USING CUSTOM MAPS AND
SELECTION FILTERS TO EXPLORE
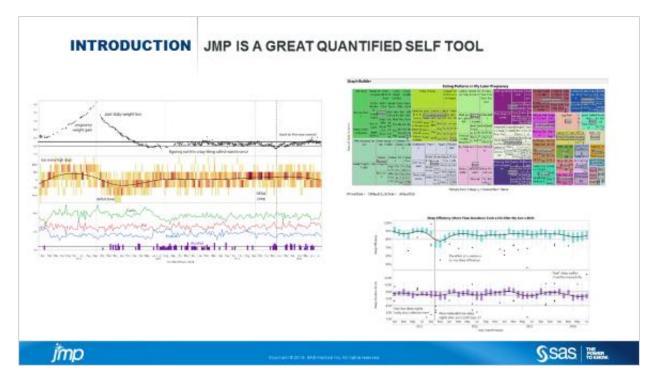WORKOUT DATA IN JMP 12
SHANNON CONNERS, JMP R&D

Hi everyone, I'm Shannon Conners and I am director of development operations for JMP. My group handles many of the tasks downstream of feature development-host and display system testing, documentation, localization, builds/installs and getting JMP software updates out the door, through the SAS release process, and on their way to you…again and again!

But we're not going to be talking about those fun and games today. Instead, I'm going to be sharing a personal project that I did that took advantage of some new- and older-JMP 12 features.

???: How many people here are using JMP 12? If you're not, you might be a bit disappointed you don't have some of the features I'll describe today. That just means you'll have to go home and bug your IT department to deploy 12!

INTRODUCTION | **JMP IS A GREAT QUANTIFIED SELF TOOL**

If you stopped by my poster at JMP Discovery in Cary last year, or have read any of my blogs in my Fitness and Food series this year, you have probably seen some of the Graph Builder graphs that I created with the help of Xan Gregg, who you heard this morning. I have collected several years of activity monitor, sleep and food log data, and getting the data out of various apps and into JMP helped me to improve my JSL skills, get more familiar with JMP's primary graphing platform-and helped me learn a thing or two about myself and my patterns.

Now don't get me wrong-I use JMP for plenty of work-related projects exploring our internal software development data-but those aren't really bloggable topics. Working with my own personal data gives me the chance to give developers early feedback on features, and learn about new areas of JMP with data sets that mean a lot to me.

My personal projects also generate new ideas and tools that I can apply to work-related projects. The food log parsing script I wrote last year to do text import with regular expression pattern matching turned out to be adaptable to parsing all the text logs in our source control system-very useful information when keeping tabs on development progress!

Through my blogs, I got connected to others in the quantified self community and had the opportunity to attend and give a short show and tell talk at QS15 in San Francisco last June. If you haven't heard of it before, the quantified self movement encompasses all kinds of self-tracking activities. This is accomplished in part by using internet-connected self-trackers, and so QS connects to the larger concept commonly referred to as Internet of Things (IOT). IOT is important at the large scale for companies, cities, and countries but also at the personal level.

I find people tend to track the things that most interest them. Some people get obsessed with monitoring their home environment (talk to Dan Valente about that one-just ask him about his crawlspace sensors and whole house power monitoring system), while others go off the deep end with measurement devices related to their diet, exercise and body composition (that's me!).

Of course, now I'm uncovering many flaws in how my personal data is made accessible to me, and complaining to the device manufacturers when it's just harder than it needs to be to extract an analysis-ready data table. Just give me my CSV files people!!!

I even have a device, shown at the lower right, called the Push Strength band, that tracks information about all the reps in my weight training workouts.

INTRODUCTION ACCESSING MY HISTORICAL WORKOUT DATA

But unlike my activity monitor data and the system I'm currently using for tracking my strength training data, my historical workout data isn't in a set of files requiring scripting to combine. It's sitting in a series of hand-written notebooks! I have kept paper notebooks with details of each of my weight training workouts since high school and have notebooks dating back to 1998. It always seemed like it would be way too much work to transfer this data out of my notebooks and get it into electronic form.
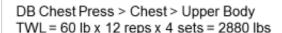
Now, I know you're immediately thinking why didn't I try OCR-well, I did, but it just didn't work out very well. I found it was faster just to enter the data manually. So early this year, I began to take little chunks of my early morning time to enter my data. I started with all my January workouts, since I had recorded workouts during 14 of the last 17 Januaries. That's expected, right? Most people are the most motivated by New Year's resolutions!

INTRODUCTION | **WORKOUT METRICS**

- Exercise Name > Primary Body Part > Body Zone
- Total Weight Lifted = Sum(Weight used) x # of Reps x # of Sets

DB Chest Press > Chest > Upper Body
TWL = 60 lb x 12 reps x 4 sets = 2880 lbs

DB Hammer Curl > Biceps > Upper Body
TWL = 30 lb x 12 reps x 4 sets = 1440 lbs

Before I get into my data, a little about the metrics I used just in case you are unfamiliar with lifting weights. Tracking metrics for weight lifting is different than for cardio exercise tracking time, distance or steps.

