

# CODECHECK certificate 2025-018

<https://doi.org/10.5281/zenodo.15755369>



## Summary of metadata

Key	Value
Title	Exploring Categorical Colors
Authors	Lukas Röseler (ORCID:0000-0002-6446-1901)
Reference	<a href="https://doi.org/10.31234/osf.io/gj76p">https://doi.org/10.31234/osf.io/gj76p</a>
Codecheckers	Prince Oppong Boakye (ORCID:0009-0003-5447-8034)
Repository	<a href="https://github.com/codecheckers/Exploring-Categorical-Colors.git">https://github.com/codecheckers/Exploring-Categorical-Colors.git</a>
Check time	2020-04-13 10:00:00
Certificate	2025-018
Report	<a href="https://doi.org/10.5281/zenodo.15755369">https://doi.org/10.5281/zenodo.15755369</a>

Output	Comment	Size (b)
ministudy1_analyses_final.R	Analysis script for pilot study.	2013
ministudy2_analyses_final.R	Analysis script for main study.	9262
study1_data_processed.csv	Dataset for pilot study.	8645
study2_data_processed.csv	Dataset for main study.	54252
pilot.jpg	Figure 2 in the manuscript.	185627
colors_scatterplot.jpg	Figure 3 in the manuscript.	408634
colors_violinplot.jpg	Figure 5 in the manuscript.	557456
colors_means.jpg	Figure 4 in the manuscript.	292457

Table 1: Summary of output files generated

## Summary

This workflow was straightforward to follow, as per the authors' README. All figures stored in the repository could be recreated and matched the ones presented in the manuscript.

## CODECHECKER notes

- Ensure that the `pilot.jpg` file is in the same directory as `codecheck.yml` and `codecheck.Rmd` before running the `make` command.
- The R package `codecheck` (if used) expects the exact filenames as listed in the manifest. Verify the existence and format of all files in the manifest prior to execution.
- The analysis scripts download data from OSF, so an internet connection is required.

The GitHub repo is at <https://github.com/codecheckers/Exploring-Categorical-Colors.git>, This check is based on the commit `547c8bb90dd5a235cdfa0a9b0d7efa33e715c1c0`. Code was written in R. I went through the following steps:

- Installed required packages: `ggplot2`, `reshape`, `dplyr`, `psych`
- Executed `ministudy1_analyses_final.R` and `ministudy2_analyses_final.R` which downloaded data from OSF
- Generated all figures in working directory

This took 2 minute to complete on my laptop.

## Recommendations

The manuscript's results were successfully reproduced. The analysis code is robust and well-structured. Minor adjustments were required to the manifest to accommodate the actual file format of one figure, which did not affect the computational results which did not affect the computational results.

## Manifest files

`ministudy1_analyses_final.R`

Cannot include output file as figure.

ministudy2\_analyses\_final.R

Cannot include output file as figure.

study1\_data\_processed.csv

Summary statistics of tabular data:

```
-- Data Summary -----
Name                               Values
Number of rows                    read.csv(path)
Number of columns                  25
                                   99
-----
Column type frequency:
character                          5
logical                           5
numeric                           89
-----
Group variables                    None

-- Variable type: character -----
skim_variable n_missing complete_rate min max empty
1 QUESTNNR      0           1  4  4  0
2 MODE          0           1  9  9  0
3 STARTED       0           1 19 19  0
4 DE02_01       0           1  2 15  0
5 LASTDATA      0           1 19 19  0
n_unique whitespace
1      1           0
2      1           0
3     24           0
4     12           0
5     24           0

-- Variable type: logical -----
skim_variable n_missing complete_rate mean count
1 SERIAL      25           0 NaN ": "
2 REF         25           0 NaN ": "
3 MAILSENT    25           0 NaN ": "
4 FINISHED     0           1  1 "TRU: 25"
5 Q_VIEWER     0           1  0 "FAL: 25"

-- Variable type: numeric -----
skim_variable n_missing complete_rate mean sd p0
1 X            0           1 40.9 7.89 24
2 CASE         0           1 83.7 8.52 64
3 C001_01      0           1 47.1 29.7 4
4 C002_01      0           1 52.5 30.2 6
5 C003_01      0           1 51.7 23.4 7
6 C004_01      0           1 46.5 27.5 6
7 C005_01      0           1 57.3 31.1 5
8 C006_01      0           1 45.0 30.8 3
9 C007_01      0           1 46.4 24.2 2
10 C008_01     0           1 53.7 28.2 7
11 C009_01     0           1 48.0 26.2 6
12 C010_01     0           1 52.2 25.2 5
13 C011_01     0           1 51.7 26.8 7
14 C012_01     0           1 50.2 27.3 2
15 C013_01     0           1 54.4 25.5 13
16 C014_01     0           1 48.0 29.1 8
17 C015_01     0           1 48.7 24.6 7
18 C016_01     0           1 45.9 30.0 7
19 C018_01     0           1 60.7 24.4 5
20 C017_01     0           1 48.4 31.3 2
21 C019_01     0           1 50.6 31.5 3
22 C020_01     0           1 54.7 28.8 3
23 RA01_CP     0           1 43.8 8.16 28
24 RA01x01     0           1 9.88 5.56 1
25 RA01x02     0           1 11.0 6.38 1
26 RA01x03     0           1 10.9 5.04 2
27 RA01x04     0           1 9.64 6.08 2
28 RA01x05     0           1 12.4 6.14 1
29 RA01x06     0           1 9.2 5.75 1
30 RA01x07     0           1 9.6 4.65 2
31 RA01x08     0           1 10.9 5.97 1
32 RA01x09     0           1 9.44 5.62 1
33 RA01x10     0           1 11.0 5.84 1
34 RA01x11     0           1 10.8 5.15 2
35 RA01x12     0           1 10.1 5.35 1
36 RA01x13     0           1 11.7 5.27 3
37 RA01x14     0           1 10.2 6.20 1
38 RA01x15     0           1 10.5 5.17 2
```

