

# Data Analytics CA Pair Project - VR Jungian Sandplay

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# **Abstract**

## **Aim and Rationale**

The aim and rationale of this project is to formulate a single hypothesis based on a set of data we were given on an experiment conducted to attempt to determine the effectiveness of use of VR technology in Jungian Sandbox therapy, compare the effectiveness of the approaches based on the data we were provided, and cleaning up any data that requires cleanup.

## **Participants and setting**

Participants of this experiment were young adults aged between 18 - 25 years old with no exact ages of the participants recorded. 150 participants were recorded in this study with an equal amount of male and female participants recorded. (Male = 75 / Female = 75) Participants were broken into 3 groups using random sampling. These groups were Control (traditional CBT, w/ No VR), Static (Non-animated model content, w/ VR), Animated (Animated model content, w/ VR)

## **Experiment design**

## **Results gathering**

Results of the experiment were tracked in an excel spreadsheet detailing the gender and test group of each participant (Control, Static, Animated) along with their CPSS (Child PTSD Symptom Scale) and OR (Observer Rating) pre and post treatment.

## **Major findings**

## **Findings/Implications**

## **Introduction**

## **Topics And content**

## **Rationale**

The Rationale behind this experiment was to determine if using VR technology in a Jungian Sandbox setting could be beneficial in reducing the PTSD levels in patients.

## **Method**

Upon first analysis of the data, a missing datum was found for participant 100 in their Pre-Trial Self Reported CPSS. Between the group, we discussed our options. Between ourselves, two conflicting ideas emerged - one, that we ignore the missing data and calculate results without it (deletion), and the other that we replace the missing data with a suitable value and proceed with an adjusted dataset (imputation). We decided to proceed with both methods, and to compare both results, to infer the difference between the two.

First we analysed the missing datum to be Missing Completely at Random (MCAR), as being the sole unrecorded datum in the set, we can conclude that it being missing has nothing to do with any other

observed variables (data Missing at Random), or missing due to the values themselves (Missing Not at Random).

We then discussed how we could impute the missing datum. We came up with a variety of potential options based on research and discussion: 1. Take the mean of all Pre-Trial Self Reported CPSS values. 2. Take the median of all Pre-Trial Self Reported CPSS values. 3. Take the mode of all Pre-Trial Self Reported CPSS values. 4. Take the mean of all female control Pre-Trial Self Reported CPSS values. 5. Take the median of all female control Pre-Trial Self Reported CPSS values.

The following values were calculated for each option: 1. 6.06 2. 6.09 3. 6.24 4. 5.76 5. 5.82

## Hypothesis

Our hypothesis was that imputing data would provide results with a more varied outcome than data that was ignored.

## Participants

Participants of this experiment were young adults aged between 18 - 25 years old with no exact ages of the participants recorded. 150 participants were recorded in this study with an equal amount of male and female participants recorded. (Male = 75 / Female = 75) Participants were broken into 3 groups using random sampling. These groups were Control (traditional CBT, w/ No VR), Static (Non-animated model content, w/ VR), Animated (Animated model content, w/ VR)

## Design

## Materials

## Procedure

## Results

Table 1: Patient Data

X	gender	test_group	pre_trial_cpss	post_trial_cpss	pre_trial_or	post_trial_or
1	Male	Static	4.54	5.77	4.48	5.95
2	Male	Static	6.36	5.29	6.08	5.24
3	Male	Static	5.17	6.86	5.08	6.90
4	Male	Static	4.56	5.59	4.09	5.36
5	Male	Static	3.84	5.43	4.33	5.26
6	Male	Static	7.09	6.92	7.58	6.69
7	Male	Static	4.91	5.46	4.89	5.50
8	Male	Static	7.24	5.65	7.37	5.72
9	Male	Static	6.24	7.54	6.46	7.73
10	Male	Static	8.52	5.51	8.51	5.70
11	Male	Static	5.83	6.10	6.16	6.31
12	Male	Static	7.78	5.18	7.28	5.00
13	Male	Static	5.76	5.11	5.35	5.10
14	Male	Static	6.29	6.19	6.82	6.37
15	Male	Static	7.31	5.18	7.16	5.17