Often people think about maximum weight lifted, but very few people train this way regularly unless they are training for a powerlifting competition. Working at your upper strength limit greatly increases the risk of injury so most weightlifters don't. They tend to take a volume approach.

The metrics I track include the date and time and/or duration of the workout, workout program and workout name, and exercises performed in each session. Every exercise can be mapped to a primary body area that it works. And those body areas can be separated into body zones-upper body, lower body, and core.

For each exercise, I track the weight I used, how many repetitions of the movement I performed, and how many distinct sets of reps I performed. Using these component pieces of information, I calculate a total weight lifted metric for each unique combination. I can then sum that information at various levels. I've shown two example exercises here to illustrate these metrics. TWL (total weight lifted) is the sum of the two weights used, times the number of reps times the number of sets.
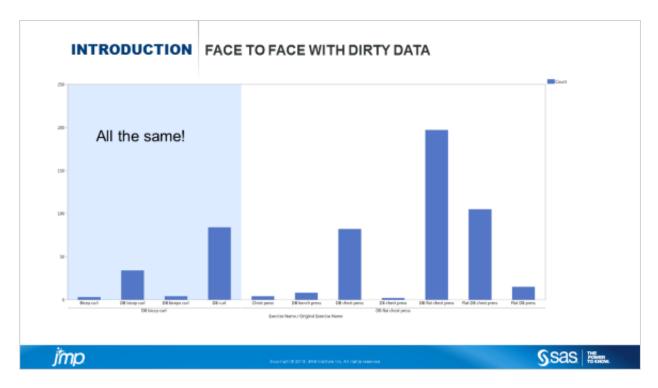
INTRODUCTION WORKOUT DATA TABLE

	Date	Workout	Exercise Name	Primary Body Part	Body Zone	DB or BB Weight	Reps	# DBs	# Sets	Workout Length	Total Weight Lifted	Start Time	End Time
3	10/13/1998	Legs and Abs	Leg press	Quadriceps	Lower body	50	20	1	1	1:10	1000	9:35 AM	10:45 AM
4	10/13/1998	Legs and Abs	Leg press	Quadriceps	Lower body	70	20	1	4	1:10	5600	9:35 AM	10:45 AM
5	10/13/1998	Legs and Abs	Leg extension	Quadriceps	Lower body	20	20	1	1	1:10	400	9:35 AM	10:45 AM
6	10/13/1998	Legs and Abs	Leg extension	Quadriceps	Lower body	30	20	1	4	1:10	2400	9:35 AM	10:45 AM
7	10/13/1998	Legs and Abs	Machine leg curl	Hamstrings	Lower body	40	25	1	1	1:10	1000	9:35 AM	10:45 AM
8	10/13/1998	Legs and Abs	Machine leg curl	Hamstrings	Lower body	30	20	1	4	1:10	2400	9:35 AM	10:45 AM
9	10/13/1998	Legs and Abs	Calf raise	Calves	Lower body	60	20	1	5	1:10	6000	9:35 AM	10:45 AM
10	10/13/1998	Legs and Abs	Machine glute raise	Glutes	Lower body	30	15	2	1	1:10	900	9:35 AM	10:45 AM
11	10/13/1998	Legs and Abs	Machine glute raise	Glutes	Lower body	20	20	2	1	1:10	800	9:35 AM	10:45 AM
12	10/13/1998	Legs and Abs	Ab machine	Abs	Core	40	25	1	1	1:10	1000	9:35 AM	10:45 AM
13	10/13/1998	Legs and Abs	Ab machine	Abs	Core	55	25	1	1	1:10	1375	9:35 AM	10:45 AM
14	10/13/1998	Legs and Abs	Ab machine	Abs	Core	70	25	1	1	1:10	1750	9:35 AM	10:45 AM
15	10/13/1998	Legs and Abs	BW situp	Abs	Core	1	50	1	1	1:10	50	9:35 AM	10:45 AM
16	10/13/1998	Legs and Abs	BW side crunch	Abs	Core	1	25	2	1	1:10	50	9:35 AM	10:45 AM
17	10/13/1998	Legs and Abs	BW single leg lift	Abs	Core	1	25	2	1	1:10	50	9:35 AM	10:45 AM
18	10/14/1998	Back and Abs	DB bent row	Back	Upper body	12	15	2	1	1:15	360	8:05 PM	9:20 PM
19	10/14/1998	Back and Abs	DB bent row	Back	Upper body	20	15	2	2	1:15	1200	8:05 PM	9:20 PM
20	10/14/1998	Back and Abs	DB bent row	Back	Upper body	15	15	2	2	1:15	900	8:05 PM	9:20 PM
21	10/14/1998	Back and Abs	Machine pulldown	Back	Upper body	40	15	1	1	1:15	600	8:05 PM	9:20 PM
22	10/14/1998	Back and Abs	Machine pulldown	Back	Upper body	60	15	1	4	1:15	3600	8:05 PM	9:20 PM
23	10/14/1998	Back and Abs	Cable row	Back	Upper body	40	15	1	1	1:15	600	8:05 PM	9:20 PM

