

Animate your Data!

Kriss Harris and Richann Watson

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Kriss Harris, SAS Programmer, SAS Specialists Limited

Kriss Harris worked at GlaxoSmithKline for almost 6 years from 2005 to 2011 as a Statistician supporting drug discovery.

Whilst at GSK he developed an increasing passion for teaching and taught SAS Graphics to SAS Programmers, Statisticians and Scientists.

Since then Kriss has moved on to become an independent Statistical Programmer and has consulted at Eli Lilly and Eisai. Currently Kriss is consulting at Eli Lilly supporting early phase Oncology.

<https://twitter.com/krissharris>

Animate your Data!

Richann Watson, Statistical Programmer and CDISC Consultant,
DataRich Consulting

Richann Watson is an independent statistical programmer and CDISC consultant. She has been using SAS since 1996. She has worked on various therapeutic areas including Oncology and Diabetes.

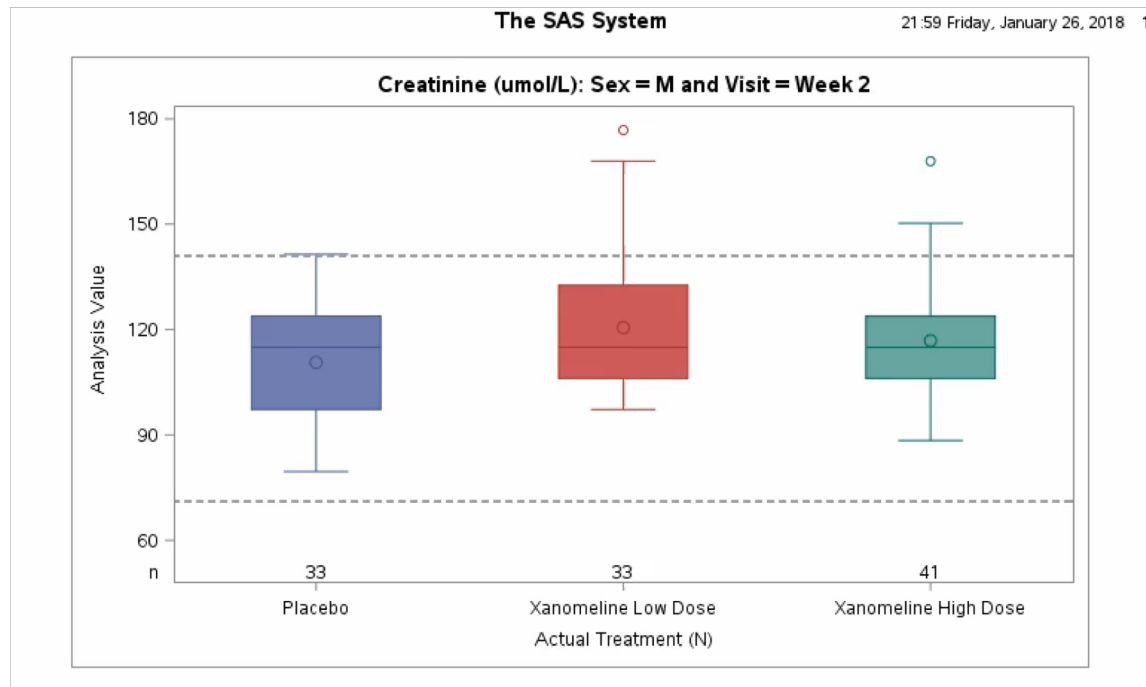
She is also a member of the CDISC ADaM team and various sub-teams. In addition, she is the chairperson for the local SAS user group in her area and is actively involved with SAS Global Forum, PharmaSUG, MWSUG and other SAS User Groups.