X	gender	test_group	pre_trial_cpss	post_trial_cpss	pre_trial_or	post_trial_or
16	Male	Static	6.61	4.19	6.54	4.15
17	Male	Static	5.73	4.43	5.75	4.37
18	Male	Static	6.93	6.46	6.79	6.45
19	Male	Static	7.41	7.91	7.46	7.68
20	Male	Static	7.00	6.13	7.49	6.35
21	Male	Static	7.88	5.47	7.90	5.32
22	Male	Static	6.25	4.97	6.00	5.18
23	Male	Static	5.88	5.12	6.04	4.93
24	Male	Static	5.79	7.24	6.30	7.18
25	Male	Static	7.56	6.47	7.60	6.64
26	Female	Static	6.28	5.72	5.98	5.95
27	Female	Static	5.50	4.65	5.50	4.50
28	Female	Static	5.81	5.07	6.07	5.17
29	Female	Static	5.06	4.03	4.53	3.96
30	Female	Static	6.17	5.58	6.54	5.69
31	Female	Static	6.06	5.41	5.87	5.58
32	Female	Static	6.56	6.11	6.96	6.30
33	Female	Static	5.82	5.09	5.82	4.86
34	Female	Static	6.24	5.67	6.44	5.75
35	Female	Static	5.79	5.05	5.74	5.01
36	Female	Static	5.50	4.65	5.30	4.58
37	Female	Static	5.66	4.87	5.59	5.01
38	Female	Static	4.49	3.24	4.09	3.03
39	Female	Static	6.04	5.39	6.41	5.24
40	Female	Static	6.90	6.59	6.58	6.37
41	Female	Static	6.04	5.39	5.93	5.26
42	Female	Static	5.28	4.34	5.57	4.30
43	Female	Static	6.09	5.46	5.79	5.49
44	Female	Static	4.10	2.70	4.26	2.50
45	Female	Static	6.19	5.61	6.38	5.67
46	Female	Static	6.92	6.61	7.03	6.70
47	Female	Static	5.37	4.47	5.05	4.28
48	Female	Static	6.13	5.52	5.78	5.35
49	Female	Static	4.86	3.76	4.86	3.94
50	Female	Static	5.74	4.97	5.83	4.95
51	Male	Control	5.60	6.53	5.62	6.66
52	Male	Control	4.37	4.86	4.59	4.88
53	Male	Control	6.86	6.24	6.96	6.27
54	Male	Control	4.97	5.52	4.95	5.75
55	Male	Control	7.40	5.21	7.06	5.45
56	Male	Control	6.66	6.87	7.18	7.08
57	Male	Control	6.17	5.10	6.17	5.13
58	Male	Control	7.24	5.82	7.46	5.61
59	Male	Control	8.00	5.61	8.34	5.49
60	Male	Control	6.30	6.20	6.42	6.25
61	Male	Control	7.23	4.41	6.89	4.46
62	Male	Control	5.73	3.62	5.25	3.69
63	Male	Control	7.90	6.32	7.88	6.23
64	Male	Control	4.93	5.98	5.09	6.14
65	Male	Control	5.09	4.42	4.97	4.59
66	Male	Control	4.03	5.19	4.02	5.02
67	Male	Control	5.37	6.05	5.21	6.12