Here is my data table containing information about my workouts and exercises. It's currently about 10,000 rows worth of data, with multiple rows per workout that detail each unique weight-rep-set combination I did that day.
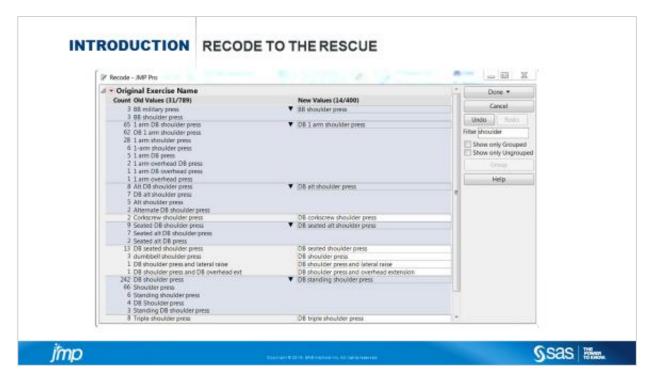
Once I finally had my table ready, I started to make some graphs to explore my workout volume. But immediately I noticed a problem. I hadn't standardized my exercise names, so I had a ton of redundancy in the table. I did eventually fix the names to make them more consistent, so I've nested the old names in the new names so you can get an idea of how many variations of names I had used over the years. On the left are the various names I used for bicep curls, and on the right the various names I used for dumbbell flat chest press.

Fortunately JMP has a tool for that! I'd become best friends with the JMP 12 Recode platform during last year's Discovery food log project, so I began to group and filter my table until I had a consolidated set of unique exercise names.

???: How many of you have used the new JMP 12 Recode platform? (Answer was not too many-more of you need to be using it!!! It's awesome.)

Don McCormick will be presenting on data cleanup with Recode in JMP tomorrow. There are a number of blogs about the new platform written by me and others. I continue to use the scripts as I get new data, since I can reload the script into the dialog, redo my groupings, and run the script again to update my data table.
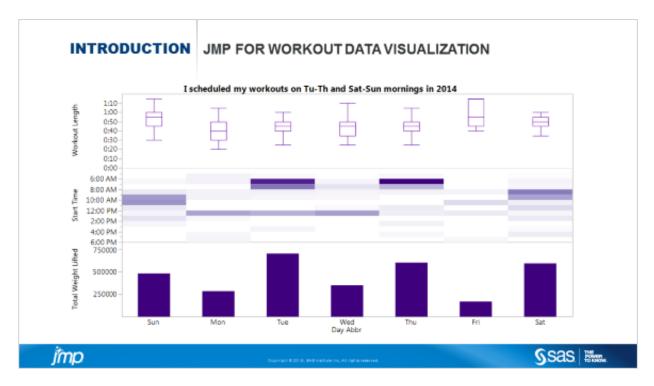
Exercise Recode blog link: http://blogs.sas.com/content/jmp/2015/04/24/cleaning-up-workout-data-with-recode-in-jmp-12/

Food log Recode blog link: http://blogs.sas.com/content/jmp/2015/02/20/cleaning-up-and-visualizing-my-food-log-data-with-jmp-12/

Blog on creating Recode script from a lookup table: http://blogs.sas.com/content/jmp/2015/07/06/creating-a-jmp-12-recode-script-from-a-lookup-table-containing-original-and-new-values/

INTRODUCTION | JMP FOR WORKOUT DATA VISUALIZATION

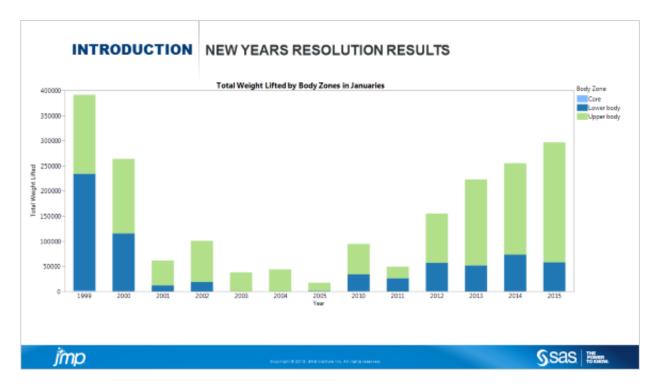I scheduled my workouts on Tu-Th and Sat-Sun mornings in 2014

I started out initially with relatively simple graphs of my weight training data in Graph Builder, exploring the timing of my workouts and the total poundage lifted.

I was amazed at how well my data identified the days of the week that I usually work out. I used my workout duration for the box plot, start time data for the heatmap, and total weight lifted for the bar charts.

My typical workout schedule in 2014 was Tu-TH early am, a bit later on Sat-Sun, and occasionally M-T-W at lunchtime. You can see this reflected in the heatmap element above and the total poundage lifted on those days.

