TMABlockSupraStyle_MSAP_summer2017

Intro

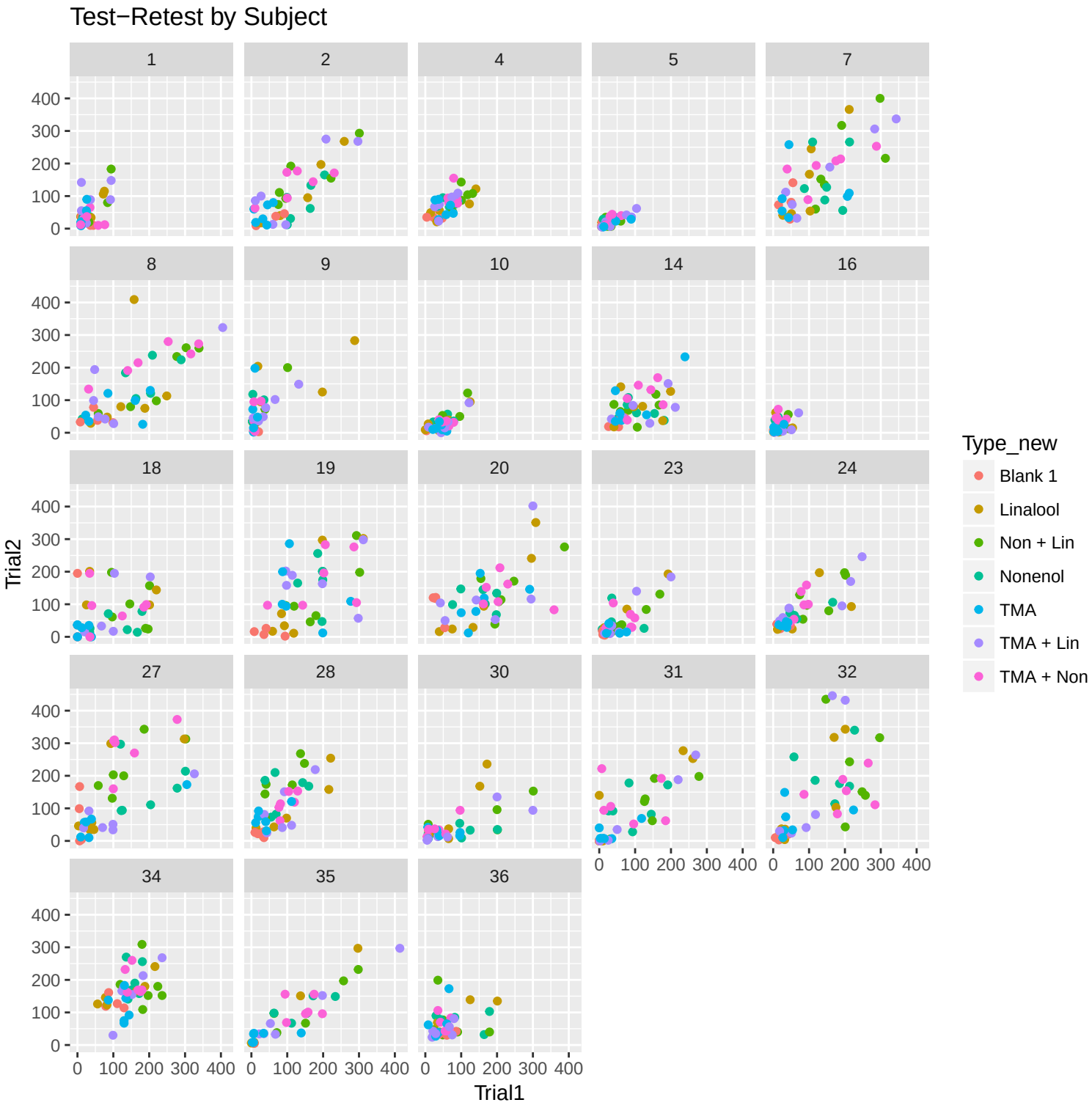
We ran several experiments this summer becuase TMA was giving us problems.

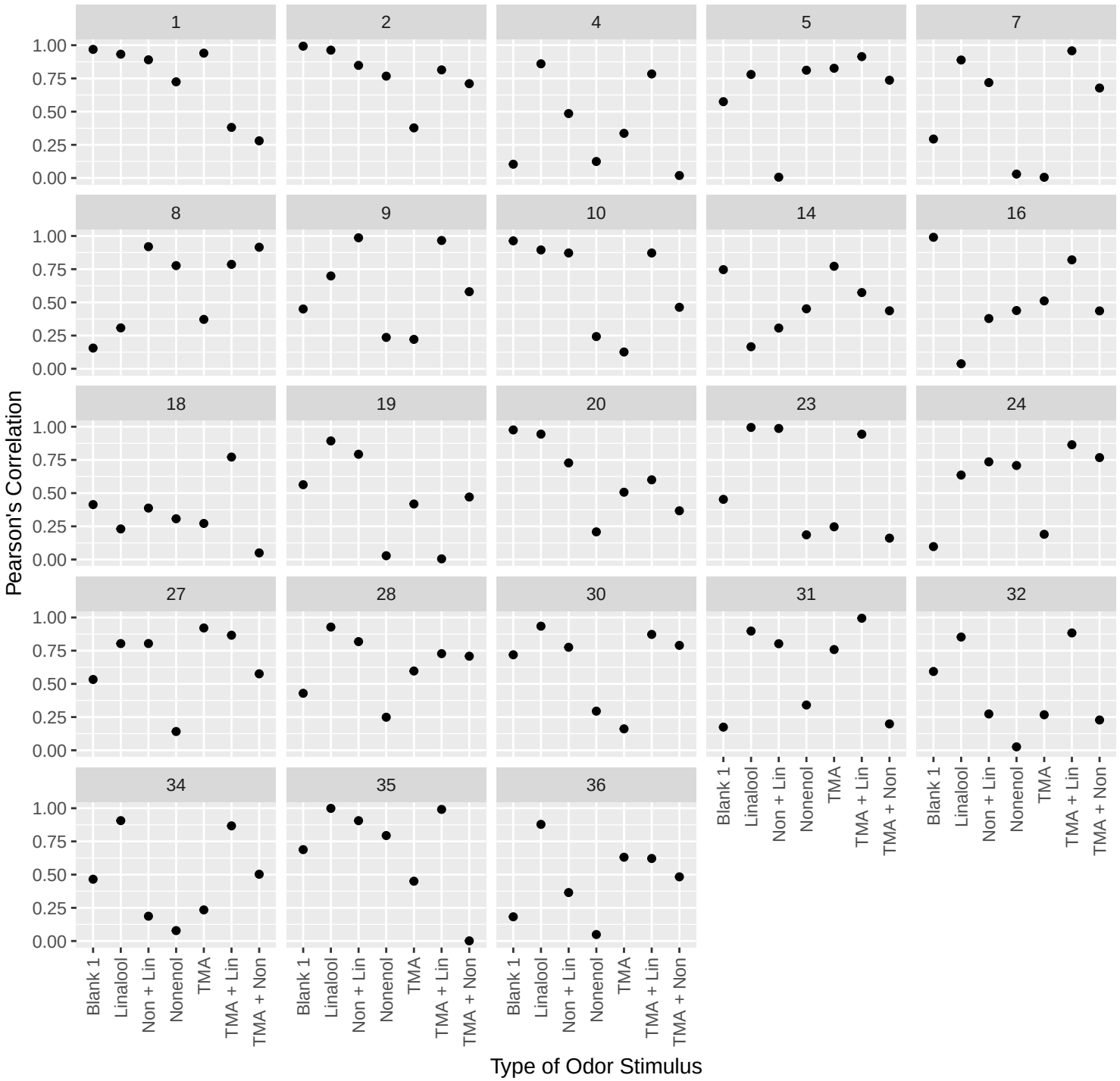
Experiment 1:

Original planned experiment. TMA, Linalool, and trans-2-nonen-1-ol were run at 6 different concentrations. Mixtures of all of them were also run, paired-wise. For example, the lowest concentration of TMA was mixed with the lowest concentration of linalool for all of the concentrations (See Experiment Setup for more info). All of the mixtures were combined: TMA + linalool, TMA + trans-2-nonen-1-ol, and linalool + trans-2-nonen-1-ol. The goal was to collect dose-response curves for all of the individual components and their mixtures and then model them. We were expecting the modeling of linalool plus trans-2-nonen-1-ol and TMA + linalool to be more additive than TMA + trans-2-nonen-1-ol.

