

1 Dataset

86 subjects, mean age 144.1 (~ 12 years), sd 30.90.



Figure 1: Age distribution.

Clinical profile:

- DSM5: classification of dyslexia in ‘low’ (class 1), ‘medium’ (class 2), ‘high’ (class 3).

DSM5 class	number of subjects
class 1	42
class 2	14
class 3	30

Table 1: Clinical profile. DSM5 classification.

Cognitive profile:

- WISC-III/IV: 5 *scores*, 7 *subscales*.
Only the subscale scores are considered. This in order to perform machine learning procedures without involving dependent variables.
The subscale scores were reduced to 7 after the two instruments, WISC-III and WISC-IV, were merged.

Subscale mean: 10.

Subscale standard deviation: 3.

WISC subscales	range	mean	sd
dc	6 : 18	11.13	2.86
so	4 : 17	10.36	2.79
mc	2 : 15	8.40	2.75
cf	1 : 14	7.60	2.67
vc	3 : 17	10.02	2.73
co	5 : 19	11.08	2.70
rs	2 : 16	9.36	2.88

Table 2: Cognitive profile. WISC subscales.

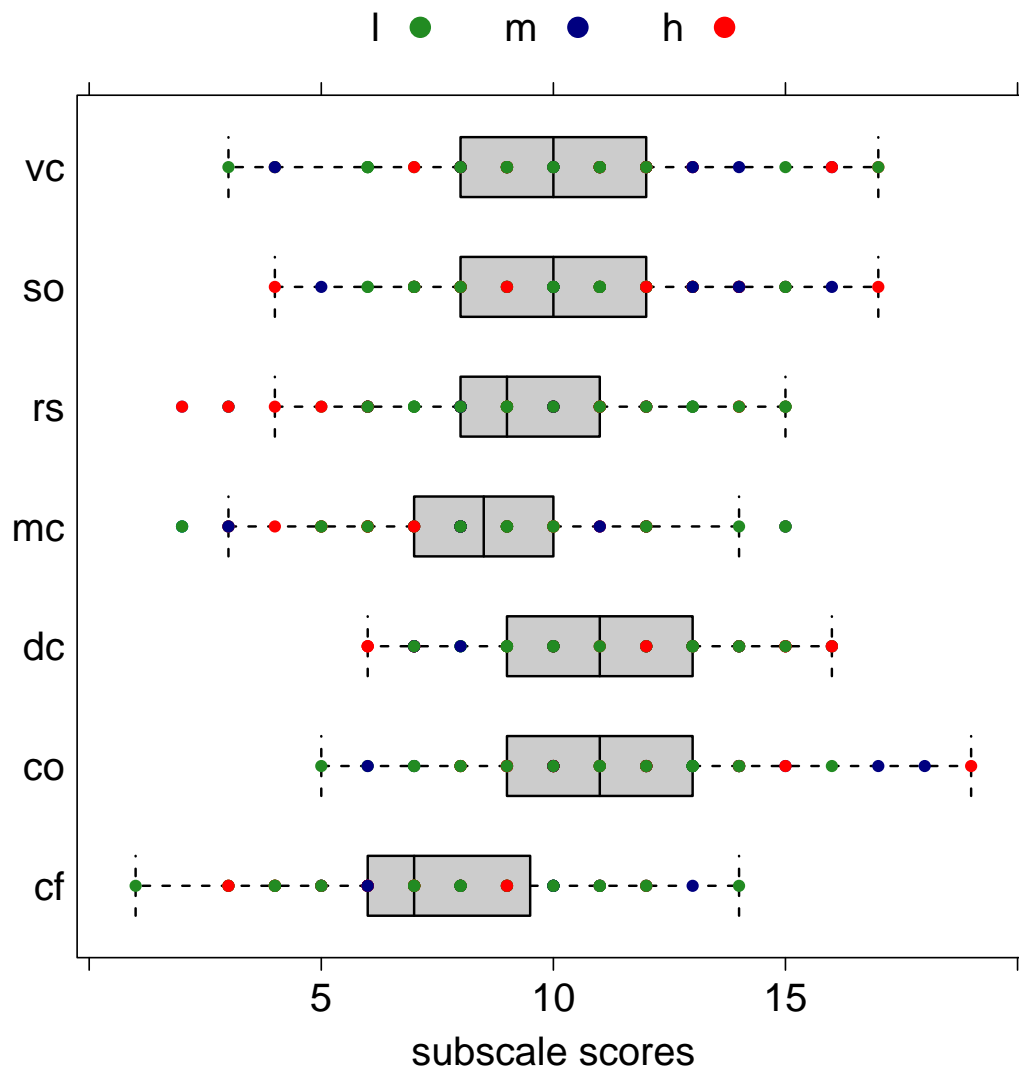


Figure 2: WISC subscale distribution.

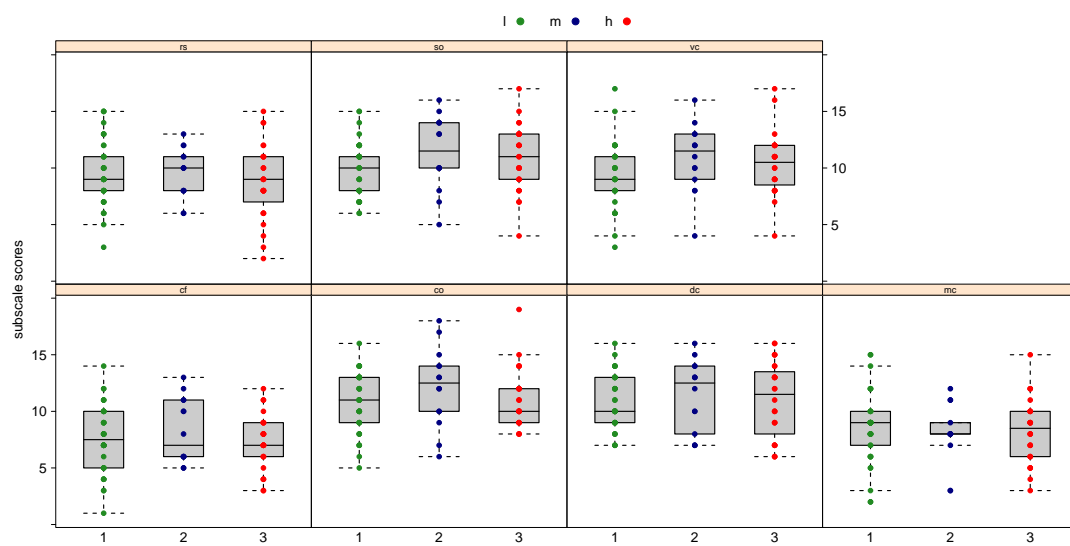


Figure 3: WISC subscale distribution by class.

- DDE: 4 *scores* measuring word/non-word reading speed (wspeed, nwspeed) and accuracy (wacc, nwacc).
DDE scores are sigma values, with -2.0 as the threshold for impairment. These values are computed with respect to age.

DDE scores	range	mean	sd
wspeed	$-13.43 : -0.46$	-3.93	2.61
wacc	$-10.30 : 1.00$	-2.50	2.40
nwspeed	$-9.90 : 0.20$	-3.57	2.24
nwacc	$-9.00 : 1.30$	-1.33	1.74

Table 3: Cognitive profile. DDE scores.

Outliers: subject 5, 673.

