# Human Factors in Exhaustion and Stress of Japanese Nursery Teachers: Evidence from Regression Model on a Novel Dataset

Tran Phuong Thao

2020/09

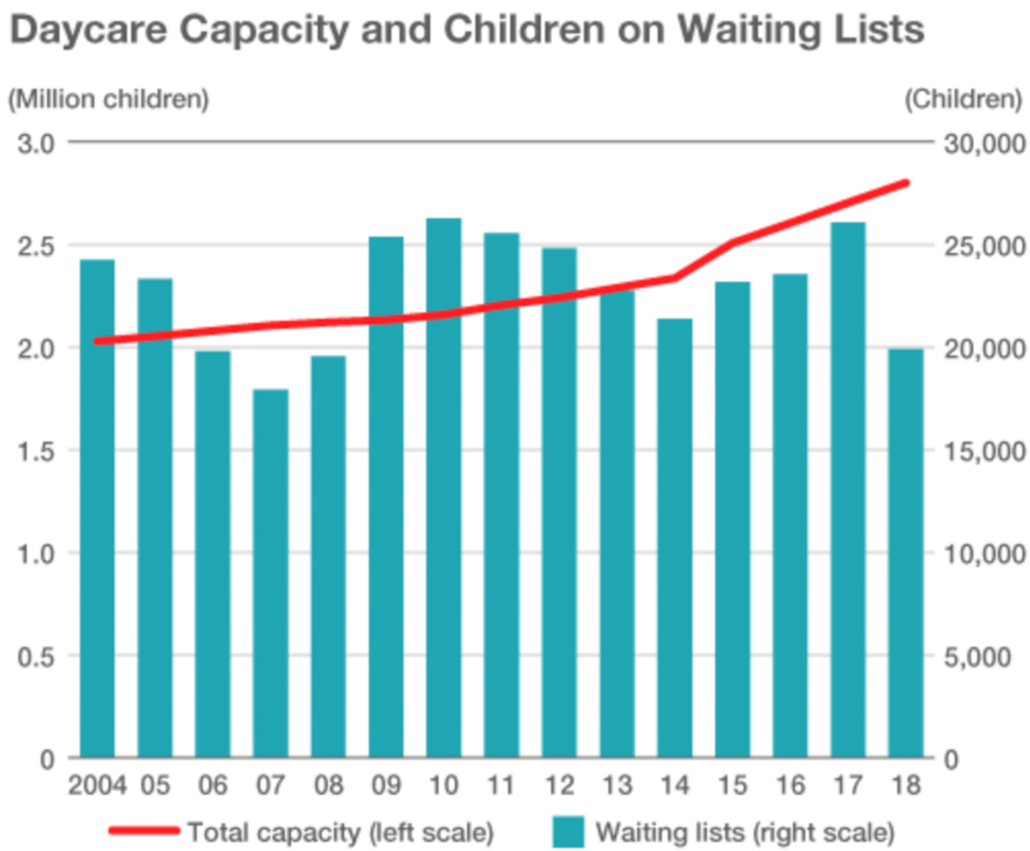
The University of Tokyo
Graduate School of Information Science and Technology

# Agenda

- Introduction
- Procedure
- Methodology
- Experiment
- Conclusion

# Daycare Capacity and Children Waiting List in Japan

- Japan is putting much effort into the childcare's crisis of a massive demand for nursery teachers.




Graph from nippon.com based on Ministry of Health, Labor, and Welfare report on daycare centers and related facilities
https://www.nippon.com/en/features/h00289/

- The number of children on the waiting lists of nursery schools is over 15,000 for 15 years.
- Among 18 most common job categories, education was found as in the top 6 job categories that are highly affected by overwork and stress [1].

[1] Y. Takashi et al., "Overwork-related disorders in Japan: recent trends and development of a national policy to promote preventive measures". Industrial Health, vol. 55, no. 3, 2017, pp. 293-302

# This paper

**Goal**: which factors influencing the exhaustion and stress of nursery teachers in Japan?

**Contribution**:

- We collected the first dataset of exhaustion and stress measurements of the nursery teachers using a survey-based approach and a real-time approach with the help of professional devices.
- The result from the proposed regression model showed that:
  - Teachers working on Thursday and Friday tend to get exhausted and stressed.
  - While working on Friday is more exhaustive than on Thursday, working on Thursday is more stressful than on Friday.
  - While working on Saturday does not affect either the exhaustion or the stress, working on Sunday is a factor affecting the stress but not the exhaustion, although both Saturday and Sunday are weekend.
  - People under 30 years old get stressed easier than the others.