39	RA01x16	0	1	9.08	6.45	1
40	RA01x17	0	1	9.72	7.20	1
41	RA01x18	0	1	12.4	5.24	2
42	RA01x19	0	1	10.8	6.74	1
43	RA01x20	0	1	11.0	5.73	1
44	DE01	0	1	1.88	0.332	1
45	TIME001	0	1	600.	1158.	3
46	TIME002	0	1	1.44	0.651	1
47	TIME003	0	1	10.2	8.19	4
48	TIME004	0	1	1.4	0.5	1
49	TIME005	0	1	4.8	2.36	2
50	TIME006	0	1	1.16	0.374	1
51	TIME007	0	1	4.6	2.89	2
52	TIME008	0	1	1.28	0.458	1
53	TIME009	0	1	5.4	5.67	2
54	TIME010	0	1	1.12	0.332	1
55	TIME011	0	1	4.08	2.18	1
56	TIME012	0	1	1.2	0.408	1
57	TIME013	0	1	3.76	1.42	2
58	TIME014	0	1	1.28	0.458	1
59	TIME015	0	1	3.48	1.12	2
60	TIME016	0	1	1.2	0.408	1
61	TIME017	0	1	3.72	2.39	2
62	TIME018	0	1	1.16	0.374	1
63	TIME019	0	1	3.68	1.03	2
64	TIME020	0	1	1.16	0.374	1
65	TIME021	0	1	3.36	1.29	2
66	TIME022	0	1	1.04	0.2	1
67	TIME023	0	1	3.64	1.63	1
68	TIME024	0	1	1.2	0.408	1
69	TIME025	0	1	3.32	1.55	2
70	TIME026	0	1	1.24	0.436	1
71	TIME027	0	1	3.2	1.22	2
72	TIME028	0	1	1.32	0.476	1
73	TIME029	0	1	3.24	1.45	2
74	TIME030	0	1	1.28	0.458	1
75	TIME031	0	1	3.4	1.26	2
76	TIME032	0	1	1.24	0.436	1
77	TIME033	0	1	2.96	1.17	2
78	TIME034	0	1	1.44	0.507	1
79	TIME035	0	1	3.2	1.71	1
80	TIME036	0	1	1.2	0.408	1
81	TIME037	0	1	3	1.15	2
82	TIME038	0	1	1.08	0.277	1
83	TIME039	0	1	3.48	1.36	2
84	TIME040	0	1	1.08	0.277	1
85	TIME041	0	1	3.2	1.44	2
86	TIME042	0	1	7.68	3.47	4
87	TIME_SUM	0	1	118.	18.2	94
88	LASTPAGE	0	1	42	0	42
89	MAXPAGE	0	1	42	0	42

p25 p50 p75 p100 hist

1	35	41	47	54
2	78	84	90	98
3	26	52	62	99
4	29	55	77	100
5	36	55	62	98
6	22	51	73	89
7	40	57	79	99
8	12	45	71	97
9	32	41	62	96
10	26	55	81	95
11	32	46	59	98
12	32	51	63	99
13	35	54	73	99
14	33	52	70	94
15	33	56	75	93
16	16	54	66	92
17	29	52	64	93
18	18	40	71	98
19	42	57	82	96
20	16	49	73	96
21	22	51	82	96
22	39	50	81	99
23	38	44	50	58
24	5	10	15	19
25	6	13	17	20
26	8	10	15	20
27	4	10	16	20
28	9	12	18	20

29	4	9	14	18
30	6	8	14	18
31	5	11	17	20
32	5	8	13	20
33	7	11	15	20
34	8	10	15	20
35	6	11	13	19
36	8	12	16	20
37	4	9	15	20
38	6	11	14	19
39	4	8	16	19
40	2	11	17	20
41	8	12	17	20
42	4	13	16	20
43	7	11	16	20
44	2	2	2	2
45	20	31	84	2949
46	1	1	2	3
47	6	7	11	39
48	1	1	2	2
49	3	4	6	14
50	1	1	1	2
51	3	4	4	16
52	1	1	2	2
53	3	4	5	30
54	1	1	1	2
55	3	4	4	12
56	1	1	1	2
57	3	4	4	9
58	1	1	2	2
59	3	3	4	6
60	1	1	1	2
61	3	3	4	14
62	1	1	1	2
63	3	3	4	6
64	1	1	1	2
65	3	3	4	7
66	1	1	1	2
67	3	4	4	10
68	1	1	1	2
69	2	3	4	8
70	1	1	1	2
71	2	3	4	7
72	1	1	2	2
73	2	3	4	8
74	1	1	2	2
75	2	3	4	6
76	1	1	1	2
77	2	3	4	6
78	1	1	2	2
79	2	3	4	10
80	1	1	1	2
81	2	3	4	6
82	1	1	1	2
83	3	3	4	7
84	1	1	1	2
85	2	3	4	7
86	6	7	8	22
87	104	119	132	156
88	42	42	42	42
89	42	42	42	42

