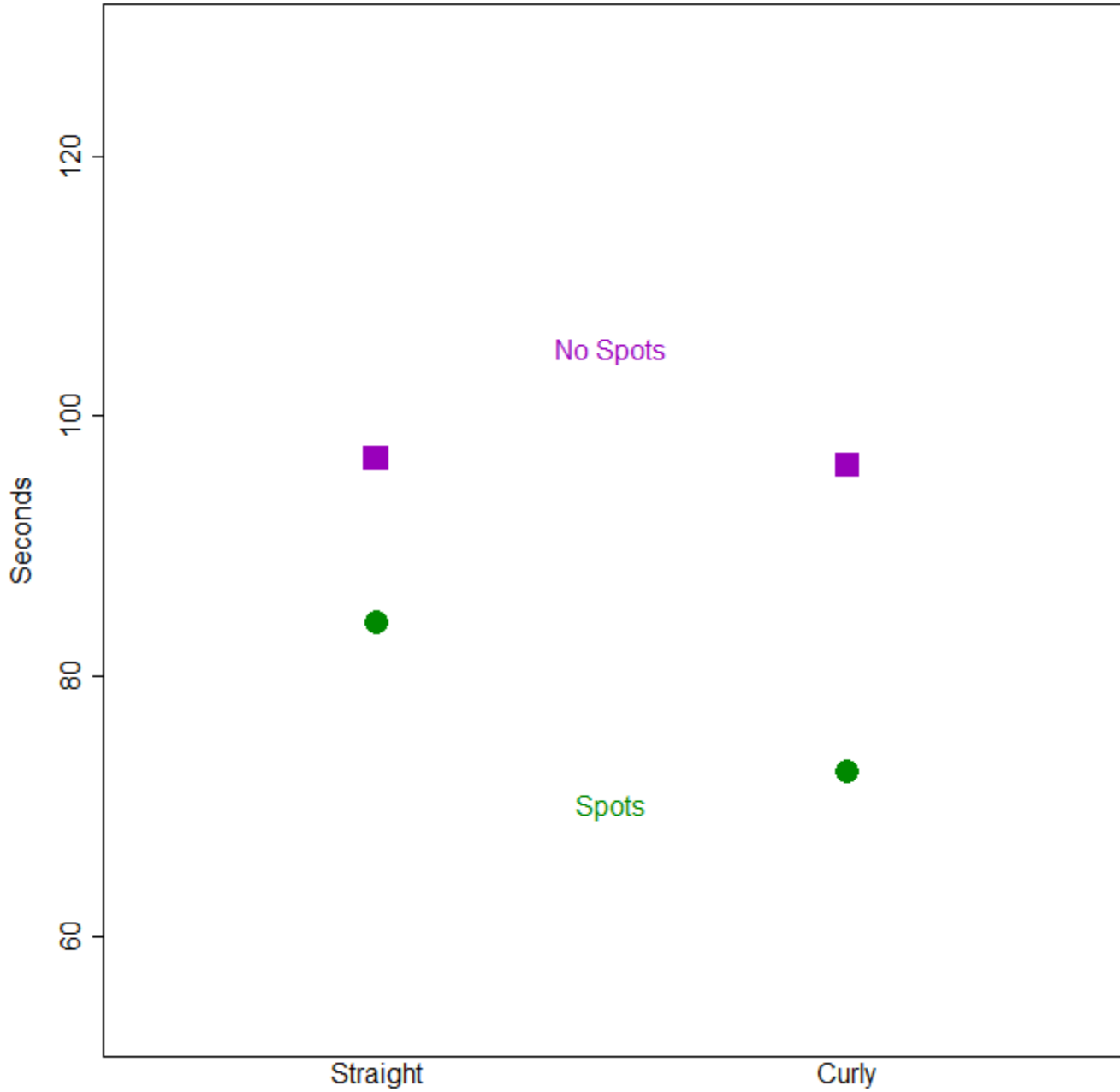