<https://twitter.com/RichannWatson>

https://twitter.com/SAS_DataRich

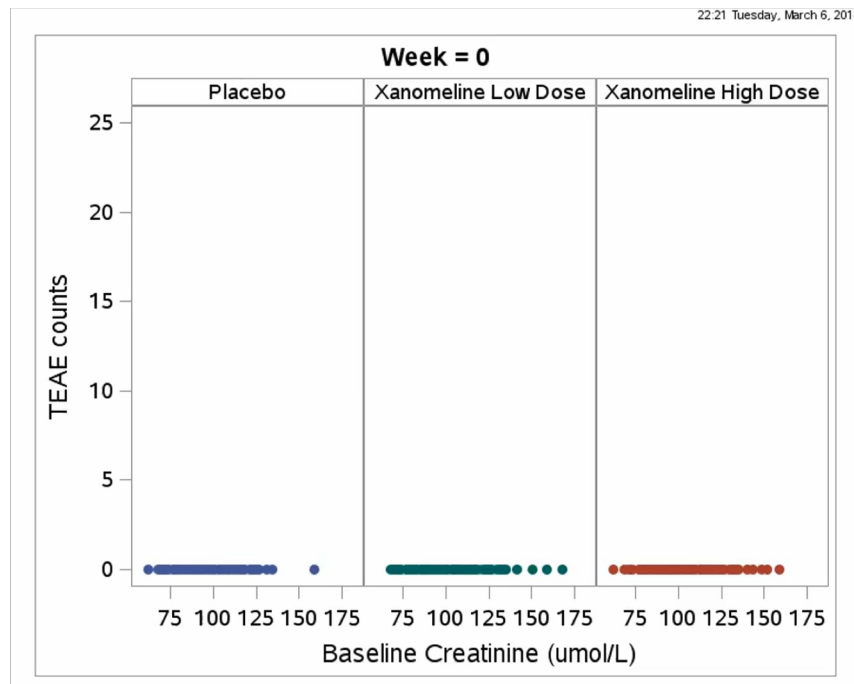
Agenda

Show you how to produce animations



Agenda

Show you how to produce **smooth** animations



Why use Animation?

- You can understand and interpret your data.
 - You can quickly get an idea of the number of subjects that had abnormal laboratory results at each visit.
 - You are also able to easily determine the adverse events each subject had and the duration of the adverse event.
 - You can monitor blood pressure over time by treatment.
 - You can easily discern a dip or a spike in someone's heart rate.

How to Animate

```
ods printer file="C:\animation.gif";  
options printerpath=gif animation=start  
    animduration=0.5 animloop=yes  
    noanimoverlay;
```

```
proc sgrender data=<data-set-name>  
    template=<template-name>;  
    <other optional statements>;  
run;
```

```
options printerpath=gif animation=stop;  
ods printer close;
```

How to Animate

```
/* define template here */
```

```
proc template;  
  define statgraph <template-name>;  
    begingraph / <options>;  
      <GTL statements>;  
    endgraph;  
  end;  
run;  
ods printer close;
```

Animating Boxplot of Laboratory Results

Example 1 – Animated Boxplot of Lab Results

Creatinine
was selected

	Actual Treatment	Actual Treatment (N)	Sex	Analysis Visit	Analysis Visit (N)	Parameter	Analysis Range 1 Lower Limit	Analysis Range 1 Upper Limit
1	Placebo	0	F	Week 2	2	Creatinine (umol/L)	62	124
2	Placebo	0	F	Week 4	4	Creatinine (umol/L)	62	124
3	Placebo	0	F	Week 6	6	Creatinine (umol/L)	62	124
4	Placebo	0	F	Week 8	8	Creatinine (umol/L)	62	124
5	Placebo	0	M	Week 2	2	Creatinine (umol/L)	71	141
6	Placebo	0	M	Week 4	4	Creatinine (umol/L)	71	141
7	Xanomeline High Dose	81	M	Week 2	2	Creatinine (umol/L)	71	141
8	Xanomeline High Dose	81	M	Week 4	4	Creatinine (umol/L)	71	141
9	Xanomeline High Dose	81	M	Week 6	6	Creatinine (umol/L)	71	141
10	Xanomeline High Dose	81	M	Week 8	8	Creatinine (umol/L)	71	141
11	Xanomeline Low Dose	54	M	Week 2	2	Creatinine (umol/L)	71	141
12	Xanomeline Low Dose	54	M	Week 4	4	Creatinine (umol/L)	71	141

The Data

Example 1 – Animated Boxplot of Lab Results

/10/18

Number of subjects
calculated at each visit for
each treatment

```
* Adding on n numbers;  
proc sql;  
  create table lab data with n as  
  select *, count(distinct usubjid) as  
    nobs_subject_visit  
  from lab_data  
  group by trtan, avisitn, sex;  
quit;
```