study2\_data\_processed.csv

Summary statistics of tabular data:

```
-- Data Summary -----
Name                               Values
Number of rows                    read.csv(path)
Number of columns                  73
                                   208

-----
Column type frequency:
character                          5
logical                           28
numeric                           175
-----

Group variables                    None

-- Variable type: character -----
skim_variable n_missing complete_rate min max empty
1 QUESTNNR      0           1  4  4  0
2 MODE          0           1  9  9  0
3 STARTED       0           1 19 19  0
4 DE03_01       0           1  5  9  0
5 LASTDATA      0           1 19 19  0
n_unique whitespace
1      1          0
2      1          0
3     73          0
4     71          0
5     73          0

-- Variable type: logical -----
skim_variable n_missing complete_rate mean
1 SERIAL      73          0      NaN
2 REF         73          0      NaN
3 DE04_01      0           1      0
4 DE04_02      0           1      0
5 DE04_03      0           1      0
6 FA01_01      9         0.877  0.375
7 FA02_01      9         0.877  0.25
8 FA03_01      9         0.877  0.172
9 FA04_01      9         0.877  0.109
10 FA05_01     9         0.877  0.0781
11 FA06_01     9         0.877  0.0625
12 FA07_01     9         0.877  0.0625
13 FA08_01     9         0.877  0.0781
14 FA09_01     9         0.877  0.109
15 FA10_01     9         0.877  0.109
16 FA11_01     7         0.904  0.136
17 FA12_01     7         0.904  0.106
18 FA13_01     7         0.904  0.121
19 FA14_01     7         0.904  0.106
20 FA15_01     7         0.904  0.0606
21 FA16_01     7         0.904  0.0909
22 FA17_01     7         0.904  0.0455
23 FA18_01     7         0.904  0.0606
24 FA19_01     7         0.904  0.152
25 FA20_01     6         0.918  0.149
26 MAILSENT    73          0      NaN
27 FINISHED    0           1      1
28 Q_VIEWER    0           1      0
count
1 ": "
2 ": "
3 "FAL: 73"
4 "FAL: 73"
5 "FAL: 73"
6 "FAL: 40, TRU: 24"
7 "FAL: 48, TRU: 16"
8 "FAL: 53, TRU: 11"
9 "FAL: 57, TRU: 7"
10 "FAL: 59, TRU: 5"
11 "FAL: 60, TRU: 4"
12 "FAL: 60, TRU: 4"
13 "FAL: 59, TRU: 5"
14 "FAL: 57, TRU: 7"
15 "FAL: 57, TRU: 7"
16 "FAL: 57, TRU: 9"
17 "FAL: 59, TRU: 7"
```

```

18 "FAL: 58, TRU: 8"
19 "FAL: 59, TRU: 7"
20 "FAL: 62, TRU: 4"
21 "FAL: 60, TRU: 6"
22 "FAL: 63, TRU: 3"
23 "FAL: 62, TRU: 4"
24 "FAL: 56, TRU: 10"
25 "FAL: 57, TRU: 10"
26 ": "
27 "TRU: 73"
28 "FAL: 73"

```

```
-- Variable type: numeric -----
```

skim_variable	n_missing	complete_rate	mean
1 X.2	0	1	40.8
2 X.1	0	1	41.8
3 X	0	1	184.
4 CASE	0	1	308.
5 CO01_01	0	1	48.0
6 CO02_01	0	1	49.7
7 CO03_01	0	1	43.4
8 CO04_01	0	1	47.4
9 CO05_01	0	1	46.6
10 CO06_01	0	1	46.6
11 CO07_01	0	1	50.5
12 CO08_01	0	1	42.5
13 CO09_01	0	1	46.9
14 CO10_01	0	1	45.4
15 CO11_01	0	1	50.4
16 CO12_01	0	1	46.8
17 CO13_01	0	1	49.0
18 CO14_01	0	1	52.8
19 CO15_01	0	1	46.2
20 CO16_01	0	1	47.7
21 CO18_01	0	1	50.5
22 CO17_01	0	1	47.5
23 CO19_01	0	1	47.6
24 CO20_01	0	1	41.1
25 RA01_CP	0	1	227.
26 RA01x01	0	1	10.8
27 RA01x02	0	1	11
28 RA01x03	0	1	10.2
29 RA01x04	0	1	9.81
30 RA01x05	0	1	10.2
31 RA01x06	0	1	10.6
32 RA01x07	0	1	11.4
33 RA01x08	0	1	8.90
34 RA01x09	0	1	10.5
35 RA01x10	0	1	9.82
36 RA01x11	0	1	11.3
37 RA01x12	0	1	11.1
38 RA01x13	0	1	11
39 RA01x14	0	1	10.8
40 RA01x15	0	1	10.4
41 RA01x16	0	1	10.3
42 RA01x17	0	1	10.6
43 RA01x18	0	1	11.2
44 RA01x19	0	1	10.4
45 RA01x20	0	1	9.79
46 DE01	0	1	1.70
47 DE02_01	0	1	46.3
48 DE04	0	1	0
49 DI01_01	0	1	5164.
50 DI02_01	0	1	11471.
51 DI03_01	0	1	7898.
52 DI04_01	0	1	13029.
53 DI05_01	0	1	16622.
54 DI06_01	0	1	9808.
55 DI07_01	0	1	10900.
56 DI08_01	0	1	15691.
57 DI10_01	0	1	9615.
58 DI11_01	0	1	5216.
59 DI12_01	0	1	15957.
60 DI13_01	0	1	5546.
61 DI14_01	0	1	9728.
62 DI15_01	0	1	13804.
63 DI16_01	0	1	11926.
64 DI17_01	0	1	9717.
65 DI18_01	0	1	4810.
66 DI19_01	0	1	8463.