# Procedure (1/4)

- We collaborated with Center of Early Childhood Development, Education, and Policy Research (CEDEP).
- CEDEP contacted 36 nursery teachers working in 7 nursery schools in different wards in Tokyo.
- All the teachers agreed to participate in our measurement and signed the Privacy Policy agreement about their personal data.
- The data collected consists of:

Paper survey-based:

- Demographics
- Working Days

Realtime-based:

(with the help of professional tracking devices)

- Stress Measurement
- Exhaustion Measurement

# Procedure (2/4)

- **Demographics**:
  - Gender: male/female
  - Age: within [15, 65] (the allowed working ages by the government), and is categorized into 3 groups (under 30, 30 to 39, and over 39)
  - Weight: unit in kilogram
  - Height: unit in centimeter

| Value | #Participants | Percentage |
|---|---|---|
| 1 (Male) | 6 | 16.67% |
| 0 (Female) | 30 | 83.33% |
| Total | 36 | 100% |

| Value | #Participants | Percentage |
|---|---|---|
| $\leq$ 29 | 16 | 44.44% |
| 30 to 39 | 10 | 27.78% |
| $\geq$ 40 | 10 | 27.78% |
| Total | 36 | 100% |

Collected data of gender, age, weight, and height, respectively (top down, left to right)

| Weight | #Participants | Percentage | Weight | #Participants | Percentage |
|---|---|---|---|---|---|
| 44 | 1 | 2.78% | 56 | 1 | 2.78% |
| 45 | 2 | 5.56% | 57 | 1 | 2.78% |
| 46 | 3 | 8.33% | 58 | 1 | 2.78% |
| 47 | 2 | 5.56% | 60 | 1 | 2.78% |
| 48 | 3 | 8.33% | 63 | 3 | 8.33% |
| 49 | 2 | 5.56% | 65 | 1 | 2.78% |
| 50 | 2 | 5.56% | 66 | 1 | 2.78% |
| 51 | 4 | 11.11% | 68 | 1 | 2.78% |
| 53 | 3 | 8.33% | 70 | 1 | 2.78% |
| 55 | 2 | 5.56% | 73 | 1 | 2.78% |
| Total | #Participants = 36 (100%) | | | | |

| Height | #Participants | Percentage | Height | #Participants | Percentage |
|---|---|---|---|---|---|
| 150 | 1 | 2.78% | 160 | 5 | 13.89% |
| 152 | 1 | 2.78% | 161 | 2 | 5.56% |
| 153 | 1 | 2.78% | 162 | 1 | 2.78% |
| 154 | 1 | 2.78% | 163 | 1 | 2.78% |
| 155 | 1 | 2.78% | 165 | 2 | 5.56% |
| 156 | 1 | 2.78 % | 167 | 1 | 2.78% |
| 157 | 6 | 16.67% | 168 | 3 | 8.33% |
| 158 | 4 | 11.11 % | 177 | 2 | 5.56% |
| 159 | 2 | 5.56% | 179 | 1 | 2.78% |
| Total | #Participants = 36 (100%) | | | | |

# Procedure (3/4)

- **Working days:**
  - The data was measured in 2019.
  - Since there were not enough devices for all the participants, the data of each participant was collected in different periods.
  - Each day is transformed to the corresponding day of the week (Monday to Sunday).

| #Part. | Measurement Period | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|---|
| 01 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 02 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 03 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 04 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 05 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 06 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 07 | 6/06-6/08 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 08 | 6/03-6/12 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| 09 | 6/07-6/09 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 10 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 11 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 12 | 5/27-6/12 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 13 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 14 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 15 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 16 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 |  | 0 |
| 17 | 6/12 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 18 | 6/13-6/14 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
|  | 6/17-6/18 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 19 | 6/12-6/14 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 20 | 5/27-6/18 | 4 | 4 | 3 | 3 | 3 | 3 | 3 |
| 21 | 5/27-6/18 | 4 | 4 | 3 | 3 | 3 | 3 | 3 |
| 22 | 6/12-6/15 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| 23 | 5/27-7/08 | 7 | 6 | 6 | 6 | 6 | 6 | 6 |
| 24 | 6/12-6/14 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 25 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
|  | 6/23-6/24 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 26 | 6/19-6/20 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
|  | 6/24 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 | 6/19 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
|  | 6/21 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 28 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 29 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 30 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 31 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 32 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 33 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 34 | 6/20-6/21 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 35 | 6/20-6/22 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 36 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |

Measurement period of working days

# Procedure (4/4)

The teachers were required to wear the devices during the working time only.