N Subjects/Visit
33
33
41
32
29
37
31

Data Manipulations

(11)

Example 1 – Animated Boxplot of Lab Results

Using Proc SGPLOT

```
title1 "#byval1: Sex = #BYVAL2 and Visit = #BYVAL4";  
proc sgplot data = adlbc_all_n_gen;  
  where avisitn ne . and sex = "M";  
  by param sex avisitn avisit;  
  vbox aval / category = trtan group = trtan groupdisplay  
    = cluster;  
  reflate alhi / axis = y lineattrs=(pattern=2);  
  reflate allo / axis = y lineattrs=(pattern=2);  
  yaxis min=60 max=180 values=(60 to 180 by 30);  
  format trtan trtfmt.;  
  xaxistable nobobs_subject_visit/ x=trtan stat=mean  
    label= "n" valueattrs=(size=9) location=inside;  
run;
```


Example 1 – Animated Boxplot of Lab Results

```
proc template;
  define statgraph boxplot_template_sex;
    dynamic _byval_ _byval2_ _byval4_ upperlim lowerlim;
    begingraph;
      entrytitle halign = center _byval_ ":" " Sex = " _byval2_ " and
        Visit = " _byval4_;
      layout overlay / yaxisopts=(linearopts=(viewmin=60 viewmax=180
        tickvaluesequence=(start=60 end=180 increment=30)));
      boxplot x = trtan y = aval / group = trtan groupdisplay=cluster;
      referenceline y=lowerlim / lineattrs=(pattern=2);
      referenceline y=upperlim / lineattrs=(pattern=2);
      innermargin;
      axistable x = trtan value = nobs_subject_visit / stat=mean
        label= "n" valueattrs=(size=9);

      endinnermargin;
      endlayout ;
    endgraph;
  end;
run;
```

First Create the Template with Graph Template Language (GTL)

Example 1 – Animated Boxplot of Lab Results

```

begingraph;
  entrytitle halign = center _byval_ ":" " Sex = " _byval2_ " and
            Visit = " _byval4_;
  layout overlay / yaxisopts=(linearopts=(viewmin=60 viewmax=180
            tickvaluesequence=(start=60 end=180 increment=30)));
  boxplot x = trtan y = aval / group = trtan
            groupdisplay=cluster;
  referenceline y=lowerlim / lineattrs=(pattern=2);
  referenceline y=upperlim / lineattrs=(pattern=2);
  innermargin;
    axistable x = trtan value = nobs_subject_visit / stat=mean
              label= "n" valueattrs=(size=9);
  endinnermargin;
endlayout;
endgraph;

```

First Create the Template with Graph Template Language (GTL)

Example 1 – Animated Boxplot of Lab Results

```

options nobyline;
options papersize=('8 in', '4.8 in') printerpath=gif
animation=start
animduration=0.5 animloop=yes noanimoverlay;
ods printer file="&outpath\boxplotM1.gif";

ods graphics / width=8in height=4.8in imagefmt=gif;

proc sgrender data = adlbc_all_n_gen template =
boxplot_template_sex;
  where avisitn ne . and sex = "M";
  by param sex avisitn avisit;
  dynamic upperlim = "alhi" lowerlim = "allo";
  format trtan trtfmt.;
run;

options printerpath=gif animation=stop;
ods printer close;

```

Animation Options and SGRENDER

Example 1 – Animated Boxplot of Lab Results

```
options nobyline;  
options papersize=('8 in', '4.8 in')  
printerpath=gif animation=start  
animduration=0.5 animloop=yes  
noanimoverlay;  
ods printer  
file("&outpath\boxplotM1.gif");  
  
ods graphics / width=8in  
height=4.8in imagefmt=gif;
```

Animation Options Before SGRENDER

Example 1 – Animated Boxplot of Lab Results

```
proc sgrender data =adlbc_all_n_gen  
template = boxplot template sex;  
  where avisitn ne . and sex = "M";  
  by param sex avisitn avisit;  
  dynamic upperlim = "alhi"  
  lowerlim = "allo";  
  format trtan trtfmt.;  
run;
```