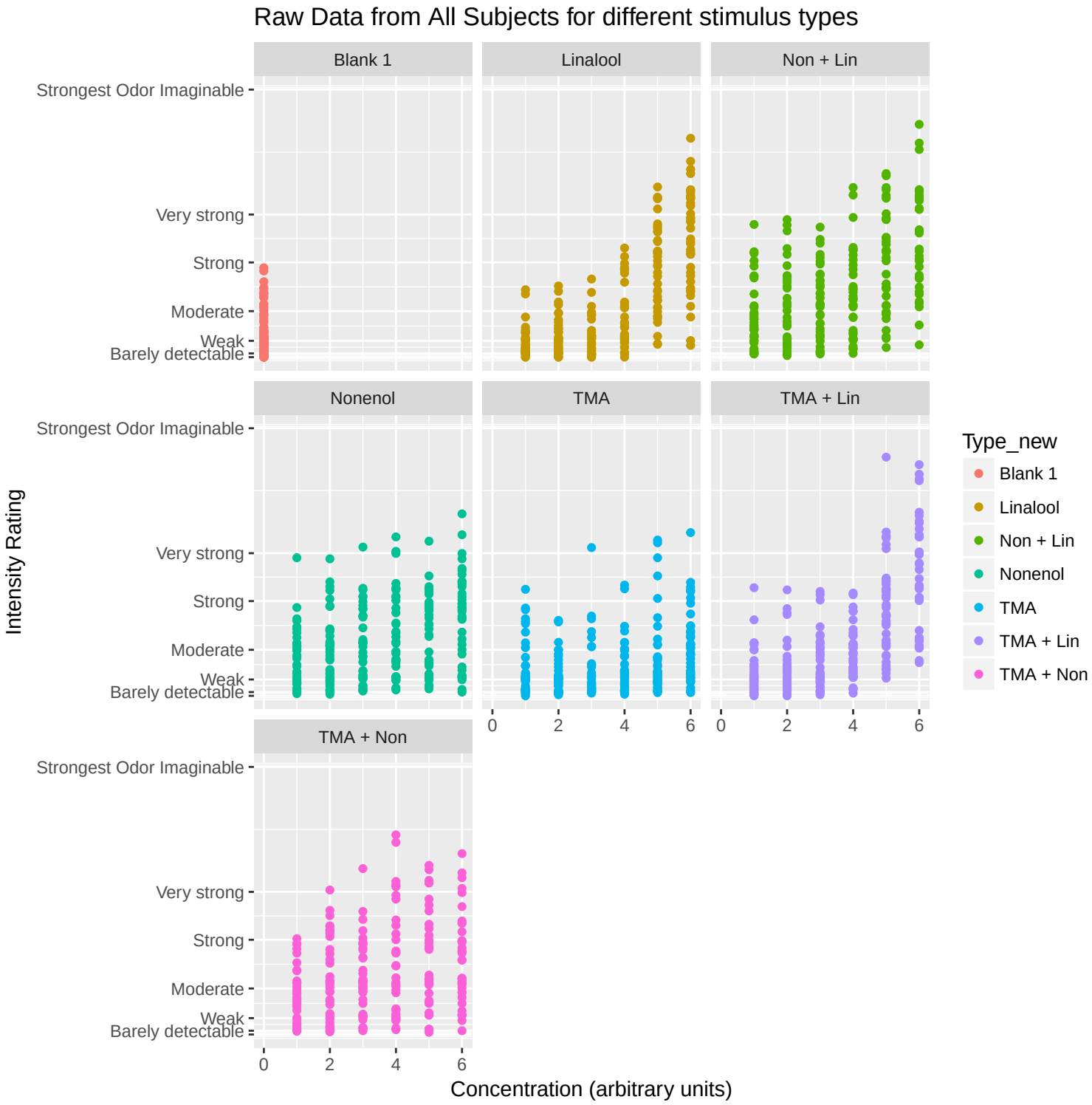
Here are some of the initial results:

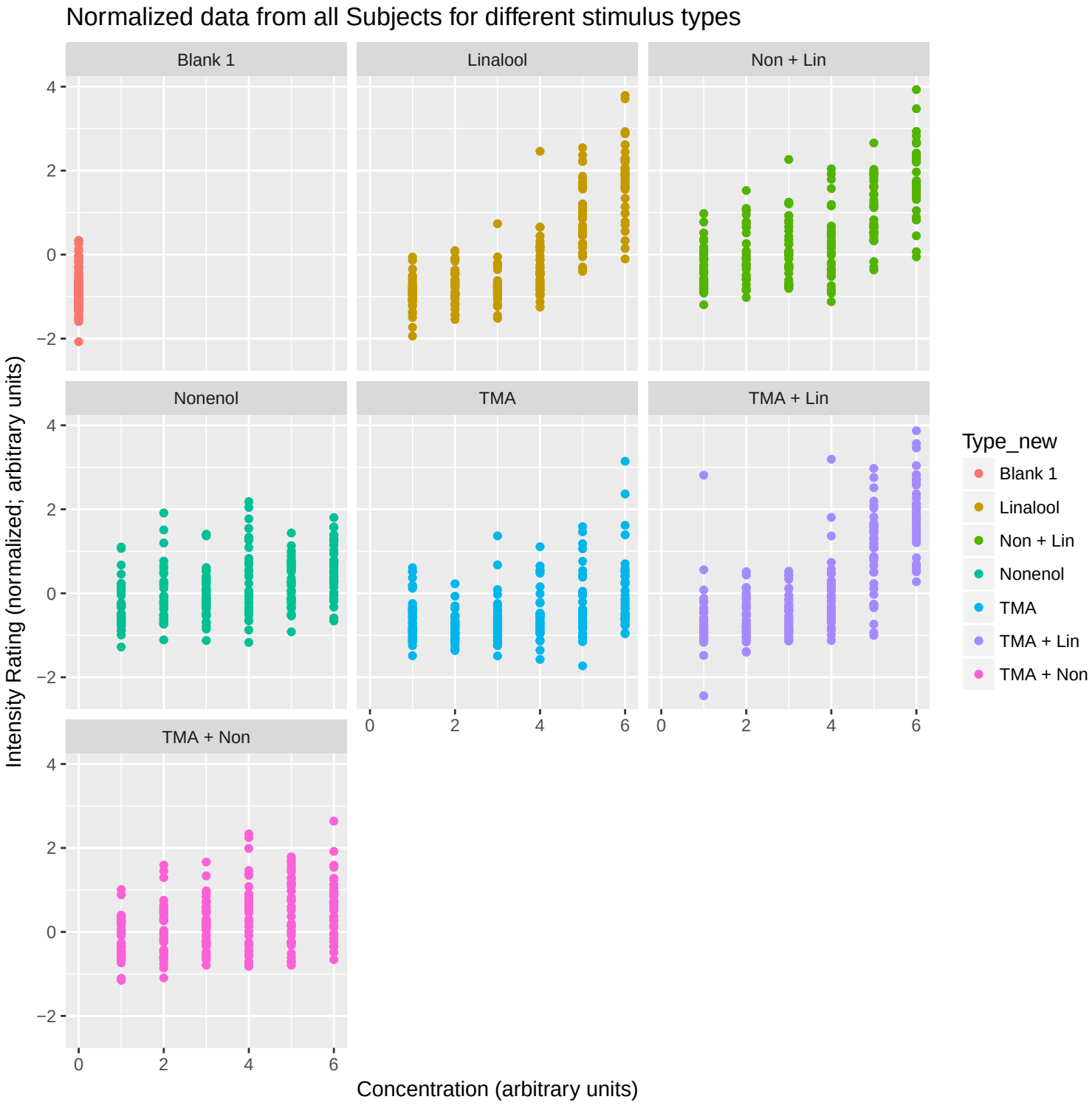
First we conducted a test-retest analysis to determine how variable the subject data was. We eliminated Subjects with 5 test-retest correlation values lower than 0.75. Each test-retest value was for how a participant performed on a Type of odor stimulus


Test−Retest by Subject
1
2
4
5
7
8
9
10
14
16
18
19
20
23
24
27
28
30
31
32
34
35
36
Trial2
Trial1
0
100
200
300
400
Type_new
Blank 1
Linalool
Non + Lin
Nonenol
TMA
TMA + Lin
TMA + Non

