

## Supplement 4 with subjects omitted as suggested by the HCP

source and input files available at <https://osf.io/p6msu/>

compiled May 13, 2020

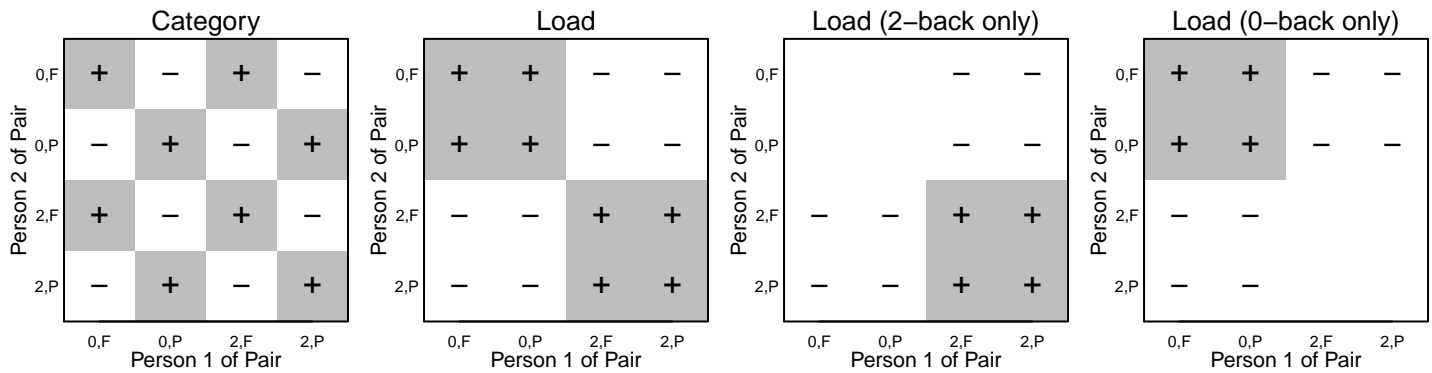
Supplement 4 for “Pattern similarity analyses of frontoparietal task coding: Individual variation and genetic influences” by Joset A. Etzel, Ya’el Courtney, Caitlin E. Carey, Maria Z. Gehred, Arpana Agrawal, and Todd S. Braver.

Cerebral Cortex, Volume 30, Issue 5, May 2020, doi:10.1093/cercor/bhz301

This is a knitr file (<https://yihui.name/knitr/>); see the .rnw file with the same name as this .pdf for the R code to generate all figures and results. To compile, change the in.path variable to the location of the input directory downloaded from <https://osf.io/p6msu/>.

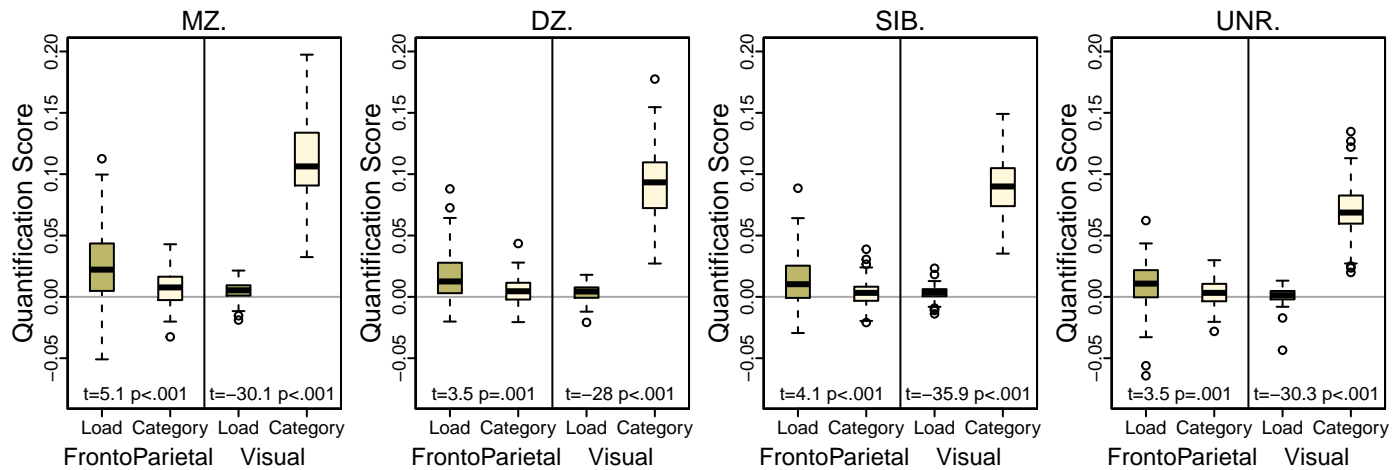
**NOTE:** This knitr was compiled using a subset of the participants in the published paper: 20 (as of 11 May 2020) people included in the original analysis were later flagged by the HCP as having problematic WM task fMRI data (11 MZ, 3 DZ, 2 SIB, 4 UNR). Omitting pairs in which at least one member was flagged by the HCP leaves 94 MZ pairs, 75 DZ pairs, 97 SIB pairs, and 96 UNR pairs for these analyses.

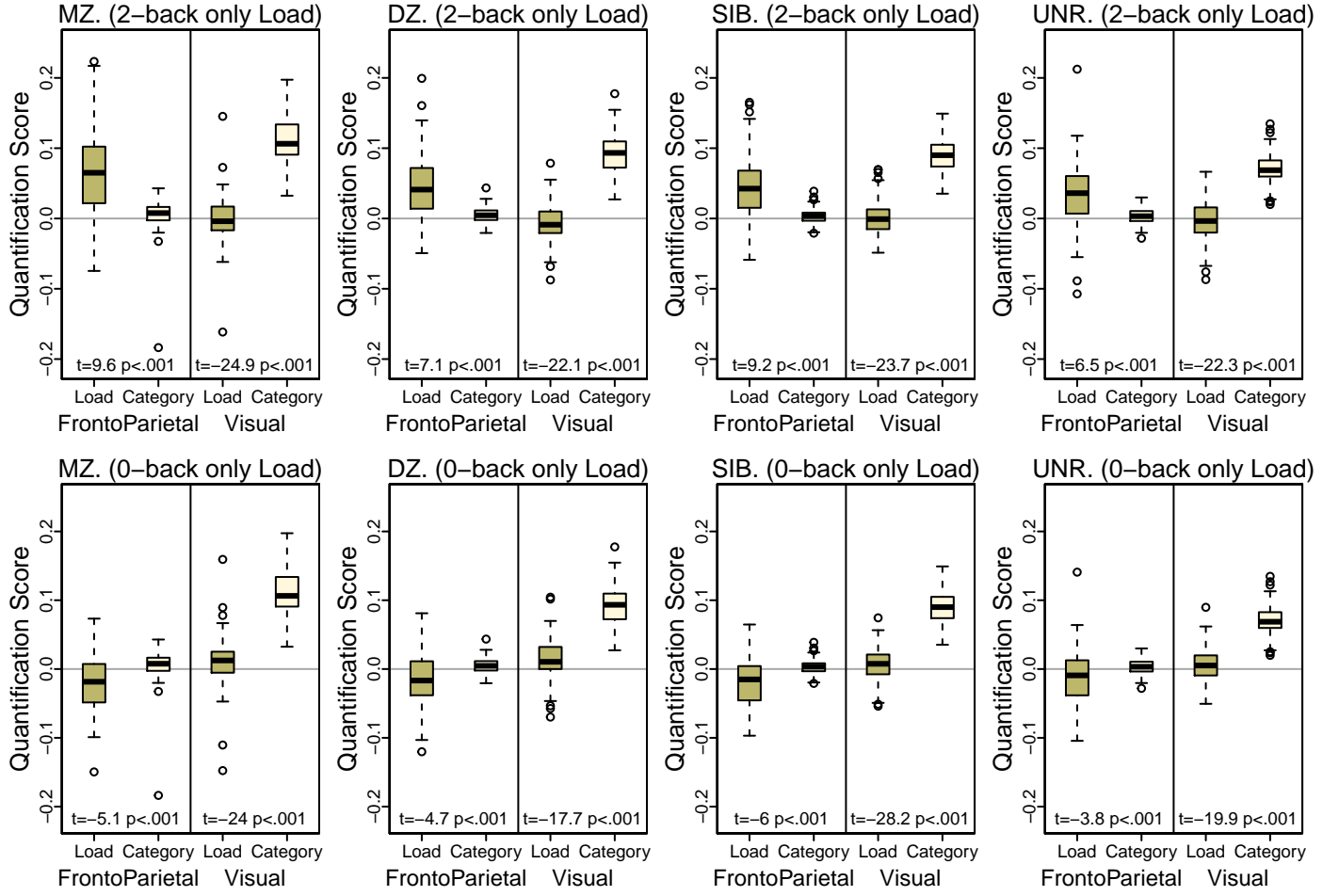
The four pairwise reference matrices; see Figure 2 on the main paper. The average of the white cells (-) is subtracted from the average of the grey cells (+) for quantification, and blank cells are not included.