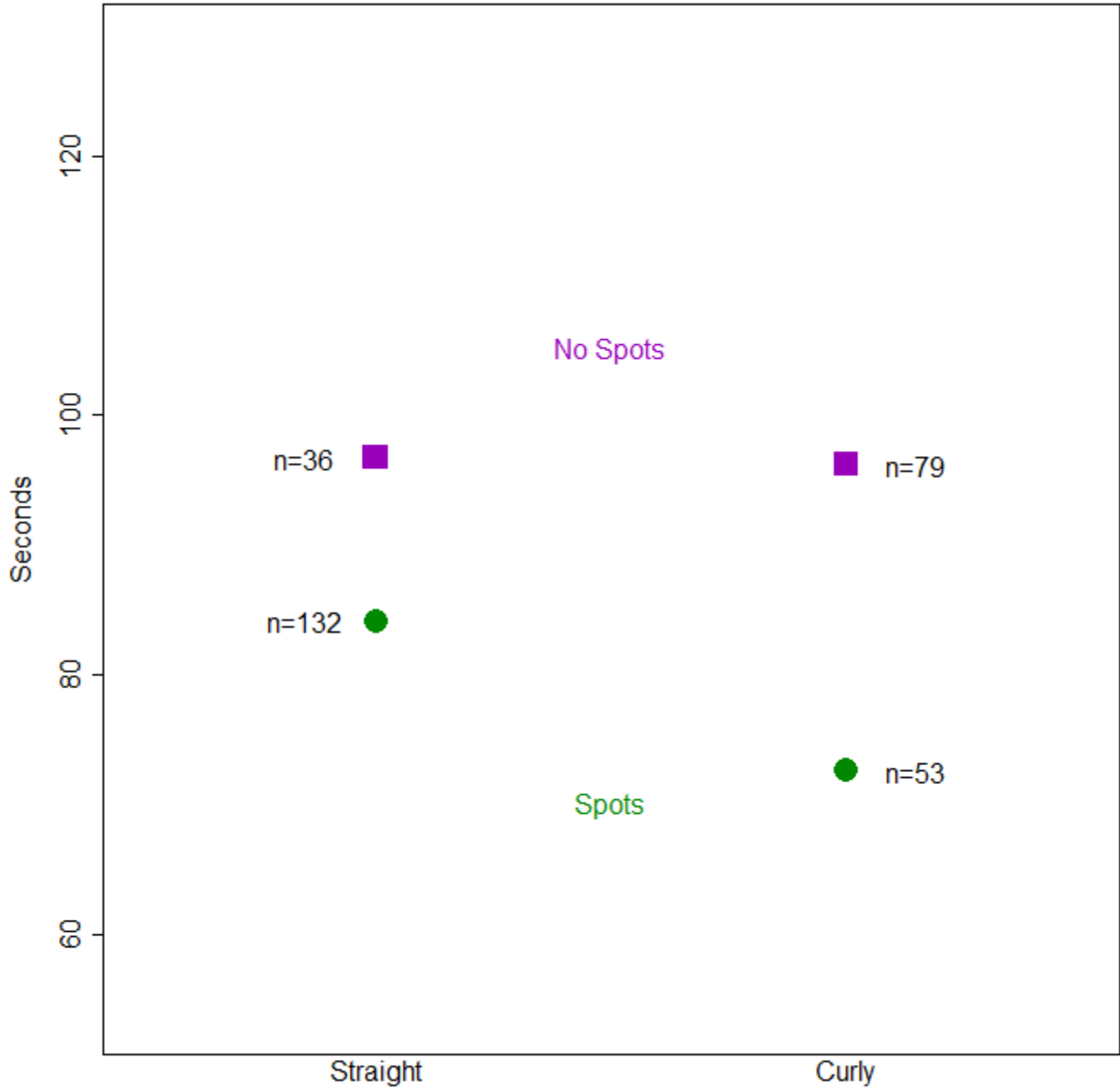
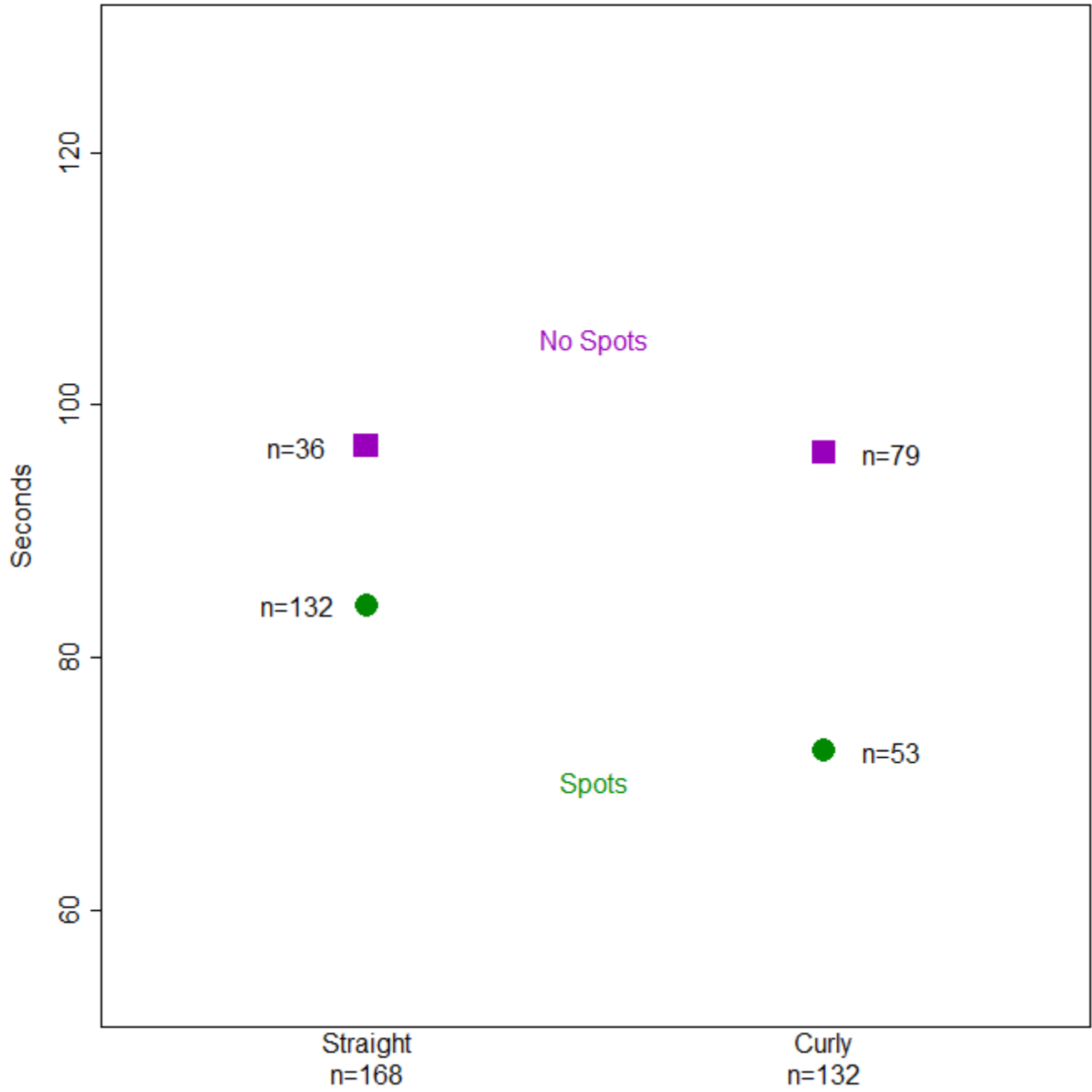