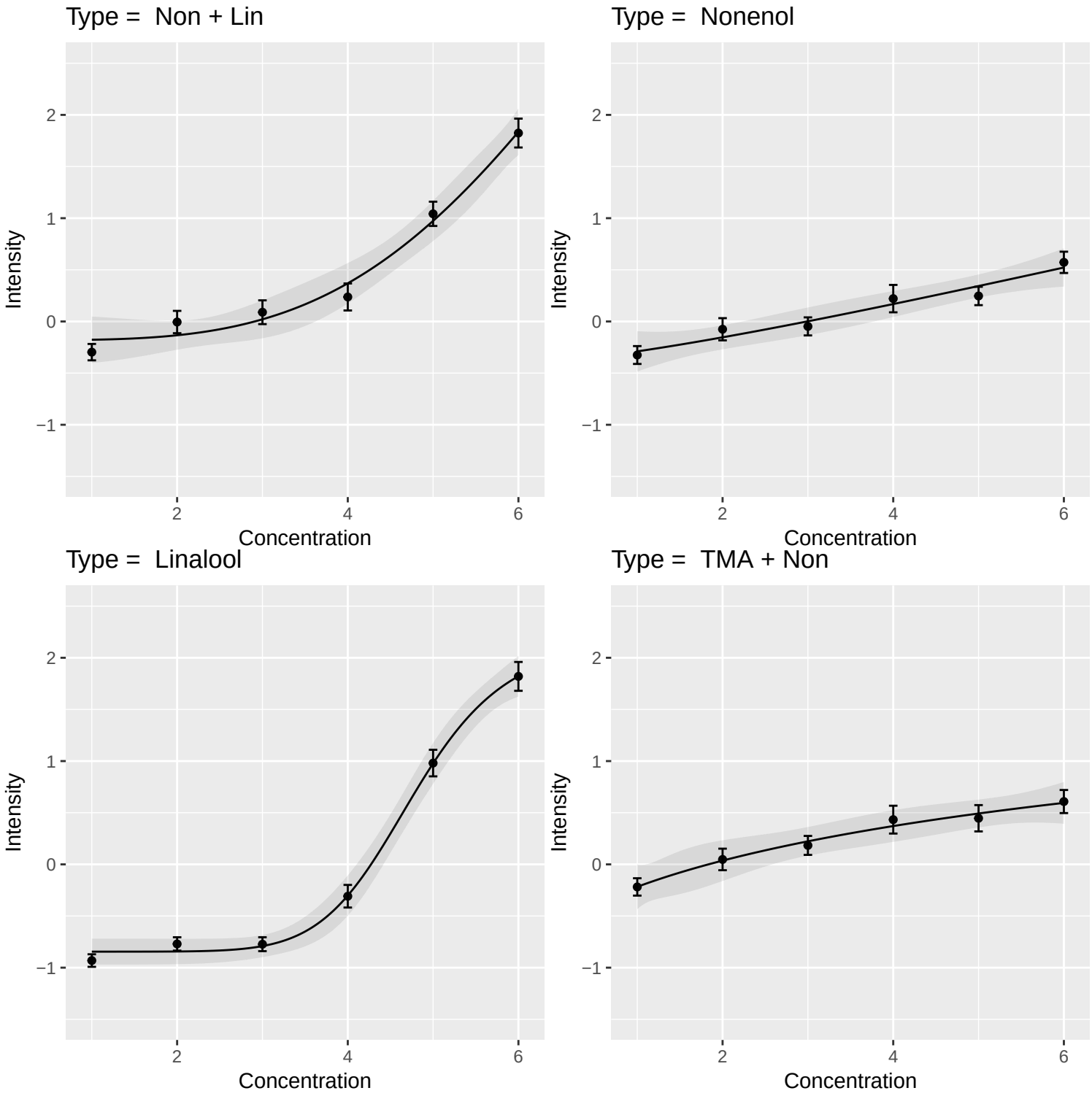


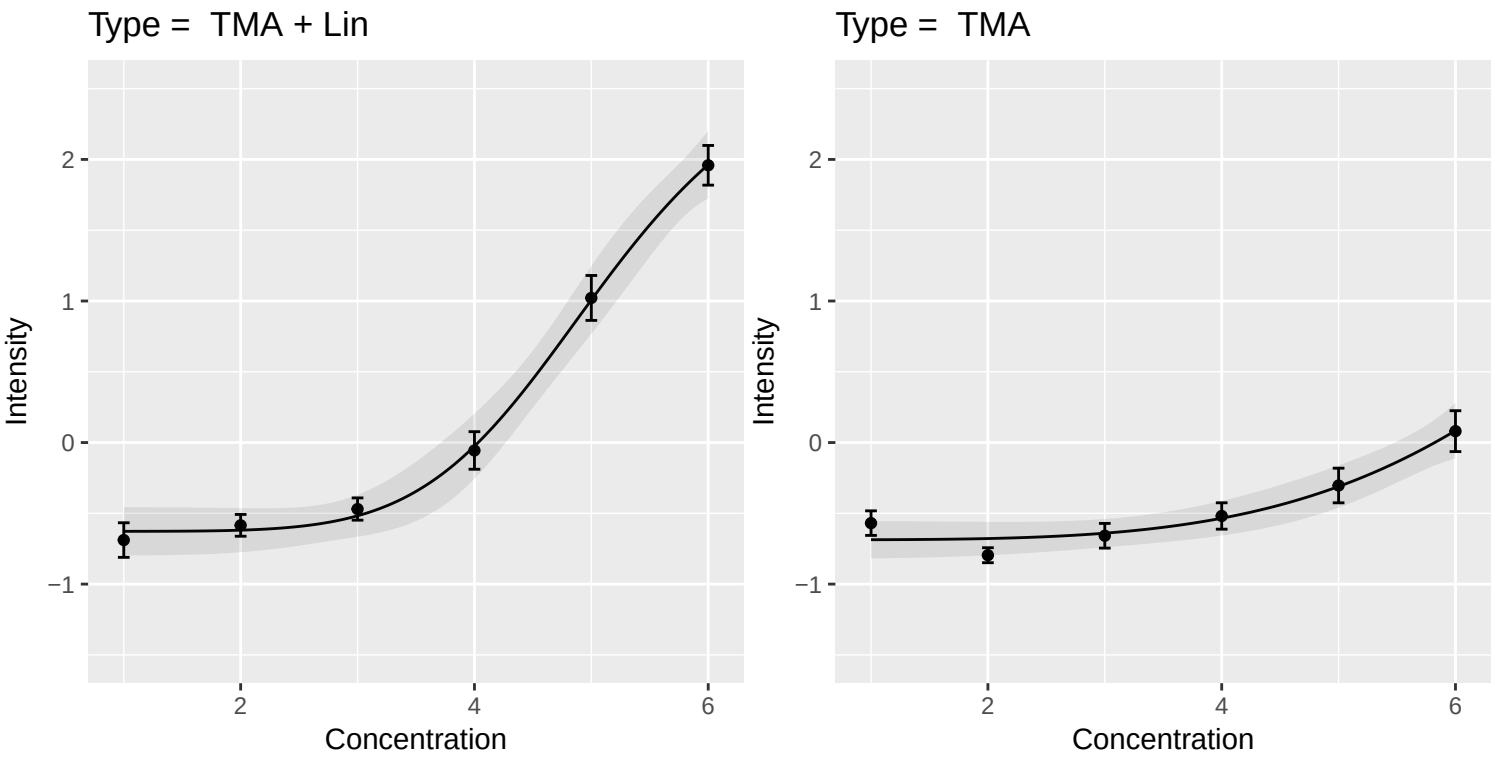
We excluded subjects: 14, 16, 18, and 36 using the above criteria.


Raw Data from All Subjects for different stimulus types
Blank 1
Linalool
Non + Lin
Nonenol
TMA
TMA + Lin
TMA + Non
Strongest Odor Imaginable
Very strong
Strong
Moderate
Weak
Barely detectable
Intensity Rating
0
2
4
6
Concentration (arbitrary units)
Type_new
Blank 1
Linalool
Non + Lin
Nonenol
TMA
TMA + Lin
TMA + Non



I can fit dose-response curves to these, but most of them look really questionable:

