Drawing Guideline for ‘Hip and Pelvis’: Plot with Error Bar

Jeehyoung Kim, MD, Jung Soo Lee, MD, Sung Jun Jang, MD

Department of Orthopedic Surgery, Seoul Sacred Heart General Hospital, Seoul, Korea

The appropriate plots effectively convey the author’s conclusions to the readers. ‘Hip and Pelvis’ will provide a series of special articles to show how to make consistent and excellent plots easier. In this article, we will cover plots with error bars.

Key Words: Plot, Error bar

INTRODUCTION

Bar plots are one of the most common and easily created plots because they can be readily made in Excel (Microsoft, Redmond, WA, USA). However, addition of error bars to the plot can be quite confusing. The present article has focused on how to add error bars to bar plots.

METHODS

The first tool is <https://tinyurl.com/Plot-with-error-bar2> (or <https://tinyurl.com/Plot-error-bar-II>) (Fig. 1). The data are presented in 5 columns. Column 1 contains all the groups represented by different colors. Column 2 contains values which are plotted on the X axis. Column 3 are the Y-axis val-

ues for each condition in column 2, which in general are the mean values of each condition. Column 4 and 5 contain the upper and lower limits of error bars which depend on the given data and may or may not be the same.

Setting the dodge to 0 may sometimes result in overlapping of the error bars (Fig. 2). The size and width of the points and error lines can be adjusted. When the error bars represent odds ratio or the hazard ratio, the presentation is usually displayed on a log scale. By flipping the axes, we can make a forest plot. The corresponding colors can be adjusted using “reverse color”, e.g., blue for men and red for women’s data, as required.

‘Divide by groups’ presents each group’s data independently and you can use ‘show line’ to connect the points visible. Use appropriate themes such as ‘classic’ for an article, or ‘gray’ for PowerPoint presentations. In the example above, ‘Set1’ was used for color contrast for better readability (Fig. 3).

Bar plots have similar menu (Fig. 4). The bars have regular intervals and the nominal variables are arranged along the X axis.

If a variable on the X axis is a text, flipping the plot should be considered for better readability (Fig. 5).

Dynamite plots are similar to bar plots; the only difference is that only the upper error bars are visible in the former.

The second tool is <https://tinyurl.com/Plot-with-error-bar> and <https://tinyurl.com/Plot-error-bar>.

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Address reprint request to

Jung Soo Lee, MD

(<https://orcid.org/0000-0003-0401-084X>)

Department of Orthopedic Surgery, Seoul Sacred Heart General Hospital, 259 Wangsan-ro, Dongdaemun-gu, Seoul 02488, Korea

TEL: +82-2-966-1616 **FAX:** +82-2-968-2394

E-mail: jokersix@naver.com

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Fig. 1. Initial feature of the first tool and example data by line plot.

Fig. 2. Setting position dodged to 0.

Fig. 3. Divided groups. Theme and color palette can be changed according to need.

Fig. 4. Applying bar plot.

Fig. 5. Applying flip setting.

Fig. 6. The plot using the second tool.

Fig. 7. Selection of example data and default variables.

Fig. 8. The simplest form of the plot.

Fig. 9. Example of data having the 3rd variable.

Fig. 10. Another example of data having the 3rd and 4th variables.

Table 1. Applying Each Variable

		2 variable		3 variable		4 variable
X variable	Nominal	A	A	A	A	A
Y variable	Continuous	B	B	B	B	B
Color	Nominal	A	C	A	D	C
Facet	Nominal			D	D	D

Fig. 11. Straightforward plot after removing jitter.

Fig. 12. Plot using line instead of bar.

Fig. 13. Result of adding box plot to jitter plot.

The plot above was made by this tool using 4 variables (Fig. 6). Continuous variables are critical which decide the height of each dot. The mean values of these dots are presented as bars which are arranged by 3 nominal variables of the X axis. Each variable is divided into 2 colors and the whole data set is divided into 2 facets. In conclusion, 4 variables are needed for the plot which are continuous variables on the Y axis, nominal variables on the X axis, color, and faceting.

On the sample data above, there are 5 variables but only 4 are actually used. Among them, the X (nominal variables) and Y (continuous variables) are essential (Fig. 7).

In simple form, the data can comprise 1 nominal and 1 continuous variable (Fig. 8). In such case, same value for color (3rd variable, nominal) and X variable can be

chosen, and the variables on the X axis will be saved as a text. By assigning 0 to the 4th variable, the variable can be neglected.

Assigning different values to the 3rd variable (color) will result in categorization of each datum into different colors (Fig. 9).

Using the same values for the 3rd and 4th variables will result in a plot shown in Fig. 10. So, how to use 2-4 variables on a bar plot has been shown. Using the appropriate number of variables for data presentation will require some practice (Table 1).

The bar plots were shown with jittered points and the mean standard error, removing those results in a more straightforward plot (Fig. 11).

Using line plots instead of bars can generate more com-

Fig. 14. Adding violin plot to jitter plot instead of boxplot.

Fig. 15. Plot using dot instead of line.

plex plots. Practicing on choosing the appropriate number of variables is necessary before attempting the line plots (Fig. 12).

Adding boxplots to jitter plots can offer good summary of a plot because they can present the maximal value, minimal value, median values, and interquartile range (Fig. 13).

Adding a violin plot instead of a boxplot also shows the distribution of data (Fig. 14).

Selecting dot plot can eliminate the traversing line of the plot. As shown in Fig. 15, there are numerous ways of presenting a plot, and the methods what researchers prefer the most have been introduced. Further applications can

Fig. 16. Examples of various combination of color.

The screenshot displays the user interface for uploading data and downloading a plot. On the left, under the heading 'data : csv file only', there are two radio buttons: 'example' and 'want to use my data', with the latter being selected. Below this is a 'Select your file' section with a 'Browse...' button and a 'No file selected' status. Further down, there is a checked checkbox for 'header' and a 'Separator' section with three radio buttons: 'Comma' (selected), 'Semicolon', and 'Tab'. On the right side, there is a checked checkbox for 'plot download'. Below this, the 'plot size (inches):' is specified with 'width:' set to 9 and 'height:' set to 6. At the bottom right, there is a button labeled '< PDF >, < SVG >, < pptx >'.

Fig. 17. Method for uploading data and downloading plot.

be tried as required (Fig. 15).

Using appropriate colors for a plot, such as for Lancet or JCO, becomes necessary sometime (Fig. 16). However, ‘Hip and Pelvis’ doesn’t have a confirmed palette; so, adjustment is not mandatory.

You can use your data referring to the example data provided above and the file should be uploaded in csv format.

The result data can be submitted to ‘Hip and Pelvis’ after saving the file in a PDF or pptx format (Fig. 17).

CONFLICT OF INTEREST

The authors declare that there is no potential conflict of interest relevant to this article.