Subject 5 \rightarrow wspeed = -13.43 , new range $-11.60 : -0.46$

Subject 673 \rightarrow nwacc = -9.00 , new range $-4.40 : 1.30$

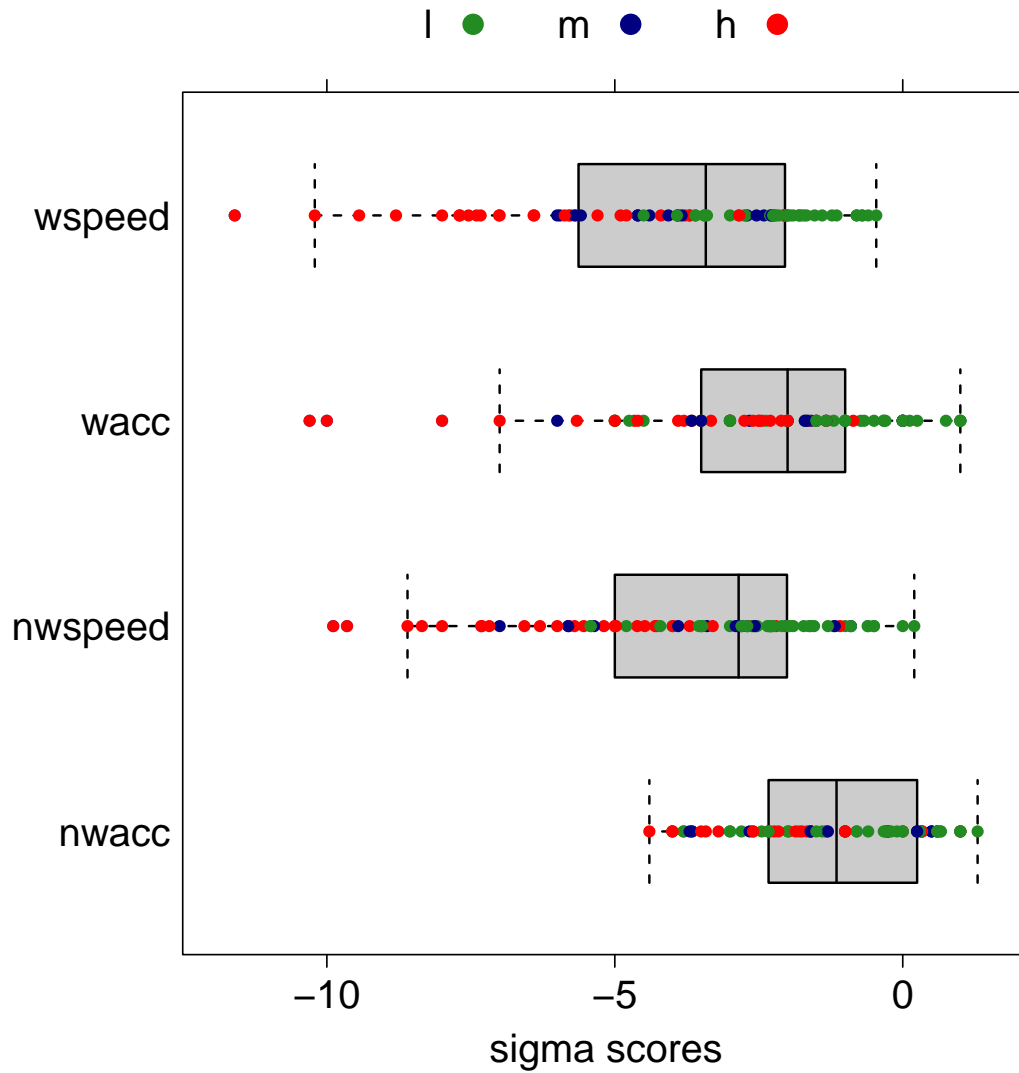


Figure 4: DDE score distribution.

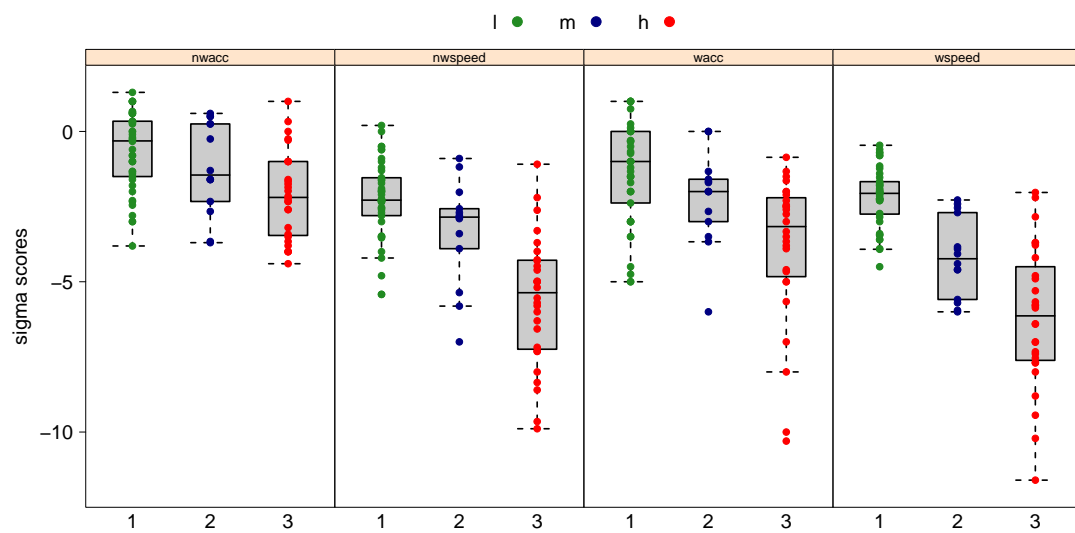


Figure 5: DDE score distribution by class.

In order to investigate the distribution of DSM5 classes and the correlation between the scores we provide the graph below.

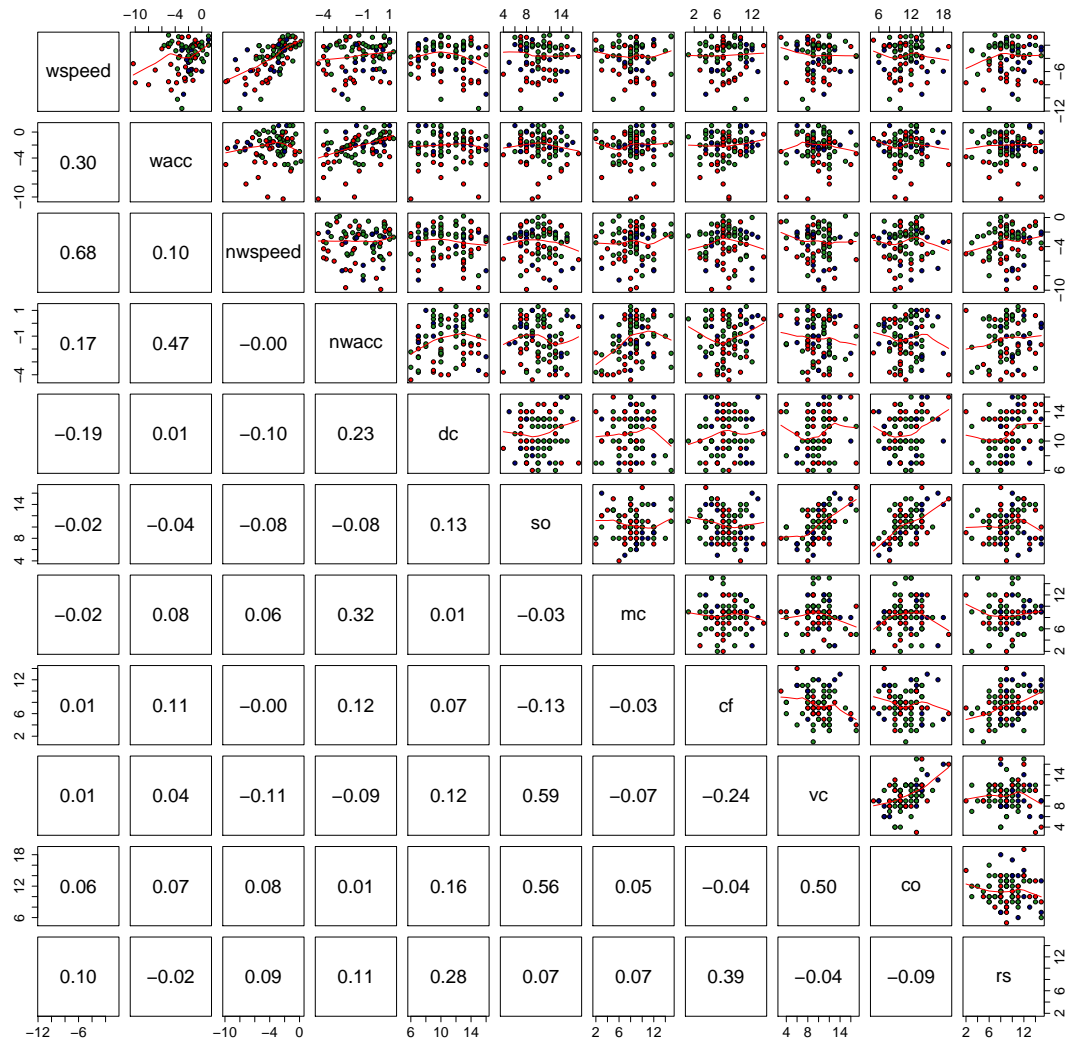
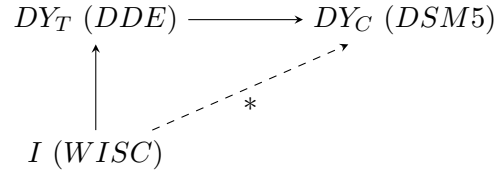


Figure 6: Pair graph with DDE scores and WISC subscales. Correlation coefficient in the lower panel.