X	gender	test_group	pre_trial_cpss	post_trial_cpss	pre_trial_or	post_trial_or
68	Male	Control	7.85	4.87	7.70	4.80
69	Male	Control	6.65	5.76	7.11	5.69
70	Male	Control	5.56	5.93	6.07	5.71
71	Male	Control	6.83	7.04	7.29	7.25
72	Male	Control	6.21	4.75	6.44	4.58
73	Male	Control	5.75	6.19	6.07	6.17
74	Male	Control	6.06	6.64	5.76	6.67
75	Male	Control	6.75	5.23	7.25	5.35
76	Female	Control	5.14	4.14	5.28	4.04
77	Female	Control	6.45	5.96	6.11	5.95
78	Female	Control	5.03	3.99	5.24	3.90
79	Female	Control	6.33	5.80	6.03	5.68
80	Female	Control	4.66	3.48	5.04	3.51
81	Female	Control	6.20	5.61	6.30	5.57
82	Female	Control	5.68	4.90	5.24	5.01
83	Female	Control	5.02	3.98	5.12	3.94
84	Female	Control	5.74	4.98	5.33	5.20
85	Female	Control	7.27	7.10	7.79	7.16
86	Female	Control	6.73	6.35	6.67	6.35
87	Female	Control	5.57	4.73	5.25	4.94
88	Female	Control	6.49	6.01	6.48	5.82
89	Female	Control	5.50	4.65	6.05	4.45
90	Female	Control	7.10	6.86	7.02	6.88
91	Female	Control	6.16	5.56	6.47	5.65
92	Female	Control	5.17	4.19	4.86	4.05
93	Female	Control	5.89	5.19	6.16	5.02
94	Female	Control	6.47	5.99	6.46	5.87
95	Female	Control	2.49	0.48	2.97	0.25
96	Female	Control	4.18	2.82	4.04	2.71
97	Female	Control	5.30	4.36	5.53	4.16
98	Female	Control	7.64	7.61	7.50	7.54
99	Female	Control	5.93	5.24	6.30	5.11
100	Female	Control	6.06	6.17	7.00	6.30
101	Male	Animated	7.34	4.99	6.85	4.83
102	Male	Animated	6.32	6.18	6.48	6.35
103	Male	Animated	7.62	5.49	7.82	5.27
104	Male	Animated	5.11	6.36	4.75	6.14
105	Male	Animated	7.29	4.64	7.71	4.86
106	Male	Animated	6.42	4.28	6.79	4.34
107	Male	Animated	6.50	4.29	7.03	4.08
108	Male	Animated	5.29	3.56	5.56	3.46
109	Male	Animated	6.42	6.05	6.84	6.05
110	Male	Animated	5.52	6.38	5.13	6.19
111	Male	Animated	5.59	5.11	5.83	5.35
112	Male	Animated	7.21	3.79	6.90	3.72
113	Male	Animated	5.61	6.79	5.73	6.83
114	Male	Animated	4.63	6.61	4.23	6.73
115	Male	Animated	5.87	6.56	5.60	6.57
116	Male	Animated	4.28	4.87	4.44	4.93
117	Male	Animated	6.10	4.88	5.94	4.98
118	Male	Animated	4.65	4.56	4.99	4.45
119	Male	Animated	8.63	6.13	8.74	5.99

X	gender	test_group	pre_trial_cpss	post_trial_cpss	pre_trial_or	post_trial_or
120	Mal	Animated	7.18	6.45	7.22	6.69
121	Male	Animated	7.21	5.49	7.78	5.66
122	Male	Animated	7.83	3.90	8.37	3.65
123	Male	Animated	6.84	6.96	6.33	6.79
124	Male	Animated	5.77	5.82	6.02	5.90
125	Male	Animated	7.41	5.08	7.25	5.17
126	Female	Animated	5.40	4.50	4.99	4.49
127	Female	Animated	5.83	5.10	6.40	5.11
128	Female	Animated	5.87	5.15	5.87	5.22
129	Female	Animated	4.22	2.87	3.98	2.88
130	Female	Animated	5.74	4.98	5.45	5.21
131	Female	Animated	6.24	5.67	5.67	5.82
132	Female	Animated	6.63	6.21	6.33	6.43
133	Female	Animated	5.38	4.48	5.71	4.69
134	Female	Animated	5.96	5.29	6.23	5.34
135	Female	Animated	6.59	6.16	6.35	6.23
136	Female	Animated	6.34	5.80	6.83	5.72
137	Female	Animated	6.57	6.12	6.38	5.89
138	Female	Animated	7.33	7.17	6.81	7.01
139	Female	Animated	4.05	2.64	3.93	2.86
140	Female	Animated	7.22	7.02	7.20	6.80
141	Female	Animated	5.13	4.13	5.51	3.88
142	Female	Animated	5.22	4.26	5.41	4.24
143	Female	Animated	5.10	4.09	5.45	4.08
144	Female	Animated	6.40	5.90	6.62	5.69
145	Female	Animatd	6.51	6.05	7.05	5.89
146	Female	Animated	6.20	5.62	6.66	5.61
147	Female	Animated	5.98	5.31	6.26	5.23
148	Female	Animated	6.31	5.77	6.37	5.73
149	Female	Animated	5.61	4.80	5.95	4.91
150	Female	Animated	6.25	5.69	6.06	5.83

