

Application of PLS regression on binary qualitative data

Issues of taste performance, ageing, experience and exposure

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Background

- Taste impairment with age
- Learning effect with sensory experience and exposure



Are they too old?



Research question

- Can ageing, experience and exposure explain the variation in taste performance of the judges of the sensory panel?

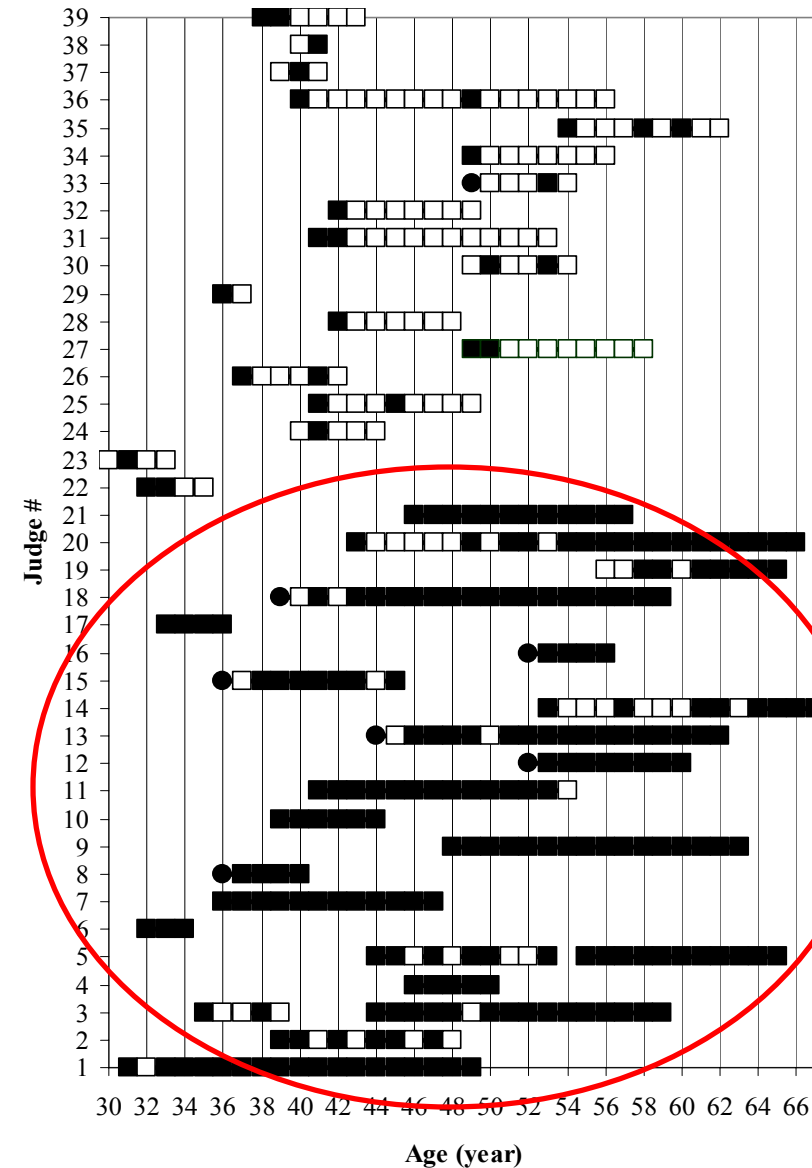


Subjects

- The sensory panel at Matforsk
- 10-12 members
- Specifically selected, employed and educated as sensory panellists (ISO standards)
- Perform sensory work on all kinds of food products three days a week



Participation in the basic taste identification test during the period 1976-2003



Stimuli

- 13 different samples
- Sucrose, sodium chloride, citric acid and caffeine dissolved in water
- Three different concentrations
- To provide the basic taste stimuli of sweet, salt, sour and bitter plus water