2 Data Analysis

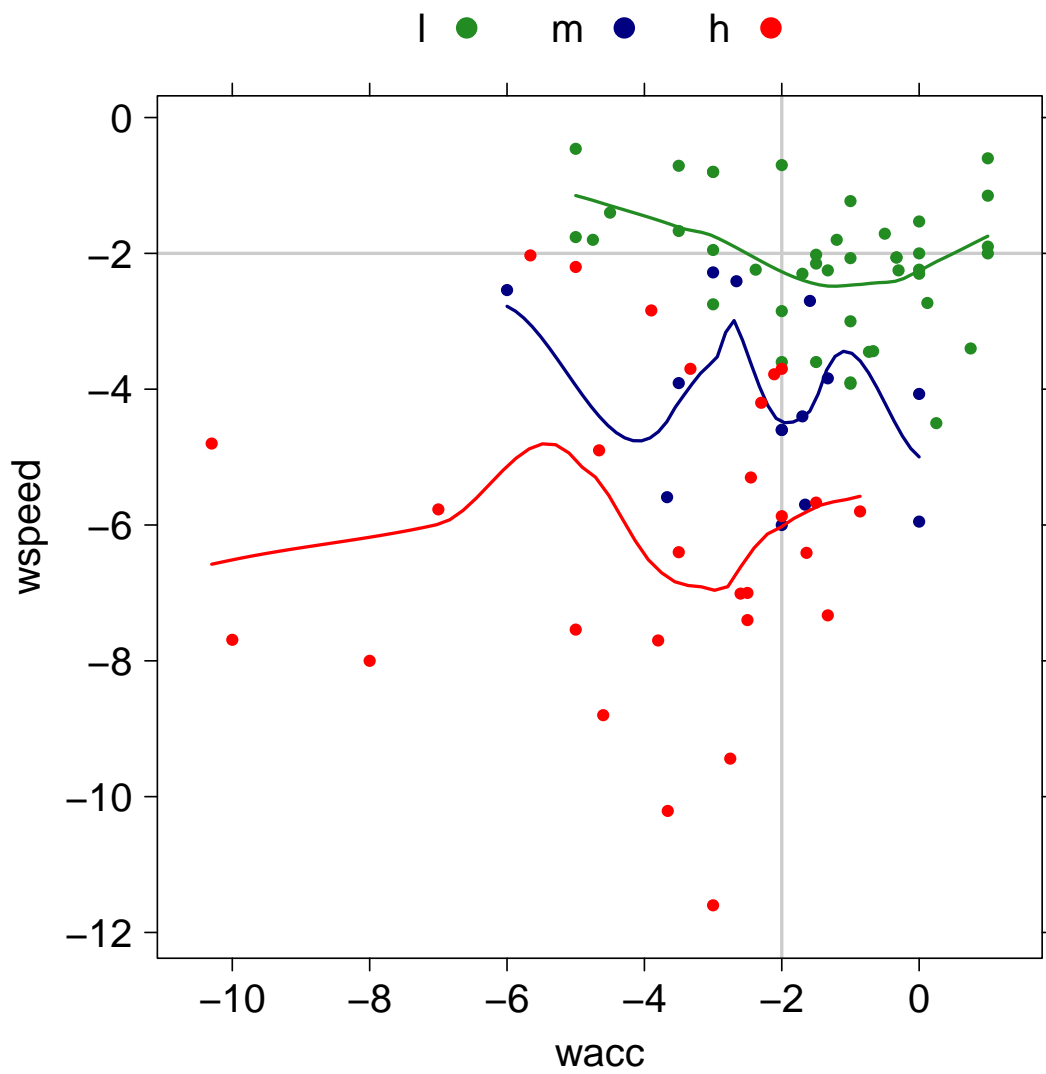
From previous Figures we can suppose that DSM5 classification can be driven from DDE scores, hence DDE is a classifier, while WISC subscales work as a modulator. We want to assess the following diagram in order to provide a cognitive profile to the DSM5 classification (*).



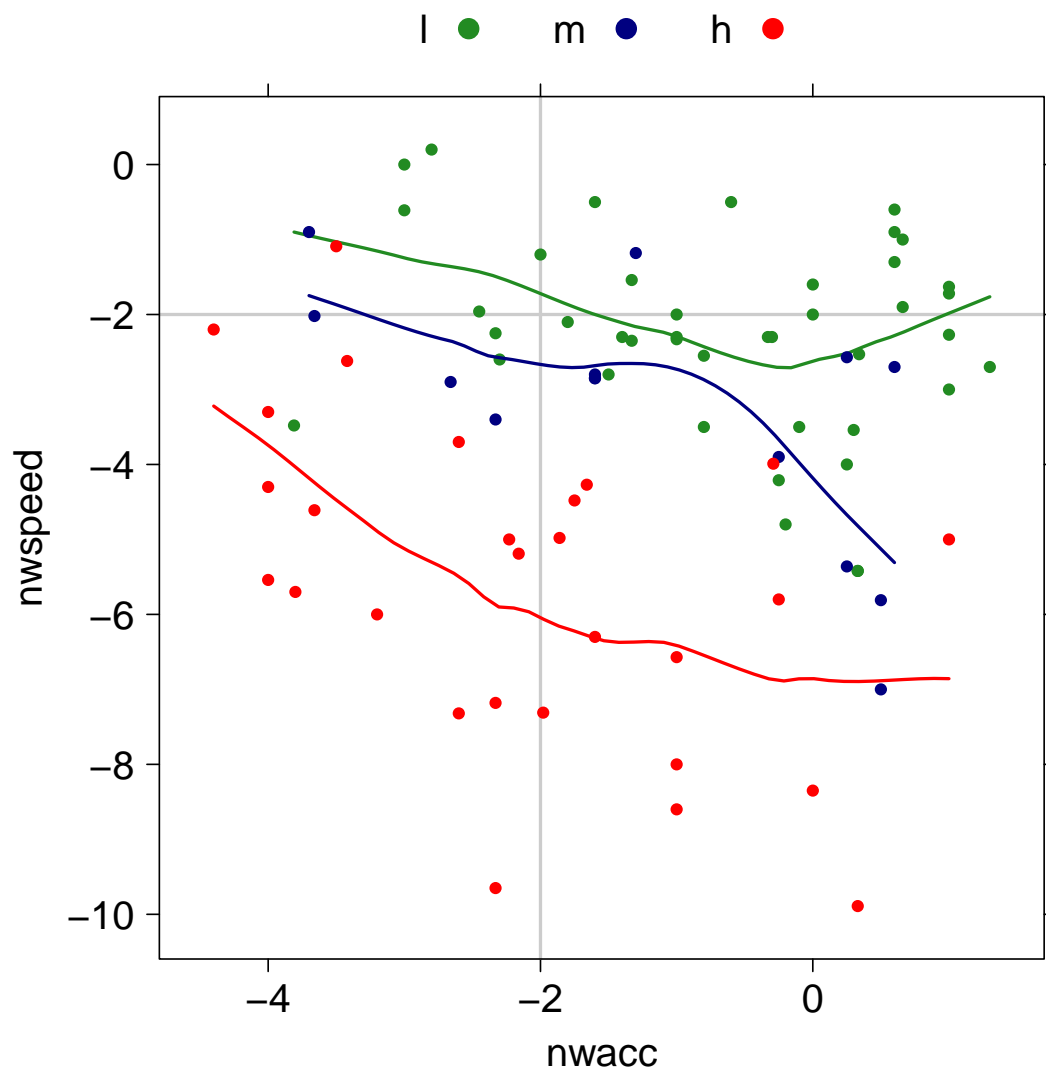
DY_T : technical dyslexia, DY_C : clinical dyslexia, I : intelligence.

2.1 DDE scores

Firstly we want to see if it is possible to reduce the number of DDE variables, from 4 to 2, expressing the processing speed in function of the processing accuracy.



(a) Scatterplot word accuracy against word speed in the three classes.



