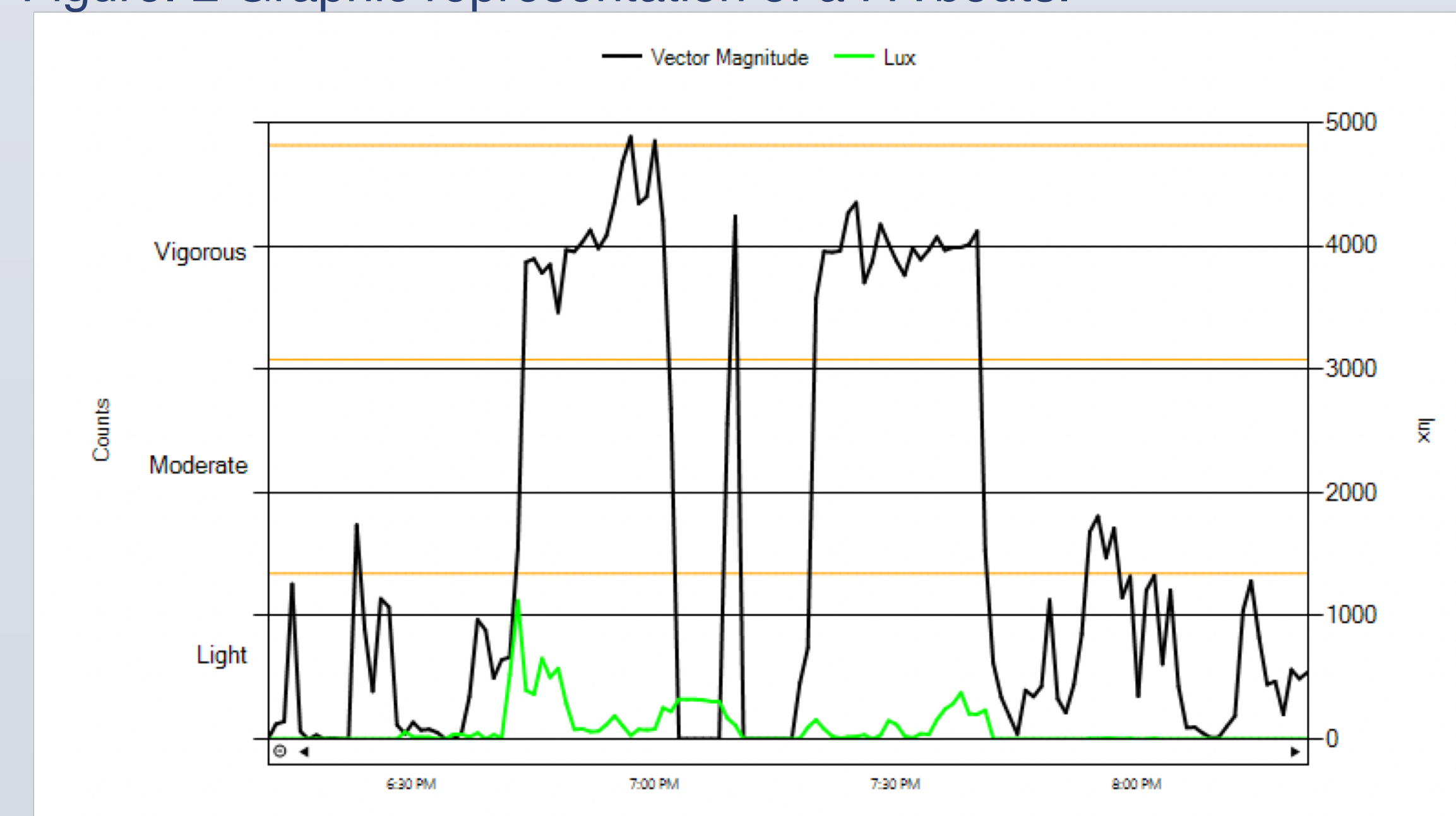
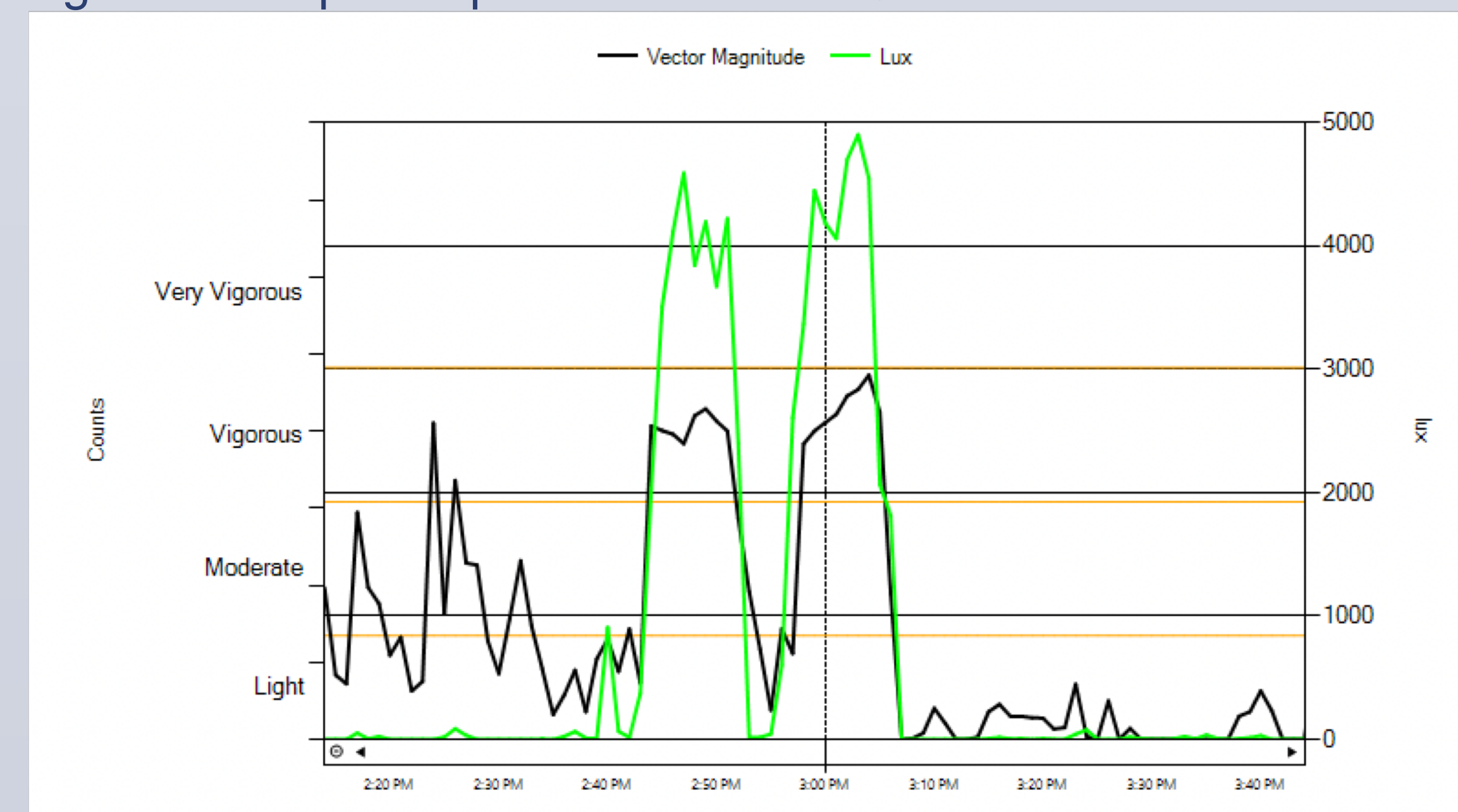