INTRODUCTION | **NEW YEARS RESOLUTION RESULTS**

Total Weight Lifted by Body Zones in Januaries
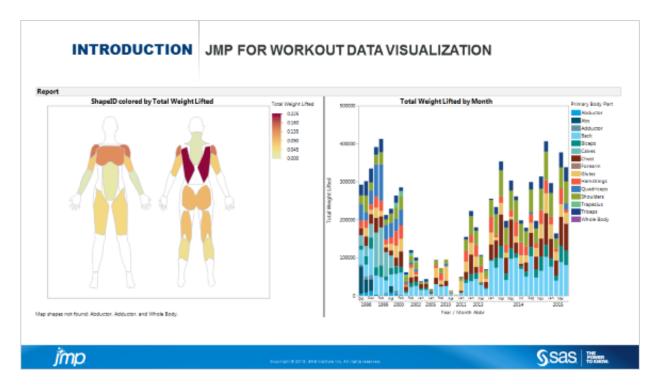
I also explored data for only Januaries and it was certainly interesting to see how my patterns differed over the years. Back in grad school, I used to lift a lot too, but when I switched to much shorter home workouts, my volume dropped off considerably. In recent years I've been ramping up the volume of my workouts and working more upper than lower body.

INTRODUCTION | JMP FOR WORKOUT DATA VISUALIZATION

But I have to thank Xan for pointing me in the direction of JMP custom maps. With the incorporation of mapping into this project, it evolved into a fun opportunity for me to learn more about custom maps in Graph Builder and the new JMP 12 selection filter feature.

??: How many people have used selection filters?

THINGS TO DO AT JMP DISCOVERY — CORNER XAN AND DAN!

Xan Gregg
Director of Research and Development
JMP Graph Builder

Dan Schikore
Principal Software Developer
Application Builder
Bubble Plot, Ternary Plot

And that brings me to my next point-while you all might not be so lucky to have Xan there in person to help you make your graphs better (as he frequently does with mine), he is here at Discovery so please be sure to find him! Xan is active in the JMP online community, and blogs about Graph Builder frequently.   In addition to being the primary developer for Graph Builder, Xan runs a group that we struggle to name but I call it Data Discovery because it includes developers who support the JMP data table, scripting, visualization and the display system. Xan really appreciates it when customers share their favorite features, bugs and suggestions! You will probably find him in tie dye and not a suit.
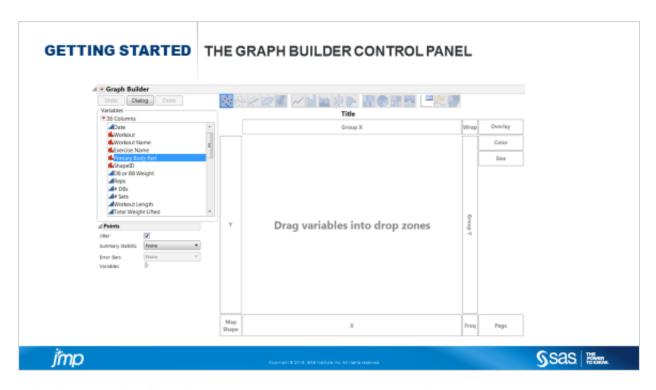
Several of Xan's team members including JMP Developer Dan Schikore are also here at Discovery. Dan presented yesterday and he has a poster on the selection filters that I showed on the last slide, so please stop by to get a lot more details from him on how to incorporate them into your dashboards. Dan is also the brains behind JMP's App Builder and supports Bubble Plot, so keep that in mind if you have ideas for those platforms for the future.

John Ponte from Xan's team is also here, so please stop by his poster if you have questions about custom maps or images in JMP.