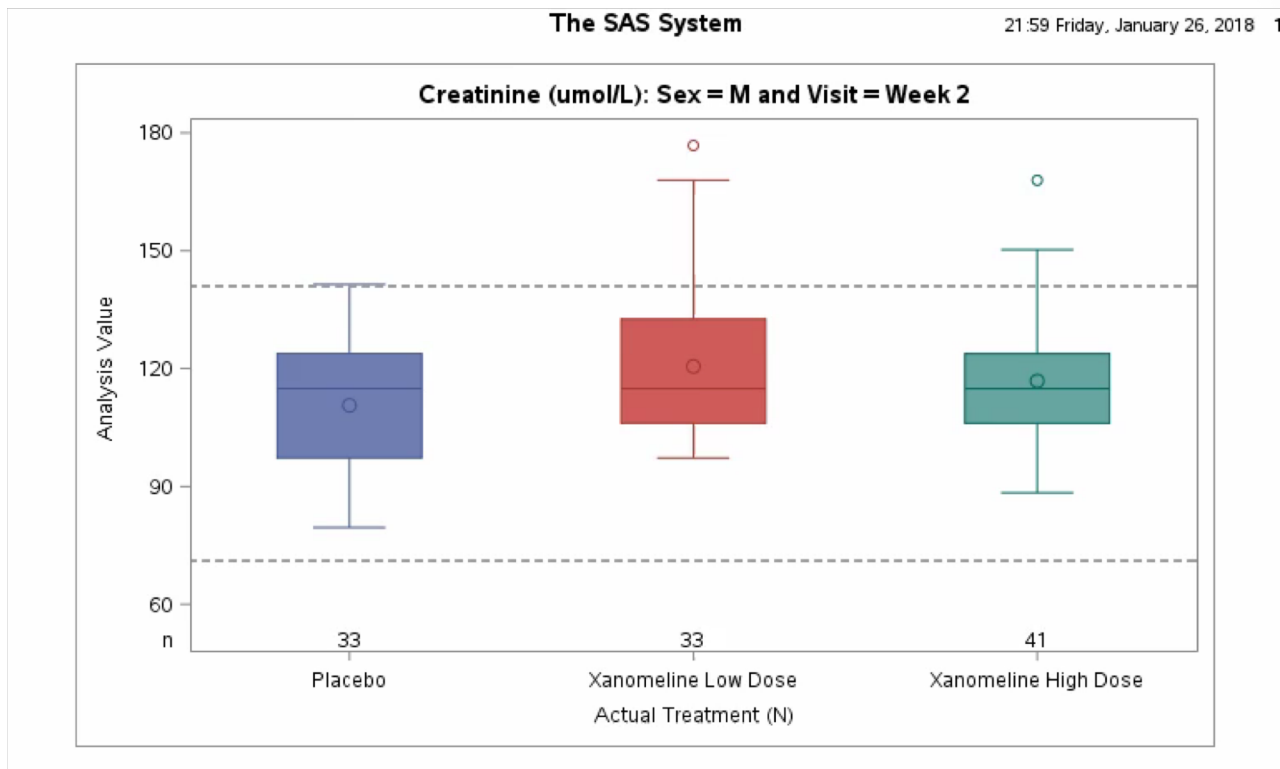
SGRENDER

Example 1 – Animated Boxplot of Lab Results

```
options printerpath=gif animation=stop;  
ods printer close;
```