### S4.1a Pairwise quantification scores: Load and Category comparisons

Pairwise quantification scores, by subject group, and with different ways of quantifying Load. One MZ FrontoParietal Category outlier at -0.18 not shown for the 0 and 2-back Load quantification. Numbers printed on boxplots are for a paired robust t-test for Load  $\neq$  Category within each community and subject group. Note that y-axis scaling varies between the first row of plots and the others.





Robust t-tests for the mean of each set of quantification scores  $\neq 0$ . p-values uncorrected for multiple comparisons.

Category	Load	
	FrontoParietal	Visual
MZ	5.07 (<.001)	30.78 (<.001)
DZ	4.15 (<.001)	28.54 (<.001)
SIB	3.36 (.001)	36.28 (<.001)
UNR	2.55 (.013)	31.12 (<.001)

Load	Category	
	FrontoParietal	Visual
MZ	7.62 (<.001)	7.73 (<.001)
DZ	6.04 (<.001)	5.37 (<.001)
SIB	5.8 (<.001)	7 (<.001)
UNR	5.49 (<.001)	2.69 (.009)

Load (2-back only)	Category	
	FrontoParietal	Visual
MZ	10.42 (<.001)	-.74 (.46)
DZ	8.22 (<.001)	-1.75 (.085)
SIB	9.78 (<.001)	-.31 (.754)
UNR	7.1 (<.001)	-1.66 (.101)

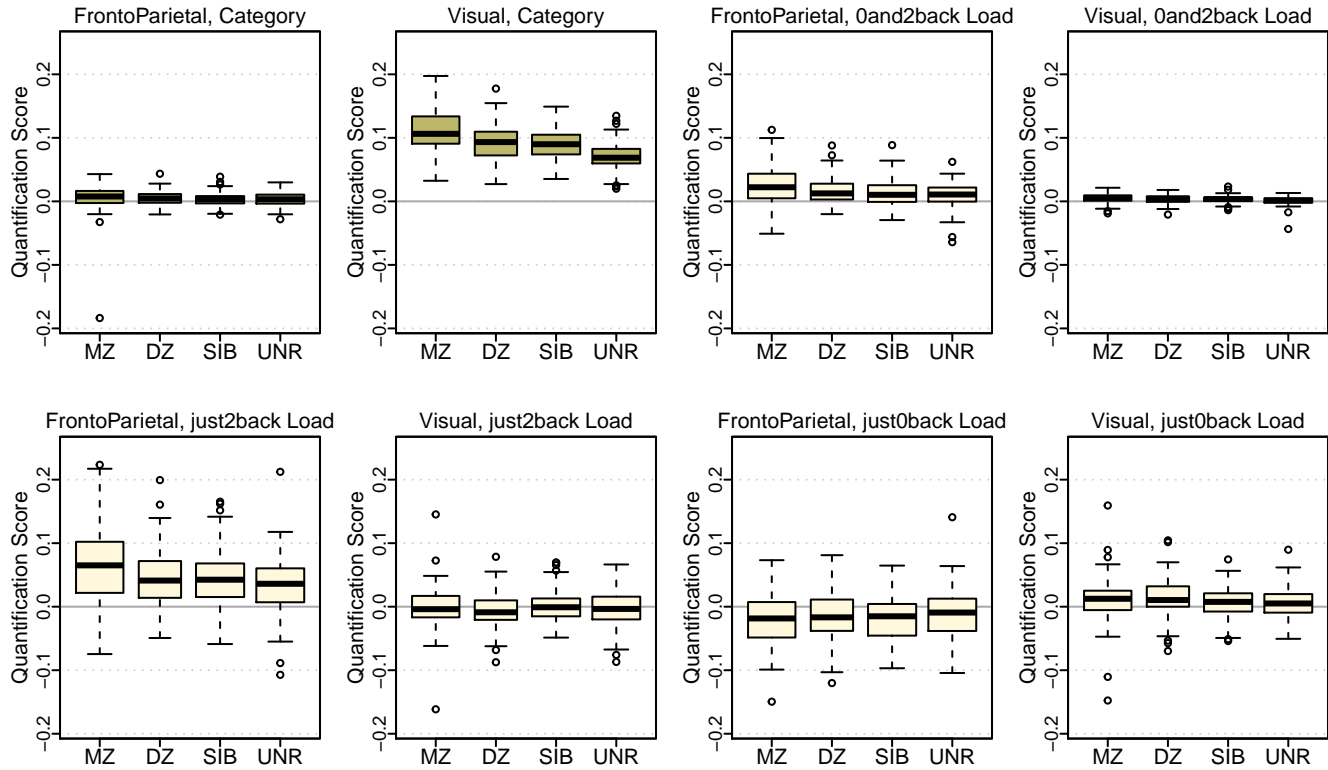
Load (0-back only)	Category	
	FrontoParietal	Visual
MZ	-4.18 (<.001)	4.67 (<.001)
DZ	-3.42 (.001)	3.76 (<.001)
SIB	-5.26 (<.001)	2.65 (.01)
UNR	-3.11 (.003)	2.38 (.02)

Robust t-tests for difference between Load and Category quantification scores within each subject group. p-values uncorrected for multiple comparisons. (Same as number printed on top row of boxplots.)

	Load	
	FrontoParietal	Visual
MZ	5.06 (<.001)	-30.07 (<.001)
DZ	3.55 (.001)	-28.03 (<.001)
SIB	4.09 (<.001)	-35.88 (<.001)
UNR	3.46 (.001)	-30.29 (<.001)

## S4.1b Pairwise quantification scores: group comparisons

These are rearranged versions of the boxplots shown in S4.1a to make the group comparisons more visually obvious. The group comparisons are then tested with robust ANOVAs; posthoc tests only shown when model  $p < 0.05$ .



Category

```
## [1] "FrontoParietal Category"
## [1] "F=2.04391164498205 p=0.109990289227187"
## [1]
## [1] #####
## [1] "Visual Category"
## [1] "F=32.2386514978153 p=2.22044604925031e-16"
## [1] "Note: confidence intervals are adjusted to control FWE"
## [1] "But p-values are not adjusted to control FWE"
## [1] "Adjusted p-values can be computed with the R function p.adjusted"
##      Group Group      psihat      ci.lower      ci.upper      p.value
## [1,]      1      2 0.018586438 0.005921517 0.03125136 1.584977e-04
## [2,]      1      3 0.020653754 0.009236804 0.03207070 4.320599e-06
## [3,]      1      4 0.039811716 0.028587563 0.05103587 2.220446e-16
## [4,]      2      3 0.002067316 -0.008621123 0.01275576 6.083745e-01
## [5,]      2      4 0.021225278 0.010743211 0.03170735 3.936934e-07
## [6,]      3      4 0.019157962 0.010298761 0.02801716 5.570606e-08
## [1]
## [1] #####
```

the different Loads

```
## [1] "FrontoParietal 0and2back"
## [1] "F=4.47373348761263 p=0.00482089050455958"
## [1] "Note: confidence intervals are adjusted to control FWE"
## [1] "But p-values are not adjusted to control FWE"
```

