Exersices — A-not A and same-different tests in sensR

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Topics:

Analysis of data from the protocols

- A-not A
- Same-different
- A-not A with sureness

Exercise 1

You have conducted an A-not A experiment with 100 subjects. The answers are summarized in table 1.

Table 1: A-not A data for exercise 1.

Sample	Response		Total
	"A"	"not A"	
A	57	43	100
Not A	42	58	100

1. Have you shown that the A and not-A products are different?
2. Have you shown that the A and not-A products are similar (using $d' = 0.75$ as the boundary of similarity) at the 5% level?
3. Have you shown that the A and not-A products are similar at the 1% level (again using $d' = 0.75$ as the boundary of similarity)?

Exercise 2

It has come to you knowledge that the technicians undertaking the test formulated the question in the following mannor:

"You are now given two samples and you are asked to determine if these samples are the same or not. Answer A if you believe the samples are the same and *not* A if you believe they are not the same"

As you may realize, these are the instructions for the same-different test rather than the A-not A test, and we will have to analyze the data assuming the same-different cognitive decision rule rather than that of the A-not A.

1. Estimate d' assuming the same-different protocol instead of the the A-not A protocol. Does the estimate of d' change? and if so, is it a large difference or a small unimportant one?
2. What is the p-value of the test of "no product difference"? Compare this to the p-value obtained using the A-not A test. Has the p-value changed? Is it important?
3. Make a similarity analysis similar to the one for the A-not A analysis. Are there any differences?
4. At what boundary-of-similarity (d'_0) are you able to declare the products 'similar' at the 5% level?

Exercise 3

You have conducted a large-scale consumer study using the A-not A with sureness protocol and obtained the data in the following table.

```
      sureness
prod    1  2  3  4  5  6
  ref  10 40 70 50 20 10
  test 20 30 20 30 60 40
```

To get the data into R you may use the following commands:

```
> wts <- c(10, 40, 70, 50, 20, 10, 20, 30, 20, 30, 60, 40)
> dat <- data.frame(sureness = factor(rep(1:6, 2), ordered=TRUE),
+                   prod = factor(rep(c("ref", "test"), each = 6)),
+                   freq = wts)
> dat

   sureness prod freq
1         1  ref   10
2         2  ref   40
3         3  ref   70
4         4  ref   50
5         5  ref   20
6         6  ref   10
7         1 test   20
8         2 test   30
9         3 test   20
```

```
10        4 test   30
11        5 test   60
12        6 test   40
```

```
> ## Tabulate the data:
> xtabs(freq ~ prod + sureness, dat)
```

```
      sureness
prod    1  2  3  4  5  6
  ref  10 40 70 50 20 10
  test 20 30 20 30 60 40
```

1. First assume that there i no difference in scale: compute d' using the `clm` function. Also compute the *sensitivity* and the overlap of the perceptual distributions.
2. Test if the products are different assuming the equal-variances model.
3. Now fit the model that allows for differences in scale/unequal variances for the two products.
4. Test if the variances are different or whether they can be assumed to be equal.
5. Test if products are different in the unequal-variances model and compare results to the question 2.
6. Compute d', the scale-ratio (i.e. the standard deviation of the 'test' distribution assuming the standard deviation of the 'reference' distribution is 1), the sensitivity and the overlap of the perceptual distributions.
7. Compare and discuss differences and similarities in d', sensitivity and distribution overlap.