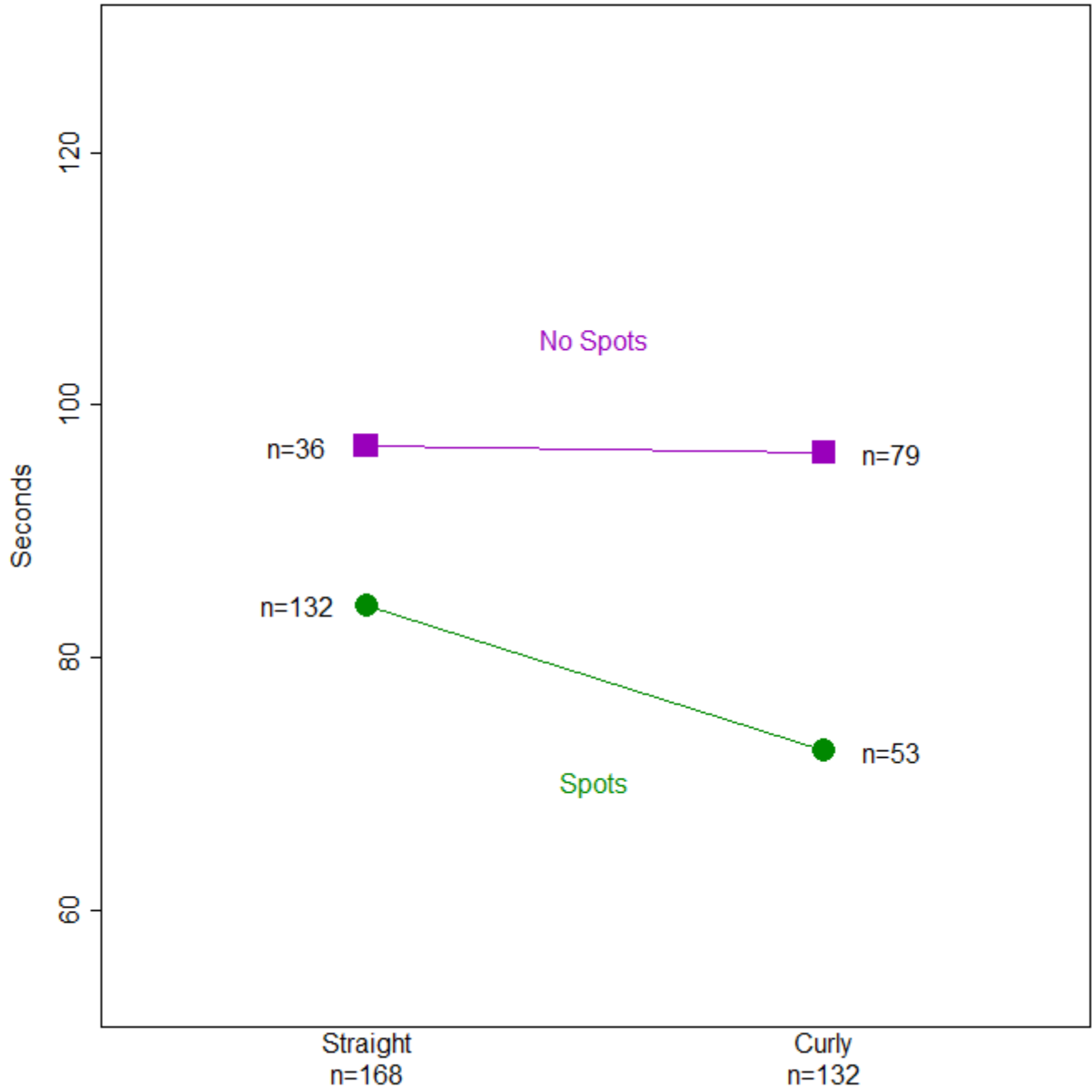