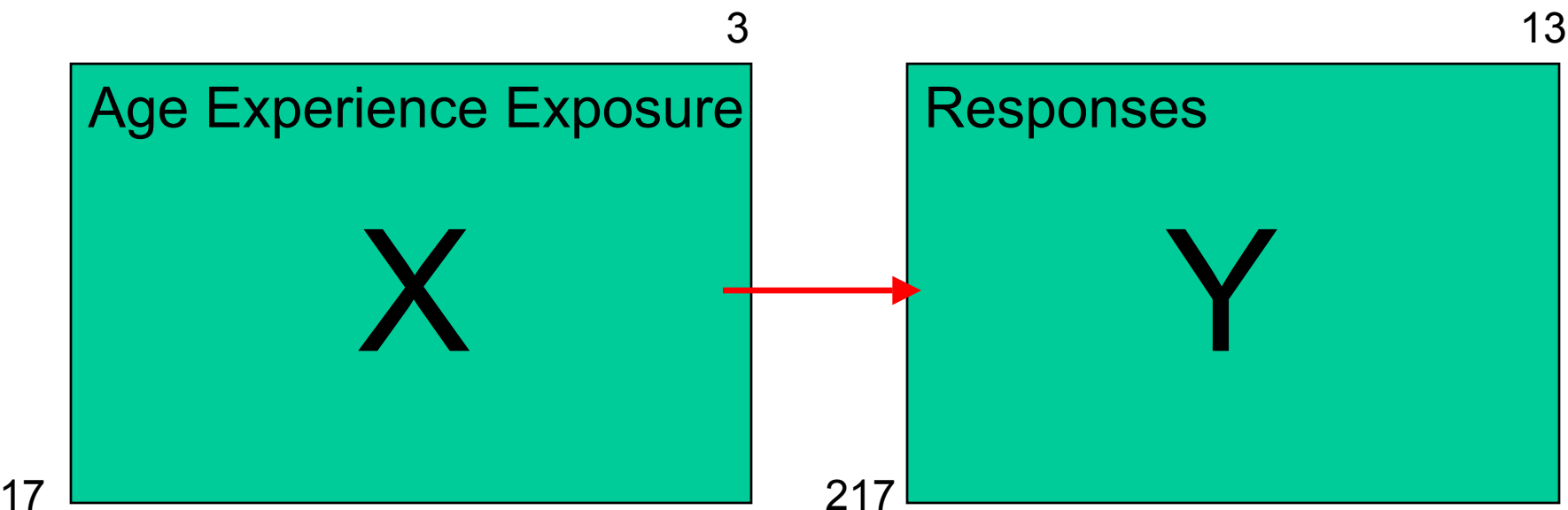
| Sample | Concentration | Taste stimulus |
|--------|-------------------------|-----------------|
| 1 | 0,2 % | Sucrose |
| 2 | 0,4 % | Sucrose |
| 3 | 0,6 % | Sucrose |
| 4 | 0,01 % | Sodium Chloride |
| 5 | 0,03 % | Sodium Chloride |
| 6 | 0,06 % | Sodium Chloride |
| 7 | 0,005 % | Citric acid |
| 8 | 0,01 % | Citric acid |
| 9 | 0,015 % | Citric acid |
| 10 | 0,06'10 ⁻³ % | Caffeine |
| 11 | 0,14'10 ⁻³ % | Caffeine |
| 12 | 0,27'10 ⁻³ % | Caffeine |
| 13 | 100 % | Water |

Identification test

- 13 Samples (25 ml) were presented with a three-digit random number
- Random order within each test session and identical for all subjects.
- There were two replicates divided in two sessions one before and one 1 hour after lunch.
- The sensory panellists responded with one of the five choices: sweet, salt, sour, bitter or water.

Data analysis

Partial Least Squares Regression (PLSR): To what extent the background variables ageing, experience and exposure explain the variation in the responses from the judges.