Pre trial cpss mean = 6.0634228

Post trial cpss mean = 5.3642

Pre trial or mean = 6.1146667

Post trial or mean = 5.3570667

Pre trial cpss standard deviation = 1.0134715

Post trial cpss standard deviation = 1.0966577

Pre trial or standard deviation = 1.0606125

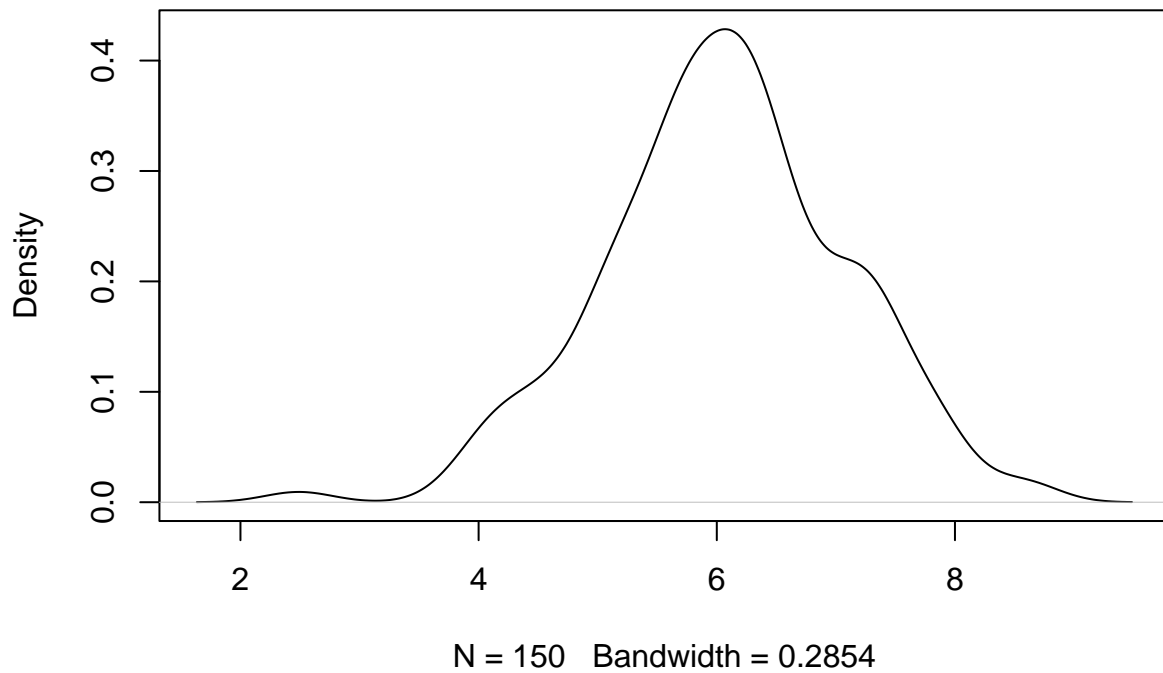
Post trial or standard deviation = 1.1234167

##	X	gender	test_group	pre_trial_cpss
##	Min. : 1.00	Length:150	Length:150	Min. :2.490
##	1st Qu.: 38.25	Class :character	Class :character	1st Qu.:5.500
##	Median : 75.50	Mode :character	Mode :character	Median :6.077
##	Mean : 75.50			Mean :6.063
##	3rd Qu.:112.75			3rd Qu.:6.657
##	Max. :150.00			Max. :8.630