Animation Options After SGRENDER

Example 1 – Animated Boxplot of Lab Results



Output

Interpolation

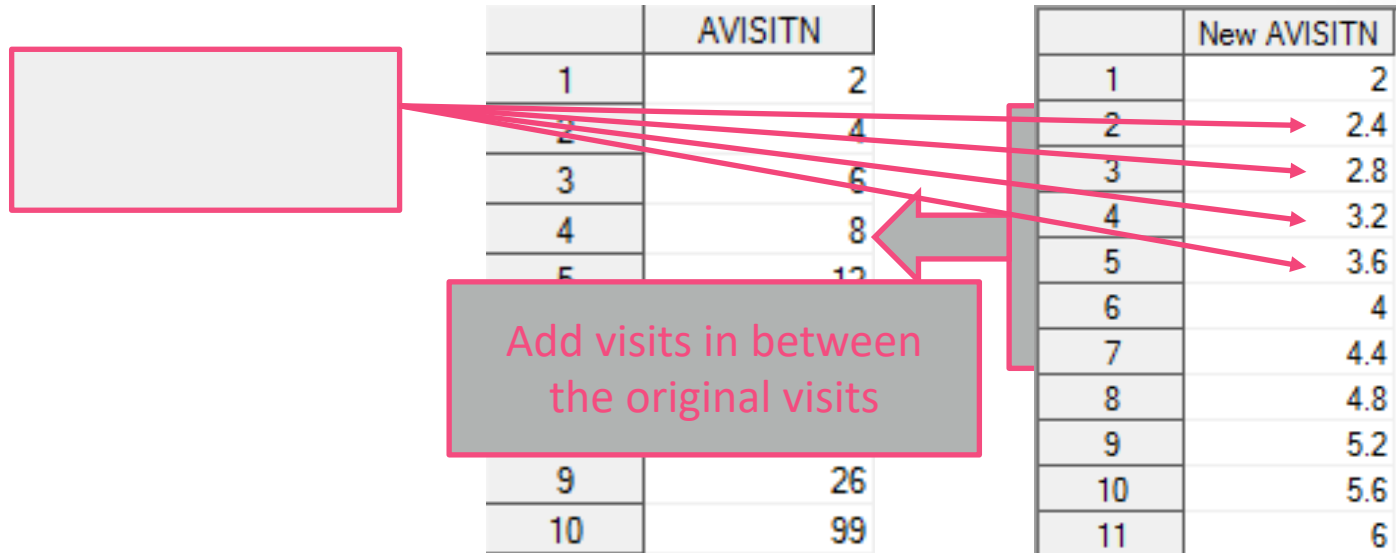
Creating Smooth Animations - Scatterplot Example

11/10/18



How to Interpolate?

- First step is determine variable that will drive animation (e.g., AVISITN)



How to Interpolate?

- Merge the data together so that the new visit records are between the existing visit records

Unique Subject Identifier	Analysis Visit	Analysis Visit (N)	New AVISITN	Actual Treatment (N)	Analysis Value	Analysis Visit (N)
---------------------------	----------------	--------------------	-------------	----------------------	----------------	--------------------

```
proc expand data=proc_expand_data
  out=LinInterp_scatter;
  by usubjid param sex trtan;
  convert aval=linear / method=join;
  id id;
run;
```

It's not possible to
use Proc EXPAND
with SAS UE

How to Interpolate?

Interpolated Data set

Unique Subject Identifier	Analysis Visit	Analysis Visit (N)	New AVISITN	Actual Treatment (N)	Analysis Value	Analysis Values with Interpolation	Analysis Visit (N)
01-701-1023	Week 2	2	2	0	132.6	132.6	2
01-701-1023	Week 2	2	2.4	0		129.064	.
01-701-1023	Week 2	2	2.8	0		125.528	.
01-701-1023	Week 2	2	3.2	0		121.992	.
01-701-1023	Week 2	2	3.6	0		118.456	.
01-701-1023	Week 4	4	4	0	114.92	114.92	4
01-701-1023	Week 4	4	4.4	0		114.92	.
01-701-1023	Week 4	4	4.8	0		114.92	.
01-701-1023	Week 4	4	5.2	0		114.92	.
01-701-1023	Week 4	4	5.6	0		114.92	.
01-701-1023	End of Treatment	99	99	0	114.92	114.92	99
01-701-1023	End of Treatment	99	99.8	0			.
01-701-1023	End of Treatment	99	100.2	0			.
01-701-1023	End of Treatment	99	100.6	0			.
01-701-1023	End of Treatment	99	101	0			.

