

Data Visualization Mid-Term Project

Topic:

Effect of yoga or physical exercise on physical, cognitive and emotional measures
in children: a randomized controlled trial

Authored by:

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Data Visualization and Breakdown: Marc Mailloux

I chose the topic of this paper because of my interest in the immense mental and physical benefits of yoga and associated philosophies. I was initially drawn to authors' experimental objective, which aimed to determine how effective Yoga and Physical Exercise (PE) is for children's mental and physical health. To test this hypothesis, the authors assessed 98 children over the course of 3 months to monitor specific variables before and after performing two different types of exercise activities: Yoga and PE. Four assessments were used to monitor the children: 1) Stroop-Word Test, 2) Physical Fitness Test, 3) Self Esteem Questionnaire, and 4) Teacher Questionnaire. The Stroop-Word Test tested cognitive abilities by asking the children to recite either the word or the color, where the word of a color ("blue") would be written in the ink of another color ("blue" written in red ink). The Physical Fitness test was an array of challenges to measure the participants' physical aptitude through activities like Shuttle Run, number of sit-ups during a time period, BMI, and others. The Self Esteem Questionnaire covered four areas of self esteem perception: Social, Parental, General, Academic. The survey in total had 50

questions, where ten pertained to Social, Parental, and Academic Self Esteem, and 20 to General Self Esteem. Lastly, the Teacher Questionnaire helped measure the students' mental and physical improvements through the teachers' perspective, since they worked closely with the students for three months and had intimate knowledge of their behaviors over the course of the trial.

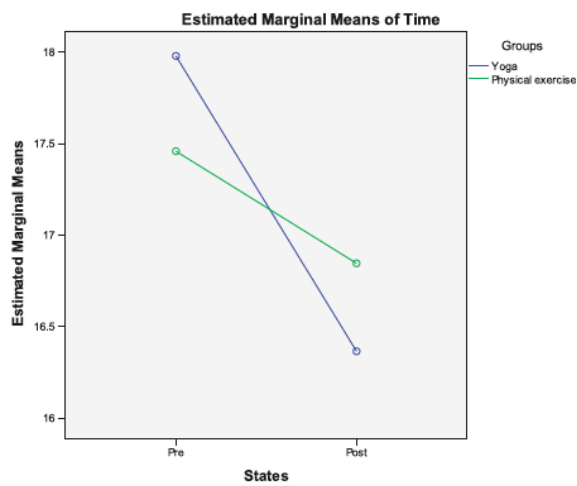


Figure 1

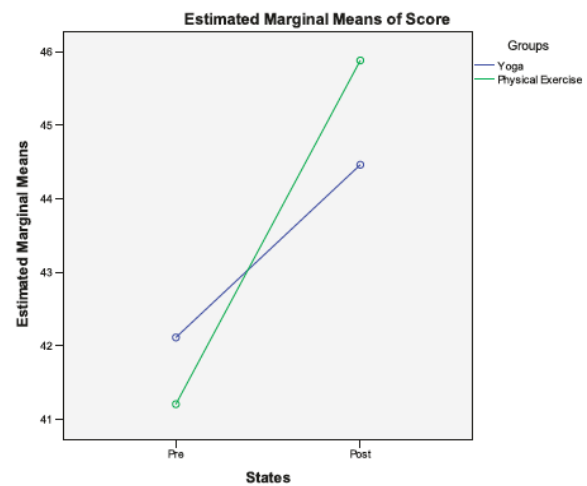


Figure 2

Variables	Yoga (n = 49)			Physical exercise (n = 49)		
	Pre	Post	Cohen's d	Pre	Post	Cohen's d
Obedience	6.05 (2.36)	7.59 (1.46)***	0.7847	5.98 (2.12)	7.68 (1.23)***	0.9808
Academic performance	5.25 (2.32)	7.48 (1.85)***	1.0628	5.13 (2.72)	7.733 (1.33)***	0.2158
Attention	5.48 (2.27)	7.42 (1.19)***	1.0704	5.32 (2.50)	7.71 (1.41)***	1.1776
Punctuality	6.28 (2.23)	7.87 (1.50)***	0.8366	6.23 (2.72)	7.94 (1.36)***	0.7952
Behavior with friends	6.61 (1.89)	7.78 (1.04)***	0.7670	6.53 (1.84)	7.86 (1.09)***	0.8794
Behavior with teachers	7.16 (1.67)	8.35 (1.19)***	0.8206	7.01 (1.68)	8.39 (0.98)***	1.0034

Values are group mean (S.D.).