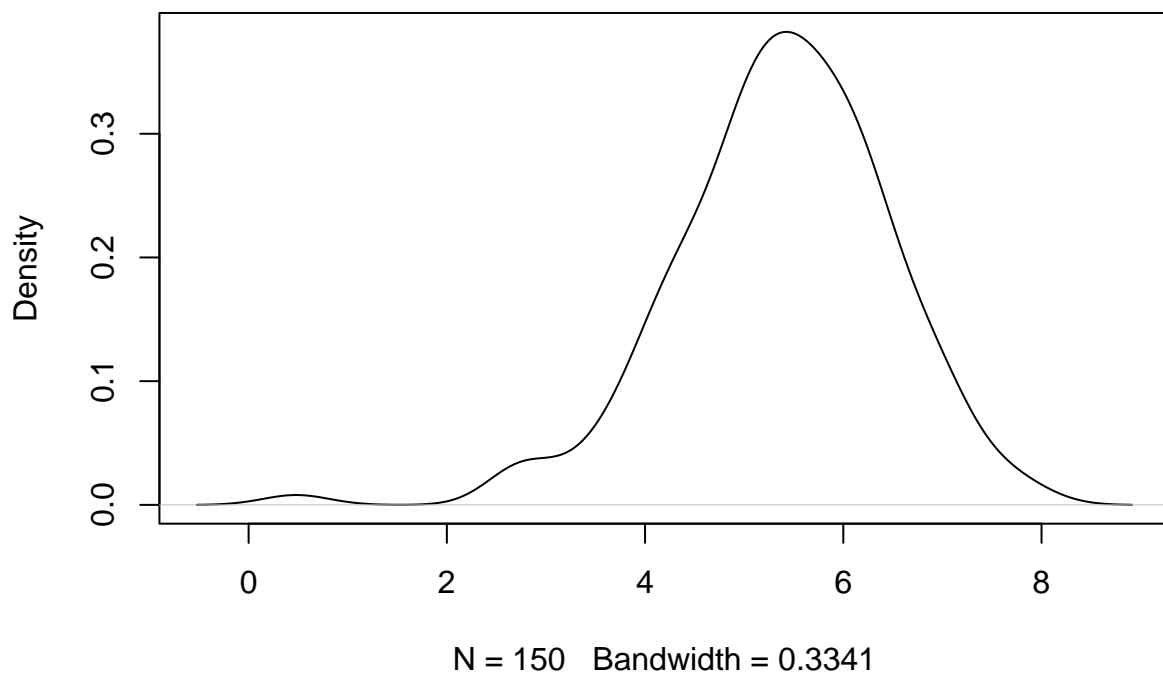
##	post_trial_cpss	pre_trial_or	post_trial_or
##	Min. :0.480	Min. :2.970	Min. :0.250
##	1st Qu.:4.763	1st Qu.:5.420	1st Qu.:4.838
##	Median :5.460	Median :6.095	Median :5.355
##	Mean :5.364	Mean :6.115	Mean :5.357
##	3rd Qu.:6.117	3rd Qu.:6.848	3rd Qu.:6.140
##	Max. :7.910	Max. :8.740	Max. :7.730