- **Stress**: Garmin smartwatches (Vivoactive 3):
  - Measured the stress from 1 to 100 (1-25: resting states, 26-50: low stress, 51-75: medium stress, 76-100: high stress).
  - Determine the stress based on the heart-rate variability:
    - Extracts the interval between each heartbeat.
    - If the variable length of time in between each heartbeat is fast, it reflects the autonomic nervous system of the user’s body.
    - The lower the variability between beats, the higher the stress levels, whereas an increase in variability indicates less stress.
  - We can read the stress directly from the devices or logging in the accounts from the API webpage of Garmin.

Garmin Vivoactive 3 (left) and Omron Active Style Pro HJA-750C (right) devices

- **Exhaustion**: The devices measure:
  - Total burned calories
  - Basal Metabolic Rate (BMR): is the amount of energy per unit of time that a person needs to keep the body functioning at rest.

# Methodology (1/3)

**Model defined:**

$$f = demog + wdays$$

**<u>Variables</u>:**

- $\boldsymbol{demog}$: consist of gender, age, weight, and height.
  - Gender: input values are normalized to binary (male: 1 and female: 0.
  - Age: the input values are grouped into three features (i.e., ≤29, 30 to 39, and ≥40), and are normalized to binary for each feature.
  - Weight: original input value
  - Height: original input value
- $\boldsymbol{wdays}$: consist of seven days in a week (Monday to Sunday) extracted from the measurement period.
  - For each weekday, the variable is a binary (i.e., working on that day: 1 and vice versa: 0)

=> In total, there are 13 variables (11 binary and 2 continuous).

# Methodology (2/3)

**Target Function**:

- **Exhaustion**:

$$f_1 = \frac{wkcal}{bmr}$$

  - $wkcal$: calories burned for each day of the weeks (Monday to Sunday), calculated as the average of calories burned in all the working days. Suppose that the measurement period is $n$ days $\{d_1, \cdots, d_n\}$. For each $w \in \{Mon, \cdots, Sun\}$: $wkcal = average\big(CaloriesBurned(d_i)\big)$ for all $\forall i = [1, n]$ s.t. $WeekDay(d_i) = w$.
  - $bmr$: body's metabolism (typically constant for each person)

- **Stress**:

$$f_2 = wsl$$

  - $wsl$: the stress for each day of the week, calculated as the average of stress in all the working days: $wsl = average(StressLevel(d_i))$ for all $\forall i = [1, n]$ s.t. $WeekDay(d_i) = w$.

# Methodology (3/3)

- **Multiple linear regression**:

$$y(w, x) = w_0 + w_1 x_1 + \cdots + w_n x_n$$

  - $(x_1, \cdots, x_n)$: variables
  - $w = (w_1, \cdots, w_n)$: coefficients
  - $w_0$: intercept (the constant which is the expected mean of y when all x's are 0)
  - To estimate $w$ and $w_0$, we use Ordinary Least Squares (OLS) which fits the model to minimize the residual sum of squares between the observed targets in the dataset and the targets predicted by the linear approximation:

$$min_x ||xw - y||_2^2$$

- **Factor determination using t-test**:
  - $p \le 0:001$: significant factors, marked as (***)
  - $0.001 < p \le 0.01$: nearly-significant, marked as (**)
  - $0.01 < p \le 0.05$: normal factor, marked as (*)

# Experiment (1/5)

- **Cronbach's Alpha (α) Measurement Test:** to measure if the questions that have multiple Likert-scale are reliable or consistent:
  - Suppose $X$ has K components: $X = Y_1 + Y_2 + \cdots + Y_{\mathrm{K}}$
  - Cronbach $\alpha$:

$$\alpha = \frac{\mathrm{K}}{\mathrm{K}-1}\left(1 - \frac{\sum_{\mathrm{i}=1}^{\mathrm{K}} \sigma_{\mathrm{Y_i}}^2}{\sigma_{\mathrm{X}}^2}\right)$$

where $\sigma_X^2$ denotes the variance of the observed total test scores, $\sigma_{Y_i}^2$ denotes the variance of the component $i$ for the current sample.