PLSR, X variables

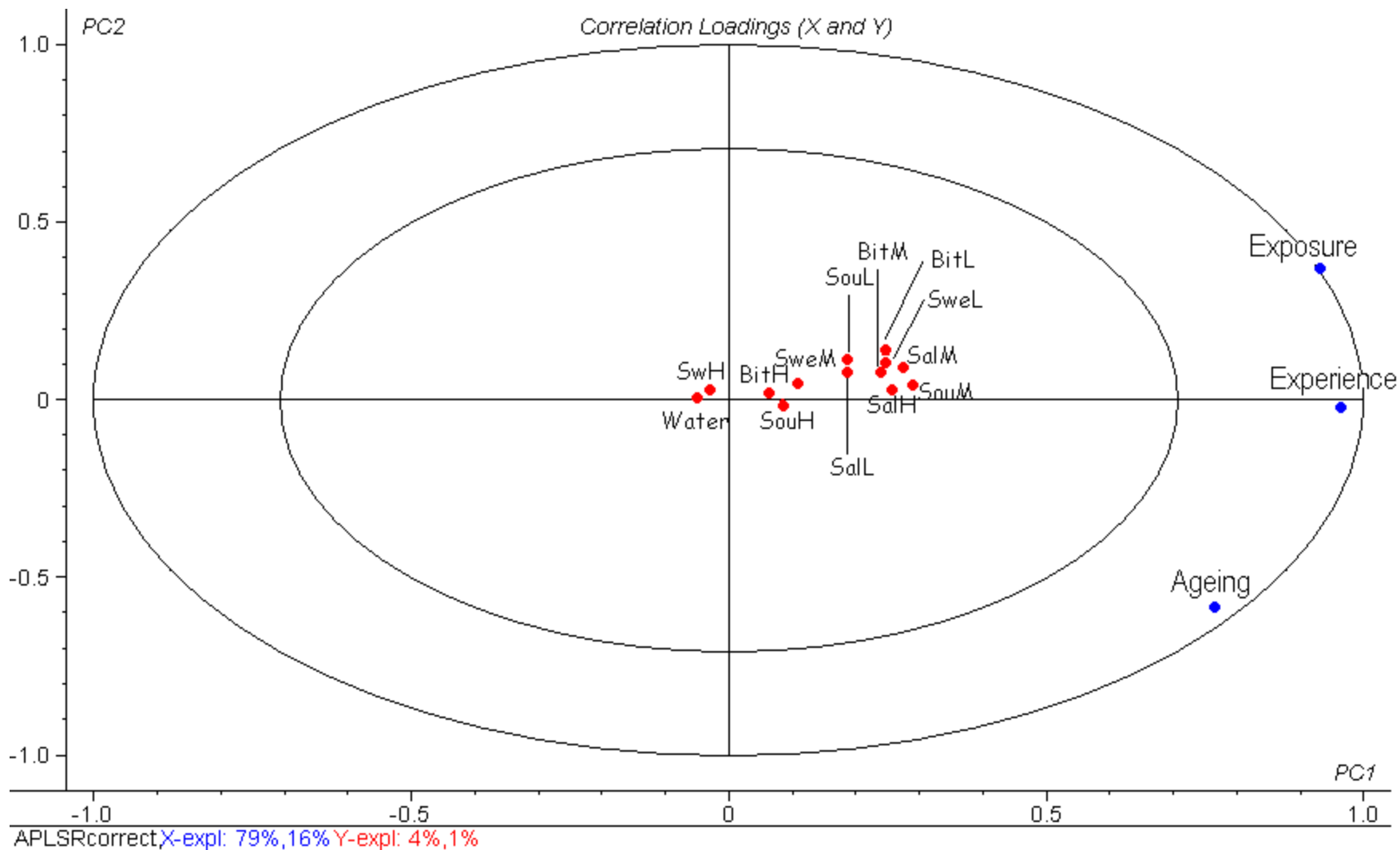
X = Ageing, experience and exposure

- Ageing: measures the specific age of the panellists at the time of the test
- Experience: measures number of years the judges have participated in the sensory panel
- Exposure: measures number of performed identification tests for the individual panellists