67 DI20_01	0	1	13707.
68 DI09_01	0	1	10169.
69 FA01	9	0.877	0.375
70 FA02	9	0.877	0.25
71 FA03	9	0.877	0.172
72 FA04	9	0.877	0.109
73 FA05	9	0.877	0.0781
74 FA06	9	0.877	0.0625
75 FA07	9	0.877	0.0625
76 FA08	9	0.877	0.0781
77 FA09	9	0.877	0.109
78 FA10	9	0.877	0.109
79 FA11	7	0.904	0.136
80 FA12	7	0.904	0.106
81 FA13	7	0.904	0.121
82 FA14	7	0.904	0.106
83 FA15	7	0.904	0.0606
84 FA16	7	0.904	0.0909
85 FA17	7	0.904	0.0455
86 FA18	7	0.904	0.0606
87 FA19	7	0.904	0.152
88 FA20	6	0.918	0.149
89 TIME001	0	1	155.
90 TIME002	0	1	1.33
91 TIME003	0	1	24.1
92 TIME004	0	1	15.2
93 TIME005	0	1	1.22
94 TIME006	0	1	21.8
95 TIME007	0	1	8.59
96 TIME008	0	1	1.34
97 TIME009	0	1	28.2
98 TIME010	0	1	7.14
99 TIME011	0	1	1.23
100 TIME012	0	1	21.1
101 TIME013	0	1	6.36
102 TIME014	0	1	1.25
103 TIME015	0	1	33.2
104 TIME016	0	1	6.62
105 TIME017	0	1	1.16
106 TIME018	0	1	25.9
107 TIME019	0	1	6.26
108 TIME020	0	1	1.14
109 TIME021	0	1	25.4
110 TIME022	0	1	6.29
111 TIME023	0	1	1.18
112 TIME024	0	1	28.1
113 TIME025	0	1	6.12
114 TIME026	0	1	1.22
115 TIME027	0	1	22.5
116 TIME028	0	1	5.74
117 TIME029	0	1	1.25
118 TIME030	0	1	20.2
119 TIME031	0	1	7.10
120 TIME032	0	1	1.15
121 TIME033	0	1	20.5
122 TIME034	0	1	6.36
123 TIME035	0	1	1.23
124 TIME036	0	1	25.6
125 TIME037	0	1	6.11
126 TIME038	0	1	1.22
127 TIME039	0	1	15.9
128 TIME040	0	1	17.3
129 TIME041	0	1	1.19
130 TIME042	0	1	19.2
131 TIME043	0	1	7.18
132 TIME044	0	1	2.44
133 TIME045	1	0.986	17.2
134 TIME046	0	1	8.04
135 TIME047	0	1	1.22
136 TIME048	0	1	18.5
137 TIME049	0	1	5.88
138 TIME050	0	1	1.21
139 TIME051	0	1	15.6
140 TIME052	0	1	5.51
141 TIME053	0	1	1.25
142 TIME054	0	1	21.1
143 TIME055	0	1	5.90
144 TIME056	0	1	1.66
145 TIME057	1	0.986	25.4
146 TIME058	0	1	5.37

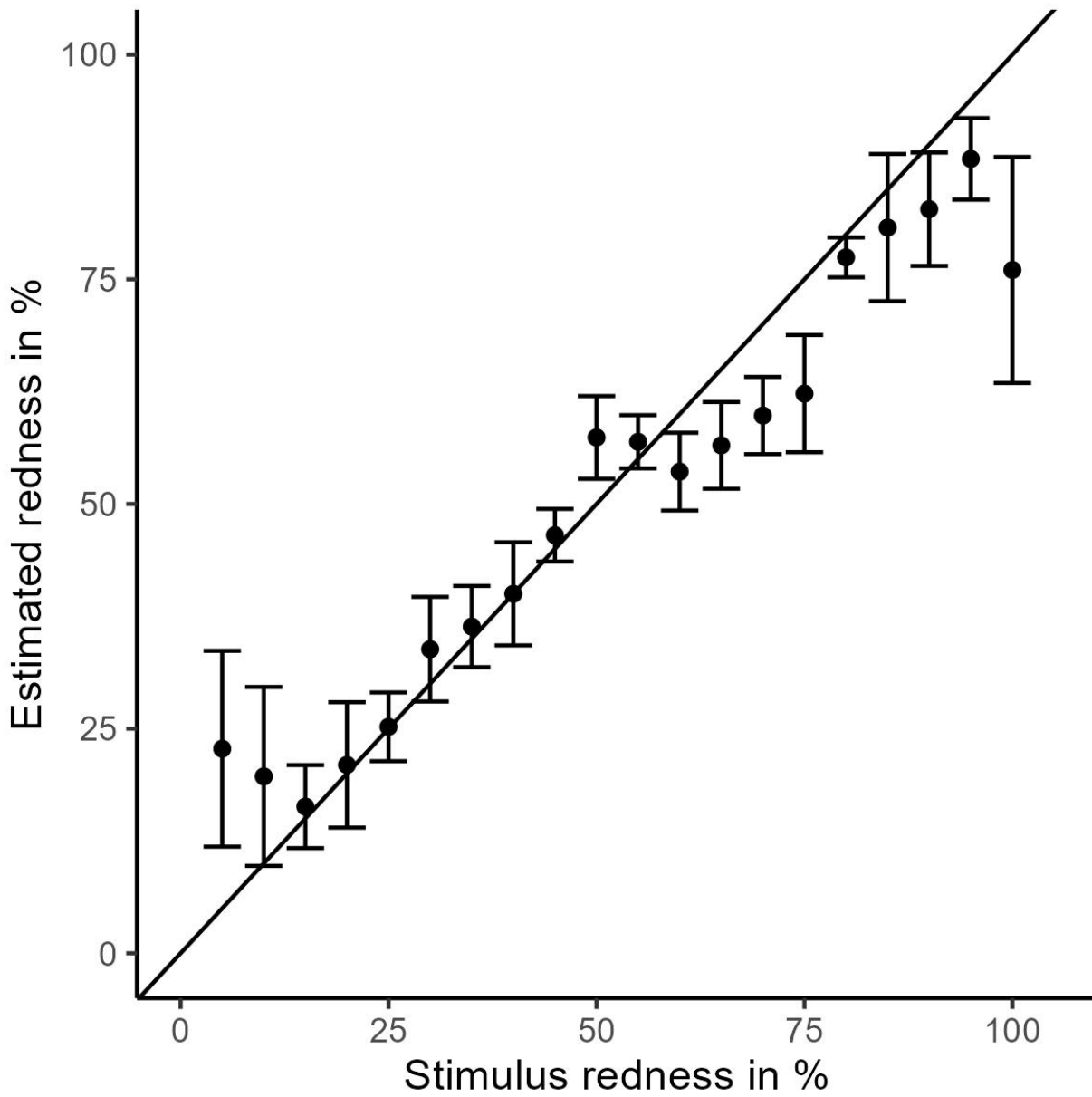
147	TIME059	0	1	1.27		
148	TIME060	0	1	23.0		
149	TIME061	0	1	5.66		
150	TIME062	0	1	77.5		
151	TIME_SUM	0	1	688.		
152	LASTPAGE	0	1	62		
153	MAXPAGE	0	1	62		
154	dis01	0	1	0.822		
155	dis02	0	1	0.808		
156	dis03	0	1	0.712		
157	dis04	0	1	0.904		
158	dis05	0	1	0.808		
159	dis06	0	1	0.836		
160	dis07	0	1	0.904		
161	dis08	0	1	0.753		
162	dis09	0	1	0.918		
163	dis10	0	1	0.890		
164	dis11	0	1	0.877		
165	dis12	0	1	0.753		
166	dis13	0	1	0.945		
167	dis14	0	1	0.904		
168	dis15	0	1	0.904		
169	dis16	0	1	0.945		
170	dis17	0	1	0.959		
171	dis18	0	1	0.904		
172	dis19	0	1	0.808		
173	dis20	0	1	0.849		
174	dis	0	1	17.2		
175	rechenzeit	2	0.973	450.		
sd p0 p25 p50 p75 p100 hist						
1	23.8	1	20	41	61	81
2	24.1	1	21	42	62	83
3	54.5	85	139	183	232	272
4	80.4	155	244	308	383	433
5	29.1	1	28	49	71	99
6	29.4	3	22	51	71	99
7	30.2	2	17	40	62	99
8	27.9	2	26	50	69	98
9	25.6	3	26	51	66	100
10	29.5	2	22	50	67	99
11	30.0	2	22	52	76	99
12	31.0	3	11	36	68	99
13	27.4	5	26	49	65	99
14	27.0	2	27	45	62	99
15	29.4	3	23	51	75	98
16	28.2	2	25	49	66	99
17	28.6	3	24	52	69	99
18	28.7	5	30	51	82	98
19	24.3	5	26	45	61	99
20	25.8	2	28	50	65	97
21	28.8	3	25	54	77	98
22	27.5	3	27	47	63	98
23	30.7	3	26	42	82	98
24	25.7	3	22	34	57	96
25	79.0	77	163	227	300	350
26	5.83	1	6	10	17	20
27	5.62	1	6	11	15	20
28	6.14	1	5	10	15	20
29	5.82	1	5	9	15	20
30	5.67	1	5	10	15	20
31	6.06	1	5	11	16	20
32	5.75	1	7	12	16	20
33	5.81	1	4	8	13	20
34	5.73	1	5	11	15	20
35	5.47	1	5	10	14	20
36	5.74	1	7	12	16	20
37	5.95	1	6	11	16	20
38	6.00	1	6	12	16	20
39	5.69	1	7	10	16	20
40	4.99	1	6	11	14	20
41	5.67	1	6	11	15	20
42	5.56	1	5	11	16	20
43	5.98	1	6	12	16	20
44	6.44	1	4	10	17	20
45	5.41	1	5	9	14	20
46	0.491	1	1	2	2	3
47	14.9	19	37	50	58	78
48	0	0	0	0	0	0
49	519.	1326	5194	5194	5194	6434
50	9310.	1978	10978	10978	10978	87910