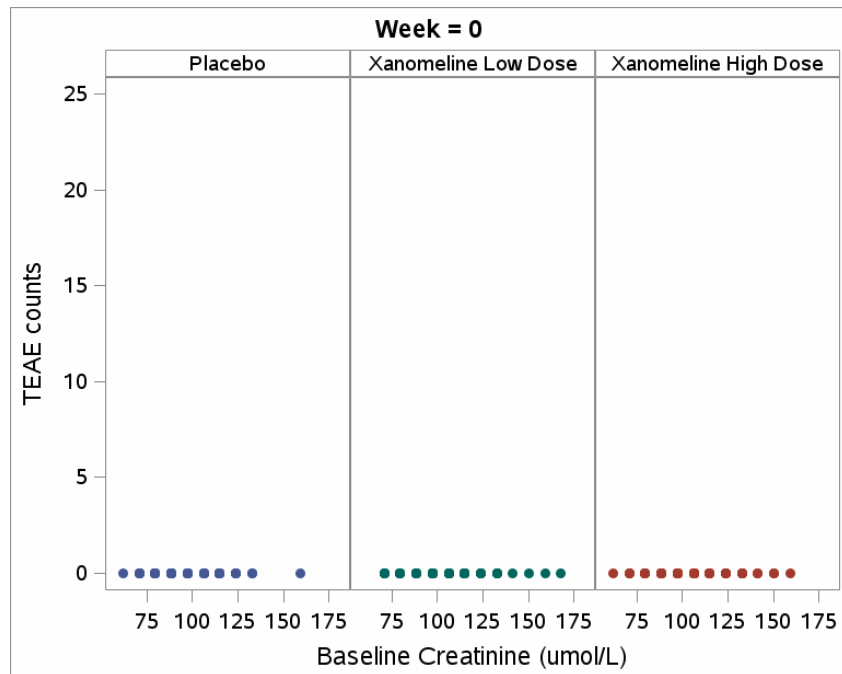
This will be filled down by using data step

Interpolation

Creating Smooth Animations – Adverse Events (AEs) over time Example

Example 3 - AEs over time by Baseline Laboratory Results

- A great way to assess the AE counts and visualize the relationship



Example 3 - AEs over time by Baseline Laboratory Results

Data sets

Week AE started was calculated

	Unique Subject Identifier	Dictionary-Derived Term	Actual Treatment (N)	Analysis Start Relative Day	Week AE started
1	01-701-1015	APPLICATION SITE ERYTHEMA	0	2	1
2	01-701-1015	APPLICATION SITE PRURITUS	0	2	1
3	01-701-1015	DIARRHOEA	0	8	2

No. of AEs for each week were calculated

Actual Treatment (N)	Unique Subject Identifier	week	count_week
0	01-701-1015	1	2
0	01-701-1015	2	1

Cumulative Counts ranged from Week 0 to Week 28

Unique Subject Identifier	Actual Treatment (N)	week	count_week	cum_counts
01-701-1015	0	0	0	0
01-701-1015	0	1	2	2
01-701-1015	0	2	1	3
01-701-1015	0	3	0	3

Example 3 - AEs over time by Baseline Laboratory Results

Final Data set

Unique Subject Identifier	Actual Treatment (N)	Baseline Creatinine (umol/L)	Week	Cumulative TEAE counts with Interpolation
01-701-1015	0	79.56	0	0
01-701-1015	0	79.56	0.2	0.4
01-701-1015	0	79.56	0.4	0.8
01-701-1015	0	79.56	0.6	1.2
01-701-1015	0	79.56	0.8	1.6
01-701-1015	0	79.56	1	2
01-701-1015	0	79.56	1.2	2.2
01-701-1015	0	79.56	1.4	2.4
01-701-1015	0	79.56	1.6	2.6
01-701-1015	0	79.56	1.8	2.8
01-701-1015	0	79.56	2	3
01-701-1015	0	79.56	2.2	3
01-701-1015	0	79.56	2.4	3
01-701-1015	0	79.56	2.6	3
01-701-1015	0	79.56	2.8	3
01-701-1015	0	79.56	3	3

Interpolated
Counts

Example 3 - AEs over time by Baseline Laboratory Results

GTL

```
begingraph / designwidth = 1200px designheight = 960px;
  entrytitle textattrs = (size = 18pt) halign = center "Week =
" byval_;
  layout datapanel classvars= (trtan) / headerlabeldisplay=value
  headerlabelattrs=(size = 15pt) columns = 3 rows = 1
  rowaxisopts=(label = "TEAE counts" labelattrs=(size = 18pt)
  tickvalueattrs=(size = 16pt) linearopts=(viewmin=0 viewmax=25
  tickvaluesequence=(start=0 end=25 increment=5)))
  columnaxisopts = (label = "Baseline Creatinine (umol/L)"
  labelattrs=(size = 18pt) tickvalueattrs=(size = 16pt));
  layout prototype;
  scatterplot x = baseline_creatinine y = aval / group = trtan
  markerattrs = (size = 15px symbol=circlefilled);
endlayout;
endlayout;
endgraph;
```