PLSR, Y variables

Y = Responses, taste performance measured as mean of correct identifications of sweet, salt, sour, bitter and water



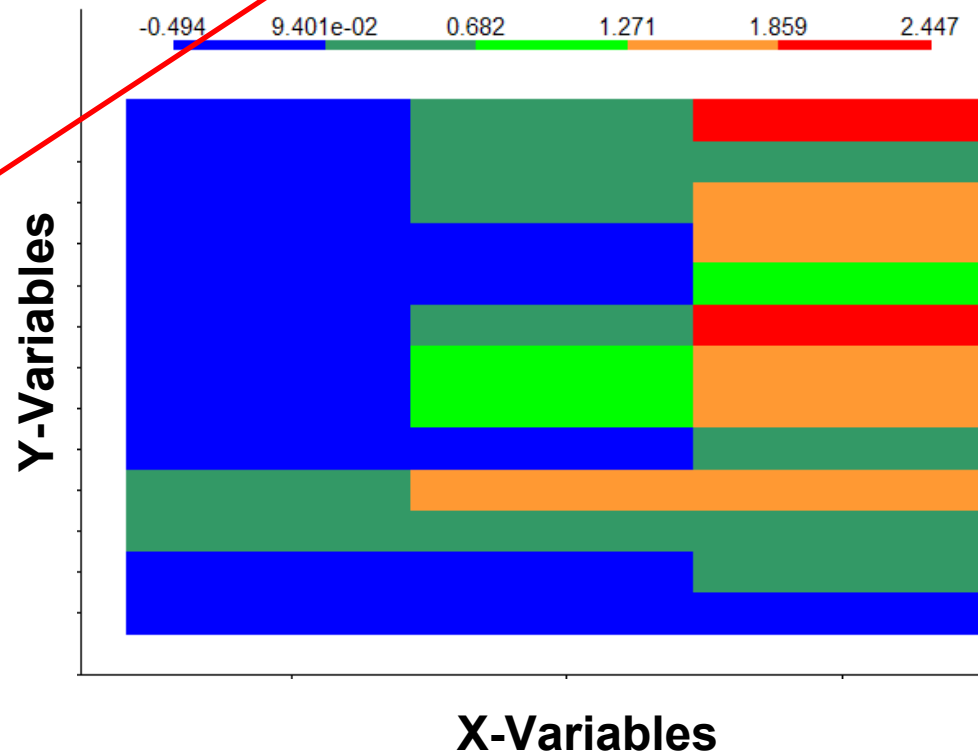


A condensed way to show significance and sign of effect

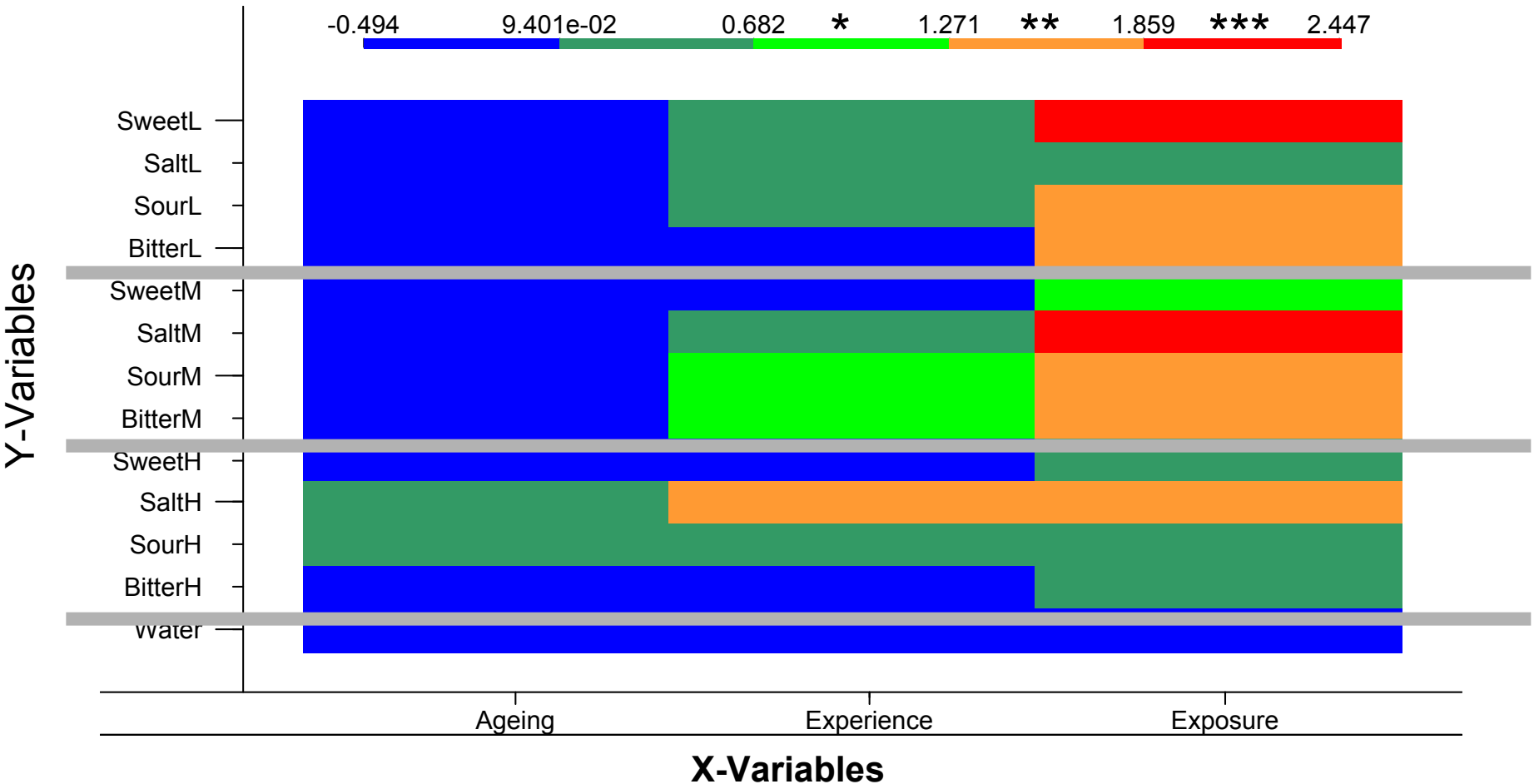
The significance levels $P(b_{kj})$ were transformed by $-\log(p)$ so that high numbers represent high reliability.

For combining interpretation of the main effects and their reliability, the sign of the main effects was combined with the transformed significance levels

$$-\log_{10}(p(b_{kj})) * \text{sign}(b_{kj})$$



Matrix plot of $-\log_{10}(p(b_{kj})) * \text{sign}(b_{kj})$ for PC2



Conclusion - are they too old?

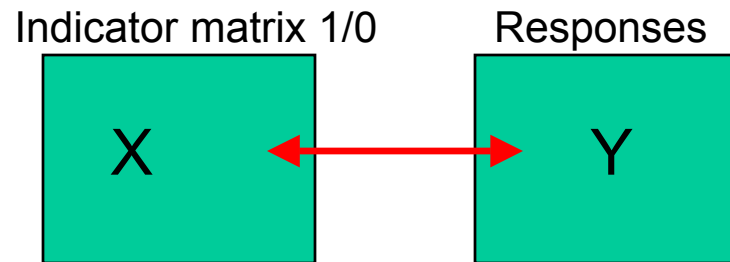
No!

There might be objections to use older subjects without previous sensory experience as sensory judges, but the general tendency is that when the panellists first are experienced with sensory work there is no major taste impairment with ageing.

Thank you for your attention ;-)

APLSR was performed in two steps

- Step 1: Judge correction



- Step 2: Effect of age and experience