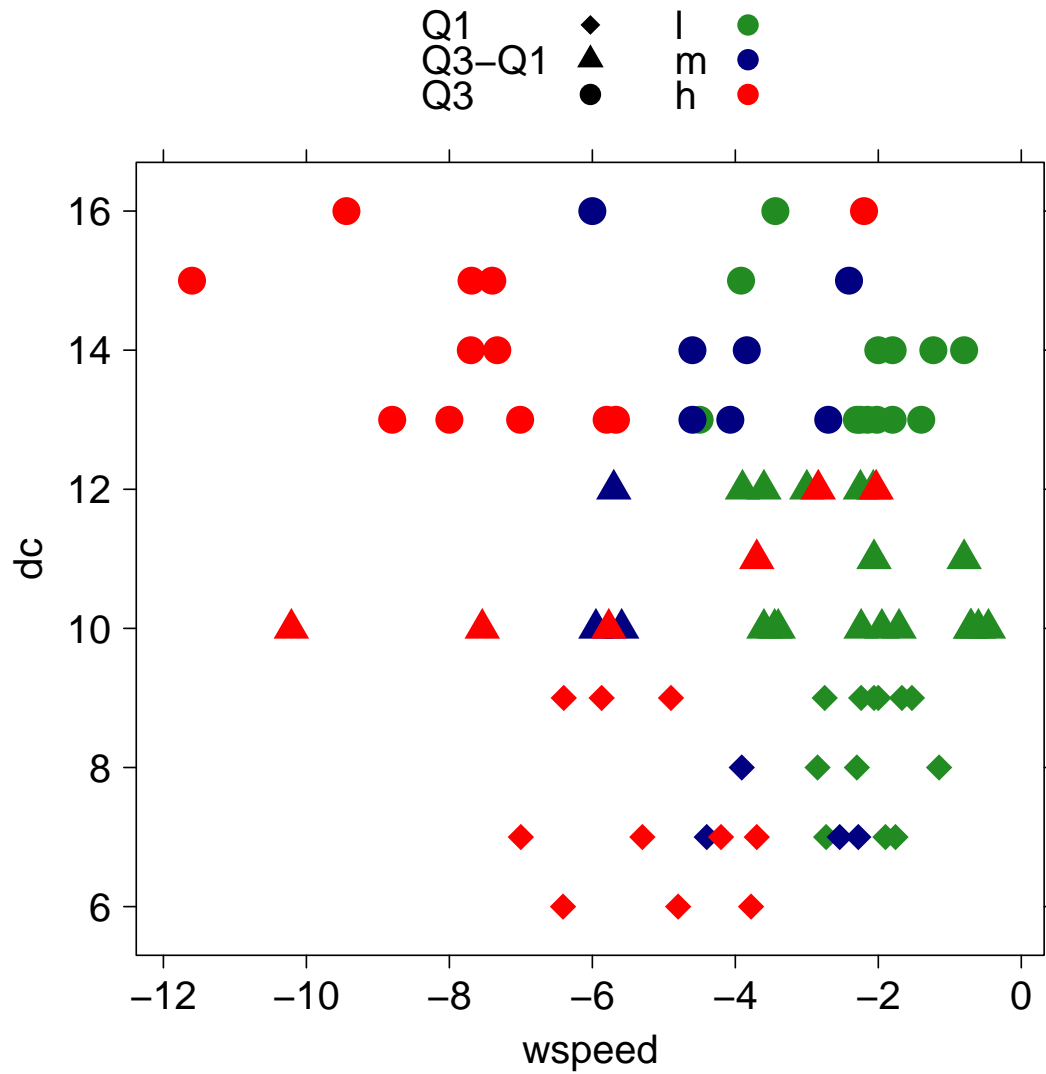
(b) Scatterplot non-word accuracy against non-word speed in the three classes.

Figure 7

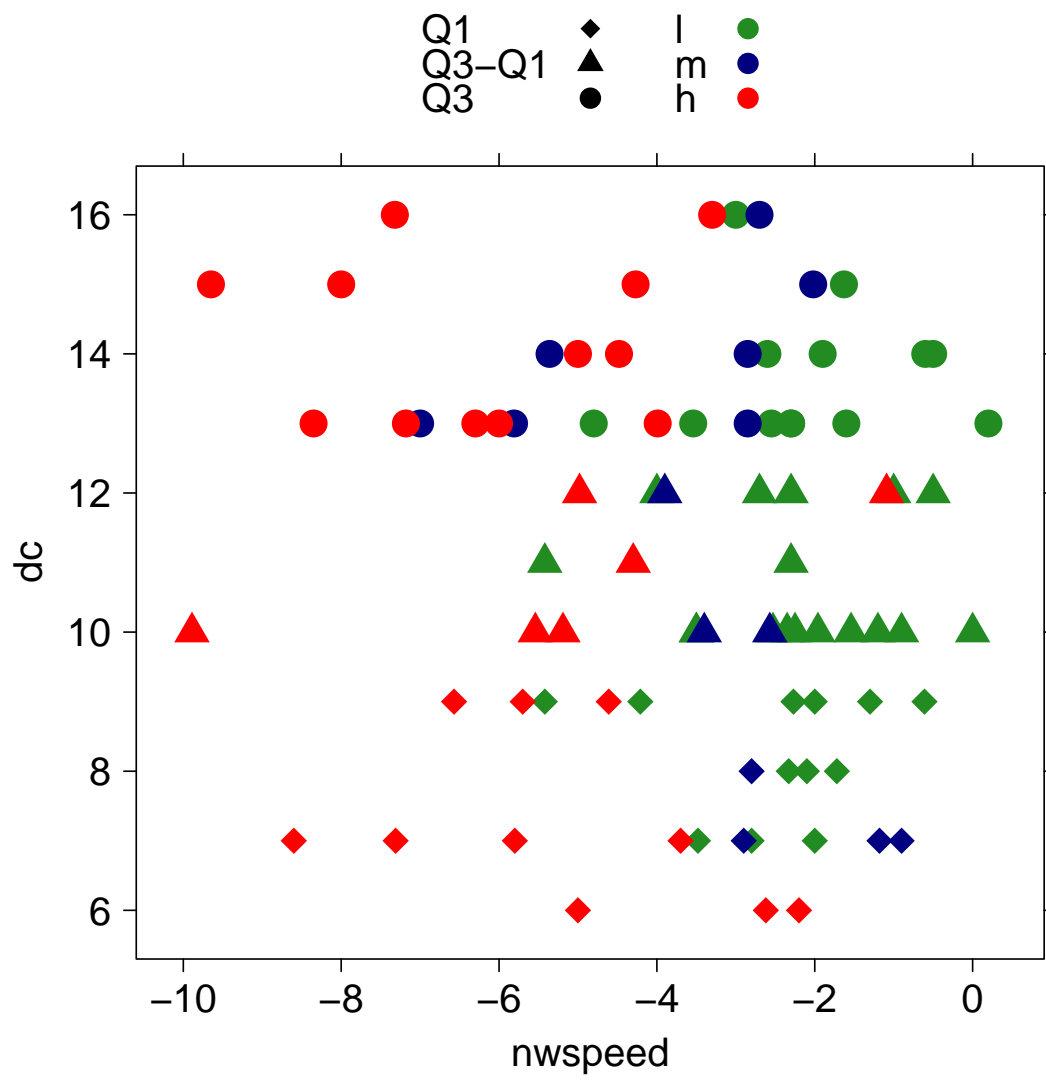
2.2 WISC subscales

We would like to parametrize the loess lines in Figures 7a-7b in order to see if the variation of WISC subscales determines a shift from the curve of one class to the curve of another.

Let us now see how the WISC subscales vary according to the DDE word/non-word speed scores. We highlight the first and third quantile, along with the DSM5 classes.

