

# Relationship Between Activity Level and Individually Experienced Temperature

## among an Elderly Population in Phoenix, AZ

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### Introduction

In 2013, there were 74 confirmed heat-associated deaths in Maricopa County. Maricopa County's 2013 Heat Related Risk Assessment shows that most of the heat related death victims were not newcomers to Arizona. One-sixth of decedents lived in Arizona for less than three years. In regards to age, one-quarter of heat related deaths occurred among males between 50-64 years of age. The majority of the people who suffer fatalities and other heat-related illnesses during heat waves and periods of high temperatures are often children and infants or people above the age of fifty (Kovats and Hajat, 2006).

The objective of this research was to assess the effect of warm season outdoor temperature on activity levels with respect to age in Maricopa County. To do this, subjects in various neighborhoods around the Phoenix area were recruited to wear air temperature sensors as they went about their daily lives in order to record Individually Experienced Temperature (IET). The subjects also participated in activity logs to inform researchers how their day was spent. This data was compared for analysis.

### Hypothesis

I hypothesize that older individuals may spend their early mornings and late evenings doing outdoor activities. Perhaps during the hottest times of the day, like the afternoon, the elderly may avoid the outdoors and stay inside in cool environments as much as possible.

### Methods

- Recruit 80 participants that live in any of the study neighborhoods to carry Thermochron iButton temperature sensors for one week in September, 2014
- Distribute iButtons, which records air temperature every 5 minutes
- Conduct telephone interviews gathering activity log data (Table 1)
  - What time do you wake up?
  - What did you do in the morning/afternoon/night?
  - For how long?
  - What was the temperature?
  - Did you feel comfortable?
- Organize and code intensity levels based on activity log data of 7 participants over 50 years of age (hereafter the "50+ Group"), selected because of data completeness
  - 1 = sitting, driving/in transportation
  - 2 = watering plants, walking, running errands, shopping, playing with dogs, guarding the crosswalk, taking the trash out, performing light work indoors or outdoors
  - 3 = biking, running, doing yard work, gym exercises
- Analyze trends between the 50+ Group's intensity levels, outside temperatures and IETs
- For the analysis, nighttime and daytime periods were defined as
  - Nighttime: 12:00AM-6:00AM
  - Daytime: 12:00PM-6:00PM

### Results

IET data tends to be similar within the 50+ Group during the nighttime period. During the daytime period, IET data shows a lot of variability within the 50+ Group (Figure 1). In this group, there is a high amount of low intensity activity throughout the day (Figure 2). There is some high intensity activity in the earlier hours of the morning. Figure 3 displays that my hypothesis that the 50+ Group people avoid high intensities may not hold much weight. All analyses result in activity during lower IET. There are peaks in intensity levels during the hottest IET measurements. This can be seen on the group level (Figure 2), as well as the individual level (Figure 3).

Nellie's Day	
12:00AM-9:30AM	Inside
9:30AM-9:45AM	Drove
9:45AM-12:45PM	Working Inside/Outside
12:45PM-2:30PM	Inside
2:30PM-3:00PM	Biking Outside
3:00PM-5:45PM	Inside
5:45PM-6:00PM	Drove
6:00PM-7:00PM	Ate Dinner Outside
7:00PM-10:00PM	Inside

Table 1. An example of an activity log.