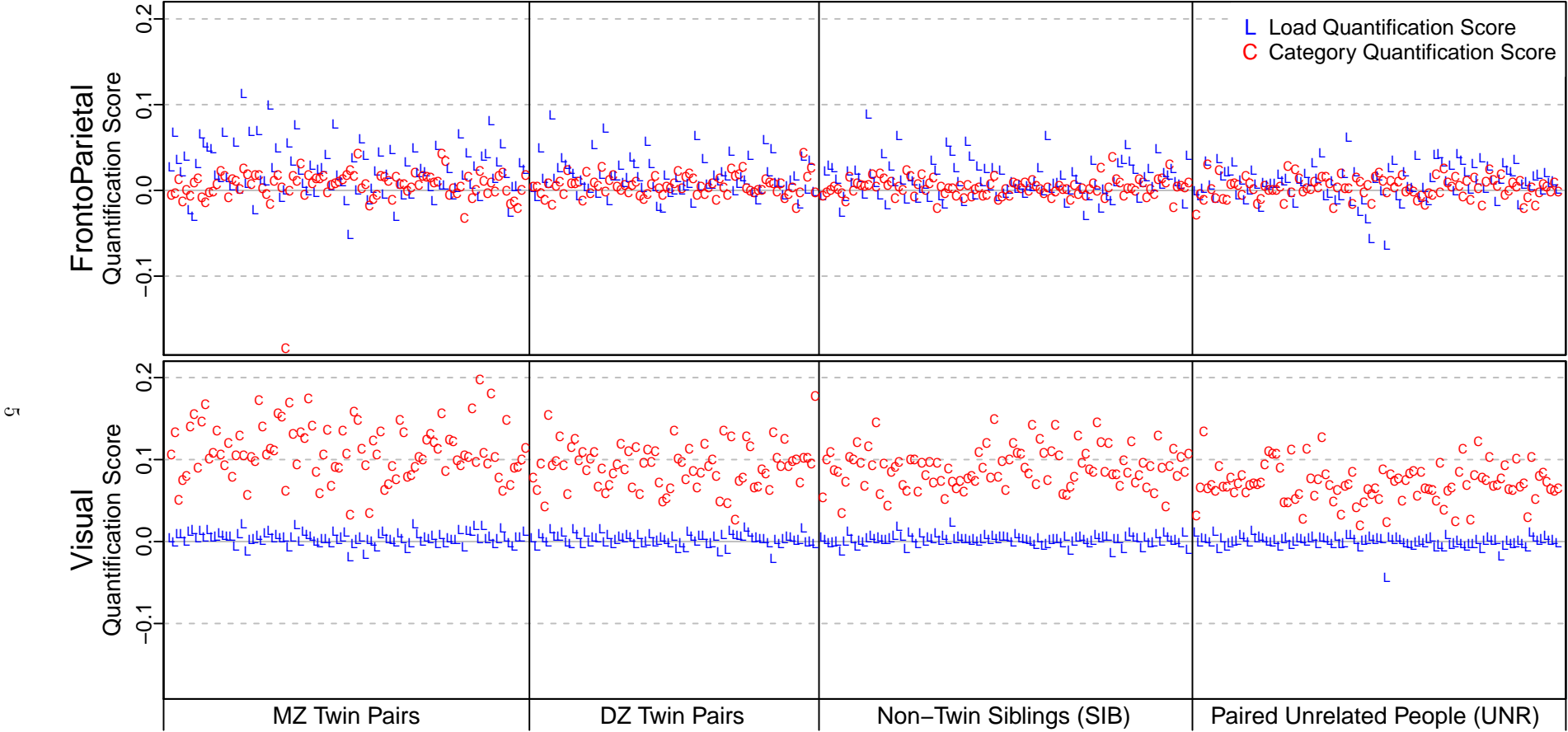
```

## [1] "Adjusted p-values can be computed with the R function p.adjusted"
##      Group Group      psihat      ci.lower      ci.upper      p.value
## [1,]      1      2 0.008825774 -0.001648580 0.019300127 0.0272641163
## [2,]      1      3 0.011722175  0.001897564 0.021546787 0.0019460647
## [3,]      1      4 0.012844783  0.003156803 0.022532763 0.0006072889
## [4,]      2      3 0.002896402 -0.005627308 0.011420111 0.3690633780
## [5,]      2      4 0.004019009 -0.004344854 0.012382873 0.2044787672
## [6,]      3      4 0.001122608 -0.006364789 0.008610005 0.6926383913
## [1]
## [1] #####
## [1] "Visual 0and2back"
## [1] "F=8.26515427575035 p=3.901084934399e-05"
## [1] "Note: confidence intervals are adjusted to control FWE"
## [1] "But p-values are not adjusted to control FWE"
## [1] "Adjusted p-values can be computed with the R function p.adjusted"
##      Group Group      psihat      ci.lower      ci.upper      p.value
## [1,]      1      2 0.0015271831 -0.0011086475 0.004163014 1.271305e-01
## [2,]      1      3 0.0019259079 -0.0003465968 0.004198413 2.644740e-02
## [3,]      1      4 0.0040533554  0.0017864446 0.006320266 5.425086e-06
## [4,]      2      3 0.0003987249 -0.0019142846 0.002711734 6.474913e-01
## [5,]      2      4 0.0025261724  0.0002185989 0.004833746 4.331397e-03
## [6,]      3      4 0.0021274475  0.0002605969 0.003994298 3.051639e-03
## [1]
## [1] #####
## [1] "FrontoParietal just2back"
## [1] "F=6.16943410536235 p=0.000544421729030464"
## [1] "Note: confidence intervals are adjusted to control FWE"
## [1] "But p-values are not adjusted to control FWE"
## [1] "Adjusted p-values can be computed with the R function p.adjusted"
##      Group Group      psihat      ci.lower      ci.upper      p.value
## [1,]      1      2 0.020371371 -0.001322313 0.04206506 0.014095367
## [2,]      1      3 0.021847988  0.001614436 0.04208154 0.004914910
## [3,]      1      4 0.032903160  0.012704932 0.05310139 0.000030612
## [4,]      2      3 0.001476617 -0.016969780 0.01992301 0.832174940
## [5,]      2      4 0.012531789 -0.005875839 0.03093942 0.073282808
## [6,]      3      4 0.011055172 -0.005534128 0.02764447 0.080362653
## [1]
## [1] #####
## [1] "Visual just2back"
## [1] "F=0.58221014302015 p=0.627526987655212"
## [1]
## [1] #####
## [1] "FrontoParietal just0back"
## [1] "F=0.871696855094179 p=0.457171079386088"
## [1]
## [1] #####
## [1] "Visual just0back"
## [1] "F=1.76836583402822 p=0.155494539884697"
## [1]
## [1] #####

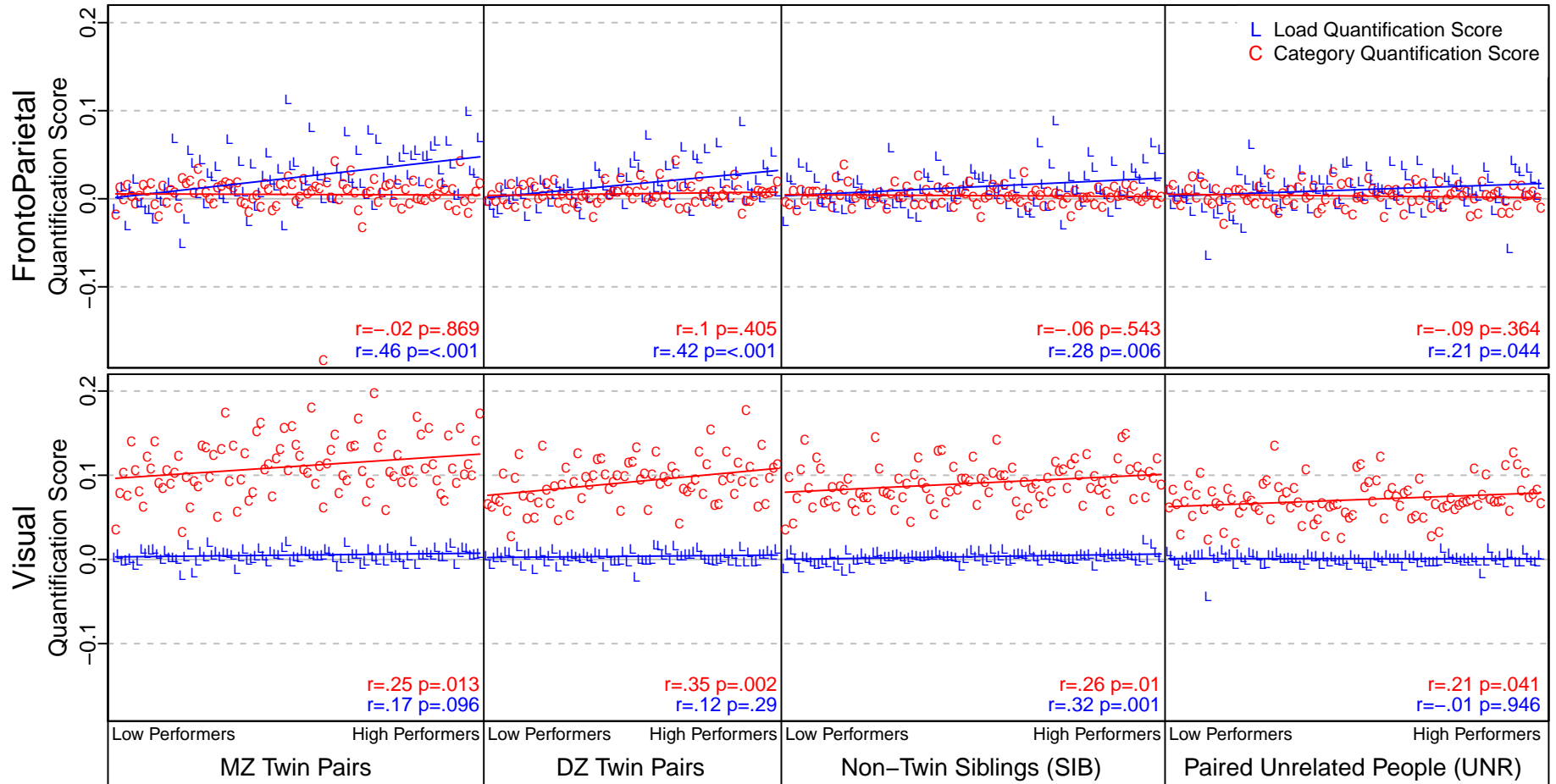
```