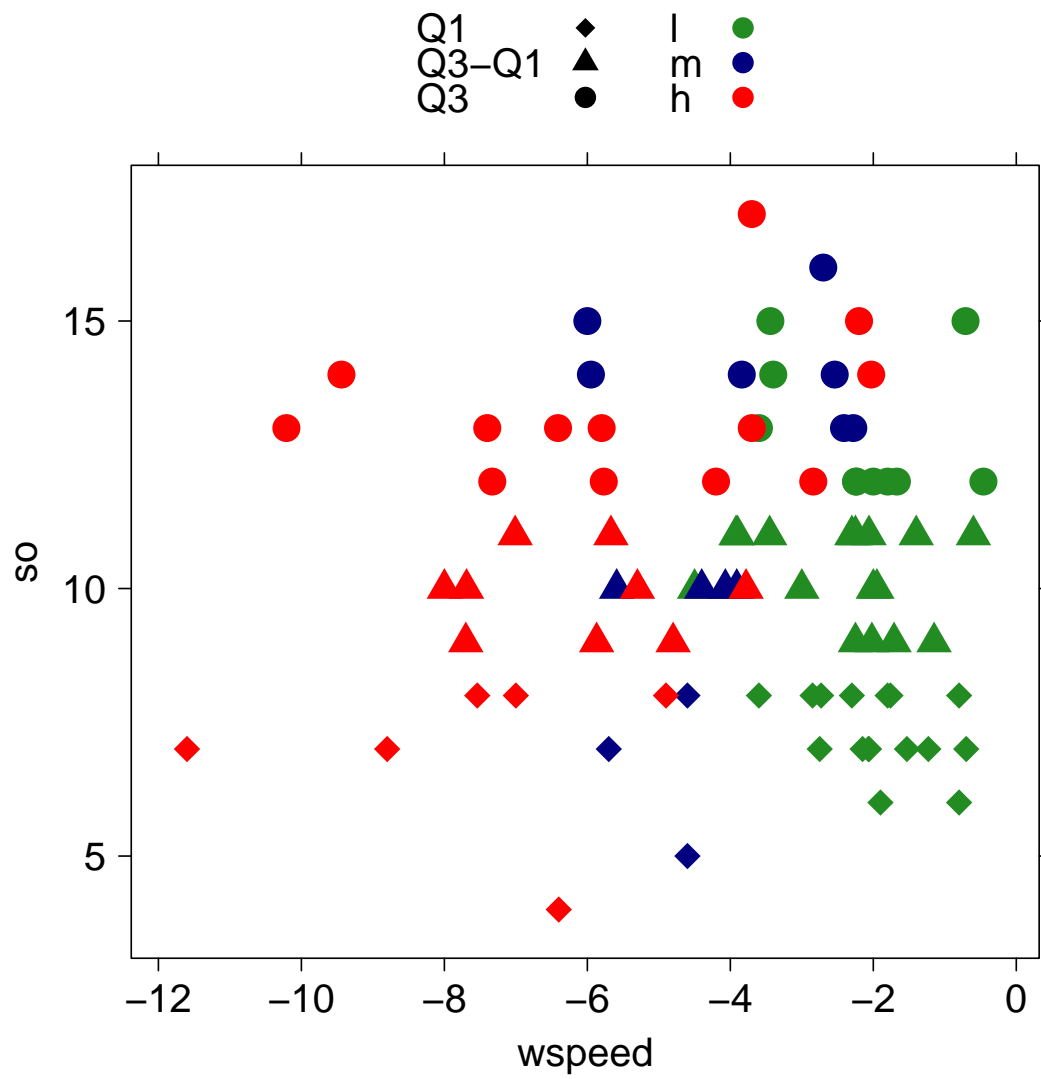


(a)

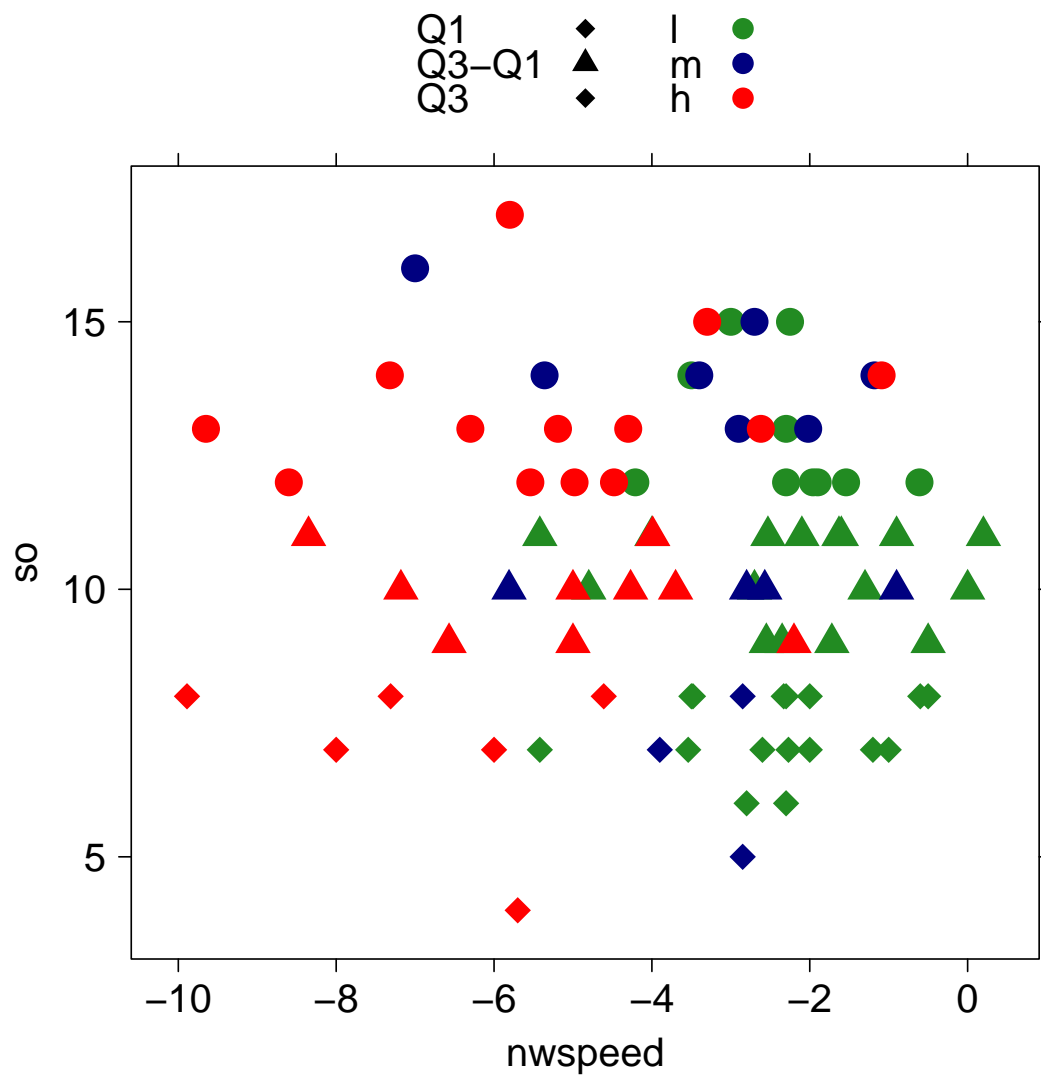


(b)

Figure 8: Reading speed of words and non-words against subscale dc.

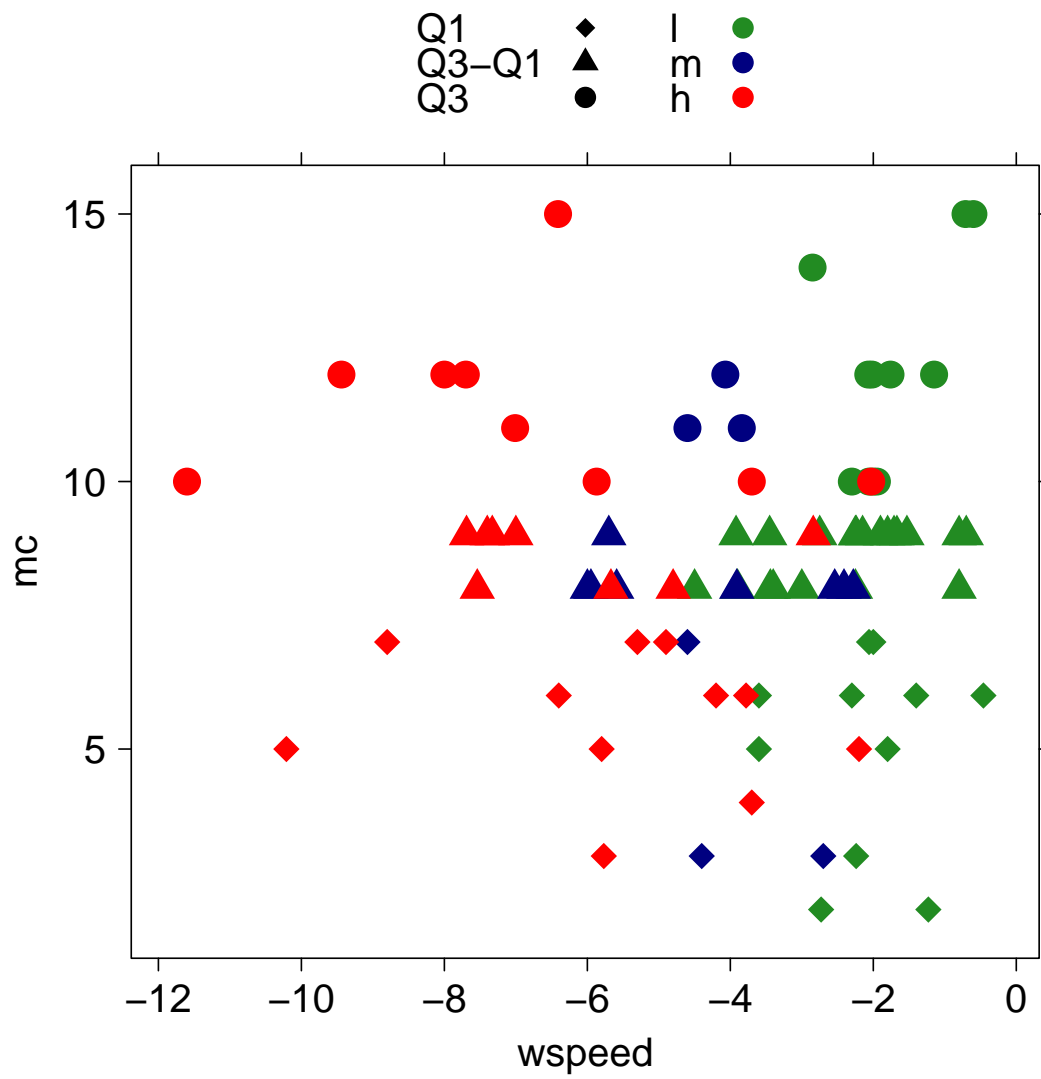


(a)