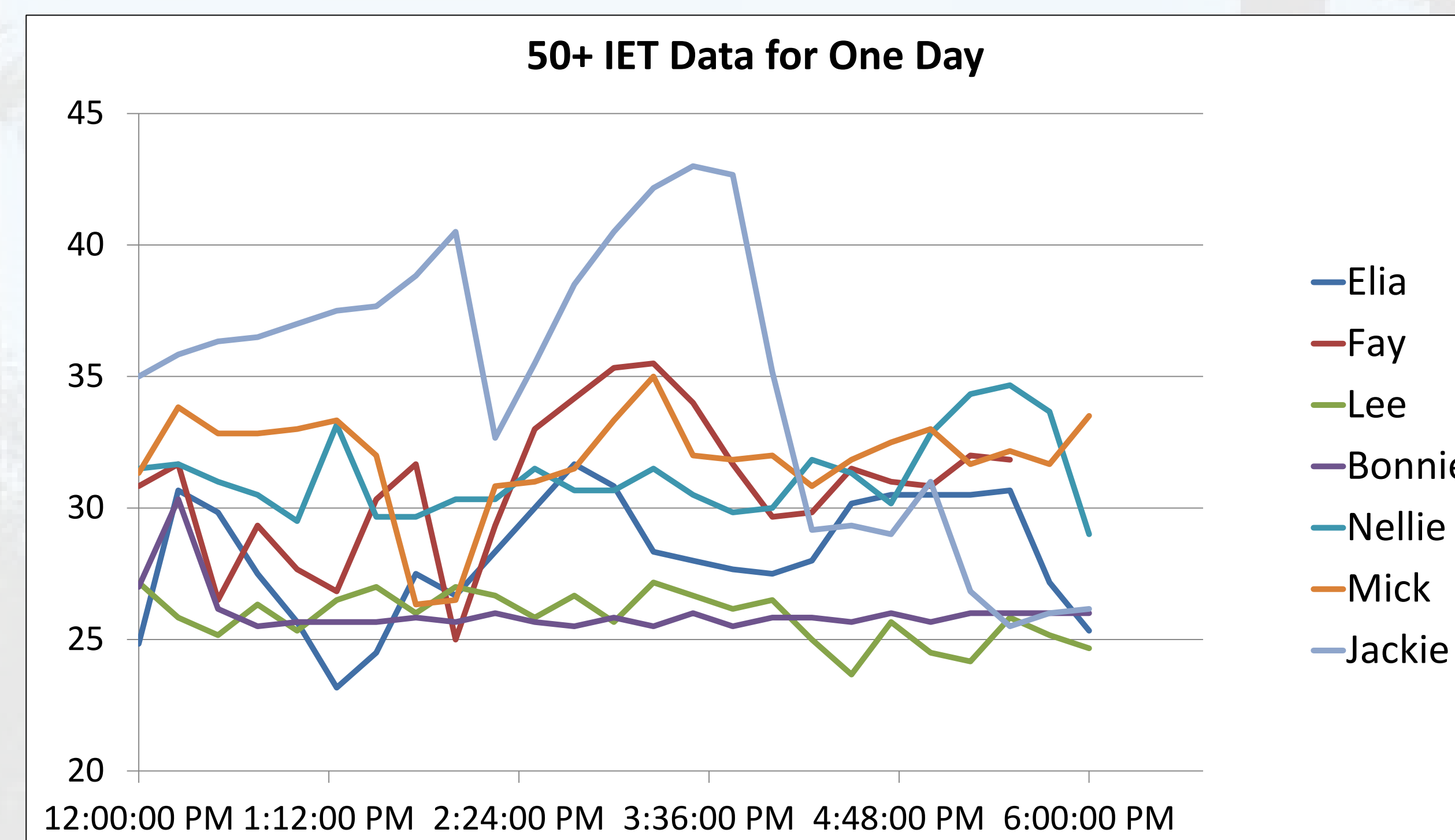


Figure 1. IET data for one daytime period.