***p < .001, post-hoc analyses with Bonferroni adjustment compared with pre.

Figure 3

Although the authors' experiment produced some compelling results, their objective was not effectively portrayed. Rather, their most telling datasets were presented with little to no detail or

visual aids, leaving the reader grasping at long tables of numbers to understand the experimental results. Figures 1-2 depict the only 2 “visual aids” that authors used to display their research, with the rest displayed as tables like Figure 3. The figures’ lack of color and visual representation make it difficult to interpret and *compare* the data. In particular, Figure 3 presents all of the resulting data from the “Pre” and “Post” Assessments in tables. This graphic proved to be ineffective at concisely presenting the information and communicating to the reader what interaction with the data was necessary to draw conclusions. But even trying to make a comparative analysis of the table proved to be difficult, as all the data contained under each variable made forming a conclusion timely and confusing. I was keeping track of 4-8 numbers in my attempt to analyze just one variable on the table. The authors’ data visualization in Figure 3 could have better supported their experimental objective by: 1) Having visualizations that describe themselves instead of relying on the annotations and 2) Effectively narrating the experiment through the visual aids so the whole experiment could be understood by a few concise visualizations.

Additionally, the lack of complete data with a control group prevented the data visualizations from painting a full picture of the experiment and its results. Having a third “control group” that did not participate in either Yoga or PE would have helped to compare the experimental results, but, unfortunately, this was not allowed by the school principal. It is also difficult to generalize the results of the experiment to “children” because of the unequal distribution of boys and girls in each experimental group. In the Yoga group, there were twice as many boys as girls and, in the

PE group, there were 26 boys and 23 girls. When the foundation of the experiment is not set on an even playing field, it becomes difficult to form a sound conclusion from the data.

My improvements to the authors' data visualizations help the reader better understand the full and complete results of the experiment. I created two sets of four graphs, Figures 4 and 5, representing the four assessment areas and their Standardized Difference of Two Means (Cohen'd) respectively. I created a separate graph for each area so the reader can make a more informed assessment of the entire dataset and it's conclusions, based upon the individual assessments and the Cohen'd values.