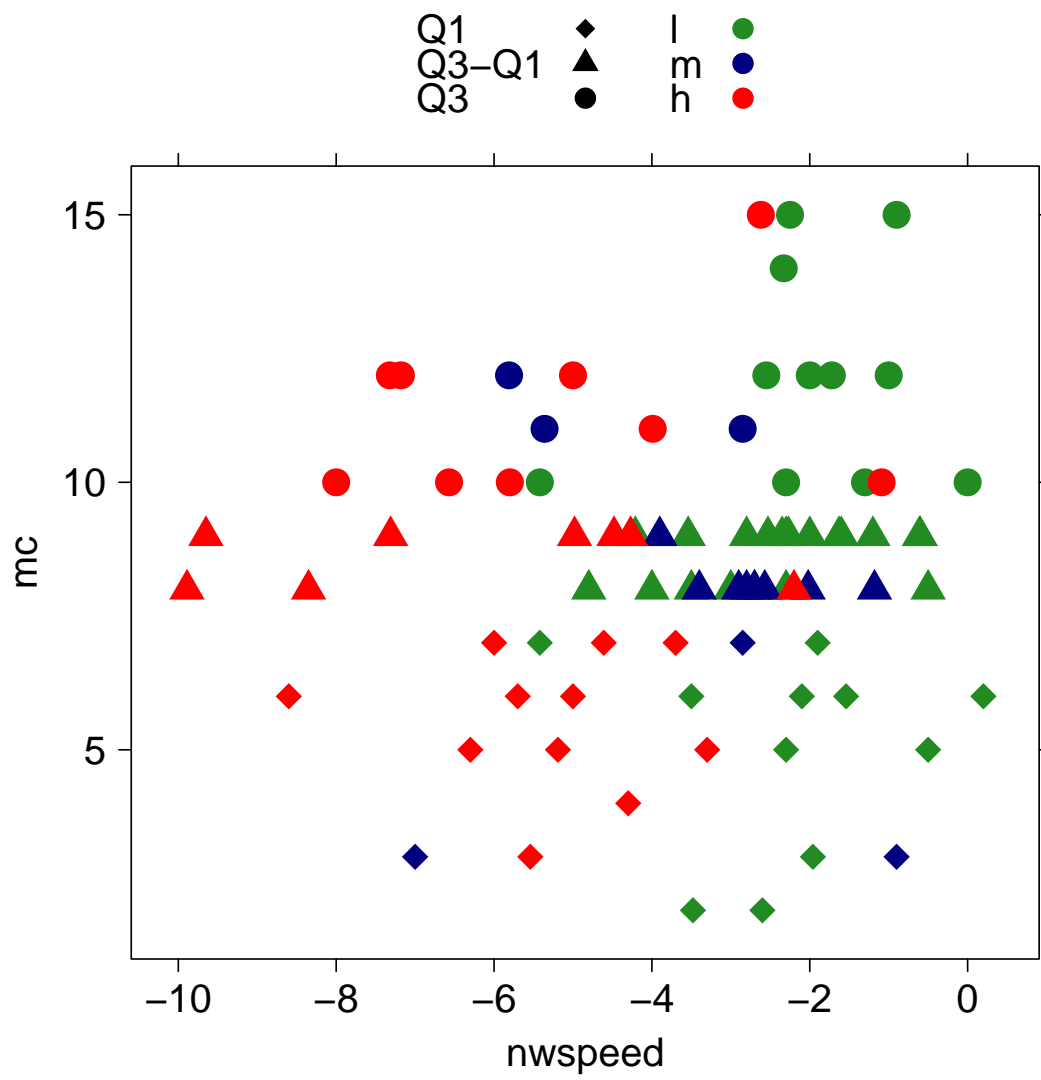


(b)

Figure 9: Reading speed of words and non-words against subscale so.

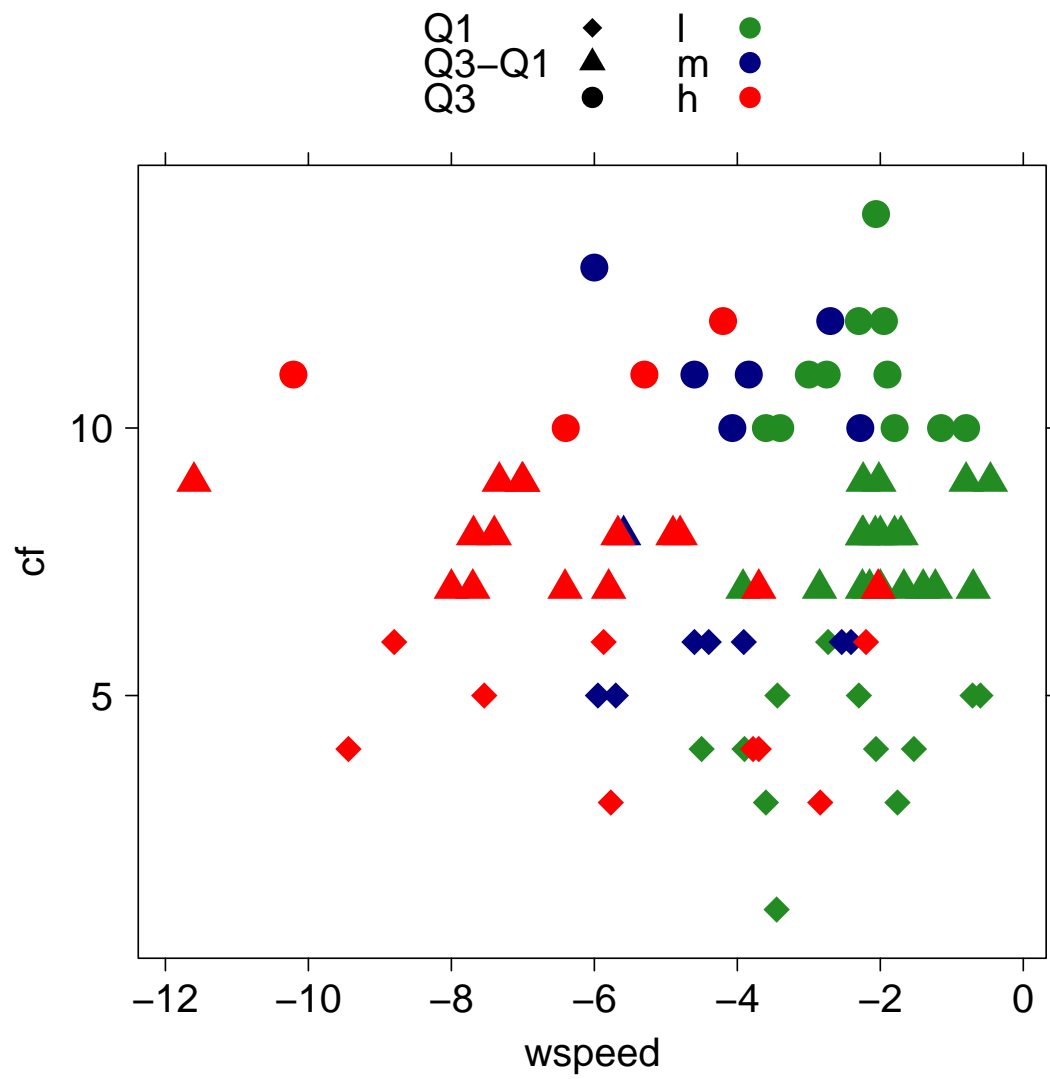


(a)