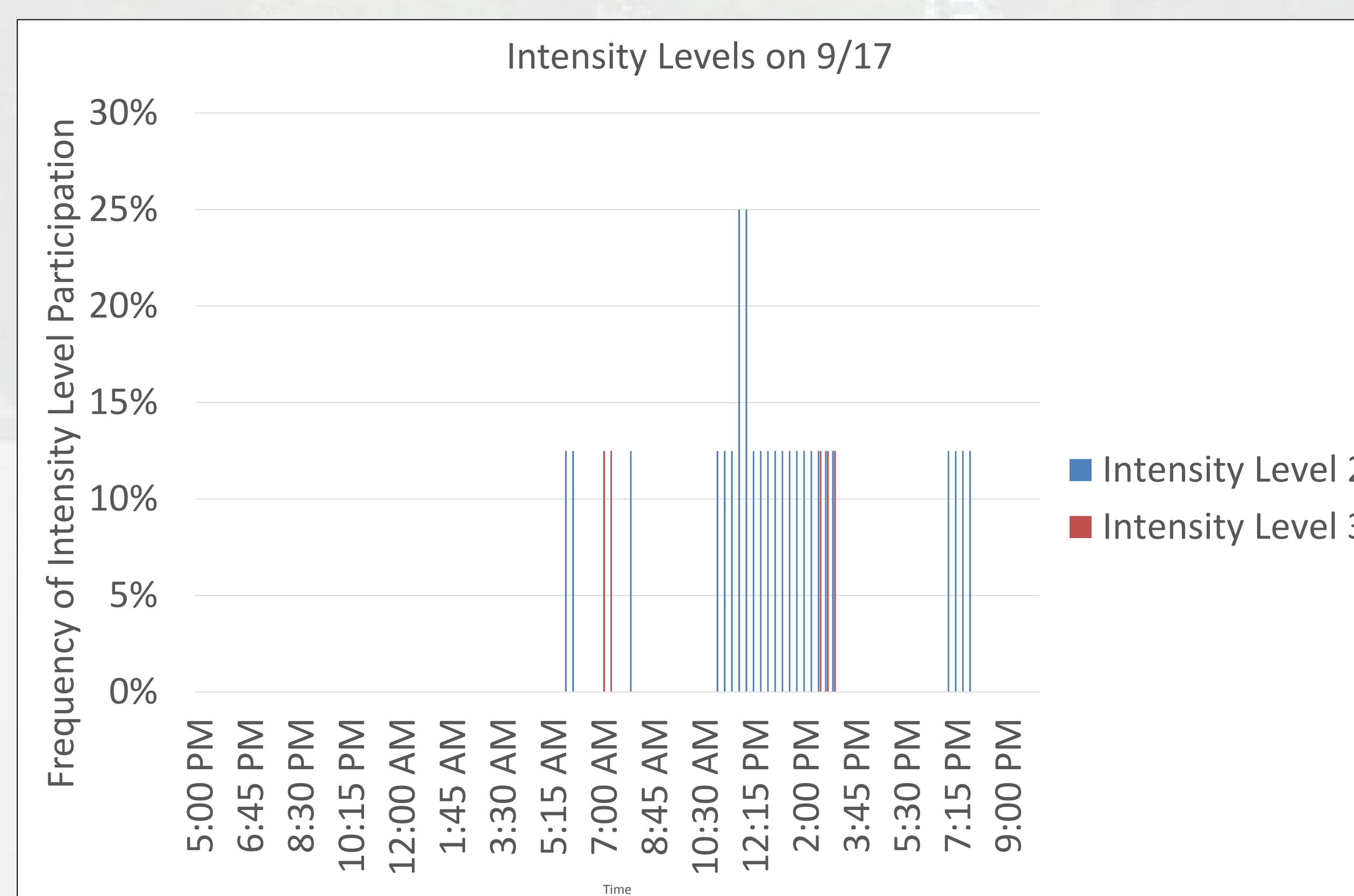


Figure 2. 50+ Intensity Level 9/17.