## S4.2 Pairwise quantification scores: full dataset

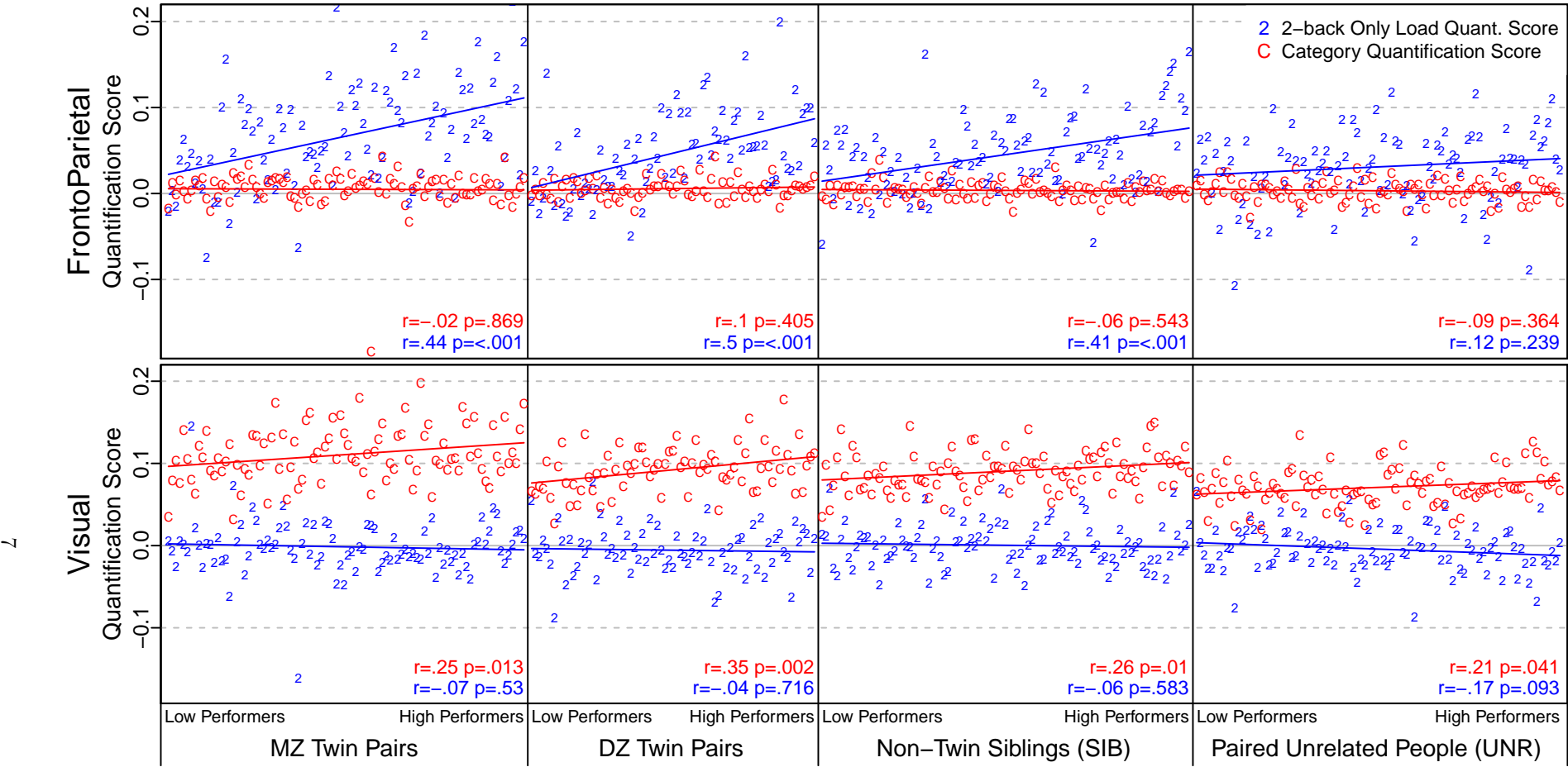
Quantification of each set of paired participants' similarity matrix to the Load (blue, L, with both 0 and 2-back) and Category (red, C). The paired participants are arrayed along the x-axis **in arbitrary order within each type** (MZ, DZ, SIB, UNR), with the two quantifications for each pair of participants in each column. The participants are shown in arbitrary order here to provide a contrast for the appearance when participants are sorted by behavioral performance in the next figure. Also, several participants are missing behavioral performance data, so are included here, but omitted from the next graph.



Quantification of each set of paired participants' similarity matrix to the Load (blue, L, with both 0 and 2-back) and Category (red, S) The paired participants are arrayed along the x-axis in **order of increasing mean behavioral performance** within each type (MZ, DZ, SIB, UNR), with the two quantification scores in each column. Displayed correlation and regression lines are between the quantification score and subject order (1:n), not the actual mean pairwise behavior. Figure 9 in the main manuscript.