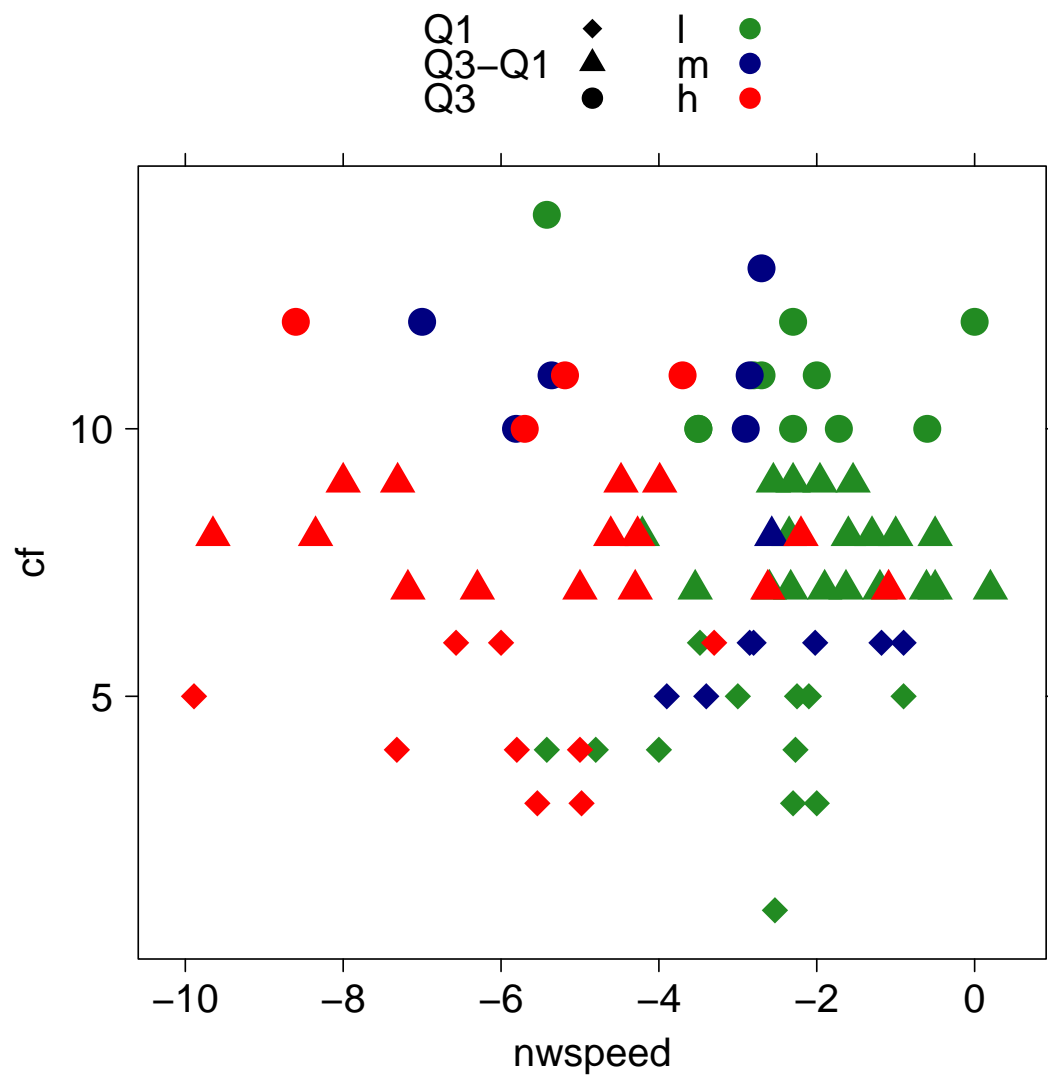


(b)

Figure 10: Reading speed of words and non-words against subscale mc.

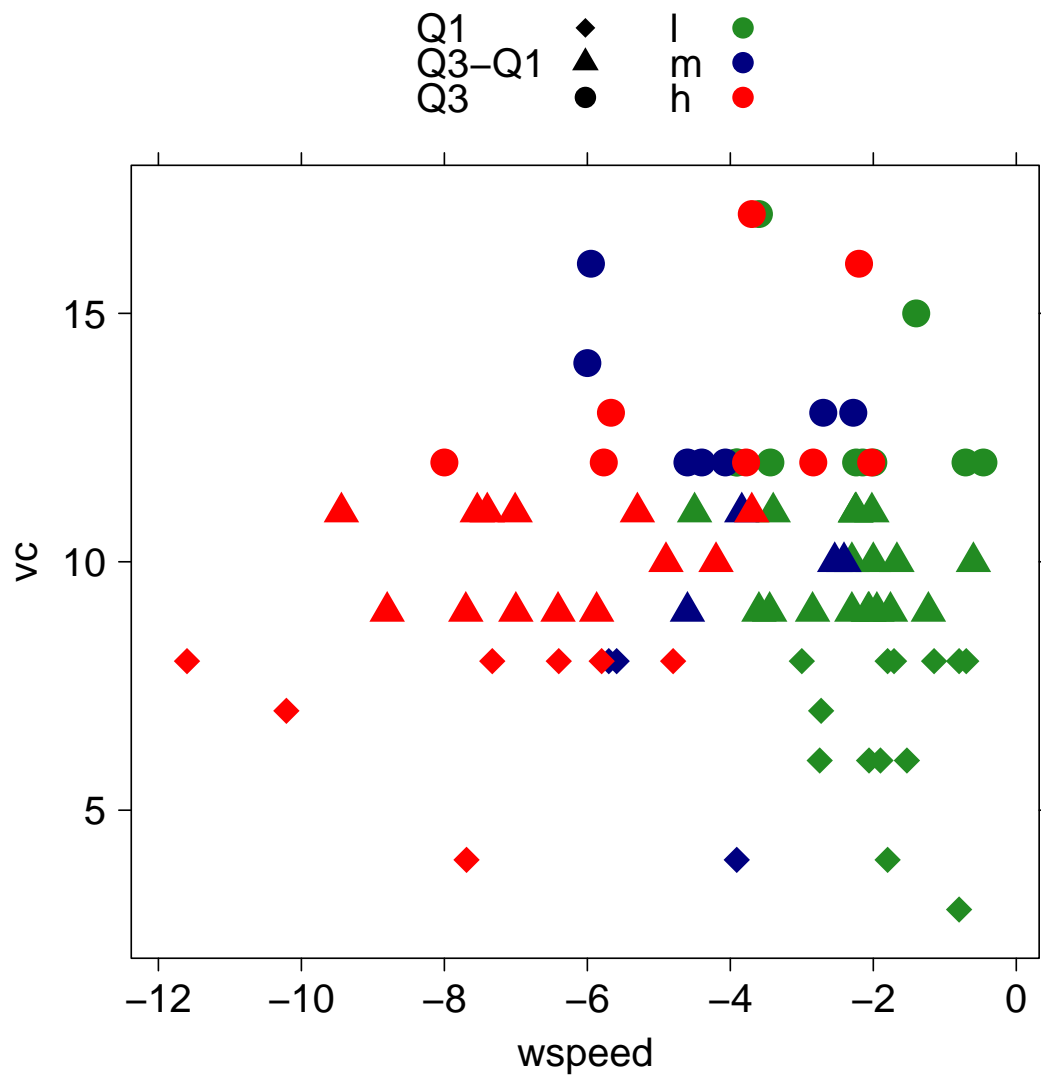


(a)

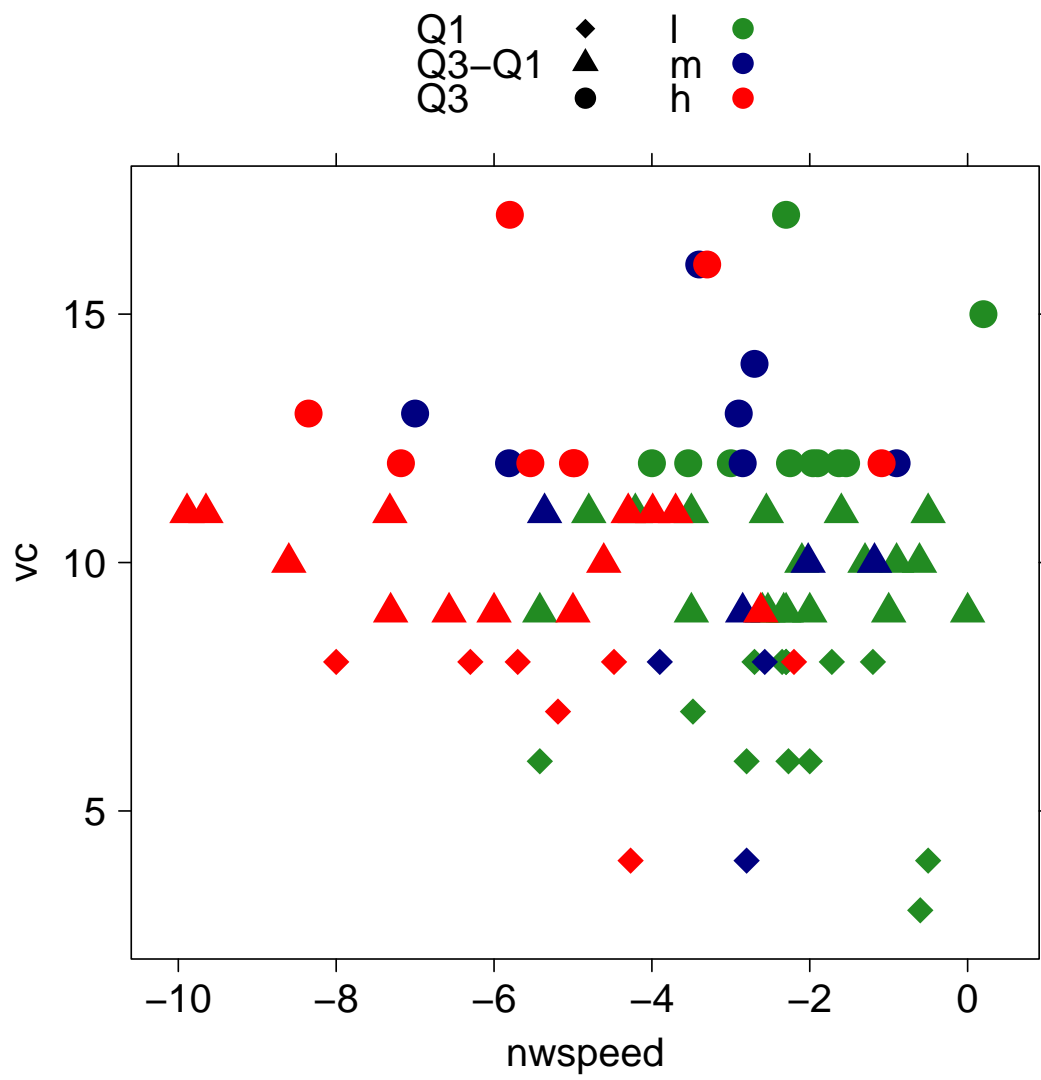


(b)

Figure 11: Reading speed of words and non-words against subscale cf.