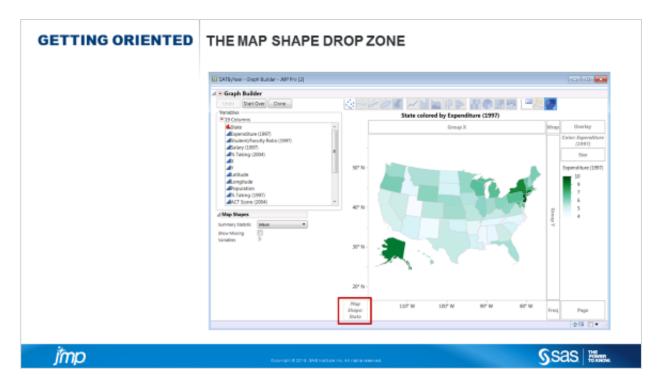**GETTING STARTED | THE GRAPH BUILDER CONTROL PANEL**

Alright, now that I've given you your developer stalking directions, back to the topic at hand.
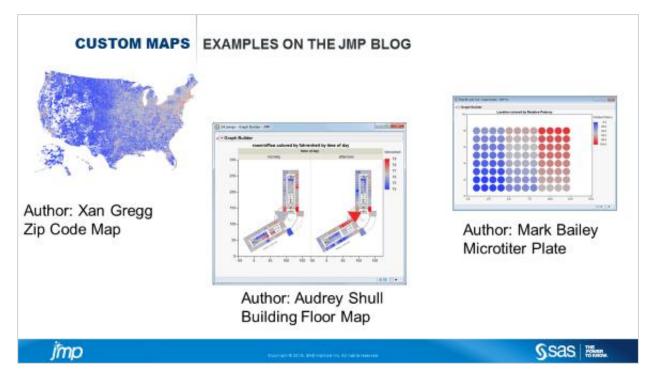
First of all, I hope that you are all familiar with JMP's Graph Builder platform. If you're not, you really should be! It's a tremendously useful tool. You can find it as the first item under the graph menu. Graph Builder gives you a blank canvas that you can use to build and customize lots of different kinds of graphs.

GETTING ORIENTED | **THE MAP SHAPE DROP ZONE**

When you open a Graph Builder window, you will see a lot of different drop zones, but the one I want to focus on is the map shape field at the lower left. If you drag a column into this field that contains a map-associated name like state, country, etc. that is found in one of JMP's built-in maps, JMP will automatically recognize it and add map shapes.
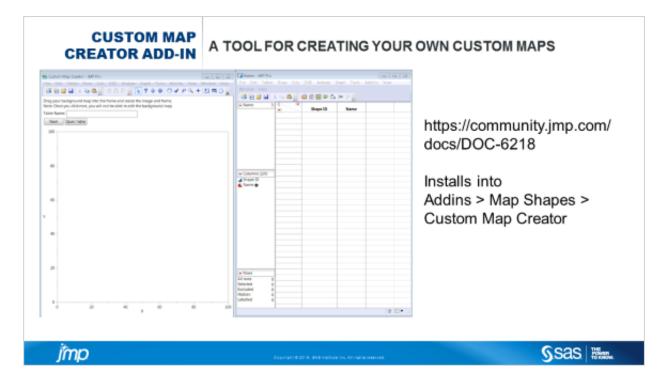
CUSTOM MAPS | EXAMPLES ON THE JMP BLOG

Author: Xan Gregg
Zip Code Map

Author: Audrey Shull
Building Floor Map

Author: Mark Bailey
Microtiter Plate

You can also add custom maps to JMP's library to help it recognize other kinds of map shapes beyond the standard ones.

There are a few great JMP blogs out there that show examples of creating custom geographic maps, like the zip code map Xan created and posted to the file exchange. This custom map was created by importing a set of existing shape files from another source.

The shape ID field can be used to display smaller scale maps too. For example, you can display locations within a building and color the room shapes by temperature data, like this example on the bottom. Mark Bailey from SAS Education also published a blog on creating custom shape files for a microtiter plate.

Really, the possibilities are endless!

CUSTOM MAP CREATOR ADD-IN

A TOOL FOR CREATING YOUR OWN CUSTOM MAPS

https://community.jmp.com/docs/DOC-6218

Installs into
Addins > Map Shapes >
Custom Map Creator

And you're not left alone in the process of creating custom maps. Thanks again to Xan for pointing out the existence of a freely available add-in on the JMP file exchange that lets you create custom map shape files by tracing shapes from a picture or line drawing. The shapes can be anything that you can draw with line segments. For example, the add-in was used to create the floor plan diagram on the previous slide.
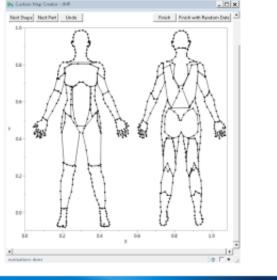
When you downloaded the add-in, you drag it into JMP to install it. From then on, it appears in your Addins > Map Shapes directory

CUSTOM MAP CREATOR ADD-IN | TRACING MY CUSTOM BODY MAP SHAPES

- What did I need?
  - Custom Map Creator add-in
  - Image of female muscle structure
  - Patience!
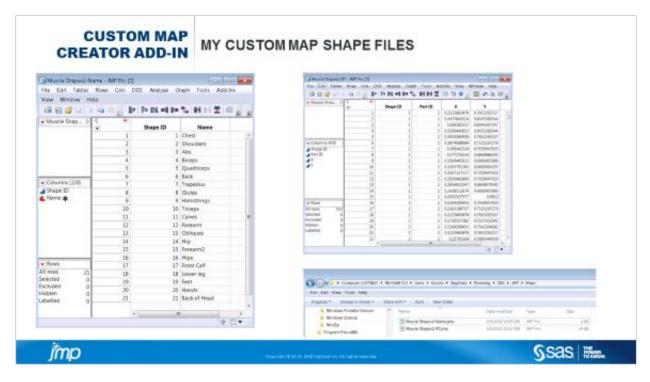
In my case, my shapes of interest were body areas containing major muscle parts on a female body. I looked online for a free jpg of female muscle structure, saved it to a file on my computer, and dragged the file into the Custom Map Creator window.