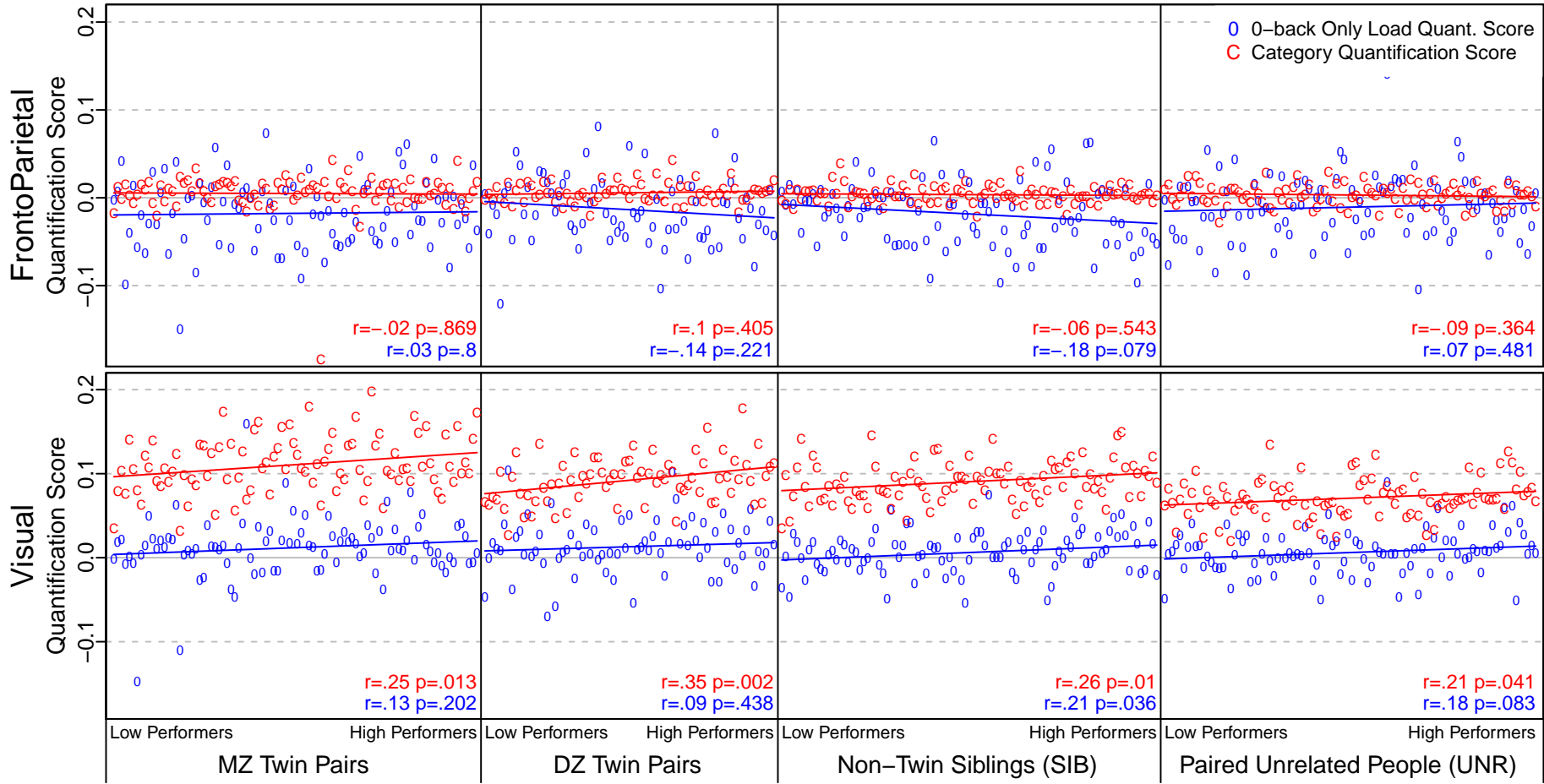


Same, but Load quantified using **2-back only**.



Same, but Load quantified using **0-back only**.

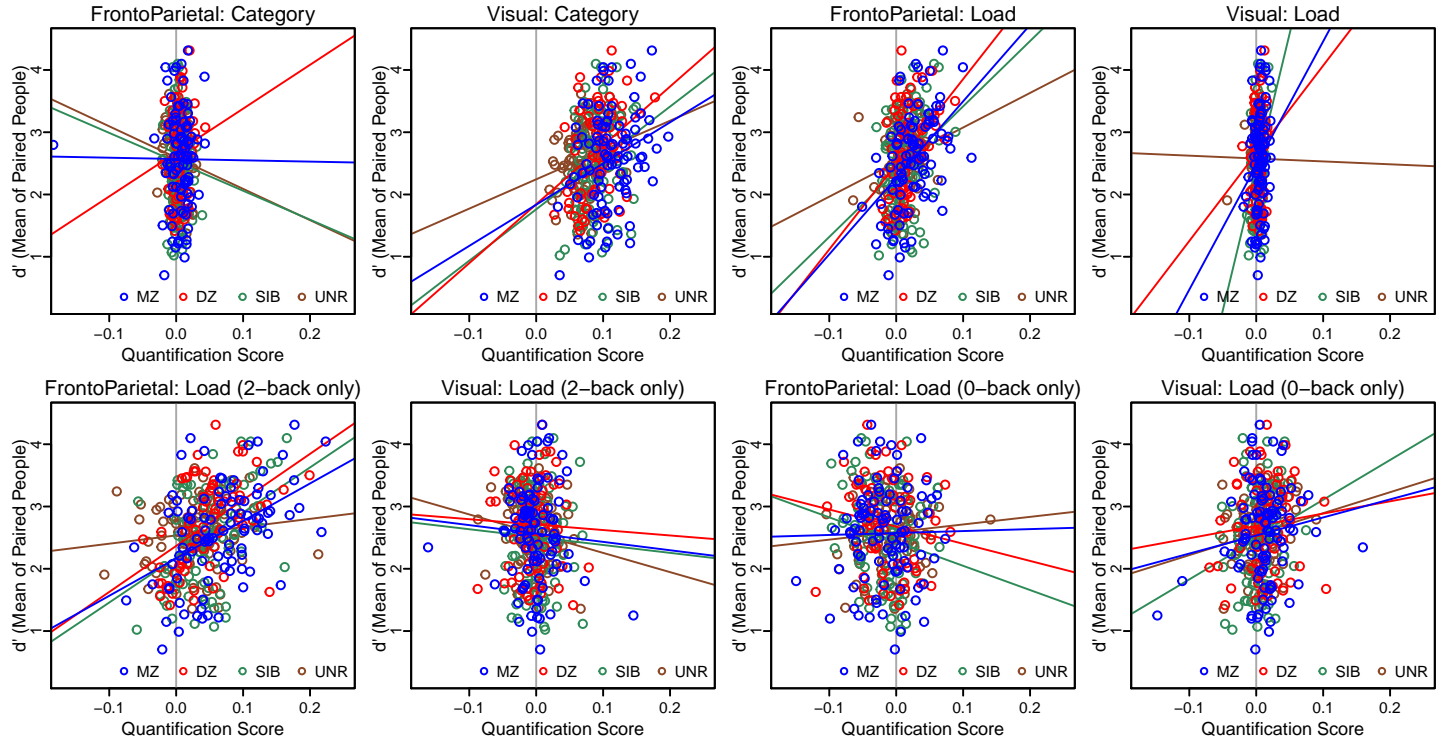
8





## S4.3 Pairwise quantification scores: correlation with behavior

The correlation between the average of pair's behavioral performance ( $d'$ ) and the pairwise quantification as specified by the Load and Category references. The correlations are listed below the graphs; p-values for each in parentheses, from `hc4wtest`, and uncorrected for multiple comparisons. Tests for pairwise correlation differences follow.