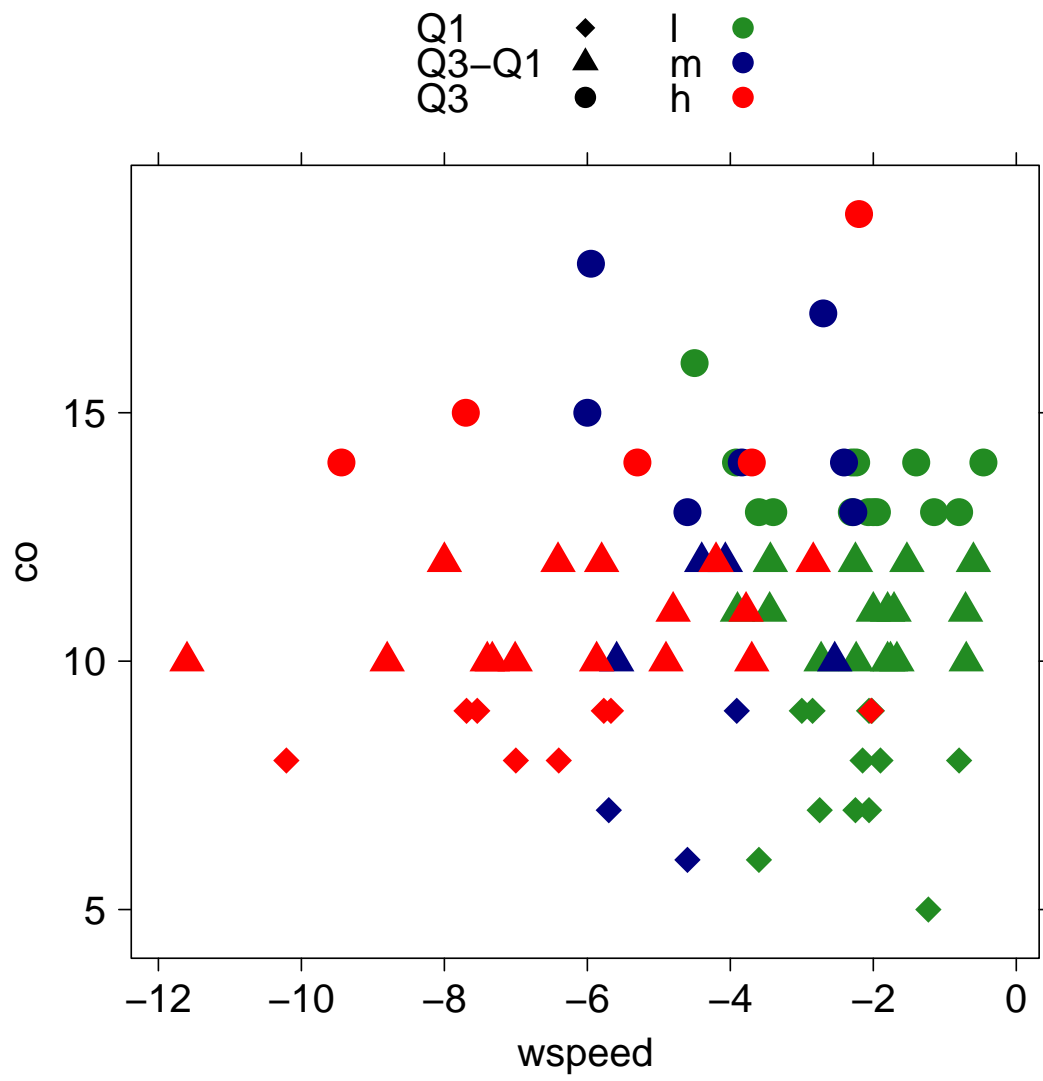


(a)

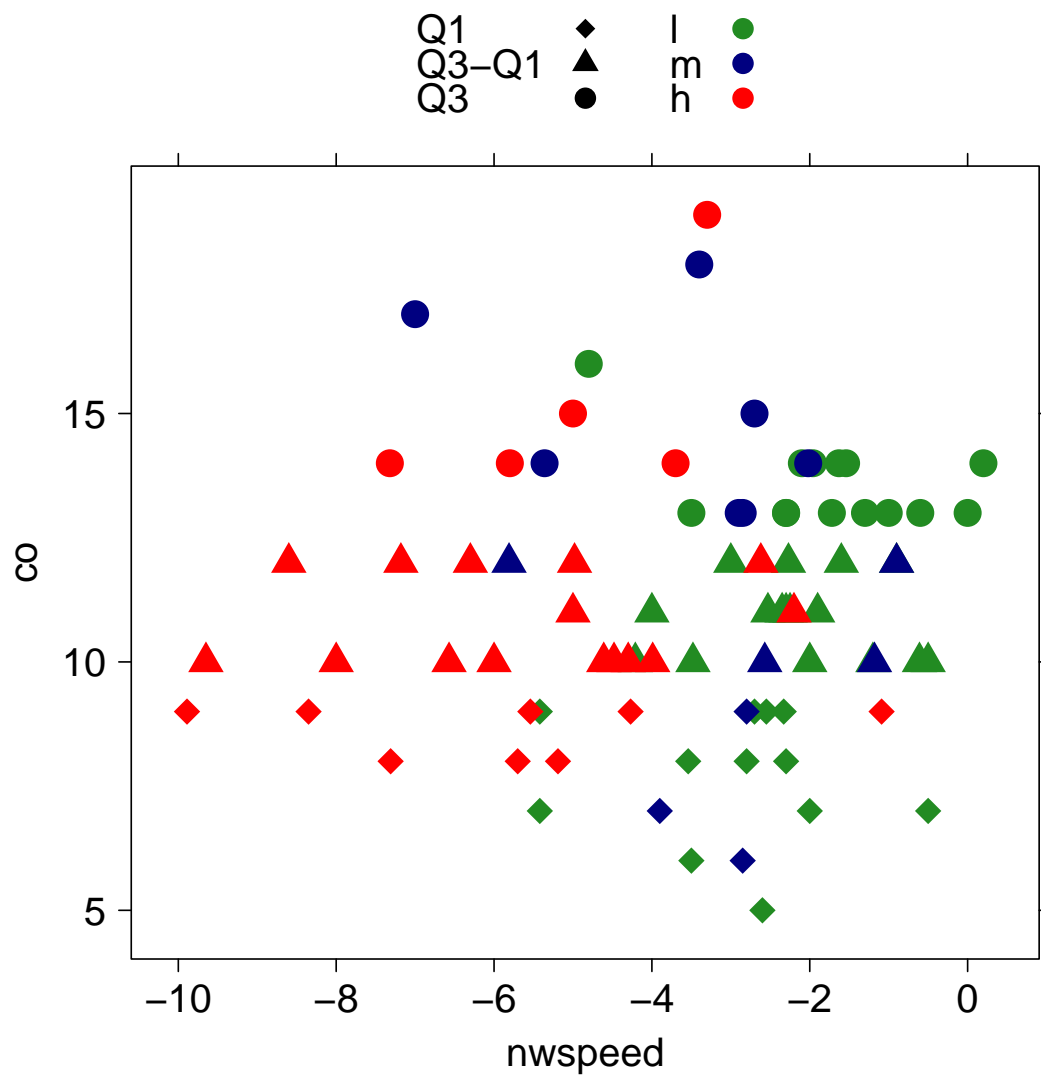


(b)

Figure 12: Reading speed of words and non-words against subscale vc.



(a)



(b)

Figure 13: Reading speed of words and non-words against subscale co.