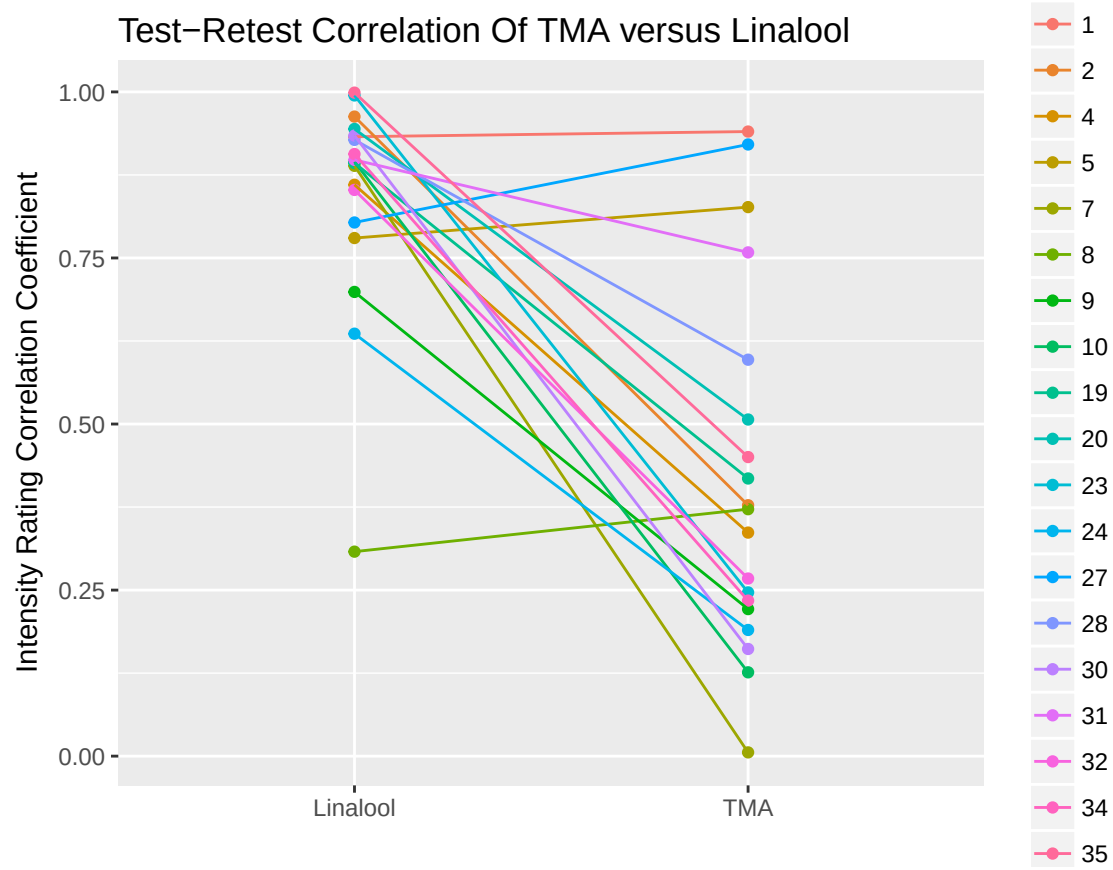

Type = Non + Lin
Type = Nonenol
Type = Linalool
Type = TMA + Non
Intensity
Concentration
2
1
0
−1
2
4
6

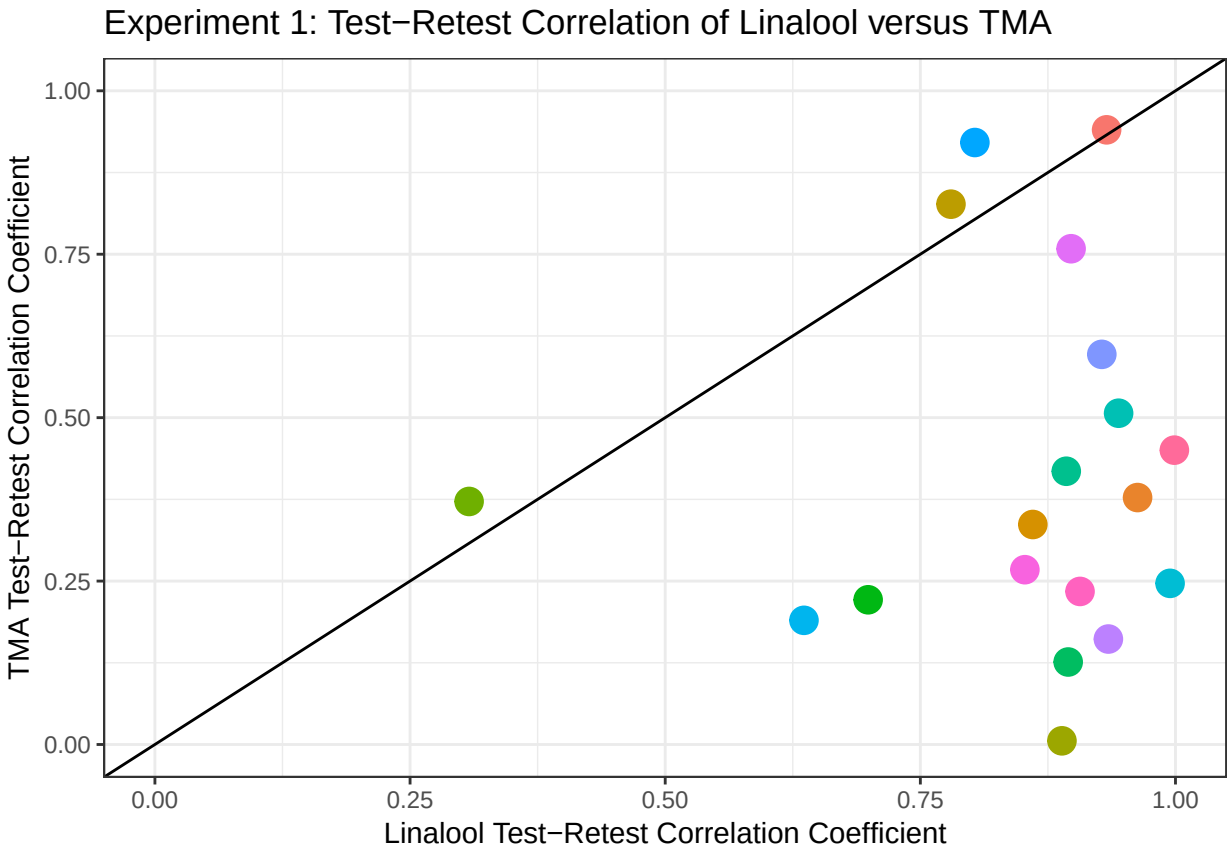


These don't look as bad as the raw data.

Overall, the test-retest of TMA (which is the compound we are most interested in) is really poor, meaning that people are still not very good at doing this task. We don't know if this is the task, olfactometer, or if some people just don't smell TMA that well (or aren't that good at the task overall).

The task shouldn't be hard because suprathreshold was pretty successful. Here we can see that people do pretty well at rating LInalool intensity, especially compared to TMA.