	MZ	DZ	SIB	UNR
FrontoParietal, Category	-.01 (.918)	.11 (.24)	-.06 (.536)	-.12 (.25)
Visual, Category	.28 (.006)	.36 (.004)	.26 (.024)	.21 (.024)
FrontoParietal, Load	.47 (<.001)	.41 (<.001)	.29 (.002)	.22 (.098)
Visual, Load	.19 (.04)	.14 (.18)	.34 (.004)	-.01 (.974)
FrontoParietal, Load (2-back only)	.46 (<.001)	.49 (<.001)	.43 (<.001)	.12 (.274)
Visual, Load (2-back only)	-.06 (.706)	-.03 (.792)	-.04 (.706)	-.16 (.176)
FrontoParietal, Load (0-back only)	.02 (.876)	-.15 (.264)	-.18 (.082)	.09 (.344)
Visual, Load (0-back only)	.13 (.246)	.09 (.49)	.21 (.04)	.16 (.086)

### FrontoParietal, Category

	MZ	DZ	SIB	UNR
MZ				
DZ	.635			
SIB	.826	.212		
UNR	.662	.106	.694	

### Visual, Category

	MZ	DZ	SIB	UNR
MZ				
DZ	.573			
SIB	.902	.513		
UNR	.591	.27	.705	

### FrontoParietal, Load

	MZ	DZ	SIB	UNR
MZ				
DZ	.692			
SIB	.235	.38		
UNR	.115	.19	.632	

### Visual, Load

	MZ	DZ	SIB	UNR
MZ				
DZ	.698			
SIB	.275	.172		
UNR	.564	.684	.315	

**FrontoParietal, Load (2-back only)**

	MZ	DZ	SIB	UNR
MZ				
DZ	.798			
SIB	.837	.663		
UNR	.03	.021	.06	

**Visual, Load (2-back only)**

	MZ	DZ	SIB	UNR
MZ				
DZ	.918			
SIB	.947	.962		
UNR	.592	.511	.491	

**FrontoParietal, Load (0-back only)**

	MZ	DZ	SIB	UNR
MZ				
DZ	.348			
SIB	.179	.83		
UNR	.62	.16	.054	

**Visual, Load (0-back only)**

	MZ	DZ	SIB	UNR
MZ				
DZ	.813			
SIB	.639	.486		
UNR	.845	.662	.768	

## S4.4 Pairwise quantification scores: multiple regression

These models have pairwise quantification score as the outcome variable, predicted by the  $d'$  of person 1 of each pair (`dprime.1`),  $d'$  of person 2 of the pair (`dprime.2`), single-subject quantification score of person 1 (`q.1`), or single-subject quantification score of person 2 (`q.2`).

Load, FrontoParietal, MZ twins.

```
mreg.tbl <- get.tbl("MZ", "load", "FrontoParietal", "0and2back"); # Load quantified with 0 & 2-back trials
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # full model F very similar to with just 2-back; dprime.2 and q.1 less sig. here

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.06861 -0.01293 -0.00044  0.01593  0.06073
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.027440   0.008627  -3.181 0.002023 **
## mreg.tbl$dprime.1  0.010215   0.002850   3.584 0.000552 ***
## mreg.tbl$dprime.2  0.004629   0.003215   1.440 0.153428
## mreg.tbl$q.1      0.030735   0.020615   1.491 0.139510
## mreg.tbl$q.2      0.080197   0.016527   4.852 5.16e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02365 on 89 degrees of freedom
## Multiple R-squared:  0.3914, Adjusted R-squared:  0.3641
## F-statistic: 14.31 on 4 and 89 DF, p-value: 4.653e-09

beta.coef(lm.full); # standardized b values (betas)

##
## Beta Coefficients for: lm.full
##
##              mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coef           0.3329155           0.1364896           0.1245931           0.414079

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # just d primes significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.061561 -0.016580 -0.003902  0.014355  0.087696
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.021038   0.009493  -2.216 0.02917 *
## mreg.tbl$dprime.1  0.009093   0.003158   2.880 0.00496 **
## mreg.tbl$dprime.2  0.008631   0.003490   2.473 0.01527 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02651 on 91 degrees of freedom
```

```
## Multiple R-squared:  0.2181, Adjusted R-squared:  0.2009
## F-statistic: 12.69 on 2 and 91 DF,  p-value: 1.373e-05

anova(lm.full, lm.d12);  # full better than just d primes

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
##      Res.Df      RSS Df Sum of Sq      F      Pr(>F)
## 1         89 0.049778
## 2         91 0.063951 -2 -0.014173 12.67 1.439e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12);  # just qs significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.089254 -0.016967 -0.000322  0.020696  0.057399
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.008468   0.004452   1.902   0.0604 .
## mreg.tbl$q.1  0.045162   0.022746   1.985   0.0501 .
## mreg.tbl$q.2  0.085876   0.017858   4.809 5.98e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02636 on 91 degrees of freedom
## Multiple R-squared:  0.2267, Adjusted R-squared:  0.2097
## F-statistic: 13.34 on 2 and 91 DF,  p-value: 8.332e-06

anova(lm.full, lm.q12);  # full better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##      Res.Df      RSS Df Sum of Sq      F      Pr(>F)
## 1         89 0.049778
## 2         91 0.063253 -2 -0.013475 12.046 2.345e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

#####
mreg.tbl <- get.tbl("MZ", "load", "FrontoParietal", "just2back");  # Load quantified with 2-back trials only
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);  # full model F very similar to with just 2-back; dprime.2 and q.1 less sig. here

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
```

```
##           Min           1Q           Median           3Q           Max
## -0.141450 -0.030320  0.000398  0.031962  0.106073
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.039632   0.017204  -2.304  0.02357 *
## mreg.tbl$dprime.1  0.016468   0.005684   2.898  0.00473 **
## mreg.tbl$dprime.2  0.011788   0.006411   1.839  0.06931 .
## mreg.tbl$q.1      0.169016   0.041109   4.111 8.74e-05 ***
## mreg.tbl$q.2      0.109538   0.032957   3.324  0.00129 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04716 on 89 degrees of freedom
## Multiple R-squared:  0.3936, Adjusted R-squared:  0.3663
## F-statistic: 14.44 on 4 and 89 DF,  p-value: 3.991e-09

beta.coef(lm.full); # standardized b values (betas)

##
## Beta Coefficients for: lm.full
##
##           mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coef           0.2686725           0.1739807           0.3429649           0.2831129

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # just d primes significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##           Min           1Q           Median           3Q           Max
## -0.121017 -0.033064 -0.000429  0.033372  0.149664
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.022587   0.019077  -1.184  0.23948
## mreg.tbl$dprime.1  0.016778   0.006346   2.644  0.00965 **
## mreg.tbl$dprime.2  0.018008   0.007014   2.567  0.01188 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.05327 on 91 degrees of freedom
## Multiple R-squared:  0.2088, Adjusted R-squared:  0.1914
## F-statistic: 12.01 on 2 and 91 DF,  p-value: 2.356e-05

anova(lm.full, lm.d12); # full better than just d primes

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##           mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
##   Res.Df    RSS Df Sum of Sq    F    Pr(>F)
## 1      89 0.19795
## 2      91 0.25827 -2 -0.060317 13.559 7.238e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12); # just qs significant
```

```
##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.175301 -0.031483  0.002878  0.032122  0.117567
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.028177   0.008732   3.227 0.001740 **
## mreg.tbl$q.1  0.195376   0.044609   4.380 3.17e-05 ***
## mreg.tbl$q.2  0.124138   0.035023   3.545 0.000623 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.05171 on 91 degrees of freedom
## Multiple R-squared:  0.2547, Adjusted R-squared:  0.2383
## F-statistic: 15.55 on 2 and 91 DF,  p-value: 1.553e-06

anova(lm.full, lm.q12); # full better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df    RSS Df Sum of Sq    F    Pr(>F)
## 1      89 0.19795
## 2      91 0.24328 -2 -0.045332 10.191 0.0001035 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

#####
mreg.tbl <- get.tbl("MZ", "load", "FrontoParietal", "justOback"); # Load quantified with O-back trials only
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # full model with just O-back Load quantification less significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.082119 -0.025182 -0.000283  0.024360  0.082326
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.015248   0.013701  -1.113  0.26873
## mreg.tbl$dprime.1  0.003961   0.004526   0.875  0.38386
## mreg.tbl$dprime.2 -0.002530   0.005106  -0.495  0.62153
## mreg.tbl$q.1     -0.107545   0.032738  -3.285  0.00146 **
## mreg.tbl$q.2      0.050855   0.026247   1.938  0.05584 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03756 on 89 degrees of freedom
## Multiple R-squared:  0.1447, Adjusted R-squared:  0.1063
## F-statistic: 3.765 on 4 and 89 DF,  p-value: 0.007087

beta.coef(lm.full);
```

```
##
## Beta Coefficients for: lm.full
##
##           mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coef           0.09636997           -0.05567414           -0.3254275           0.1960075

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12);      # not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.129968 -0.030594 -0.000373  0.025616  0.090688
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.0194878   0.0143749   -1.356   0.179
## mreg.tbl$dprime.1  0.0014090   0.0047818    0.295   0.769
## mreg.tbl$dprime.2 -0.0007473   0.0052857   -0.141   0.888
##
## Residual standard error: 0.04014 on 91 degrees of freedom
## Multiple R-squared:  0.0009556, Adjusted R-squared:  -0.021
## F-statistic: 0.04352 on 2 and 91 DF,  p-value: 0.9574

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12);      # just qs significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.08481 -0.02554 -0.00019  0.02534  0.08349
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.01124   0.00630   -1.784  0.07771 .
## mreg.tbl$q.1  -0.10505   0.03219   -3.264  0.00155 **
## mreg.tbl$q.2   0.04761   0.02527    1.884  0.06272 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03731 on 91 degrees of freedom
## Multiple R-squared:  0.1372, Adjusted R-squared:  0.1182
## F-statistic: 7.236 on 2 and 91 DF,  p-value: 0.001212

anova(lm.full, lm.q12);      # full NOT better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##           mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1       89 0.12555
## 2       91 0.12665 -2 -0.001102 0.3906 0.6778
```