Example 3 - AEs over time by Baseline Laboratory Results

Animation Options

```
ods printer file="&outpath\ae_anim1_scat.gif";  
options papersize=('8 in', '6.4 in') printerpath=gif  
    animation=start animduration=0.13 animloop=yes noanimoverlay  
    nonumber;  
ods graphics / reset = all width=8in height=6.4in  
imagefmt=png;
```

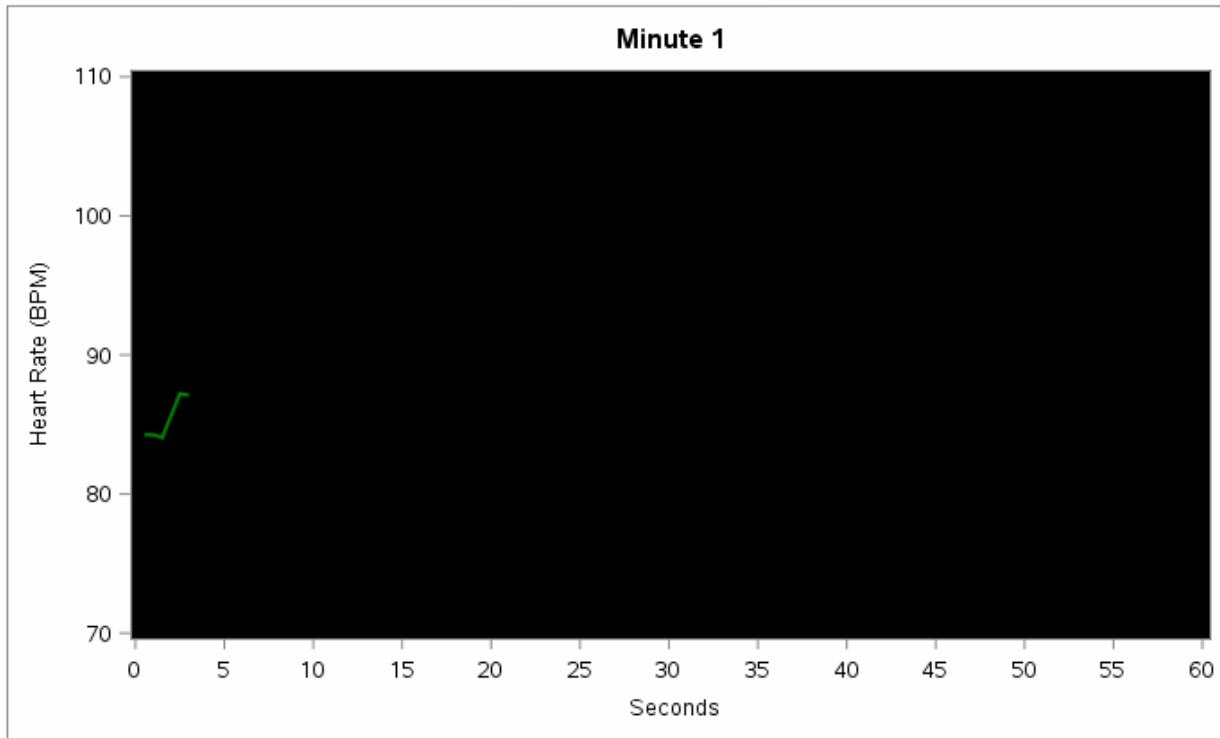
```
proc sgrender data = final_dataset template=  
aedecod_anim_scat;  
    by avisitn;  
    format trtan trtfmt.;  
run;
```

```
ods graphics / reset = all;  
options printerpath=gif animation=stop;  
ods printer close;
```

Example 4 – ECG Heart Rate over Time

- C
- d
- t

at



Conclusions

- Animations can be done quite easily with SAS 9.4. All that is needed is to wrap the appropriate OPTIONS and the ODS PRINTER statements around the plots.
- Smoother animations can be created by using Proc EXPAND to interpolate results in between the visits (if there are not enough visits for smooth animation), and then producing the animation on the data set which contains interpolated results.
- A drawing effect can be achieved by grouping data into series and retaining a duplicate of set of records for each subsequent series.

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References

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Acknowledgements

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Questions?



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