

# Wilcoxon Signed Ranks Test

## Ranks

		N	Mean Rank	Sum of Ranks
ratingPLED - ratingLED	Negative Ranks	0 <sup>a</sup>	.00	.00
	Positive Ranks	10 <sup>b</sup>	5.50	55.00
	Ties	0 <sup>c</sup>		
	Total	10		
ratingMotor - ratingLED	Negative Ranks	5 <sup>d</sup>	4.60	23.00
	Positive Ranks	5 <sup>e</sup>	6.40	32.00
	Ties	0 <sup>f</sup>		
	Total	10		
ratingSMotor - ratingLED	Negative Ranks	2 <sup>g</sup>	2.50	5.00
	Positive Ranks	8 <sup>h</sup>	6.25	50.00
	Ties	0 <sup>i</sup>		
	Total	10		
ratingPeltier - ratingLED	Negative Ranks	0 <sup>j</sup>	.00	.00
	Positive Ranks	10 <sup>k</sup>	5.50	55.00
	Ties	0 <sup>l</sup>		
	Total	10		
ratingSound - ratingLED	Negative Ranks	2 <sup>m</sup>	6.25	12.50
	Positive Ranks	8 <sup>n</sup>	5.31	42.50
	Ties	0 <sup>o</sup>		
	Total	10		
ratingMotor - ratingPLED	Negative Ranks	7 <sup>p</sup>	6.71	47.00
	Positive Ranks	3 <sup>q</sup>	2.67	8.00
	Ties	0 <sup>r</sup>		
	Total	10		
ratingSMotor - ratingPLED	Negative Ranks	6 <sup>s</sup>	4.50	27.00
	Positive Ranks	4 <sup>t</sup>	7.00	28.00
	Ties	0 <sup>u</sup>		
	Total	10		
ratingPeltier - ratingPLED	Negative Ranks	0 <sup>v</sup>	.00	.00
	Positive Ranks	10 <sup>w</sup>	5.50	55.00
	Ties	0 <sup>x</sup>		
	Total	10		
ratingSound - ratingPLED	Negative Ranks	6 <sup>y</sup>	6.08	36.50
	Positive Ranks	4 <sup>z</sup>	4.63	18.50
	Ties	0 <sup>aa</sup>		
	Total	10		

## Ranks

		N	Mean Rank	Sum of Ranks
ratingSMotor - ratingMotor	Negative Ranks	0 <sup>ab</sup>	.00	.00
	Positive Ranks	10 <sup>ac</sup>	5.50	55.00
	Ties	0 <sup>ad</sup>		
	Total	10		
ratingPeltier - ratingMotor	Negative Ranks	0 <sup>ae</sup>	.00	.00
	Positive Ranks	10 <sup>af</sup>	5.50	55.00
	Ties	0 <sup>ag</sup>		
	Total	10		
ratingSound - ratingMotor	Negative Ranks	4 <sup>ah</sup>	3.00	12.00
	Positive Ranks	6 <sup>ai</sup>	7.17	43.00
	Ties	0 <sup>aj</sup>		
	Total	10		
ratingPeltier - ratingSMotor	Negative Ranks	0 <sup>ak</sup>	.00	.00
	Positive Ranks	10 <sup>al</sup>	5.50	55.00
	Ties	0 <sup>am</sup>		
	Total	10		
ratingSound - ratingSMotor	Negative Ranks	6 <sup>an</sup>	6.17	37.00
	Positive Ranks	4 <sup>ao</sup>	4.50	18.00
	Ties	0 <sup>ap</sup>		
	Total	10		
ratingSound - ratingPeltier	Negative Ranks	10 <sup>aq</sup>	5.50	55.00
	Positive Ranks	0 <sup>ar</sup>	.00	.00
	Ties	0 <sup>as</sup>		
	Total	10		

- a. ratingPLED < ratingLED
- b. ratingPLED > ratingLED
- c. ratingPLED = ratingLED
- d. ratingMotor < ratingLED
- e. ratingMotor > ratingLED
- f. ratingMotor = ratingLED
- g. ratingSMotor < ratingLED
- h. ratingSMotor > ratingLED
- i. ratingSMotor = ratingLED
- j. ratingPeltier < ratingLED
- k. ratingPeltier > ratingLED
- l. ratingPeltier = ratingLED

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m. ratingSound < ratingLED  
n. ratingSound > ratingLED  
o. ratingSound = ratingLED  
p. ratingMotor < ratingPLED  
q. ratingMotor > ratingPLED  
r. ratingMotor = ratingPLED  
s. ratingSMotor < ratingPLED  
t. ratingSMotor > ratingPLED  
u. ratingSMotor = ratingPLED  
v. ratingPeltier < ratingPLED  
w. ratingPeltier > ratingPLED  
x. ratingPeltier = ratingPLED  
y. ratingSound < ratingPLED  
z. ratingSound > ratingPLED  
aa. ratingSound = ratingPLED  
ab. ratingSMotor < ratingMotor  
ac. ratingSMotor > ratingMotor  
ad. ratingSMotor = ratingMotor  
ae. ratingPeltier < ratingMotor  
af. ratingPeltier > ratingMotor  
ag. ratingPeltier = ratingMotor  
ah. ratingSound < ratingMotor  
ai. ratingSound > ratingMotor  
aj. ratingSound = ratingMotor  
ak. ratingPeltier < ratingSMotor  
al. ratingPeltier > ratingSMotor  
am. ratingPeltier = ratingSMotor  
an. ratingSound < ratingSMotor  
ao. ratingSound > ratingSMotor  
ap. ratingSound = ratingSMotor  
aq. ratingSound < ratingPeltier  
ar. ratingSound > ratingPeltier  
as. ratingSound = ratingPeltier

### Test Statistics<sup>a</sup>

	ratingPLED - ratingLED	ratingMotor - ratingLED	ratingSMotor - ratingLED	ratingPeltier - ratingLED
<b>Z</b>	-2.831 <sup>b</sup>	-.466 <sup>b</sup>	-2.316 <sup>b</sup>	-2.844 <sup>b</sup>
<b>Asymp. Sig. (2-tailed)</b>	.005	.641	.021	.004

### Test Statistics<sup>a</sup>

	ratingSound - ratingLED	ratingMotor - ratingPLED	ratingSMotor - ratingPLED	ratingPeltier - ratingPLED
<b>Z</b>	-1.544 <sup>b</sup>	-2.007 <sup>c</sup>	-.053 <sup>b</sup>	-2.844 <sup>b</sup>
<b>Asymp. Sig. (2-tailed)</b>	.123	.045	.958	.004

### Test Statistics<sup>a</sup>

	ratingSound - ratingPLED	ratingSMotor - ratingMotor	ratingPeltier - ratingMotor	ratingSound - ratingMotor
<b>Z</b>	-.940 <sup>c</sup>	-2.873 <sup>b</sup>	-2.831 <sup>b</sup>	-1.605 <sup>b</sup>
<b>Asymp. Sig. (2-tailed)</b>	.347	.004	.005	.108

### Test Statistics<sup>a</sup>

	ratingPeltier - ratingSMotor	ratingSound - ratingSMotor	ratingSound - ratingPeltier
<b>Z</b>	-2.825 <sup>b</sup>	-.984 <sup>c</sup>	-2.816 <sup>c</sup>
<b>Asymp. Sig. (2-tailed)</b>	.005	.325	.005

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.