Figure. 3 Graphic representation of a OPA bouts.



Results

- ❖ Physical activity and wear time variables are presented for each participant in Tables 2 and 3.

Table. 2 Percent wear time participants spent in MVPA.

Participant	Valid Wear Days	Total Wear Time (min)	Total time in MVPA (%wear time)
1	10	11390	12.1
2	10	13734	7.9
3	10	12512	11.7
4	9	11092	9.2
5	10	13619	8.1
6	6	5982	8.3
7	7	5049	17.2

Table. 3 Physical activity bouts & outdoor physical activity bouts.

Participant	Total time in MVPA	PA Bouts	Time in PA Bouts (%total MVPA)	OPA Bouts	Time in OPA Bouts (% total MVPA)
1	1383.0	10	14.6	6	10.3
2	1084.9	16	18.7	6	8.0
3	1465.0	23	21.0	16	15.6
4	1023.6	16	20.4	4	6.8
5	1102.9	9	9.8	0	0
6	497.2	7	18.8	0	0
7	870.8	15	20.2	0	0

- ❖ No significant ($p > 0.05$) correlations were seen between the STAI (range: -0.37 – 0.41) or PSS (range: -0.69 – 0.27) and physical activity or outdoor physical activity calculations.

Conclusions

- ❖ This pilot study of 7 participants demonstrated the feasibility of combining two separate protocols for determining outdoor physical activity.
- ❖ No significant correlations were found between outdoor physical activity bouts and PSS or STAI scores. This may be due to small sample size, covering of the sensor with clothing or season restricting outdoor activity.
- ❖ Future research should investigate the relationship between outdoor physical activity and perceived stress levels using a larger sample size with a representative adult population.
- ❖ Future research should also investigate the prescription of physical activity vs. outdoor physical activity in various patient populations as a means to manage stress and anxiety.

Acknowledgements

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References

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