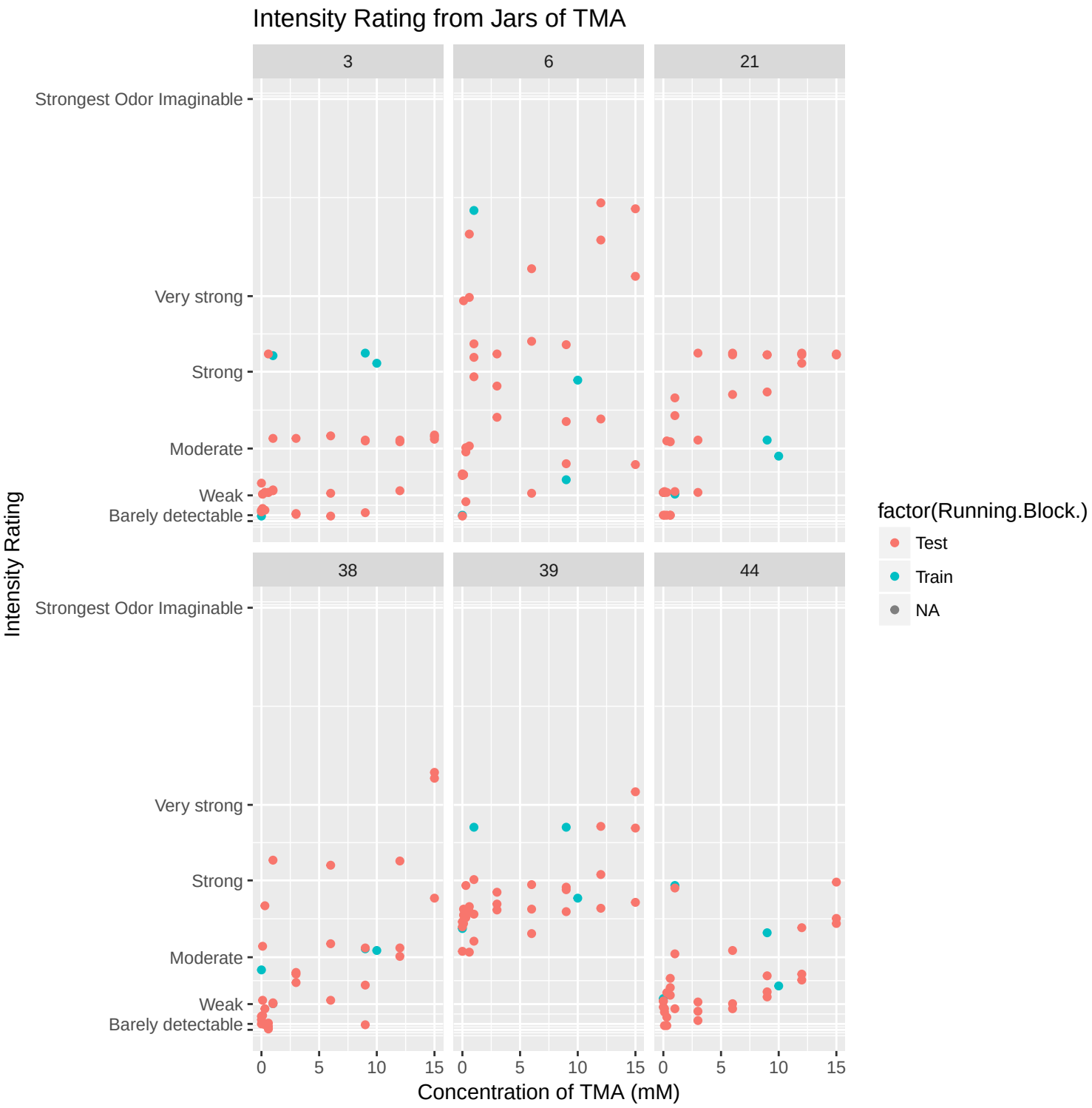


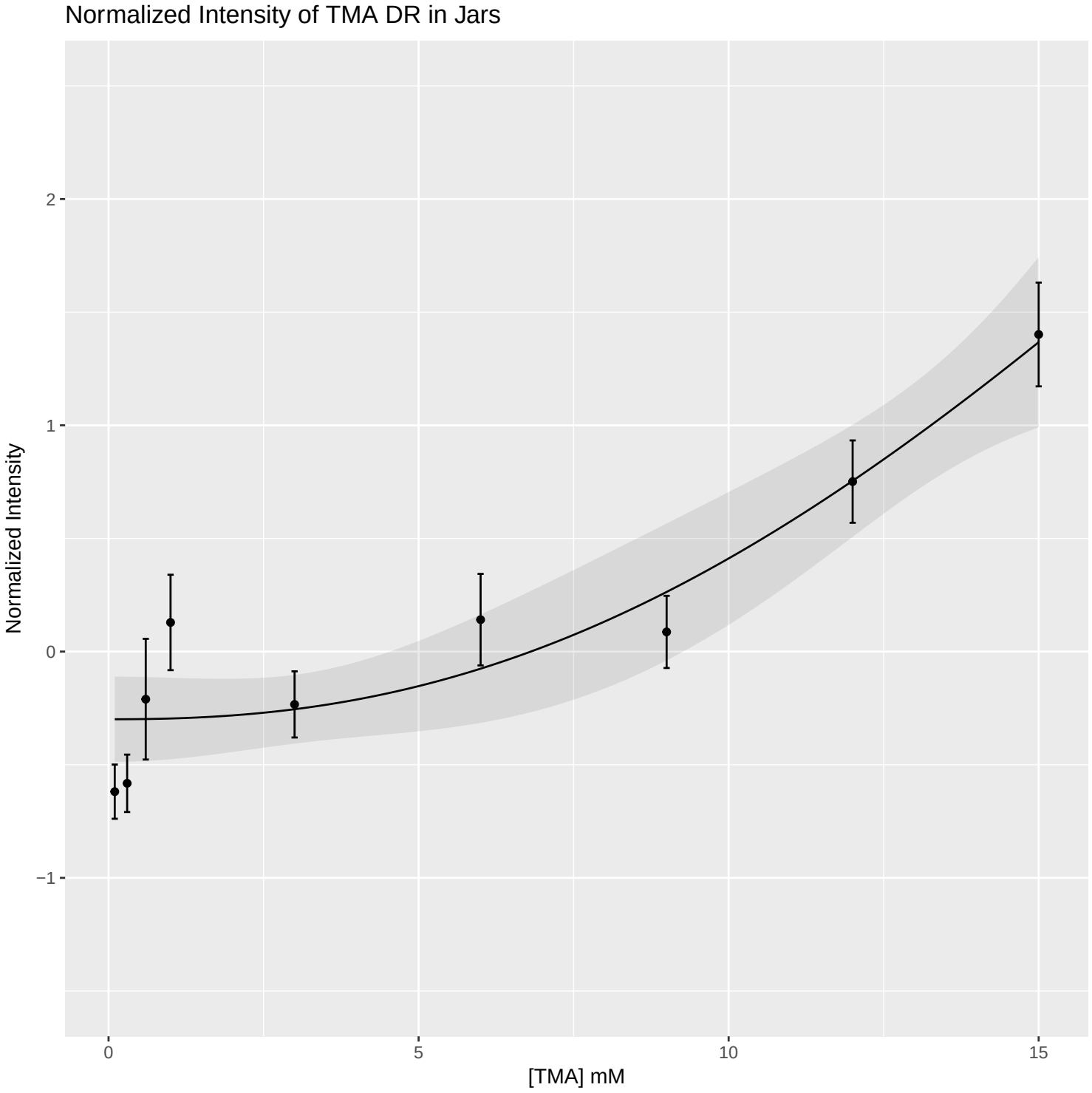


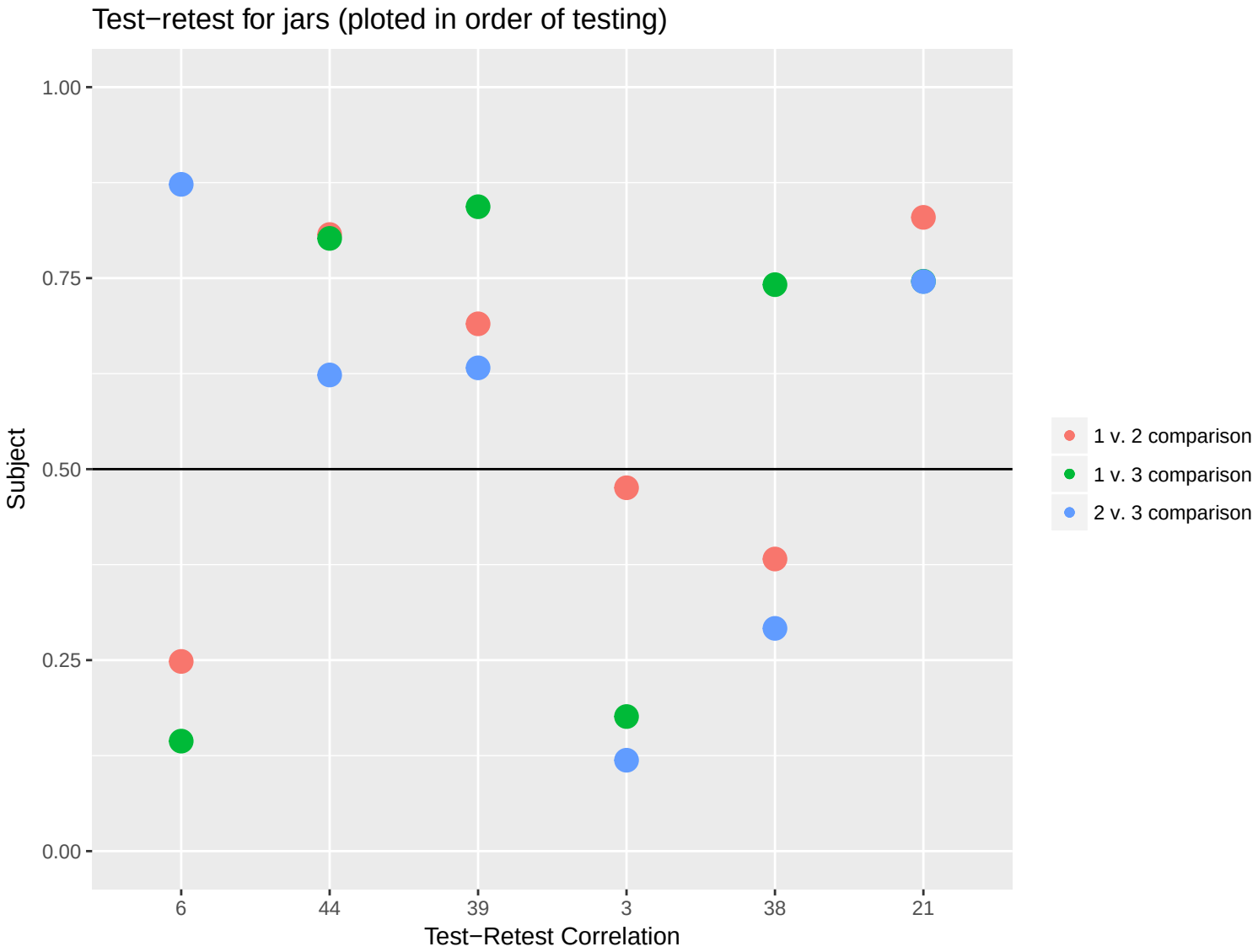
Dots below the unity line are subjects who were more consistent at rating linalool than TMA.

Experiment 2:

The question is: can participant even smell TMA?
We presented all of the same concentrations of TMA out of jars to see if the problem is our dilutions of TMA or the olfactometer itself.