## Graphs

**density.default(x = patient\_data\$pre\_trial\_cpss, na.rm = TRUE)**

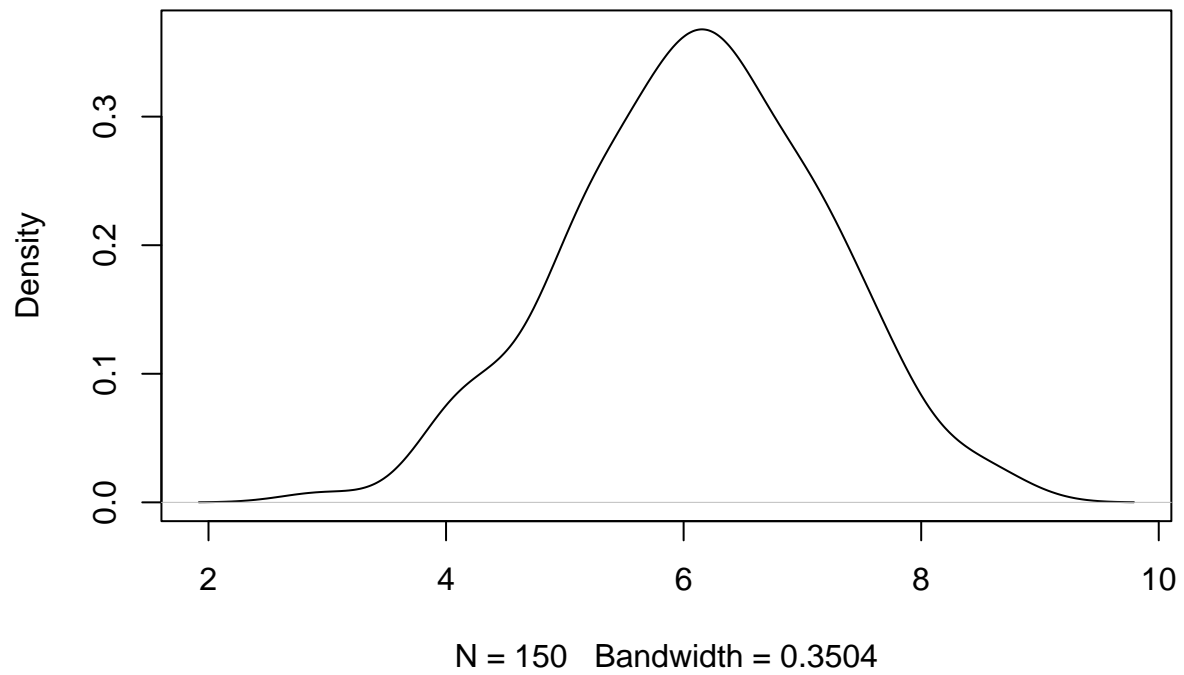


**density.default(x = patient\_data\$post\_trial\_cpss, na.rm = TRUE)**

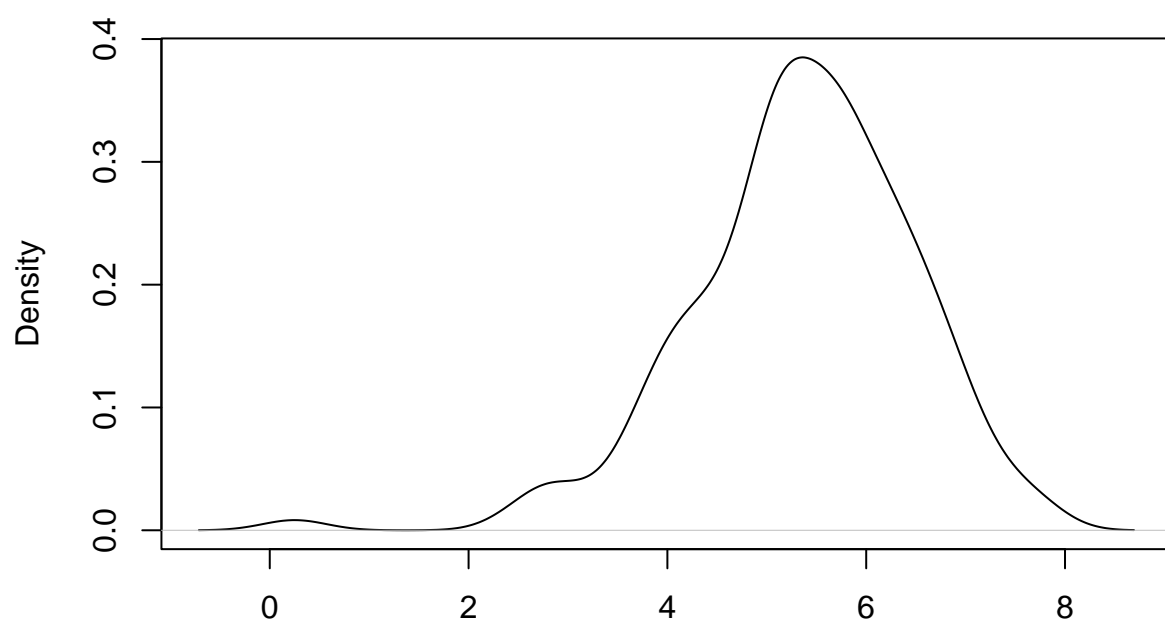




**density.default(x = patient\_data\$pre\_trial\_or, na.rm = TRUE)**

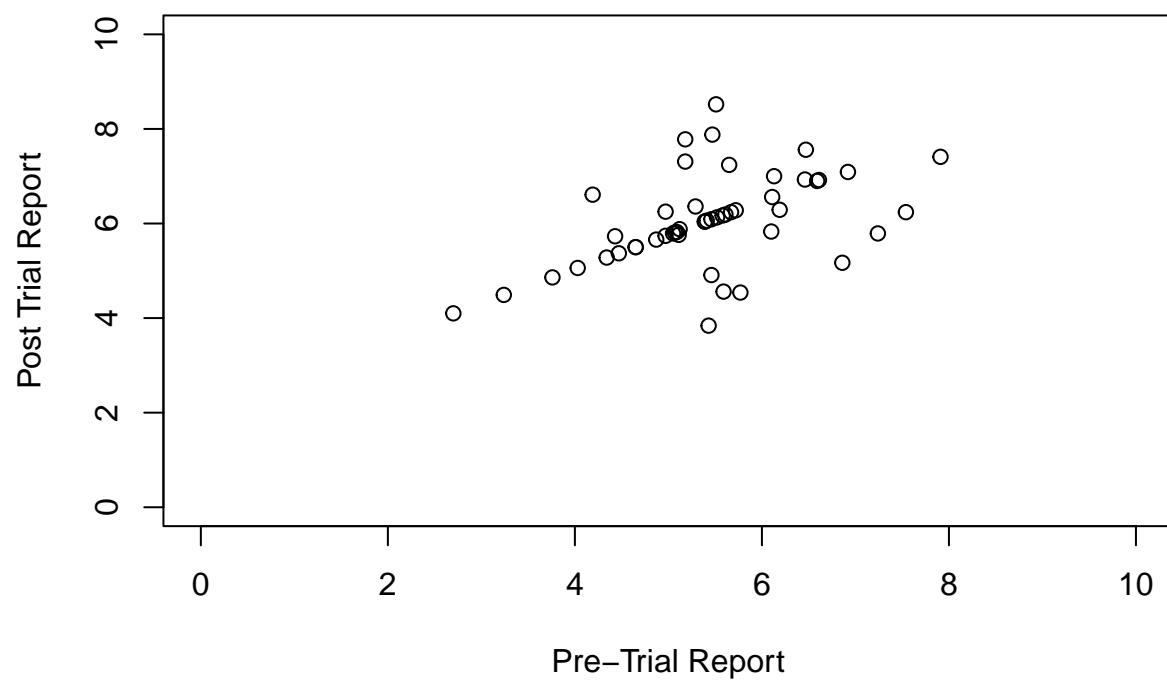