51	890.	815	8015	8015	8015	8998
52	1194.	3180	13180	13180	13180	14180
53	2532.	1600	17023	17023	17023	17908
54	1487.	1043	10043	10043	10043	11043
55	181.	10283	10883	10883	10883	11883
56	2528.	1500	16019	16019	16019	19019
57	8951.	8434	8534	8534	8534	85034
58	21.4	5110	5220	5220	5220	5230
59	15163.	1447	14407	14407	14407	143017
60	129.	5521	5531	5531	5531	6631
61	751.	4882	9872	9872	9872	9874
62	9773.	9689	12689	12689	12689	96089
63	118.	11812	11912	11912	11912	12912
64	9381.	4768	8674	8674	8674	88674
65	118.	3832	4828	4828	4828	4828
66	494.	4923	8523	8523	8523	9523
67	182.	13080	13683	13683	13683	14683
68	205.	9323	10144	10144	10144	11044
69	0.488	0	0	0	1	1
70	0.436	0	0	0	0.25	1
71	0.380	0	0	0	0	1
72	0.315	0	0	0	0	1
73	0.270	0	0	0	0	1
74	0.244	0	0	0	0	1
75	0.244	0	0	0	0	1
76	0.270	0	0	0	0	1
77	0.315	0	0	0	0	1
78	0.315	0	0	0	0	1
79	0.346	0	0	0	0	1
80	0.310	0	0	0	0	1
81	0.329	0	0	0	0	1
82	0.310	0	0	0	0	1
83	0.240	0	0	0	0	1
84	0.290	0	0	0	0	1
85	0.210	0	0	0	0	1
86	0.240	0	0	0	0	1
87	0.361	0	0	0	0	1
88	0.359	0	0	0	0	1
89	685.	2	16	32	48	5420
90	0.625	1	1	1	2	5
91	11.9	7	15	22	30	64
92	8.24	4	10	13	20	43
93	0.417	1	1	1	1	2
94	9.19	9	15	20	27	56
95	5.29	2	5	7	11	31
96	0.650	1	1	1	2	4
97	16.4	10	19	23	34	103
98	3.96	3	5	6	8	27
99	0.426	1	1	1	1	2
100	8.33	8	15	20	25	48
101	3.36	3	4	5	7	19
102	0.465	1	1	1	1	3
103	19.1	15	20	26	38	100
104	3.09	2	4	6	7	15
105	0.373	1	1	1	1	2
106	11.4	9	18	23	29	62
107	3.45	2	4	5	7	18
108	0.346	1	1	1	1	2
109	23.9	10	17	21	28	214
110	3.68	2	4	5	8	25
111	0.385	1	1	1	1	2
112	12.9	12	19	26	34	71
113	3.05	2	4	5	8	21
114	0.417	1	1	1	1	2
115	9.55	9	16	22	27	56
116	3.20	2	4	5	7	19
117	0.434	1	1	1	1	2
118	8.59	10	15	17	23	47
119	8.44	2	4	5	7	67
120	0.360	1	1	1	1	2
121	7.88	10	15	20	25	57
122	4.15	2	4	5	8	27
123	0.514	1	1	1	1	4
124	12.9	11	17	21	31	69
125	3.12	2	4	6	7	18
126	0.417	1	1	1	1	2
127	7.71	6	11	15	18	59
128	96.0	2	4	5	7	826
129	0.396	1	1	1	1	2
130	15.5	8	13	17	21	137