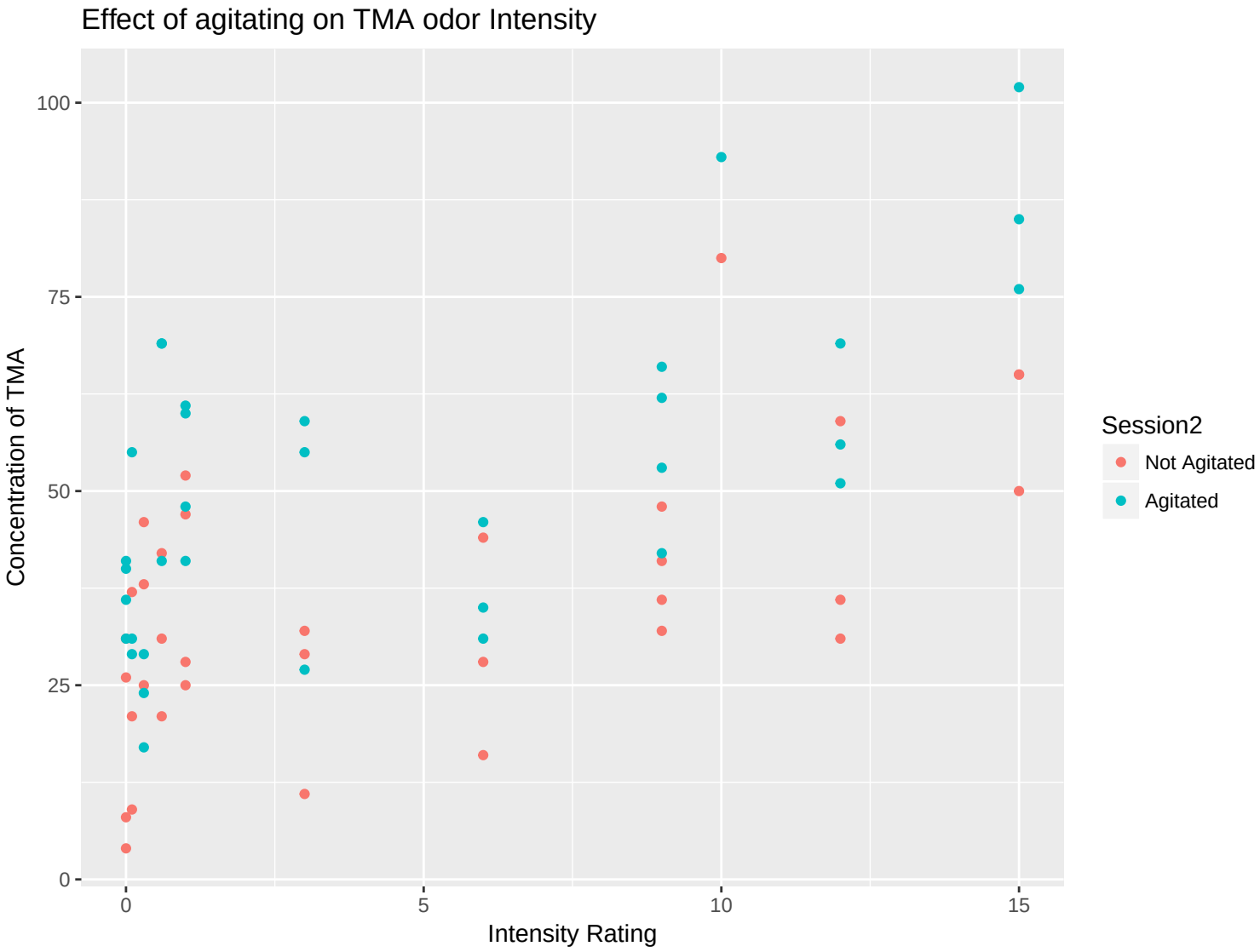

Intensity Rating from Jars of TMA
3
6
21
38
39
44
Strongest Odor Imaginable
Very strong
Strong
Moderate
Weak
Barely detectable
Intensity Rating
0
5
10
15
Concentration of TMA (mM)
factor(Running.Block.)
Test
Train
NA

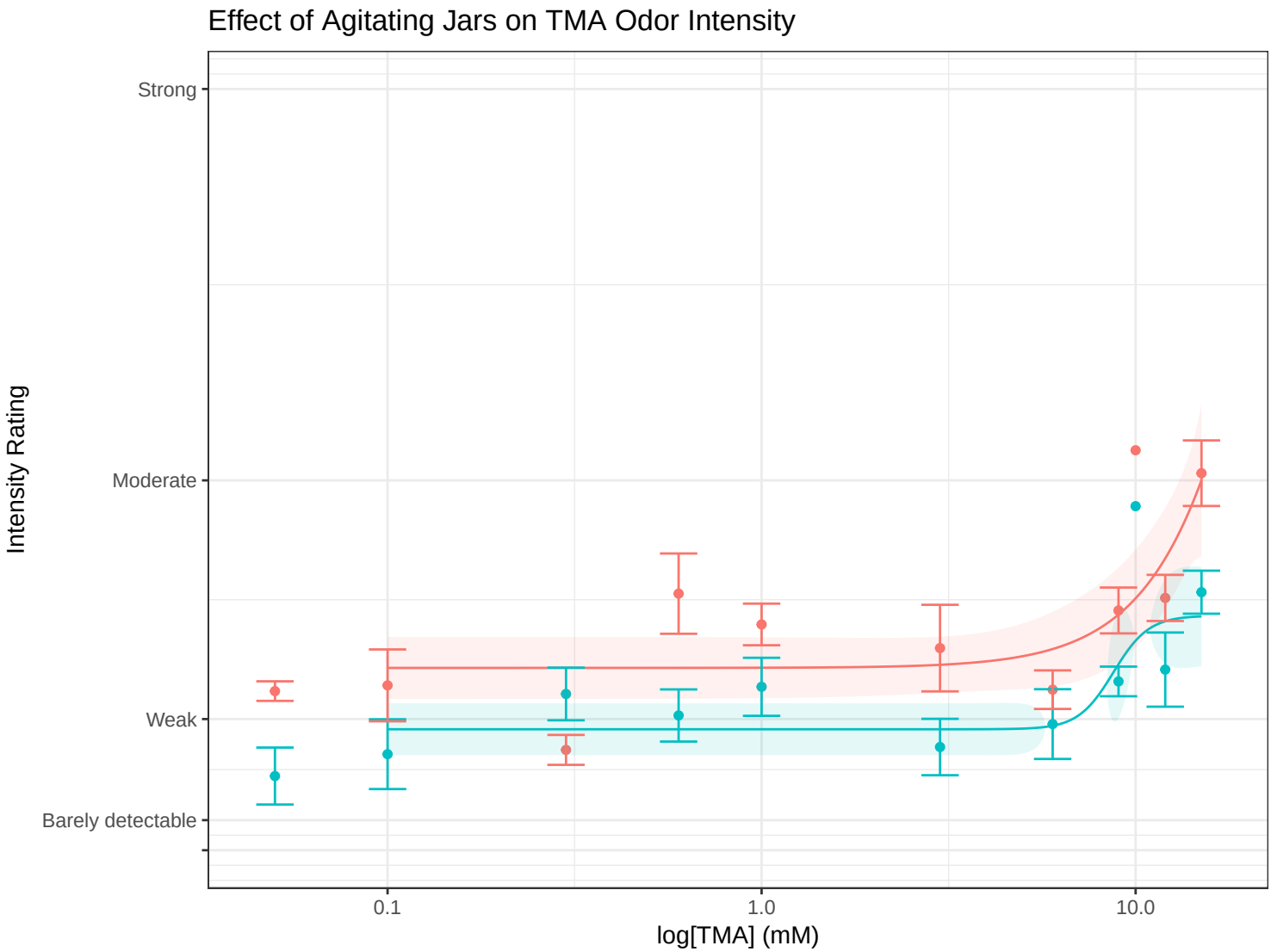

Normalized Intensity of TMA DR in Jars
Normalized Intensity
2
1
0
−1
0
5
10
15
[TMA] mM



Most participants had acceptable test-retest scores. there may be some affect of time. There may also be an experimenter effect - the worst two were performed with Dardalie as the experimenter. Overall the rating still were not very high.

Dardalie Brooks discovered while testing herself that agitating the tubes caused a higher rating for TMA.