  - Explanation:
    - $\alpha \geq 0.9$: *Excellent* internal consistency (IC)
    - $0.9 > \alpha \geq 0.8$: *Good* IC
    - $0.8 > \alpha \geq 0.7$: *Acceptable* IC
    - $0.7 > \alpha \geq 0.6$: *Questionable* IC
    - $0.6 > \alpha \geq 0.5$: *Poor* IC
    - $0.7 > \alpha$: *Unacceptable* IC

# Experiment (2/5)

## Cronbach's α (cont.)

- In the collected data, only the feature of working days contains sub-questions, so we compute $\alpha$ for it.
- $K = 7$
- Sum of item variances:

$$\sum_{i=1}^{K} \sigma_{Y_i}^2 = 10.49$$

- Variance of total score:

$$\sigma_X^2 = 67.01$$

- Thus:

$$\alpha = \frac{7}{7-1}\left(1 - \frac{10.49}{67.01}\right) = 0.98$$

=> Excellent IC

| #Part. | Measurement Period | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|---|
| 01 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 02 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 03 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 04 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 05 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 06 | 5/29-5/31 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 07 | 6/06-6/08 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 08 | 6/03-6/12 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| 09 | 6/07-6/09 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 10 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 11 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 12 | 5/27-6/12 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 13 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 14 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 15 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 16 | 6/06-6/07 | 0 | 0 | 0 | 1 | 1 | | 0 |
| 17 | 6/12 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 18 | 6/13-6/14 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| | 6/17-6/18 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 19 | 6/12-6/14 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 20 | 5/27-6/18 | 4 | 4 | 3 | 3 | 3 | 3 | 3 |
| 21 | 5/27-6/18 | 4 | 4 | 3 | 3 | 3 | 3 | 3 |
| 22 | 6/12-6/15 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| 23 | 5/27-7/08 | 7 | 6 | 6 | 6 | 6 | 6 | 6 |
| 24 | 6/12-6/14 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 25 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| | 6/23-6/24 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 26 | 6/19-6/20 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| | 6/24 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 | 6/19 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 6/21 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 28 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 29 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 30 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 31 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 32 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 33 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 34 | 6/20-6/21 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 35 | 6/20-6/22 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 36 | 6/19-6/21 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |

# Experiement (3/5)

- **Noise Removel**: 122 samples were extracted from 36 participants' working days.
  - For exhaustion: all the 122 samples were used.
  - For stress: there are 9 samples with zero or untraceable stress and were, thus, removed.

  => Remaining 122 − 9 = 113 samples were used for stress.