131	8.60	2	4	5	7	72
132	10.8	1	1	1	1	93
133	6.99	6	12.8	16	20.2	40
134	18.3	2	4	5	7	159
135	0.417	1	1	1	1	2
136	6.74	9	13	17	22	36
137	2.82	2	4	5	7	14
138	0.407	1	1	1	1	2
139	5.34	7	12	15	18	30
140	3.05	2	4	5	7	20
141	0.521	1	1	1	1	4
142	10.7	8	14	19	24	63
143	3.56	3	4	5	7	20
144	3.65	1	1	1	1	32
145	17.2	12	16.8	21.5	28.2	144
146	2.67	1	3	5	7	13
147	0.449	1	1	1	2	2
148	9.75	11	16	21	29	65
149	2.75	2	4	5	7	17
150	32.4	26	56	72	99	166
151	156.	361	578	675	774	1117
152	0	62	62	62	62	62
153	0	62	62	62	62	62
154	0.385	0	1	1	1	1
155	0.396	0	1	1	1	1
156	0.456	0	0	1	1	1
157	0.296	0	1	1	1	1
158	0.396	0	1	1	1	1
159	0.373	0	1	1	1	1
160	0.296	0	1	1	1	1
161	0.434	0	1	1	1	1
162	0.277	0	1	1	1	1
163	0.315	0	1	1	1	1
164	0.331	0	1	1	1	1
165	0.434	0	1	1	1	1
166	0.229	0	1	1	1	1
167	0.296	0	1	1	1	1
168	0.296	0	1	1	1	1
169	0.229	0	1	1	1	1
170	0.200	0	1	1	1	1
171	0.296	0	1	1	1	1
172	0.396	0	1	1	1	1
173	0.360	0	1	1	1	1
174	2.45	10	16	18	19	20
175	142.	220	360.	432	510.	892

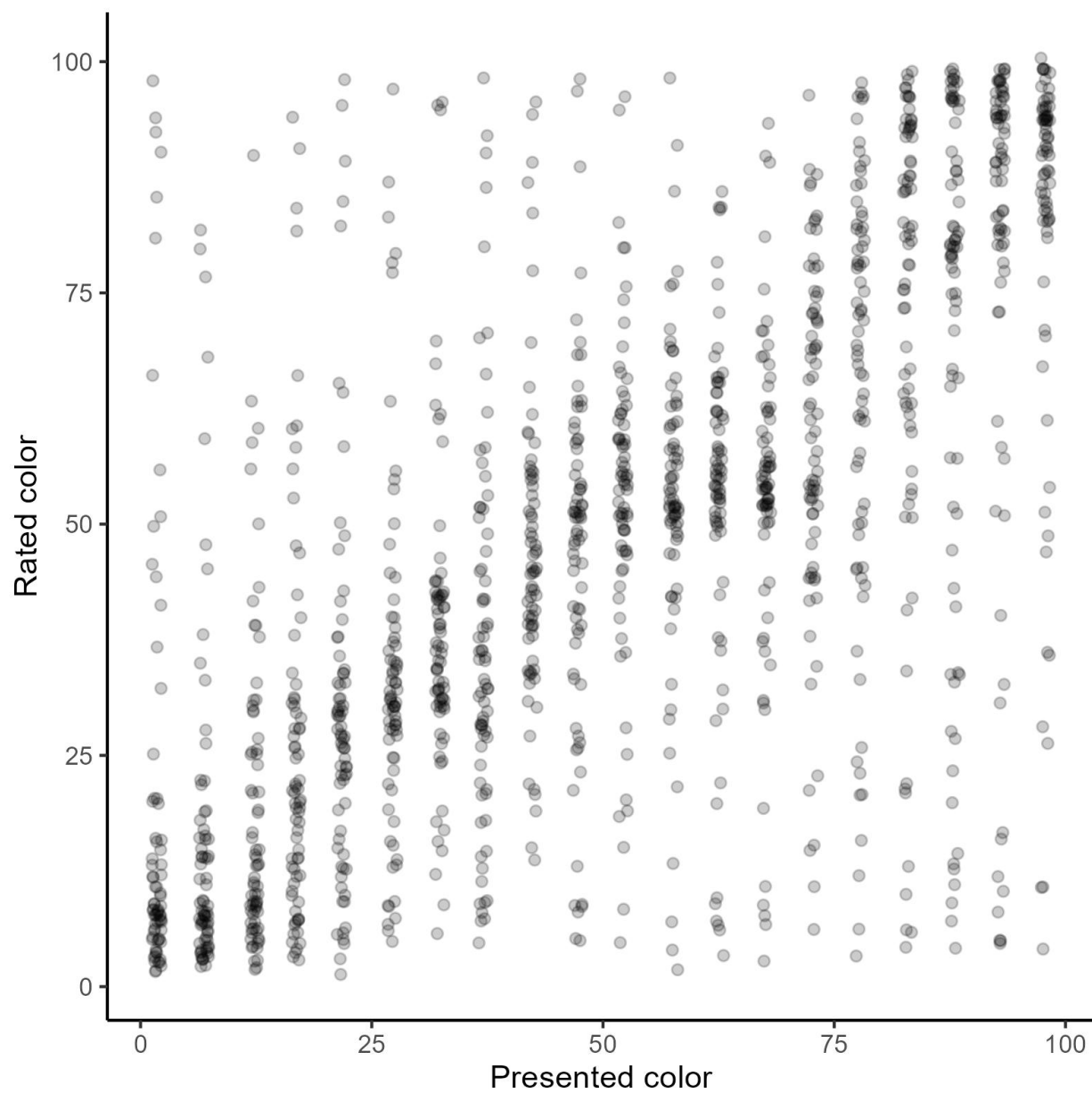
pilot.jpg

Comment: Figure 2 in the manuscript.