**density.default(x = patient\_data\$post\_trial\_or, na.rm = TRUE)**

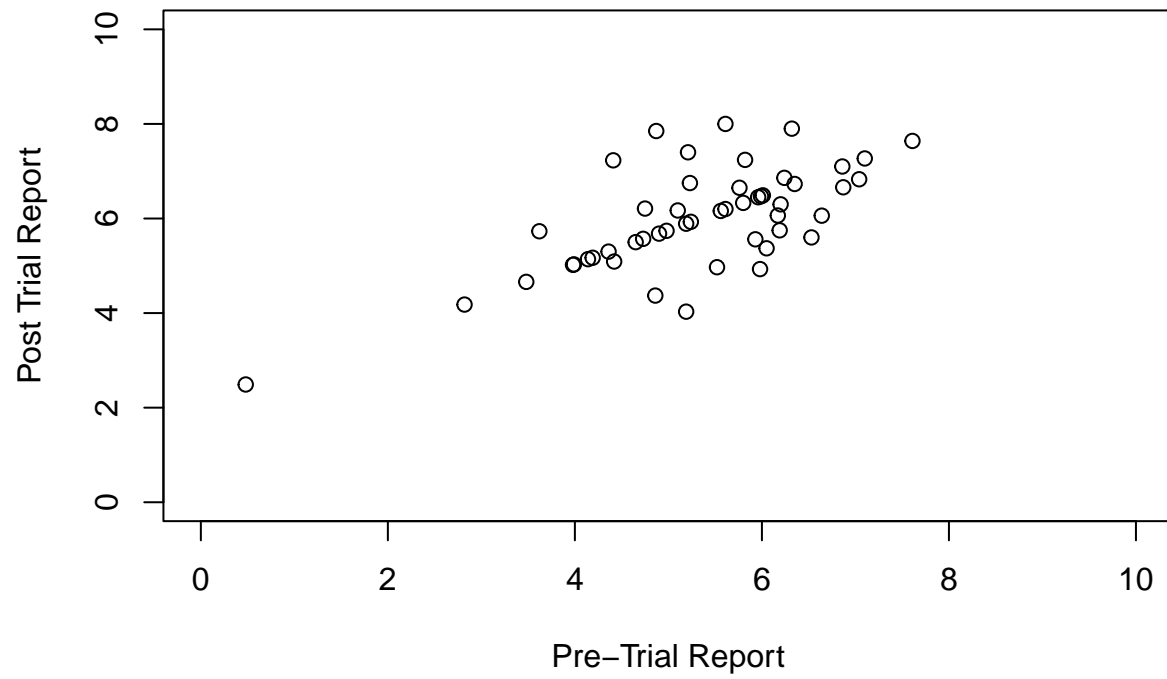


N = 150 Bandwidth = 0.3211

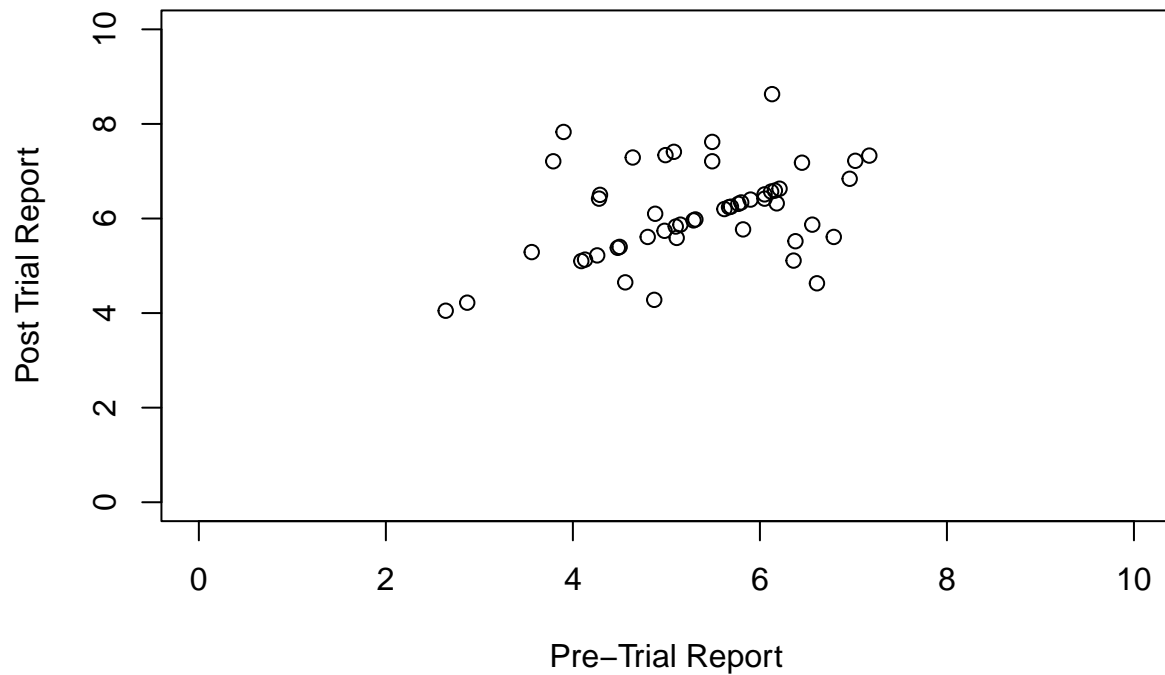
### Self Reported Data – Static



### Self Reported Data – Control



## Self Reported Data – Animated



Descriptive statistics

Inferential statistics

Statistical tests

Magnitude and direction of results

Discussion

References

Help with getting mean of data while data is missing from column \*Stack Overflow

Removing Na's by Column \*GeeksforGeeks

How to Handle Missing Data in a Dataset \*freeCodeCamp

How to Impute Missing Values in R? \*GeeksforGeeks