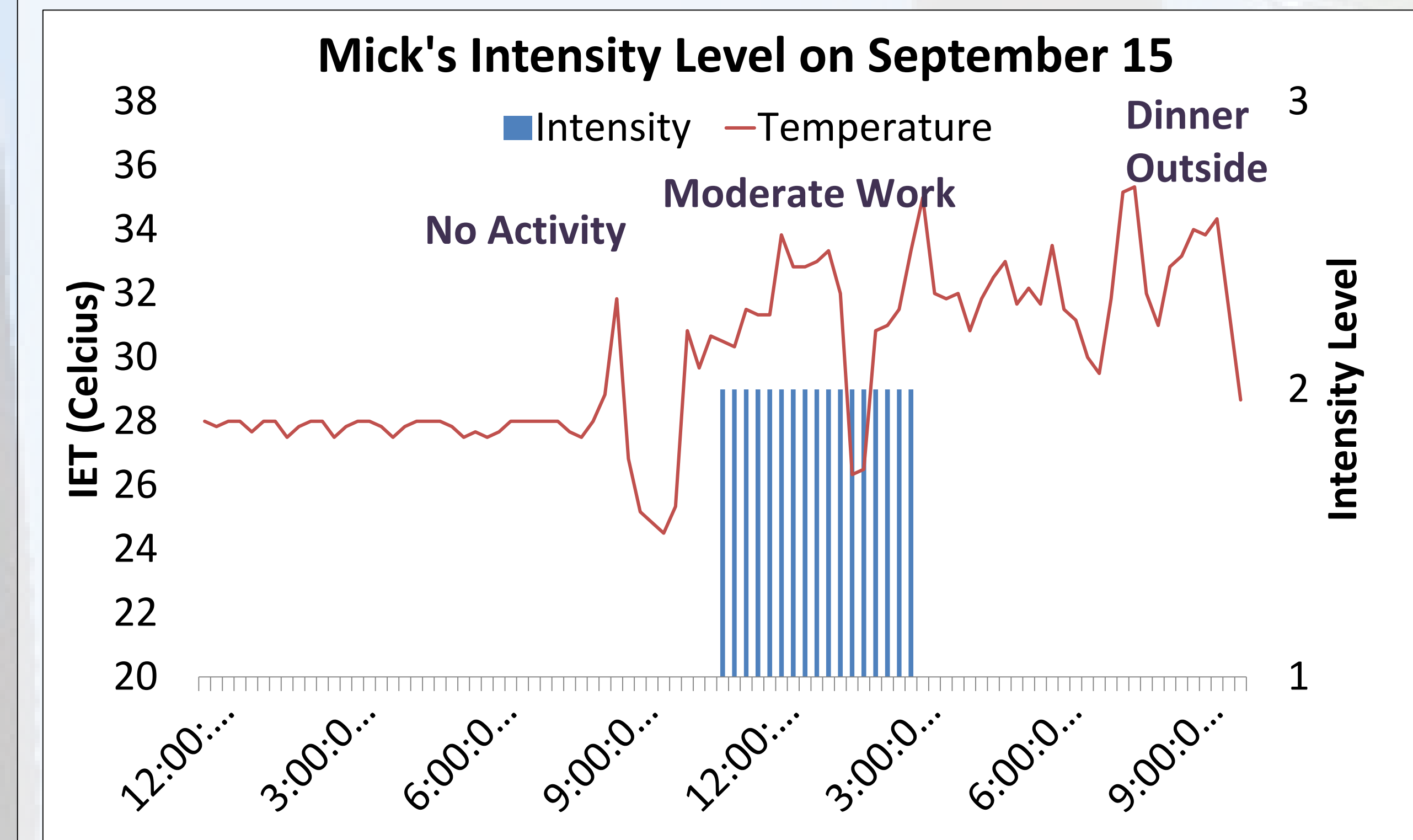


Figure 3. Individual Intensity Level and IET comparison.

### Discussion of Significance and Contribution

The original hypothesis that older people may spend their early mornings and late evenings doing outdoor activities was not supported by the analysis. People over 50 are at an elevated risk of heat related illness (Kenney & Munce, 2003). Heat related risk can be avoided by staying in cool places and drinking an adequate amount of water (Wendt & Lichtenbeck, 2007). However, the 50+ Group in the study seemed to be the most active during the hottest times of the day. This group is seemingly putting their health at high risk by engaging in intense activities during the hottest parts of the day. One explanation may be that the coolest parts of the day (when heat-risk is the lowest) is during the night, when many of the 50+ Group were asleep. Another explanation may be the group was acclimatized to the heat in Arizona, since all participants had lived in Arizona for more than one year. Further studies may research how acclimatization plays a role in heat-related illnesses.

### Bibliography

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