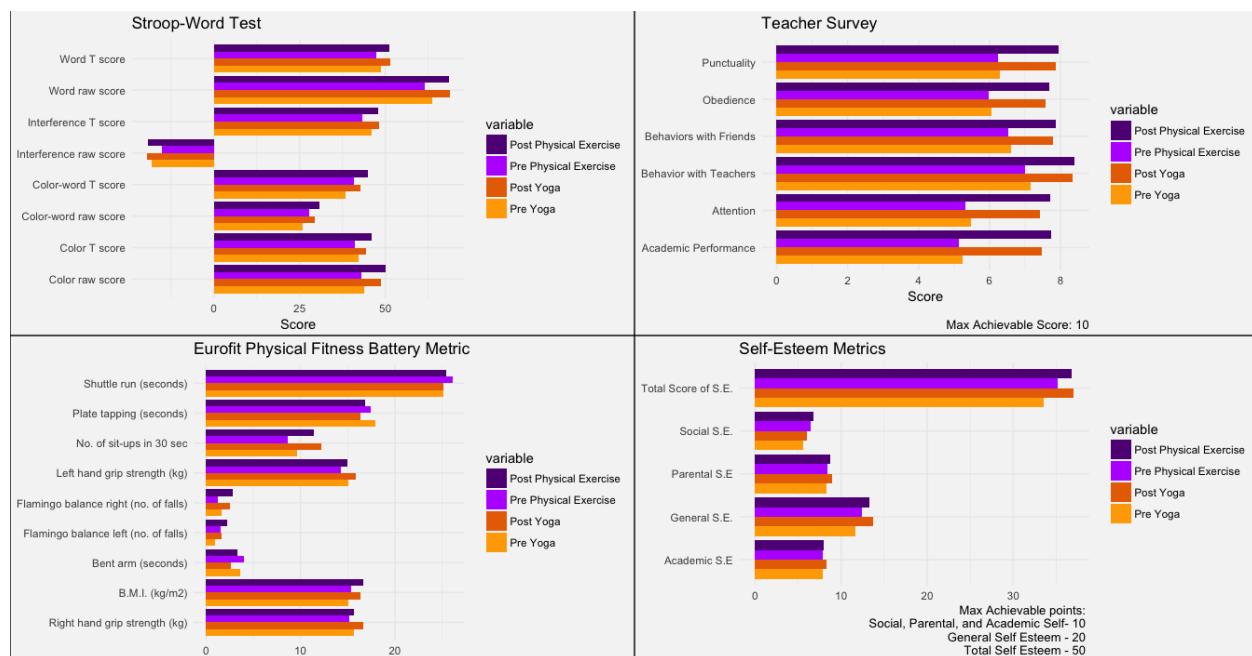


Figure 4

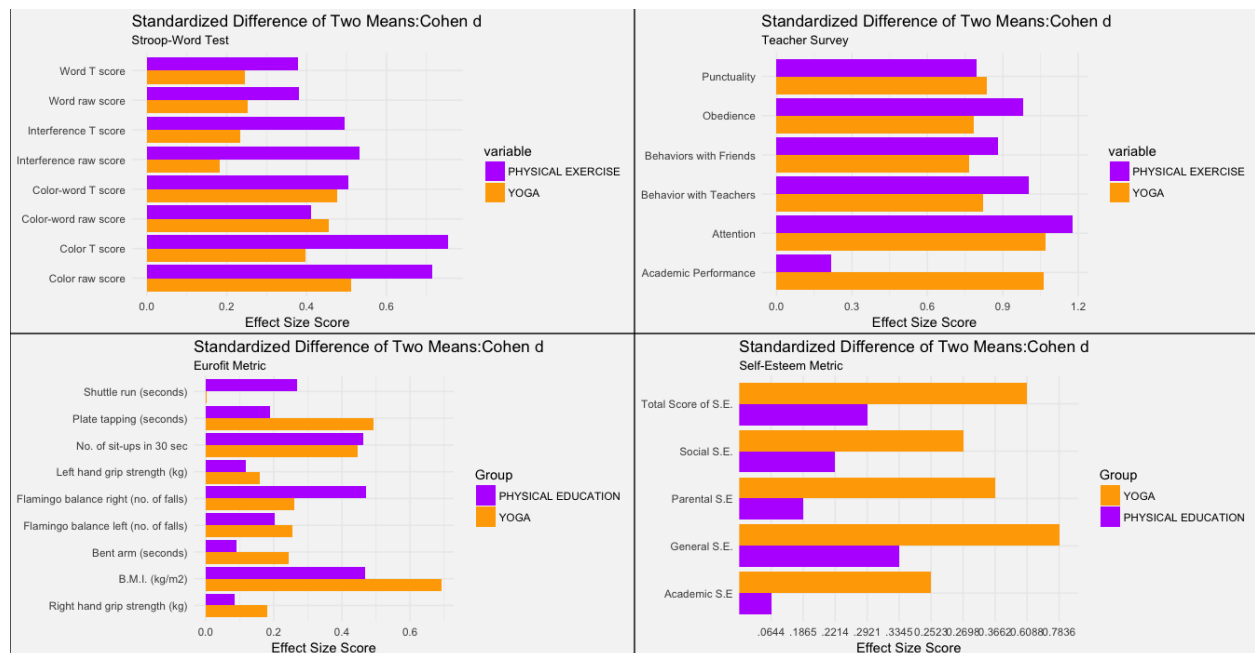


Figure 5

This approach allows for a broader viewpoint of the entire experiment, and allows the reader an unbiased view since we are looking at the entire trial as a whole rather than individual variables. When I started to create the data visualizations, I initially only considered one variable at a time on each graph. But I soon realized that looking at the results in a broader view allowed for more definitive overall conclusions and less separate conclusions that could result in biases. For example, Figure 4 clarifies the comparison between the two groups by graphically displaying the difference of the two means and their standard deviations, providing a comprehensive and concise visual for the experimental conclusions.

Using two contrasting colors allowed me to paint a binary graph that shows various variables, their respective values, and how the two groups compare. Avoiding tables and charts when

necessary allows the data to be conveyed through pictures instead of through numbers, a less comparative method. Lastly, I decided to plot all graphs on reverse coordinates so all of the variables would be readable on the axis. I also chose to give annotations to the graphs when the title alone left me with questions. For example, I added the max points to the Self-Esteem Metric so that the scale or unit of measurement for each variable was clearly understood. Similarly for the Teacher Questionnaire, I added a similar caption, and attempted to extend the scale to 10, but ran into some issues with the coding of the graph. To help draw even better comprehensive conclusions in an experiment of this nature, I would suggest using the data visualizations to highlight a specific attribute that was validated in the result--like Self-Esteem in the Yoga group or the Fitness in the PE group.

This paper proved to be a great resource for comparing the benefits of mental and physical health of children in regards to Yoga and PE, but lacked a the proper visual narrative. In general, the authors' experiment showed that Yoga and PE are both effective at improving children's fitness, self esteem, and cognition. My visualizations better depicts this improvement than the authors' visualizations because: 1) They provide a more concise and easily understood, stand-alone comparison of the data, and 2) The difference of two means comparison helps give insight on how significant the changes were based on the sample sizes.