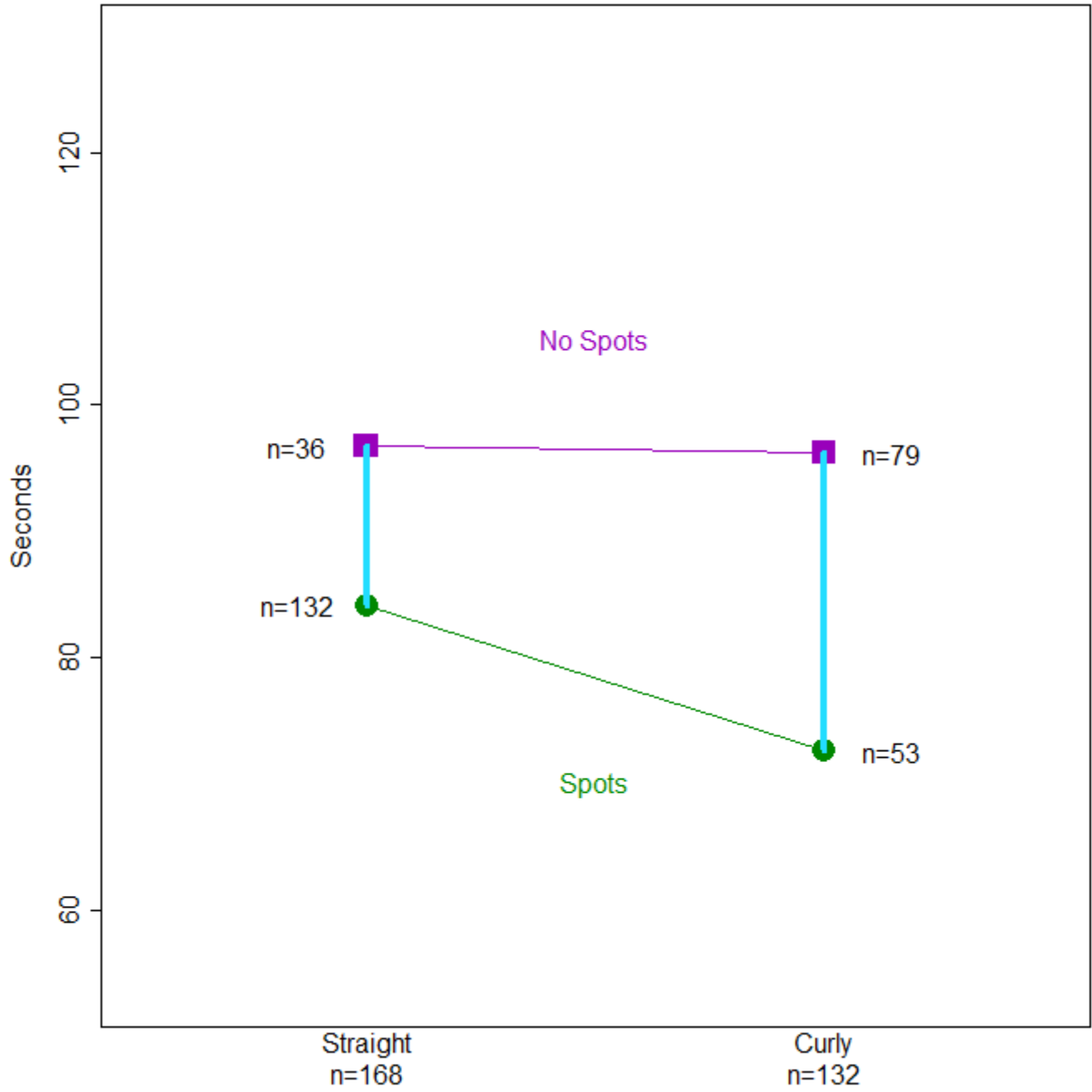
Graphical illustration

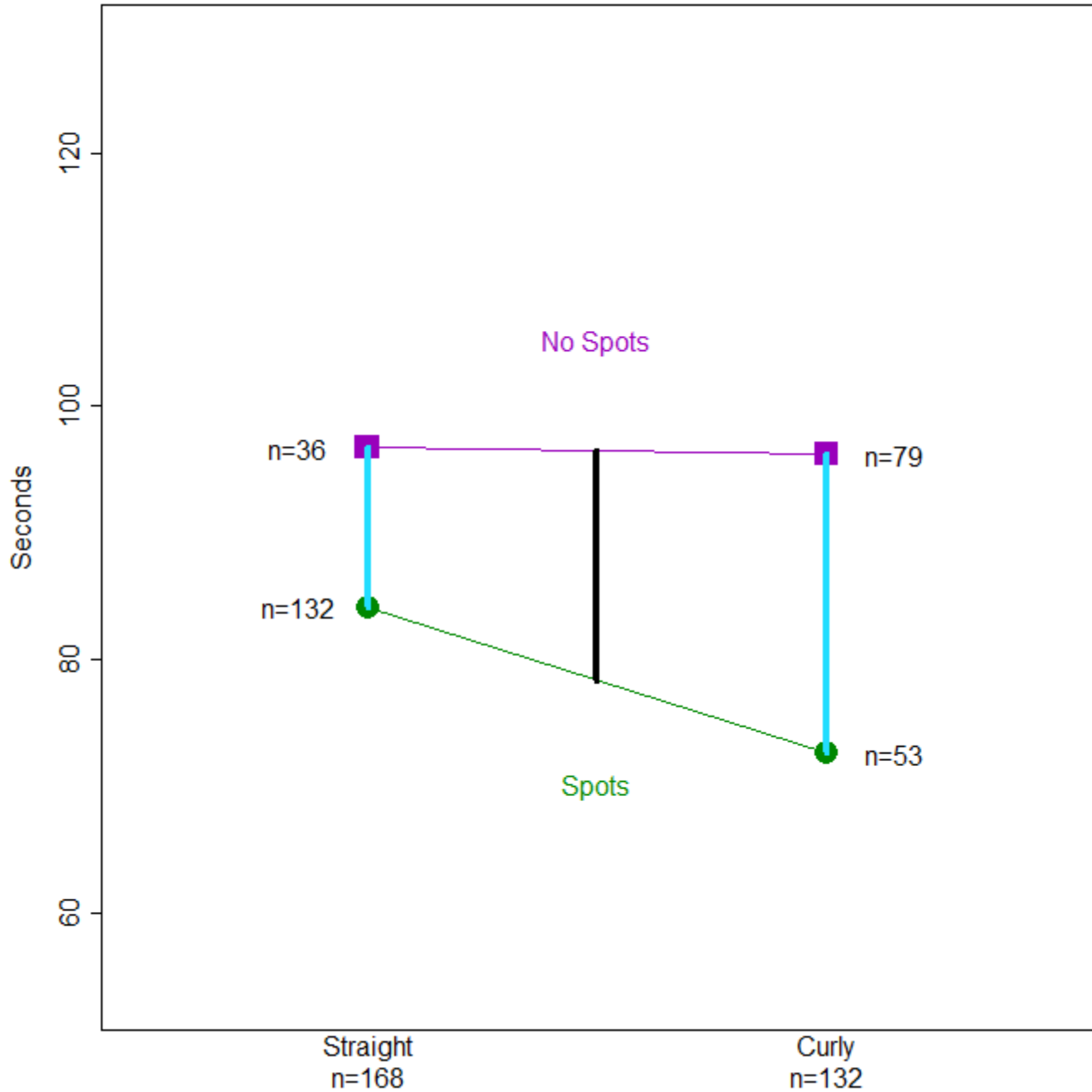


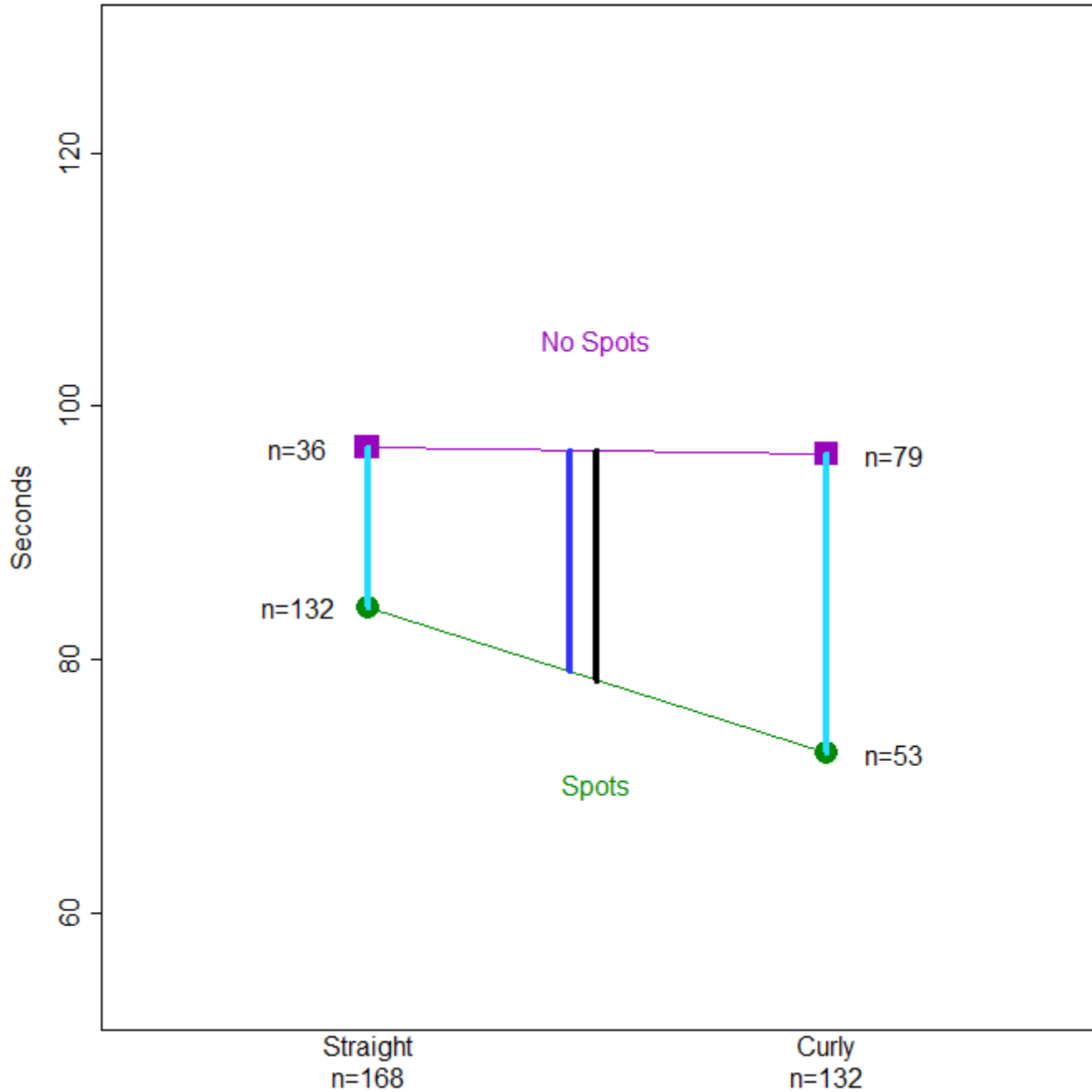


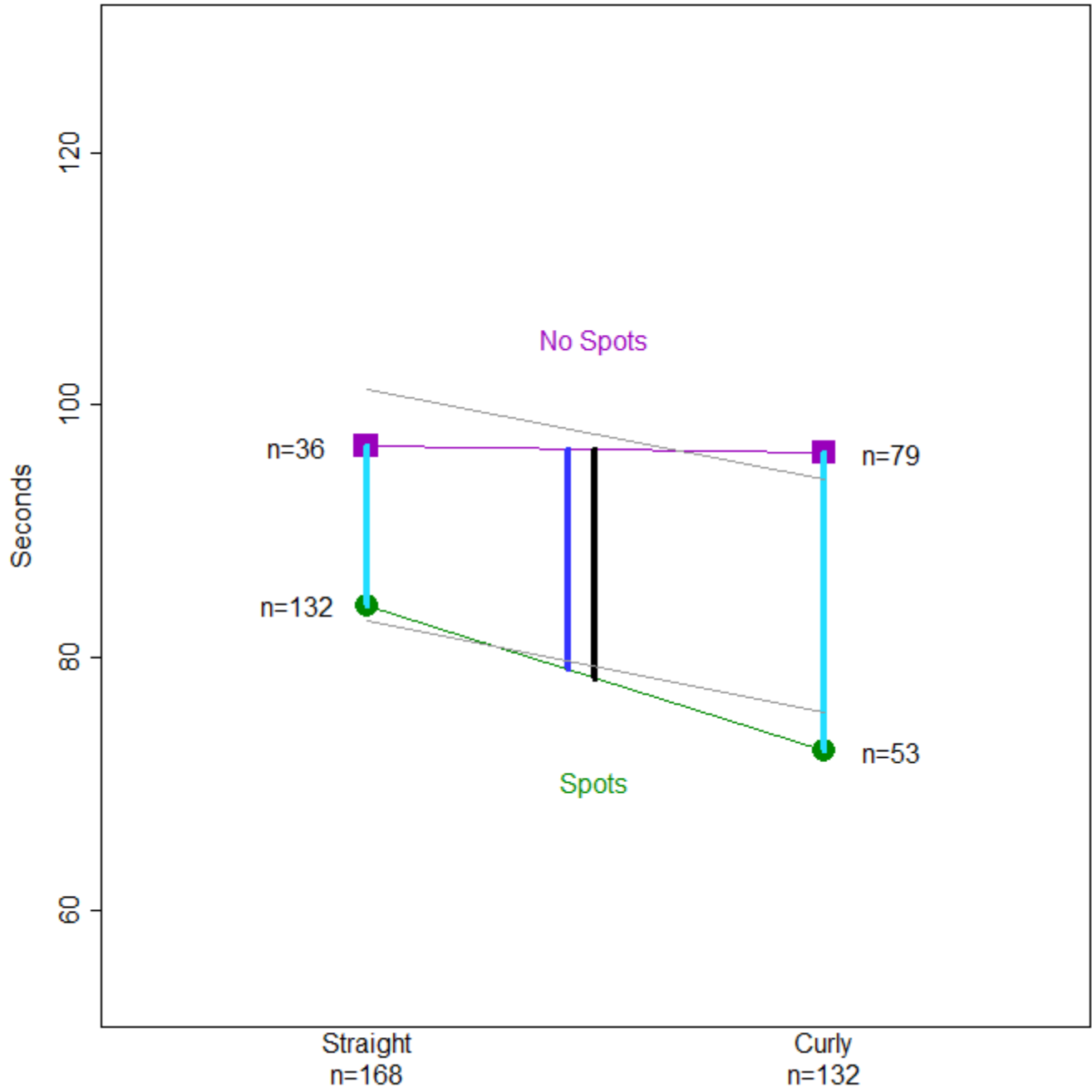