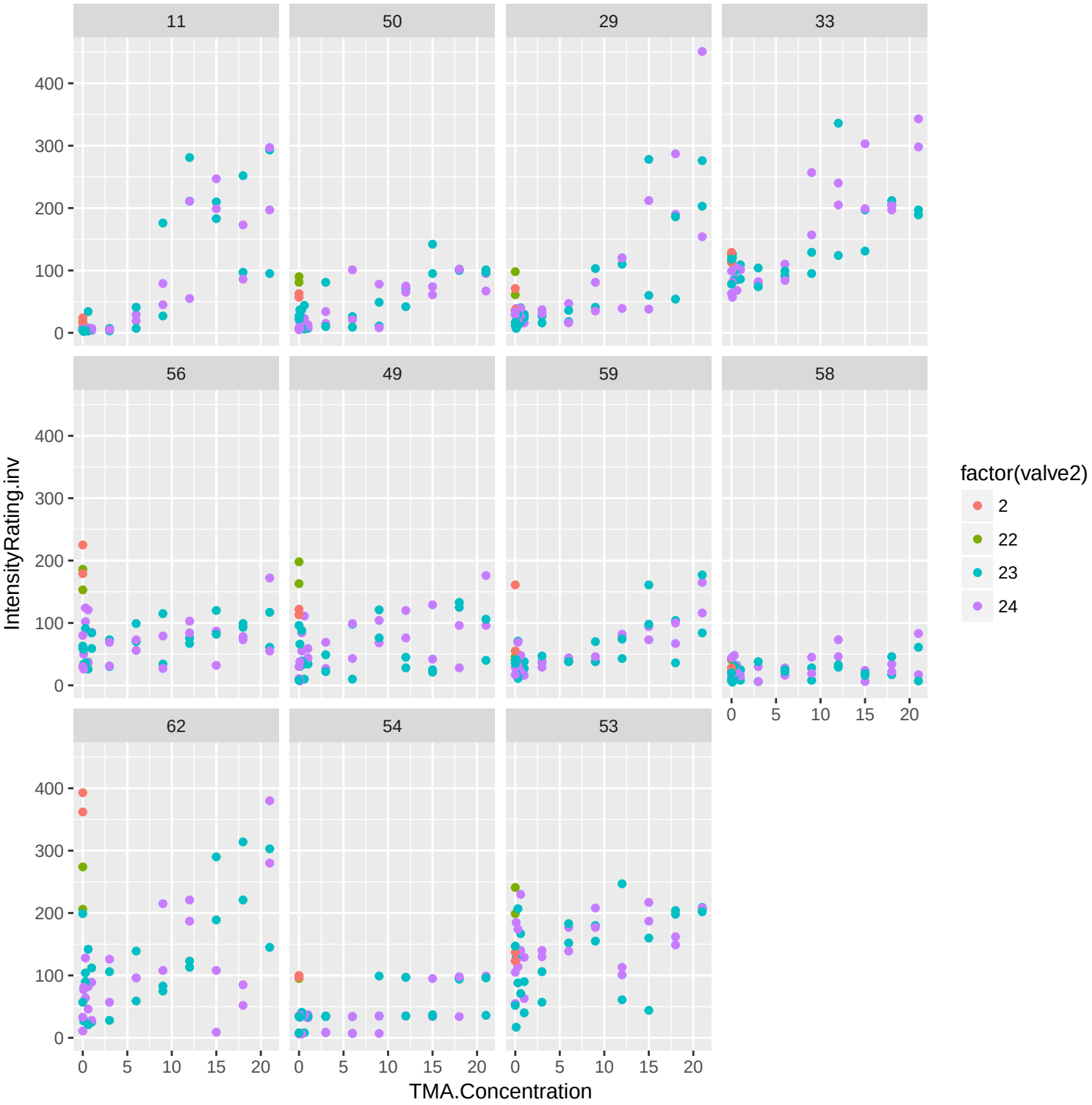

Effect of agitating on TMA odor Intensity
Concentration of TMA
100
75
50
25
0
0
5
10
15
Intensity Rating
Session2
Not Agitated
Agitated



These two are not significantly different, but it is also one person. We decided that increasing the agitation of TMA is a good strategy for trying to increase the perceived intensity.

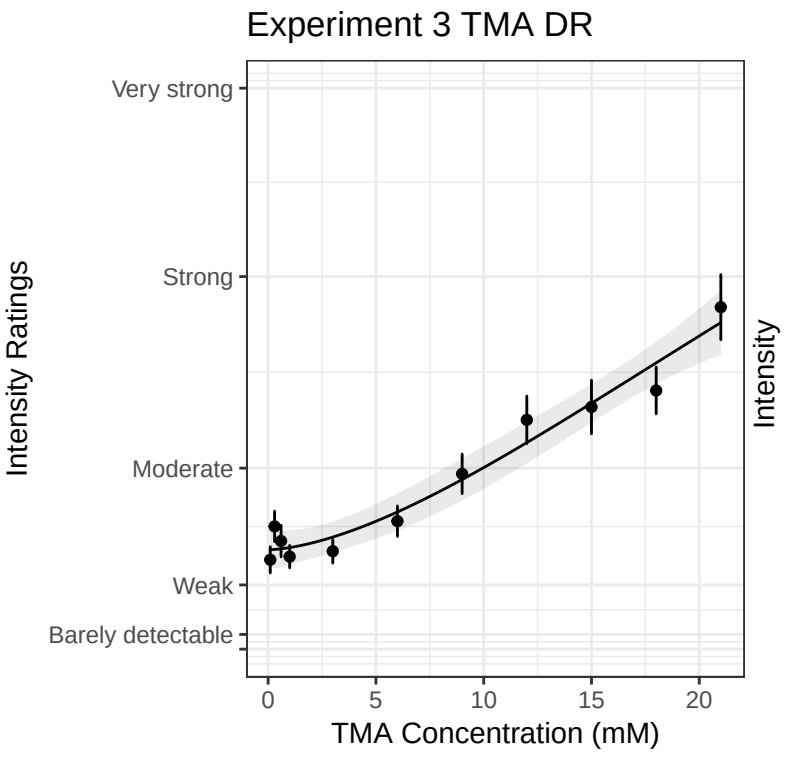
Experiment 3: TMA DR with olfactometer with bubbling through TMA.

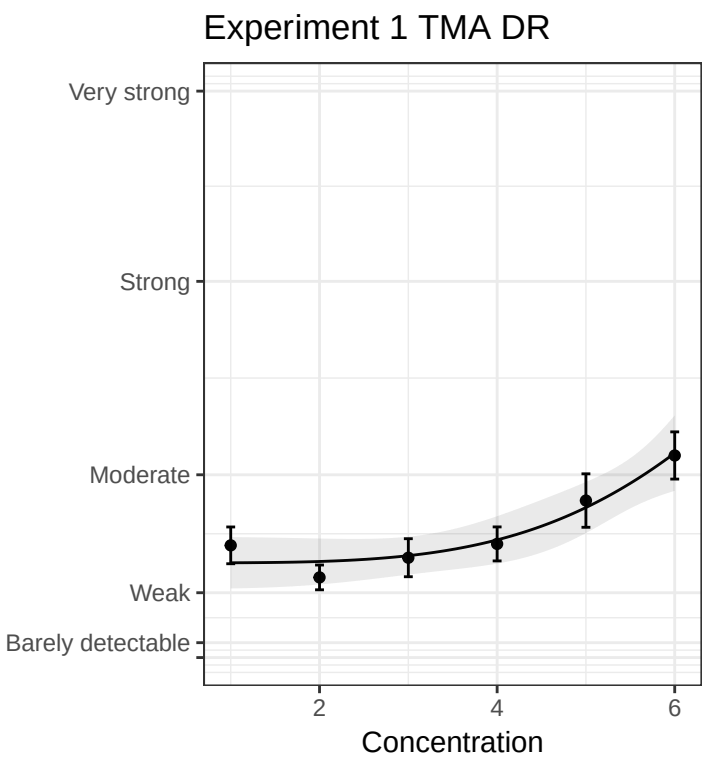
I created a jar top that allows for bubbling air through TMA using the olfactometer. Jars are difficult becuase TMA does not work on beads, which is the safe way to keep participants from spilling on themselves. Also the olfactometer is less subject to difficulties with participants not being able to complete an experiment. Therefore we ran a number of participant on the TMA with agitation to see if this causes TMA to be rated as higher intensity and also whether it increases the test-retest for ratings of TMA. This experiment had 4 stimulus presentations of a number several different concentrations of TMA that were equal to the concentrations of TMA presented in the first experiment.