# Experiement (4/5)

## ■ Distribution of features:

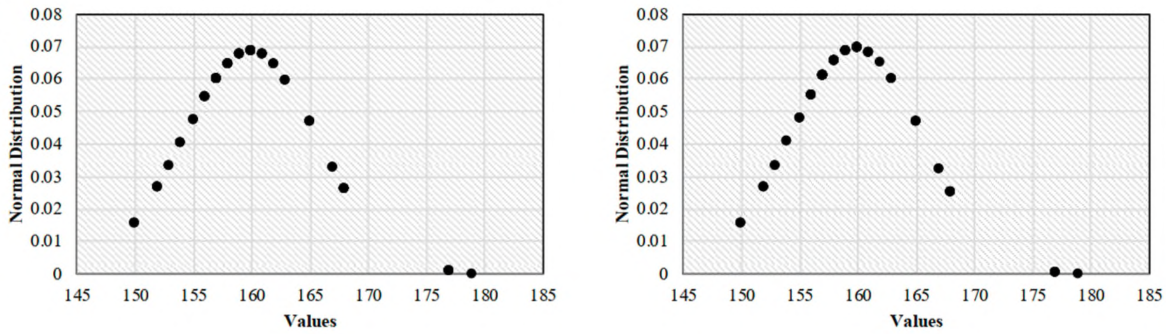
### Binary features

| Variable | Exhaustion (122 samples) | | Stress (113 samples) | |
|---|---|---|---|---|
| | Yes/1 | No/0 | Yes/1 | No/0 |
| Male | 15 (12.30%) | 107 (87.70%) | 12 (10.62%) | 101 (89.38%) |
| Age: $\leq$ 29 | 47 (38.52%) | 75 (61.48%) | 43 (38.05%) | 70 (61.95%) |
| Age: 30-39 | 35 (28.69%) | 87 (71.31%) | 31 (27.43%) | 82 (72.57%) |
| Age: $\geq$ 40 | 40 (32.79%) | 82 (67.21%) | 39 (34.51%) | 74 (65.49%) |
| Monday | 8 (06.56%) | 114 (93.44%) | 7 (6.19%) | 106 (93.81%) |
| Tuesday | 6 (04.92%) | 116 (95.08%) | 5 (4.42%) | 108 (95.58%) |
| Wednesday | 25 (20.49%) | 97 (79.51%) | 25 (22.12%) | 88 (77.88%) |
| Thursday | 33 (27.05%) | 89 (72.95%) | 31 (27.43%) | 82 (72.57%) |
| Friday | 34 (27.87%) | 88 (72.13%) | 33 (29.20%) | 80 (70.80%) |
| Saturday | 9 (07.38%) | 113 (92.62%) | 8 (7.08%) | 105 (92.92%) |
| Sunday | 7 (05.74%) | 115 (94.26%) | 4 (3.54%) | 109 (96.46%) |

### Continuous features

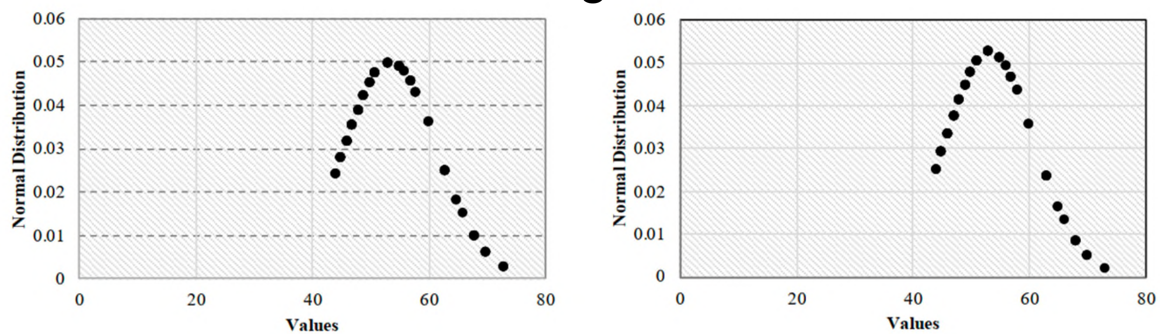
| Score | Exhaustion (122 samples) | | Stress (113 samples) | |
|---|---|---|---|---|
| | Weight | Height | Weight | Height |
| Mean | 53.61 | 159.96 | 53.61 | 159.90 |
| Standard Error | 0.72 | 0.53 | 0.72 | 0.53 |
| Median | 51 | 159 | 51 | 159 |
| Mode | 46 | 160 | 46 | 157 |
| Standard Deviation | 7.99 | 5.80 | 7.99 | 5.73 |
| Sample Variance | 63.79 | 33.64 | 63.79 | 32.79 |
| Kurtosis | -0.32 | 2.59 | -0.32 | 2.66 |
| Skewness | 0.87 | 1.44 | 0.87 | 1.44 |
| Range | 29 | 29 | 29 | 29 |
| Minimum | 44 | 150 | 44 | 150 |
| Maximum | 73 | 179 | 73 | 179 |