## Load, FrontoParietal, DZ twins.

```
mreg.tbl <- get.tbl("DZ", "load", "FrontoParietal", "0and2back"); # Load quantified with 0 & 2-back trials
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # q scores more significant than d' (opposite of when just 2-back Load quantification)

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.038235 -0.012119 -0.000609  0.011419  0.051619
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.015051   0.008881  -1.695   0.0946 .
## mreg.tbl$dprime.1  0.003423   0.002424   1.412   0.1624
## mreg.tbl$dprime.2  0.004844   0.002968   1.632   0.1071
## mreg.tbl$q.1      0.040562   0.019777   2.051   0.0440 *
## mreg.tbl$q.2      0.041779   0.015353   2.721   0.0082 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01868 on 70 degrees of freedom
## Multiple R-squared:  0.2922, Adjusted R-squared:  0.2517
## F-statistic: 7.223 on 4 and 70 DF,  p-value: 6.277e-05

beta.coef(lm.full); # standardized b values (betas)

##
## Beta Coefficients for: lm.full
##
##      mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coef           0.1589232           0.1787022     0.2250948     0.2901622

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # model significant, both people's d's significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.036403 -0.013121 -0.000647  0.010917  0.060411
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.018501   0.009377  -1.973   0.0523 .
## mreg.tbl$dprime.1  0.005440   0.002379   2.287   0.0252 *
## mreg.tbl$dprime.2  0.007496   0.002994   2.504   0.0146 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01989 on 72 degrees of freedom
## Multiple R-squared:  0.1745, Adjusted R-squared:  0.1515
## F-statistic: 7.608 on 2 and 72 DF,  p-value: 0.001006

anova(lm.full, lm.d12); # full better than just d primes

## Analysis of Variance Table
##
```



```

## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
##   Res.Df      RSS Df Sum of Sq      F Pr(>F)
## 1      70 0.024421
## 2      72 0.028481 -2 -0.0040608 5.8199 0.00459 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12)  # model significant, both people's qs significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.042261 -0.011995  0.000189  0.013225  0.055160
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.004624   0.003485   1.327 0.188696
## mreg.tbl$q.1  0.054960   0.018617   2.952 0.004258 **
## mreg.tbl$q.2  0.051995   0.014875   3.495 0.000814 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01917 on 72 degrees of freedom
## Multiple R-squared:  0.233, Adjusted R-squared:  0.2117
## F-statistic: 10.93 on 2 and 72 DF,  p-value: 7.133e-05

anova(lm.full, lm.q12);  # full marginally better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df      RSS Df Sum of Sq      F Pr(>F)
## 1      70 0.024421
## 2      72 0.026463 -2 -0.0020424 2.9272 0.06013 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

#####
mreg.tbl <- get.tbl("DZ", "load", "FrontoParietal", "just2back");  # Load quantified with 2-back trials only
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);  # q scores more significant than d' (opposite of when just 2-back Load quantification)

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.085879 -0.026186 -0.008619  0.022745  0.118928
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.042705   0.019617  -2.177  0.03285 *
## mreg.tbl$dprime.1  0.010324   0.005355   1.928  0.05792 .

```

```
## mreg.tbl$dprime.2 0.017956 0.006556 2.739 0.00781 **
## mreg.tbl$q.1 0.071261 0.043685 1.631 0.10733
## mreg.tbl$q.2 0.037427 0.033913 1.104 0.27353
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04126 on 70 degrees of freedom
## Multiple R-squared: 0.2889, Adjusted R-squared: 0.2483
## F-statistic: 7.111 on 4 and 70 DF, p-value: 7.284e-05

beta.coef(lm.full); # standardized b values (betas)

##
## Beta Coefficients for: lm.full
##
## mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coeff 0.2174759 0.3005738 0.1794359 0.1179456

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # model significant, both people's d's significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
## Min 1Q Median 3Q Max
## -0.090080 -0.025317 -0.009442 0.020831 0.123691
##
## Coefficients:
## Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.046097 0.019704 -2.339 0.02209 *
## mreg.tbl$dprime.1 0.013792 0.004999 2.759 0.00735 **
## mreg.tbl$dprime.2 0.020387 0.006291 3.241 0.00181 **
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0418 on 72 degrees of freedom
## Multiple R-squared: 0.2495, Adjusted R-squared: 0.2286
## F-statistic: 11.97 on 2 and 72 DF, p-value: 3.263e-05

anova(lm.full, lm.d12); # full better than just d primes

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
## mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
## Res.Df RSS Df Sum of Sq F Pr(>F)
## 1 70 0.11915
## 2 72 0.12577 -2 -0.0066182 1.944 0.1508

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12) # model significant, both people's qs significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
## Min 1Q Median 3Q Max
## -0.08666 -0.02977 -0.00355 0.02855 0.12627
##
```

```
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.024985   0.008099   3.085  0.00289 **
## mreg.tbl$q.1  0.116772   0.043270   2.699  0.00867 **
## mreg.tbl$q.2  0.074072   0.034574   2.142  0.03554 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04456 on 72 degrees of freedom
## Multiple R-squared:  0.1469, Adjusted R-squared:  0.1232
## F-statistic: 6.199 on 2 and 72 DF,  p-value: 0.003282

anova(lm.full, lm.q12); # full marginally better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##       mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df    RSS Df Sum of Sq    F Pr(>F)
## 1      70 0.11915
## 2      72 0.14296 -2 -0.023805 6.9924 0.001704 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

## Load, FrontoParietal, SIB.

```
mreg.tbl <- get.tbl("SIB", "load", "FrontoParietal", "0and2back"); # Load quantified with 0 & 2-back trials
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # overall model, q.2 sig.

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.041467 -0.013244 -0.001844  0.013288  0.064466
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.006947   0.007237  -0.960   0.33964
## mreg.tbl$dprime.1  0.003090   0.002331   1.326   0.18826
## mreg.tbl$dprime.2  0.003278   0.002729   1.201   0.23272
## mreg.tbl$q.1     -0.007652   0.015625  -0.490   0.62550
## mreg.tbl$q.2      0.049875   0.017022   2.930   0.00427 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01963 on 92 degrees of freedom
## Multiple R-squared:  0.1704, Adjusted R-squared:  0.1344
## F-statistic: 4.725 on 4 and 92 DF,  p-value: 0.001636

beta.coef(lm.full); # standardized b values (betas)

##
## Beta Coefficients for: lm.full
##
##              mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coeff           0.148473           0.1286318    -0.0527755    0.3013414

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # model significant; dprime.2 more sig. than dprime.1

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.04844 -0.01290 -0.00207  0.01090  0.07121
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.008829   0.007457  -1.184   0.2394
## mreg.tbl$dprime.1  0.002797   0.002161   1.294   0.1988
## mreg.tbl$dprime.2  0.005954   0.002646   2.250   0.0268 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02031 on 94 degrees of freedom
## Multiple R-squared:  0.09299, Adjusted R-squared:  0.07369
## F-statistic: 4.819 on 2 and 94 DF,  p-value: 0.01018

anova(lm.full, lm.d12); # full better than just d primes

## Analysis of Variance Table
##
```

```

## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
##   Res.Df      RSS Df Sum of Sq      F Pr(>F)
## 1      92 0.035462
## 2      94 0.038772 -2 -0.0033099 4.2935 0.01649 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12)  # model significant; q.2 significant (not q.1)