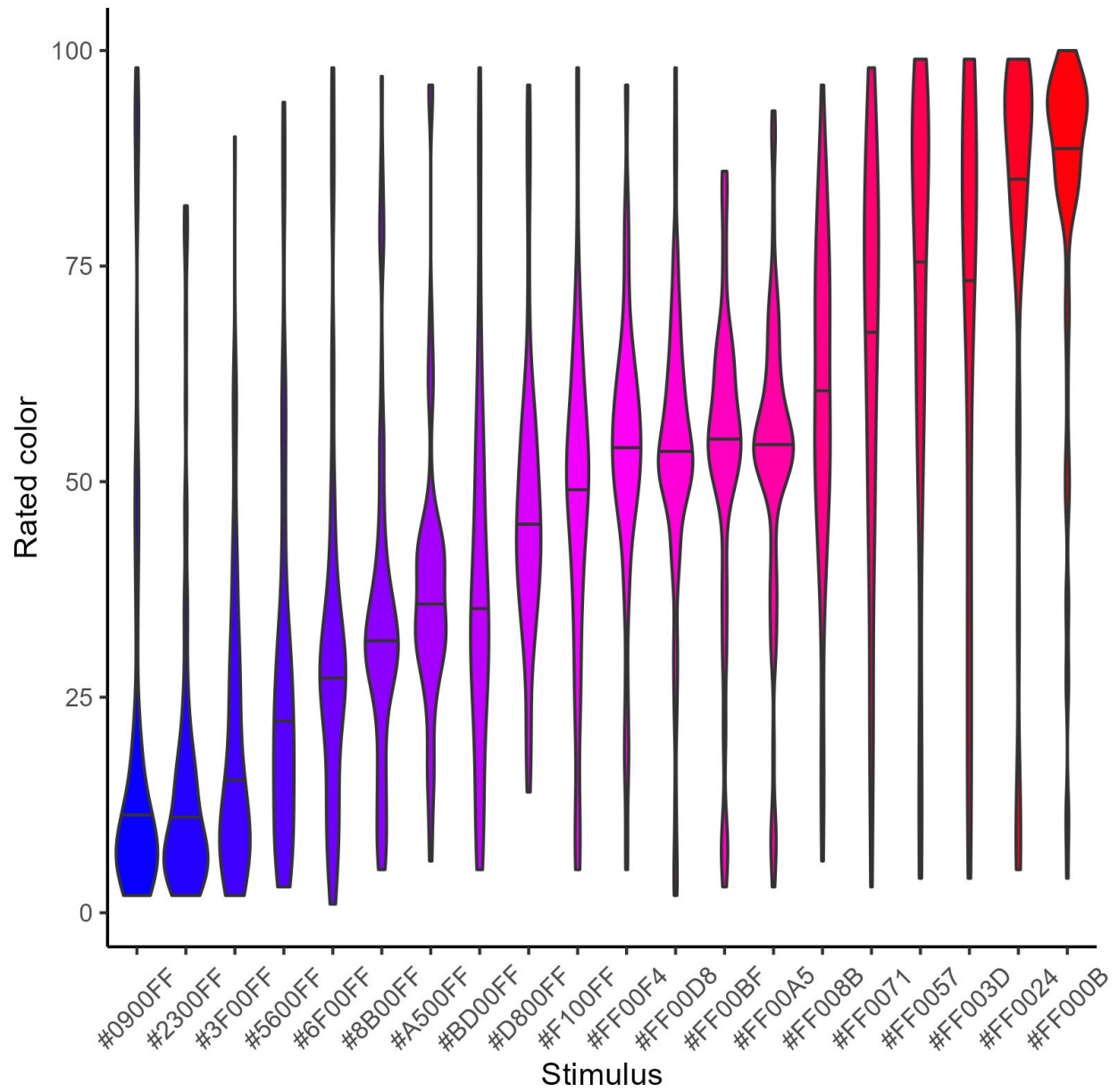
colors\_scatterplot.jpg

Comment: Figure 3 in the manuscript.