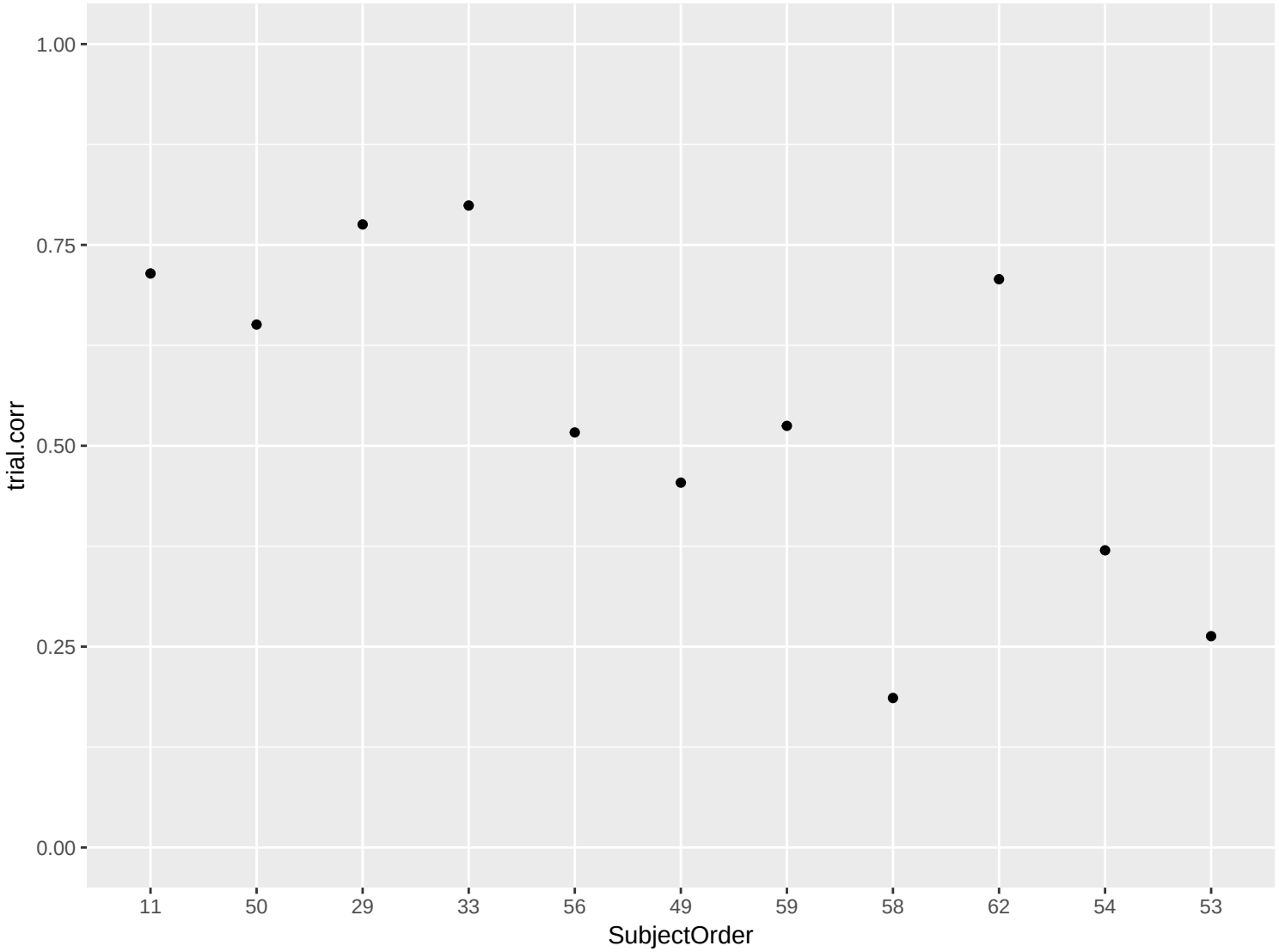
Subjects are in order here, and odors were refreshed once in the middle of the experiment, but not from scratch - only from the solution that was already pHed.

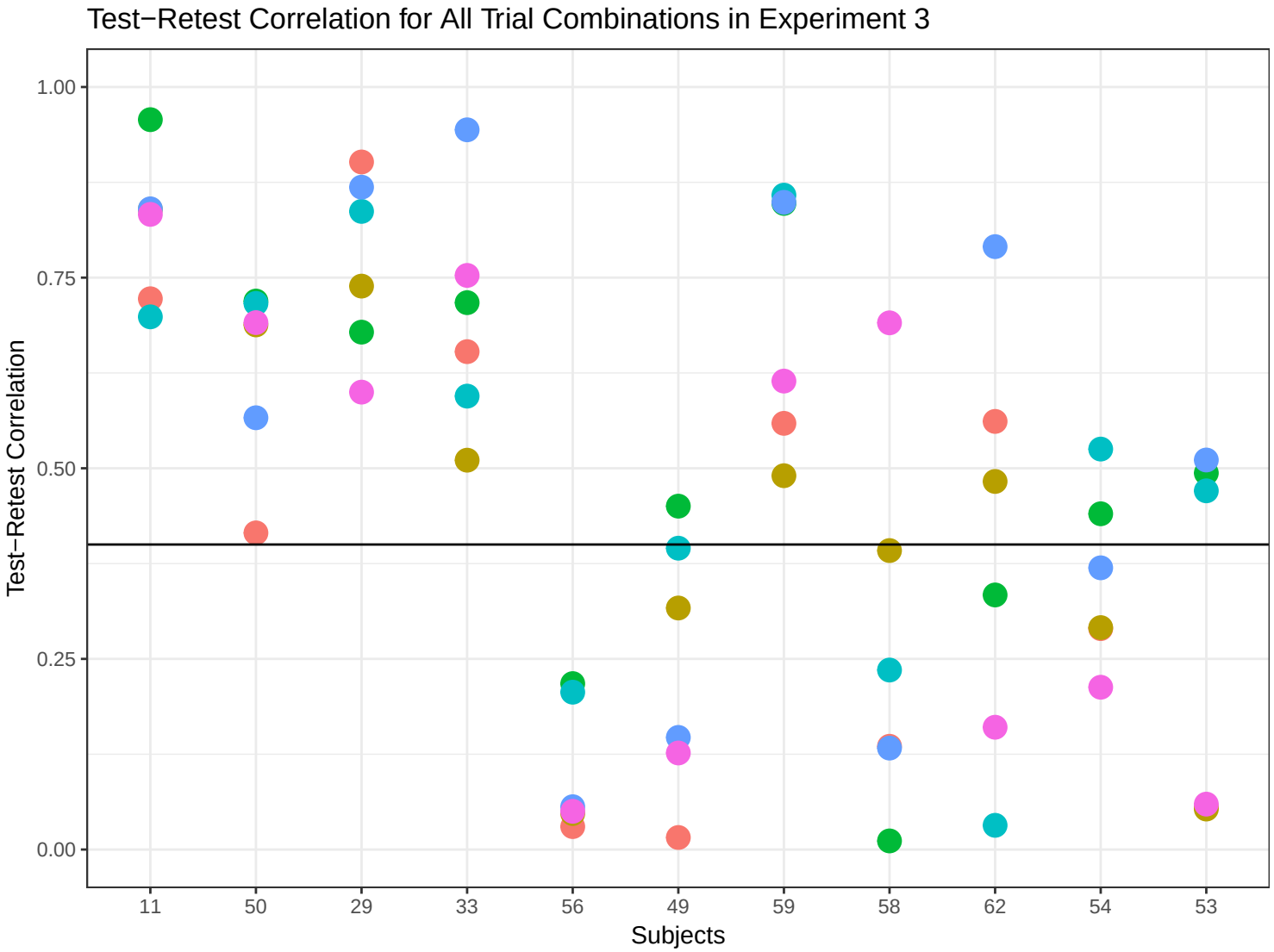
When we compare overall ratings of TMA from Experiment 1 to Experiment3, we see that experiment 3 has higher ratings.


Experiment 3 TMA DR
Very strong
Strong
Moderate
Weak
Barely detectable
Intensity Ratings
0
5
10
15
20
TMA Concentration (mM)


Experiment 1 TMA DR
Very strong
Strong
Moderate
Weak
Barely detectable
Intensity
2
4
6
Concentration

Is the test-retest correlation better for TMA in the 3rd experiment than in the 1st experiment?





The first graph shows the difference between the first set of trials and the second set (with the dataframe divided in 2). Each stimulus was presented 4 times total, but with one of two different DEP (antagonist solvent) jars. Therefore, graph 1 is with matched DEP jars. Graph 2 compares the different trials in order of presentation. DEP jars may be the same in 1 and 3 or 1 and 4, but it is not consistent between the people so we cannot draw any conclusions about whether there are differences between the two DEP jars.

There seems to be a pretty large effect of time on the test-retest scores, even after the odors were refreshed, around subject 49, the scores did not improve as much. This could just be the participants who came in, or it could be that odors need to be made from scratch every time rather than refreshing from a stock solution (maybe there is something about TMA that breaks down over time). The first few participants seemed to be able to do the task fairly well.

We are still interested in figuring out what is going on with TMA and how we can best get subjects to smell it. There is still something strange going on with our stimulus presentation here that needs to be worked out.