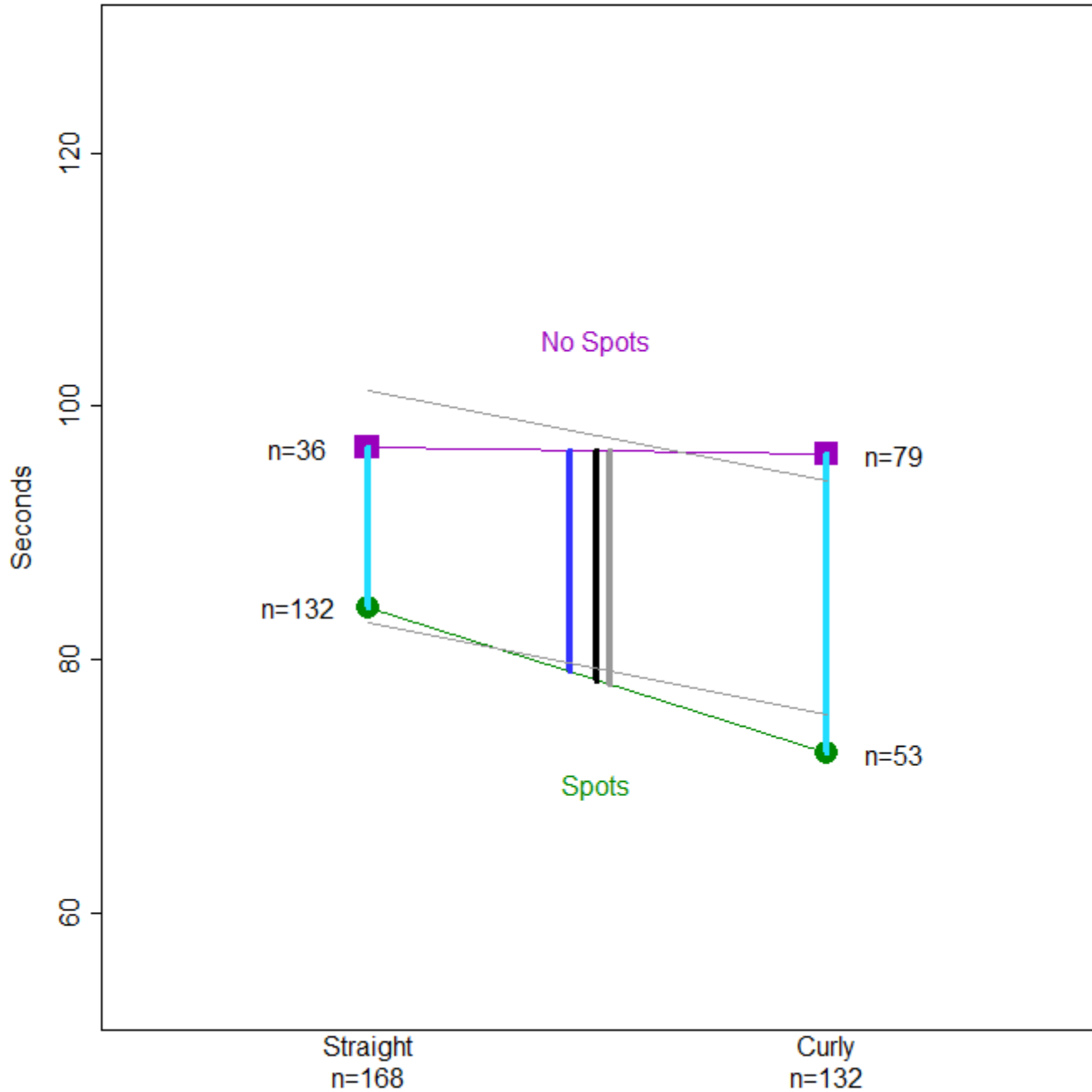












F-tests

model 1: life satisfaction \leftarrow ten demographic variables

model 2: life satisfaction \leftarrow ten demographic variables +
ten personality variables

model 1: life satisfaction \leftarrow ten demographic variables
(more error variance)

model 2: life satisfaction \leftarrow ten demographic variables +
ten personality variables
(more “explained” variance, less error variance)

model 1: life satisfaction \leftarrow ten demographic variables

model 2: life satisfaction \leftarrow ten demographic variables +
ten personality variables