The most time-consuming part of this process was creating the lines for the different shape segments. It took me a few hours to trace the various areas for front and back. It's not perfect, and in retrospect, could have been more detailed, but you get the basic idea!

Fortunately the addin did the work for me of recording the information about my custom map.

The add-in populates two files as you trace shapes. One file defines the names of the shapes and the other file defines the points along the boundaries of each shape.

Once I had created these files by tracing around the muscle areas, I placed them in a directory under my user area in the roaming folder. Note that this is the JMP 12 location. The pre-JMP 12 location was under AppData/Local.
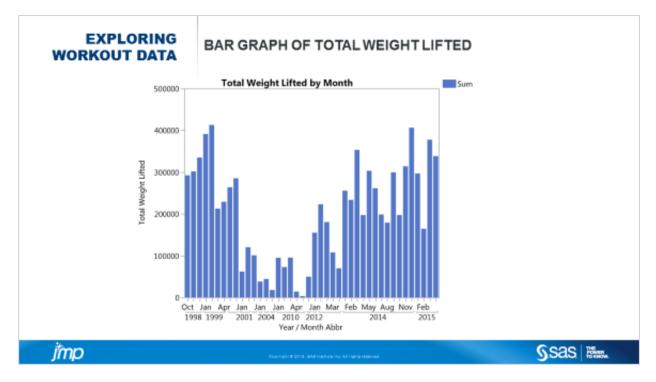
MAP SHAPES JMP DEMO

- The following slides are static images taken of the graphs I presented during my live demo at Discovery

EXPLORING WORKOUT DATA — BAR GRAPH OF TOTAL WEIGHT LIFTED
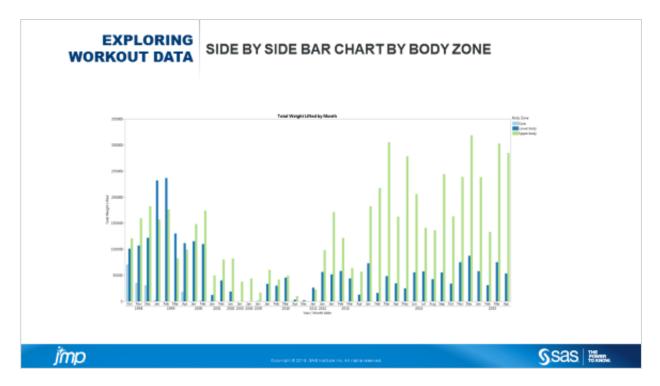
Getting back to my data table, I have a relatively simple bar graph script saved that just tracks my total weight lifted metric over months and years.

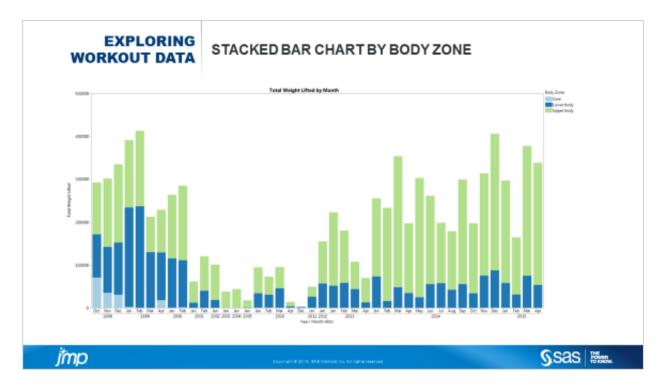I used transform columns to create month and year variables and dragged them to create a nested axis

This is a nice overall view of the total pounds I lifted over time, but not very informative about other variables in my training history.
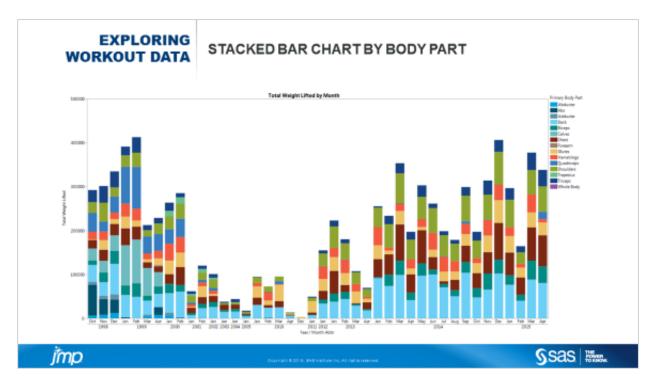
EXPLORING WORKOUT DATA — SIDE BY SIDE BAR CHART BY BODY ZONE

One option would be to add an overlay variable like body zone. Now I can see that although I am lifting about the same poundage as I did back in grad school, I did a lot more lower body work back then whereas now, I am doing more upper body work. Also, I used to do weighted core exercises but I rarely do now.