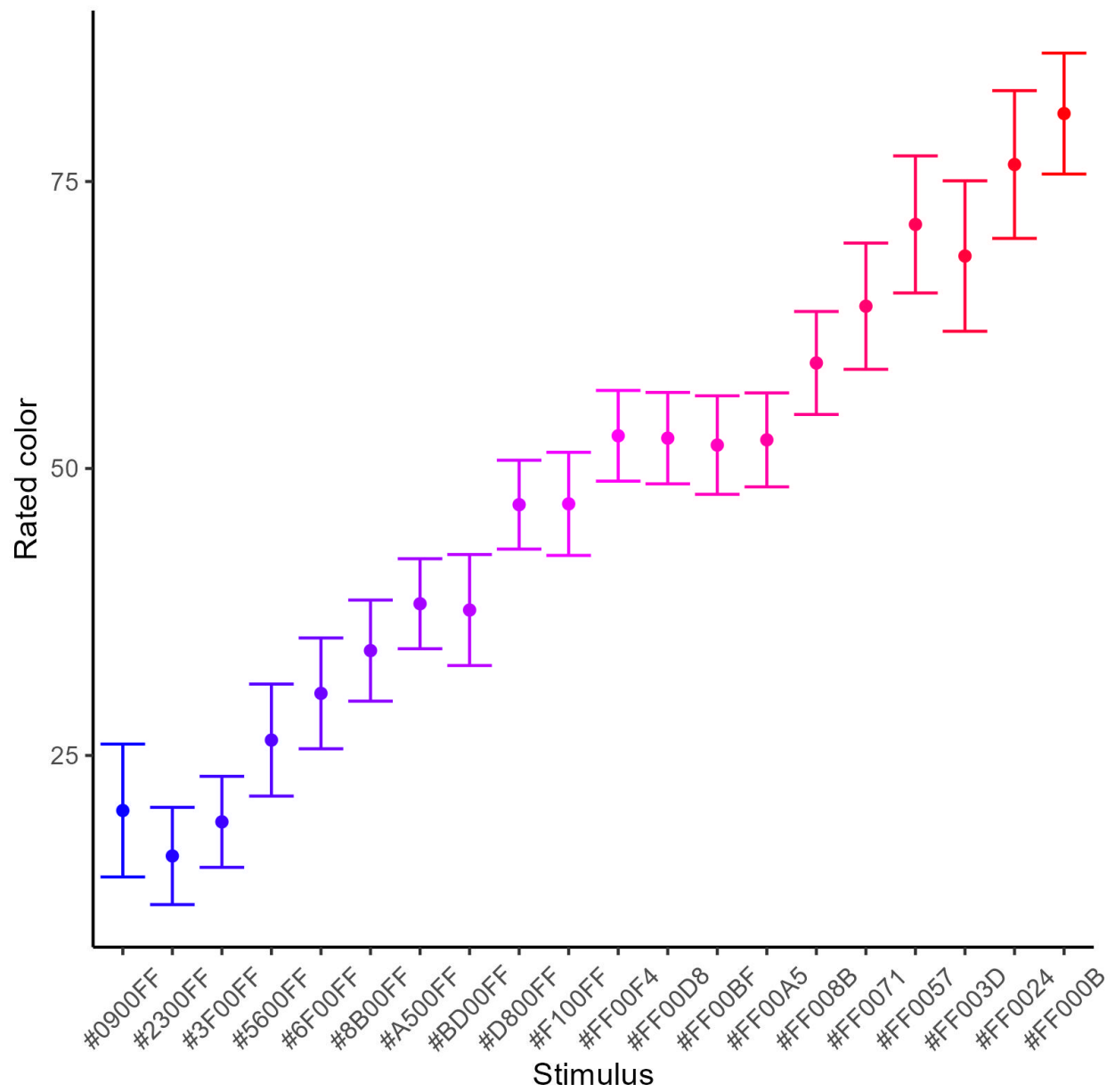
colors\_violinplot.jpg

Comment: Figure 5 in the manuscript.



colors\_means.jpg

Comment: Figure 4 in the manuscript.





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## Citing this document

Prince Oppong Boakye (2020). CODECHECK Certificate 2025-018. Zenodo. <https://doi.org/10.5281/zenodo.15755369>

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## About this document

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### `sessionInfo()`

```
## R version 4.5.0 (2025-04-11)
## Platform: aarch64-apple-darwin20
## Running under: macOS 16.0
##
## Matrix products: default
## BLAS:   /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRlapack.dylib; LAPACK v
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## time zone: Europe/Berlin
## tzcode source: internal
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets
## [6] methods    base
##
## other attached packages:
## [1] readr_2.1.5      tibble_3.3.0      xtable_1.8-4
## [4] yaml_2.3.10      rprojroot_2.0.4   knitr_1.50
## [7] codecheck_0.17.0 parsedate_1.3.2   R.cache_0.17.0
## [10] gh_1.5.0
##
## loaded via a namespace (and not attached):
```

## [1]	xfun_0.52	rdflib_0.2.9	tzdb_0.5.0
## [4]	vctrs_0.6.5	tools_4.5.0	generics_0.1.4
## [7]	curl_6.4.0	parallel_4.5.0	pkgconfig_2.0.3
## [10]	pdftools_3.5.0	R.oo_1.27.1	skimr_2.1.5
## [13]	redland_1.0.17-18	lifecycle_1.0.4	git2r_0.36.2
## [16]	compiler_4.5.0	atom4R_0.3-3	stringr_1.5.1
## [19]	repr_1.1.7	keyring_1.4.1	htmltools_0.5.8.1
## [22]	pillar_1.10.2	crayon_1.5.3	whisker_0.4.1
## [25]	tidyr_1.3.1	R.utils_2.13.0	cachem_1.1.0
## [28]	zen4R_0.10.3	tidyselect_1.2.1	zip_2.3.3
## [31]	digest_0.6.37	stringi_1.8.7	dplyr_1.1.4
## [34]	purrr_1.0.4	fastmap_1.2.0	cli_3.6.5
## [37]	magrittr_2.0.3	base64enc_0.1-3	utf8_1.2.6
## [40]	XML_3.99-0.18	crul_1.5.0	osfr_0.2.9
## [43]	withr_3.0.2	bit64_4.6.0-1	roxygen2_7.3.2
## [46]	rmarkdown_2.29	httr_1.4.7	bit_4.6.0
## [49]	qpdf_1.3.5	askpass_1.2.1	R.methodsS3_1.8.2
## [52]	hms_1.1.3	memoise_2.0.1	evaluate_1.0.4
## [55]	rlang_1.1.6	Rcpp_1.0.14	glue_1.8.0
## [58]	httpcode_0.3.0	xml2_1.3.8	fauxpas_0.5.2
## [61]	rorcid_0.7.0	rstudioapi_0.17.1	vroom_1.6.5
## [64]	jsonlite_2.0.0	plyr_1.8.9	R6_2.6.1
## [67]	fs_1.6.6		