(var. “explained” by model 2) – (var. “explained” by model 1)

(residual/error variance from model 2)

model 1: life satisfaction \leftarrow ten demographic variables

model 2: life satisfaction \leftarrow ten demographic variables +
ten personality variables

$F =$

(var. “explained” by model 2) – (var. “explained” by model 1)

(residual/error variance from model 2)

Type II

Type III

SPSS



	Name	Type
1	color	String
2	transport	Numeric
3	material	Numeric
4	mass	Numeric
5	battery	Numeric
6	price	Numeric
7	rating.fun	Numeric
8	rating.practi...	Numeric
9	rating.cool	Numeric
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

	Values	Missing	Col
ne	None		5
00, legs}...	None		10
00, metal...	None		10
ne	None		18

	GLM GEN	GLM HUI	GLM REP	GLM UCH
Power Analysis	>			
Reports	>			
Descriptive Statistics	>			
Bayesian Statistics	>			
Tables	>			
Compare Means	>			
General Linear Model	>			
Univariate...				
Generalized Linear Models	>			
Mixed Models	>			
Correlate	>			
Regression	>			
Loglinear	>			
Neural Networks	>			
Classify	>			
Dimension Reduction	>			
Scale	>			
Nonparametric Tests	>			
Forecasting	>			
Survival	>			
Multiple Response	>			
Missing Value Analysis...				
Multiple Imputation	>			
Complex Samples	>			
Simulation...				
Quality Control	>			

Width	Decim
0	
2	
2	
14	
14	
13	
14	
14	
14	

Univariate

color
mass
battery
rating.fun
rating.practical
rating.cool

Dependent Variable:
price

Fixed Factor(s):
material
transport

Random Factor(s):

Covariate(s):

WLS Weight:

Model...
Contrasts...
Plots...
Post Hoc...
EM Means...
Save...
Options...
Bootstrap...

OK Paste Reset Cancel Help

```

/CRITERIA=ALPHA(0.05)
/DESIGN=material transport material*transport.
    
```

➔ **Univariate Analysis of Variance**

Between-Subjects Factors

		Value Label	N
material	1.00	metal	253
	2.00	plastic	247
transport	1.00	legs	244
	2.00	wheels	256

Tests of Between-Subjects Effects

Dependent Variable: price

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	22985.574 ^a	3	7661.858	16.384	.000
Intercept	5262780.563	1	5262780.563	11253.517	.000
material	11722.499	1	11722.499	25.066	.000
transport	4060.098	1	4060.098	8.682	.003
material * transport	6605.793	1	6605.793	14.125	.000
Error	231957.634	496	467.657		
Total	5515295.252	500			
Corrected Total	254943.208	499			

a. R Squared = .090 (Adjusted R Squared = .085)

The default version I recommend:

```
> Anova(lm(price~material*transport,data=robots))  
Anova Table (Type II tests)
```

Response: price

	Sum Sq	Df	F value	Pr(>F)	
material	12165	1	26.013	4.836e-07	***
transport	3927	1	8.398	0.0039225	**
material:transport	6606	1	14.125	0.0001914	***
Residuals	231958	496			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Contrast-coded "Type III" version:

```
> # Contrast-coded version using contrasts() <-  
> contrasts(robots$material) <- cbind(metal=c(-.5,.5))  
> contrasts(robots$transport) <- cbind(legs=c(-.5,.5))  
> Anova(lm(price~material*transport,data=robots),type="III")  
Anova Table (Type III tests)
```

Response: price

	Sum Sq	Df	F value	Pr(>F)	
(Intercept)	5262781	1	11253.5169	< 2.2e-16	***
material	11722	1	25.0665	7.71e-07	***
transport	4060	1	8.6818	0.0033653	**
material:transport	6606	1	14.1253	0.0001914	***
Residuals	231958	496			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The default in SPSS:

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	22985.574 ^a	3	7661.858	16.384	.000
Intercept	5262780.563	1	5262780.563	11253.517	.000
material	11722.499	1	11722.499	25.066	.000
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material * transport	6605.793	1	6605.793	14.125	.000
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Anova Table (Type III tests)
```

Response: price

	Sum Sq	Df	F value	Pr(>F)	
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material	11722	1	25.0665	7.71e-07	***
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Residuals	231958	496			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1