EXPLORING WORKOUT DATA — STACKED BAR CHART BY BODY ZONE

I even like the stacked view of this one. Although it's a bit harder to tell the relative length of the green and blue bars, you can clearly see that the blue bars are quite a bit lower in recent years and the green ones are quite a bit longer, although the total poundage might be similar to my grad school days. You can also see in the middle of the graph where I was doing shorter, lower volume workouts for lack of time.
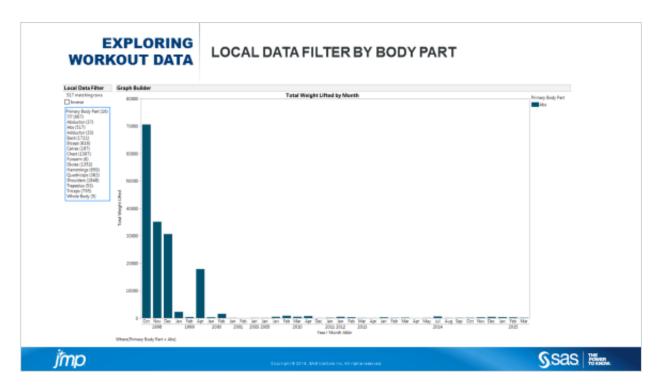
We can take it one step further and change the overlay variable to primary body part. Each exercise works a primary body part, so where am I spending my time in the gym now compared to where I used to spend it? Not surprisingly, given the last graph, I'm working my shoulders, back and chest more and legs less.

But you can see that with so many body parts, this graph quickly becomes cluttered. Although someone very familiar with the data (me) might enjoy looking at it, it's hard to judge the relative length of the bars like Xan mentioned in his plenary talk this morning.

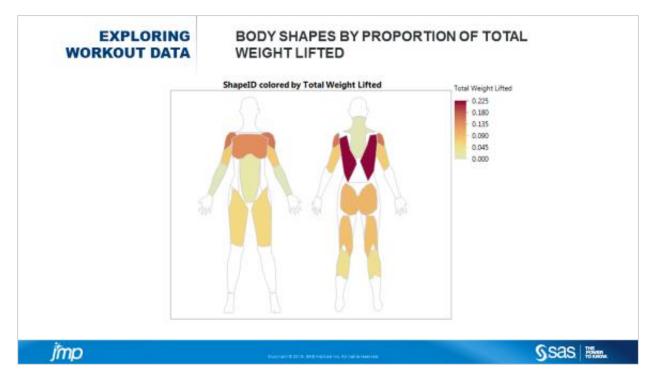EXPLORING WORKOUT DATA — LOCAL DATA FILTER BY BODY PART

This is where filtering helps. I can add a local data filter to the graph using the toolbar button and now click through a list of body parts to see their patterns. For example, I used to do weighted ab exercises in grad school. Now I don't do those anymore-any ab work I do tends to be bodyweight only.

Similarly the weight I lift for calves and quads has dropped off greatly.

EXPLORING WORKOUT DATA

BODY SHAPES BY PROPORTION OF TOTAL WEIGHT LIFTED

ShapeID colored by Total Weight Lifted

Total Weight Lifted
0.225
0.180
0.135
0.090
0.045
0.000

It would be cool to be able to visualize my overall patterns yet drill down into specific body parts too. And so let's get some shapes from my custom map in here!

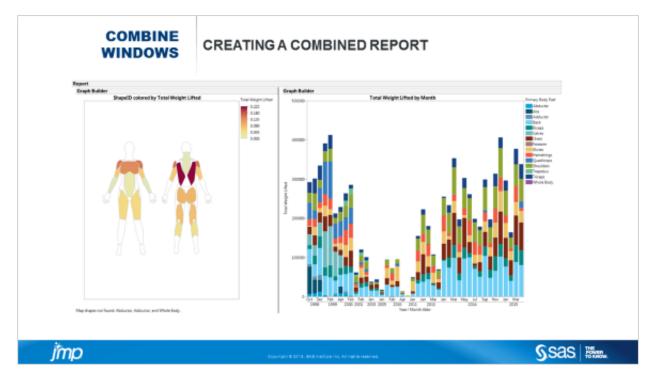It takes a few steps to get the shapes in and cleaned up like I want them.
First I drag in a column containing shape names, then color by my data (total weight lifted in this case).
I change the summary statistic to % of total to show which primary body parts lifted the most total weight.
I update the color theme since the proportion is not centered at 0 to my favorite theme (Muted Yellow to Red).
Then I clean up the axis settings a bit to remove tick marks, etc.
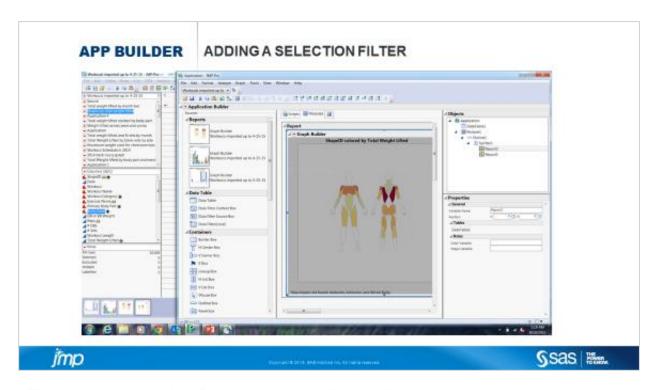
COMBINE WINDOWS — CREATING A COMBINED REPORT

