This is a companion document to R4. It includes some extra graphing options for displaying data from two-way between group designs.

**Another way to graph main effects:**

```r
> library(gplots)  # first download and install 'gplots' package, then activate it with a library command
> plotmeans(errors~A,xlab="Factor A",ylab="mean errors", p=.68, main="Main effect Plot",barcol="black")
```

Plots the main effect means with +/- 1 s.e. You can make 95% c.i. bars by setting p=.95 in the statement above. This makes a line graph.

**How about bar graphs?**

We can use the means and se's we calculated.

Set up a function that allows error bars to be superimposed. Here it is, copy this into R and type a return.

```r
> superpose.eb <-
function (x, y, ebl, ebu = ebl, length = 0.08, ...)
  arrows(x, y + ebu, x, y - ebl, angle = 90, code = 3,
         length = length, ...)
```

Now make the bar graph using R's built in barplot function.

```r
> Abar = barplot(Ameans, beside=T, ylim=c(1,18), main="A main effect means, Keppel 11.8", xlab="factor A", ylab="mean errors", axes=T,legend.text=T, offset=0, xpd=F)
> box()  # add a box around the graph
> axis(4,labels=F)  # add tick marks on the right side
```

Lastly add the error bars using the superpose function. Remember we saved the A main effect standard errors earlier in the vector 'seA'.

```r
> superpose.eb(Abar, Ameans, seA, col="black", lwd=1)
```

The superpose.eb function and other useful R things can be found on the website of Raoul Grasman:

Make the interaction plot.
The built-in interaction plot function doesn’t include standard errors, but it is quick and easy just to get a look. Plot the interaction and look at it. After you look at it, you can change things to make it look the way you want. pch is the character to use to plot the points. Type is whether to draw lines, use points, or both ("b" is for both).

I like line graphs for thinking about interactions. Yes, with a qualitative Factor A, the reviewers will tell you to graph it as a bar graph. But first we need to think about our results, and I like line graphs for that.

```
> interaction.plot(A, B, errors, fun=mean, type="b", main="Keppel Table 11.8 data", xlab="Factor A", ylab="Mean Errors", trace.lab="Levels of B", pch=20, fixed=F)
```

![Keppel Table 11.8 data](image)

Bar graph with factor B on the x-axis.
Here we are specifying many parameters that can be omitted, to give a sense of how much you can customize your graphs. You can see what all the parameters do by typing help(bargraph.CI).

Remember that you need the sciplot library installed and loaded to use this.

```
> bargraph.CI(B, errors, group=A, split=F, col=NULL, angle=NULL, density=NULL, lc=TRUE, uc=TRUE, legend=T, ncol=1, leg.lab=NULL, x.leg=NULL, y.leg=NULL, cex.leg=1, bty="n", bg="white", err.width=if(length(levels(as.factor(B))))>10) 0 else .1, err.col="black", err.lty=1, fun = function(x) mean(x, na.rm=TRUE), xlab="Factor B", ylab="mean errors", ylim=c(0,18), xpd=FALSE, cex.axis=1, yaxt="s", xaxt="s", data=NULL, subset=NULL,main="Keppel Table 11.8")
>
> box()
> axis(4,labels=F)
```

![Keppel Table 11.8](image)