### Weight




(a) Exhaustion (b) Stress

### Height




(a) Exhaustion (b) Stress

# Experiement (5/5)

**Main results:**

Exhaustion

| No | Factor | Coef. | $p$-Value | $t$-Value | 95% CI |
|---|---|---|---|---|---|
| | Intercept | 0.328 | 0.467 | 0.729 | [-0.563, 1.218] |
| 1 | Male | -0.029 | 0.708 | -0.375 | [-0.179, 0.122] |
| 2 | Weight | -0.002 | 0.380 | -0.882 | [-0.007, 0.003] |
| 3 | Height | 0.007 | 0.111 | 1.608 | [-0.002, 0.015] |
| 4 | Age: $\leq 29$ | 0.145 | 0.360 | 0.919 | [-0.167, 0.457] |
| 5 | Age: 30 to 39 | 0.080 | 0.584 | 0.549 | [-0.207, 0.366] |
| 6 | Age: $\geq 40$ | 0.103 | 0.500 | 0.677 | [-0.199, 0.406] |
| 7 | Monday | -0.078 | 0.365 | -0.909 | [-0.249, 0.092] |
| 8 | Tuesday | -0.097 | 0.304 | -1.034 | [-0.282, 0.089] |
| 9 | Wednesday | 0.104 | 0.148 | 1.455 | [-0.038, 0.245] |
| 10 | Thursday | 0.213 | (**) **0.004** | 2.941 | [0.069, 0.356] |
| 11 | Friday | 0.254 | (***) **0.001** | 3.543 | [0.112, 0.396] |
| 12 | Saturday | 0.070 | 0.398 | 0.848 | [-0.093, 0.233] |
| 13 | Sunday | -0.138 | 0.114 | -1.594 | [-0.309, 0.034] |

(*): $0.01 < p \leq 0.05$, (**): $0.001 < p \leq 0.01$, and (***): $p \leq 0.001$

Stress

| No | Factor | Coef. | $p$-Value | $t$-Value | 95% CI |
|---|---|---|---|---|---|
| | (Intercept) | 116.777 | 0.047 | 2.012 | [1.653, 231.901] |
| 1 | Male | -0.088 | 0.993 | -0.009 | [-19.792, 19.616] |
| 2 | Weight | 0.150 | 0.617 | 0.502 | [-0.442, 0.741] |
| 3 | Height | -0.920 | 0.093 | -1.698 | [-1.994, 0.155] |
| 4 | Age: $\leq 29$ | 44.978 | (*) **0.030** | 2.203 | [4.469, 85.486] |
| 5 | Age: 30 to 39 | 33.416 | 0.074 | 1.806 | [-3.294, 70.125] |
| 6 | Age: $\geq 40$ | 38.384 | 0.055 | 1.943 | [-0.797, 77.565] |
| 7 | Monday | 2.692 | 0.804 | 0.249 | [-18.778, 24.163] |
| 8 | Tuesday | -2.020 | 0.864 | -0.172 | [-25.334, 21.294] |
| 9 | Wednesday | 20.102 | (*) **0.030** | 2.201 | [1.984, 38.220] |
| 10 | Thursday | 27.626 | (**) **0.005** | 2.873 | [8.553, 46.699] |
| 11 | Friday | 25.946 | (**) **0.007** | 2.762 | [7.314, 44.579] |
| 12 | Saturday | 15.330 | 0.143 | 1.477 | [-5.254, 35.914] |
| 13 | Sunday | 27.100 | (*) **0.029** | 2.214 | [2.823, 51.377] |

(*): $0.01 < p \leq 0.05$, (**): $0.001 < p \leq 0.01$, and (***): $p \leq 0.001$

- Friday: significant factor (positive coefficient) => teachers working on Friday tend to get exhausted.
- Thursday: nearly-significant factor (positive coefficient) => teachers working on Thursday also tend to get exhausted, but the effect is less than Friday

- Age ≤ 29: normal factor (positive coef.) => teachers ≤ 29 y/o tend to get stressed
- Wednesday, Friday: normal factor (positive coef.) => teachers working on Wednesday and Sunday tend to get stressed
- Thursday, Friday: nearly-significant factor (positive coefficient) => teachers working on Thursday and Friday tend to get stressed easier than Wednesday and Friday.

# Conclusion

**In this paper**:

- Teachers working on Thursday and Friday tend to get both exhausted & stressed.
  - Probably, it's caused by the fact that Thursday and Friday are the latest two days before the weekend holidays.
  - Although working on Friday is more exhaustive than on Thursday, working on Thursday is more stressful than on Friday.
- Teachers under 30 years old get stressed easier than the others.
  - In our survey, the people under 30 years old are the youngest participants and it's reasonable because young people may not have good control on their anxiety, emotion, and stress.

**Future work**:

- Examining the deeper reasons for these results.
- Collect other promising factors, i.e.,
  - Schools (e.g., #male/female teachers/children, public/private, etc.)
  - Teachers (e.g., experience (acquired skills), self-confidence, salary, full/part-time, etc.).
- Increasing the dataset (the most challenging task because there are not many nursery teachers and due to some difficulties in regulations related to privacy)