Now I am going to make use of JMP's combine windows functionality to create a combined report with both graphs.
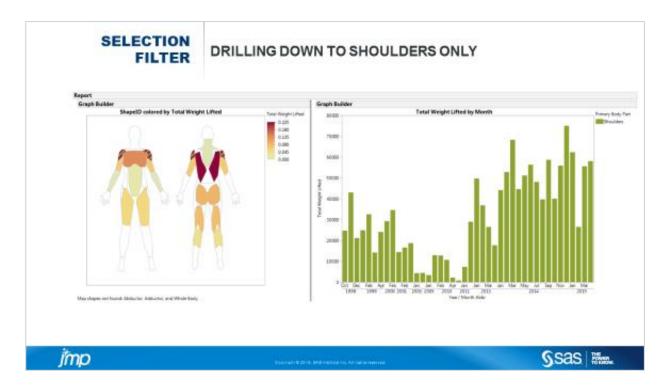
I check the boxes at the bottom of the windows I want to combine, and choose Combine Windows. A combined report opens, and I can click the red triangle to Edit Application.
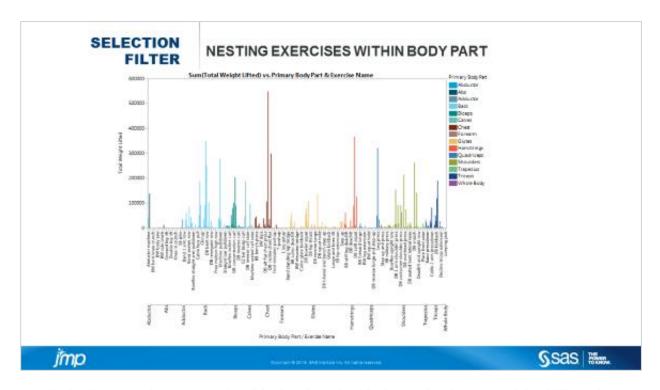
This brings me into App Builder, where I will right click on my body map and choose Use as Selection Filter. Now, when I run the application from the red triangle menu or by clicking on the script button, my body map provides a visual filter.
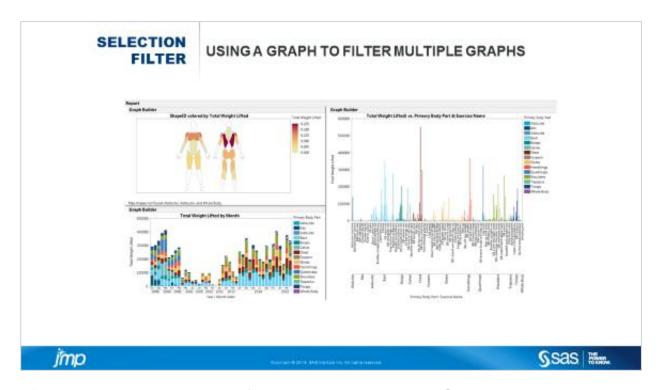
By clicking on shoulders, the bar graph updates to show only data for that body area. I can also control click to see multiple parts together.
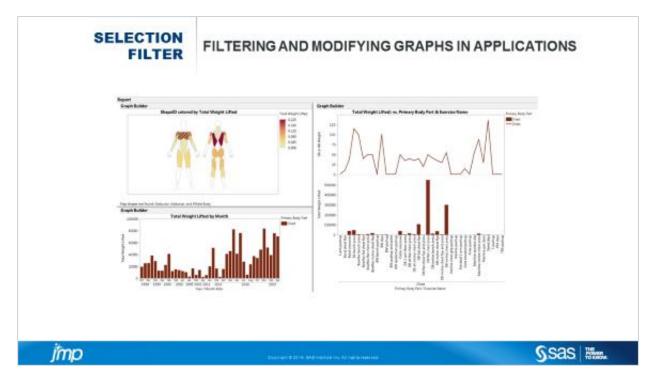
Let's look at another example. Maybe I've decided that I'm interested in drilling down into particular body parts now to try to understand my individual exercise patterns throughout the whole time frame. I have a graph with a nested axis (exercise within body part) that is pretty cluttered.

But I can use my body map to filter more than one graph. So here I can show my stacked bar chart along with my nested axis bar chart and make use the body shapes to filter them both. This allows me to drill down and see the exercises that accounted for the most total weight lifted for a specific primary body part. Here is the report without filtering.

As I filter down by clicking on chest, my graphs update to show total weight lifted for chest (lower left) as well as total poundage lifted for chest by exercise over the whole time period (right).

I also can add to the dashboard at this point. For example, I added a line graph showing the maximum weight I lifted for different exercises within the table.

I hope this presentation has given you a few new ideas about using JMP with custom maps, and I'd be happy to answer any questions!