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.037100 -0.014787 -0.000977  0.015553  0.065010
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.007016   0.002980   2.354 0.020636 *
## mreg.tbl$q.1  0.001364   0.014215   0.096 0.923765
## mreg.tbl$q.2  0.058782   0.016227   3.622 0.000473 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01992 on 94 degrees of freedom
## Multiple R-squared:  0.1275, Adjusted R-squared:  0.1089
## F-statistic: 6.866 on 2 and 94 DF,  p-value: 0.001648

anova(lm.full, lm.q12);  # full marginally better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df      RSS Df Sum of Sq      F Pr(>F)
## 1      92 0.035462
## 2      94 0.037298 -2 -0.0018366 2.3823 0.09801 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

#####
mreg.tbl <- get.tbl("SIB", "load", "FrontoParietal", "just2back");  # Load quantified with 2-back trials only
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);  # overall model, q.2 & dprime.1 sig.

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.103441 -0.027116 -0.003808  0.024853  0.110742
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.012168   0.014612  -0.833  0.40714
## mreg.tbl$dprime.1  0.015470   0.004707   3.287  0.00144 **

```

```
## mreg.tbl$dprime.2 0.004930 0.005510 0.895 0.37321
## mreg.tbl$q.1 -0.012204 0.031548 -0.387 0.69976
## mreg.tbl$q.2 0.081774 0.034367 2.379 0.01940 *
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03964 on 92 degrees of freedom
## Multiple R-squared: 0.2339, Adjusted R-squared: 0.2006
## F-statistic: 7.023 on 4 and 92 DF, p-value: 5.583e-05

beta.coef(lm.full); # standardized b values (betas)

##
## Beta Coefficients for: lm.full
##
## mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coef 0.3537495 0.09207646 -0.04006272 0.2351523

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # model significant; dprime.1 more sig. than dprime.2

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
## Min 1Q Median 3Q Max
## -0.114865 -0.026501 -0.003329 0.025972 0.130195
##
## Coefficients:
## Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.015254 0.014835 -1.028 0.306480
## mreg.tbl$dprime.1 0.015011 0.004299 3.491 0.000734 ***
## mreg.tbl$dprime.2 0.009313 0.005264 1.769 0.080136 .
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04041 on 94 degrees of freedom
## Multiple R-squared: 0.1868, Adjusted R-squared: 0.1695
## F-statistic: 10.79 on 2 and 94 DF, p-value: 6.026e-05

anova(lm.full, lm.d12); # full marginally better than just d primes

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
## mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
## Res.Df RSS Df Sum of Sq F Pr(>F)
## 1 92 0.14456
## 2 94 0.15346 -2 -0.0088989 2.8317 0.06406 .
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12) # model significant; q.2 significant (not q.1)

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
## Min 1Q Median 3Q Max
```

```
## -0.09266 -0.02948 -0.00268 0.02924 0.10877
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.030529 0.006332 4.821 5.48e-06 ***
## mreg.tbl$q.1 0.033321 0.030206 1.103 0.27279
## mreg.tbl$q.2 0.100667 0.034482 2.919 0.00439 **
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04233 on 94 degrees of freedom
## Multiple R-squared: 0.1075, Adjusted R-squared: 0.08851
## F-statistic: 5.661 on 2 and 94 DF, p-value: 0.004771

anova(lm.full, lm.q12); # full better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##           mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df    RSS Df Sum of Sq    F    Pr(>F)
## 1      92 0.14456
## 2      94 0.16842 -2 -0.023858 7.5916 0.000888 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

## Load, FrontoParietal, UNR.

```
mreg.tbl <- get.tbl("UNR", "load", "FrontoParietal", "0and2back"); # Load quantified with 0 & 2-back trials
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # full model not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.070452 -0.012878  0.002068  0.012642  0.055663
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.013334   0.010391  -1.283   0.2027
## mreg.tbl$dprime.1  0.002204   0.002460   0.896   0.3726
## mreg.tbl$dprime.2  0.006178   0.002514   2.457   0.0159 *
## mreg.tbl$q.1      0.021338   0.015770   1.353   0.1794
## mreg.tbl$q.2     -0.008848   0.015569  -0.568   0.5712
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01996 on 91 degrees of freedom
## Multiple R-squared:  0.08003, Adjusted R-squared:  0.0396
## F-statistic: 1.979 on 4 and 91 DF,  p-value: 0.1043

#####
mreg.tbl <- get.tbl("UNR", "load", "FrontoParietal", "just2back"); # Load quantified with 2-back trials only
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # full model not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.134297 -0.022106  0.004223  0.028455  0.182749
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.0009938  0.0245576   0.040   0.968
## mreg.tbl$dprime.1 0.0034855  0.0058132   0.600   0.550
## mreg.tbl$dprime.2 0.0062636  0.0059420   1.054   0.295
## mreg.tbl$q.1     0.0359413  0.0372700   0.964   0.337
## mreg.tbl$q.2     0.0014002  0.0367958   0.038   0.970
##
## Residual standard error: 0.04716 on 91 degrees of freedom
## Multiple R-squared:  0.02467, Adjusted R-squared: -0.0182
## F-statistic: 0.5754 on 4 and 91 DF,  p-value: 0.6812
```



## Load, Visual

```
mreg.tbl <- get.tbl("MZ", "load", "Visual", "0and2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);      # not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.0227740 -0.0033986 -0.0005491  0.0050181  0.0155339
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.0006025   0.0027749   0.217   0.829
## mreg.tbl$dprime.1 0.0009046   0.0009378   0.965   0.337
## mreg.tbl$dprime.2 0.0010254   0.0009851   1.041   0.301
## mreg.tbl$q.1    -0.0039609   0.0091008  -0.435   0.664
## mreg.tbl$q.2     0.0069800   0.0091563   0.762   0.448
##
## Residual standard error: 0.007481 on 89 degrees of freedom
## Multiple R-squared:  0.04372, Adjusted R-squared:  0.0007459
## F-statistic: 1.017 on 4 and 89 DF,  p-value: 0.4028

#####
mreg.tbl <- get.tbl("DZ", "load", "Visual", "0and2back");
mreg.tbl <- mreg.tbl[which(!is.na(mreg.tbl$dprime.1) & !is.na(mreg.tbl$dprime.2)),]; # complete cases only
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);      # not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.0235643 -0.0044179  0.0007246  0.0043138  0.0146575
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.0007907   0.0035136   0.225   0.823
## mreg.tbl$dprime.1 0.0006664   0.0008516   0.783   0.436
## mreg.tbl$dprime.2 0.0006898   0.0010621   0.649   0.518
## mreg.tbl$q.1     0.0099750   0.0100770   0.990   0.326
## mreg.tbl$q.2    -0.0033109   0.0135113  -0.245   0.807
##
## Residual standard error: 0.006933 on 70 degrees of freedom
## Multiple R-squared:  0.03223, Adjusted R-squared: -0.02307
## F-statistic: 0.5829 on 4 and 70 DF,  p-value: 0.6761

#####
mreg.tbl <- get.tbl("SIB", "load", "Visual", "0and2back");
mreg.tbl <- mreg.tbl[which(!is.na(mreg.tbl$dprime.1) & !is.na(mreg.tbl$dprime.2)),]; # complete cases only
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);      # model and dprime.1 significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
```

```
##      mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min        1Q      Median        3Q      Max
## -0.0147319 -0.0027595 -0.0001169  0.0028090  0.0163668
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.0029932  0.0022968  -1.303   0.1957
## mreg.tbl$dprime.1  0.0013864  0.0005875   2.360   0.0204 *
## mreg.tbl$dprime.2  0.0009060  0.0007437   1.218   0.2263
## mreg.tbl$q.1      0.0055908  0.0083063   0.673   0.5026
## mreg.tbl$q.2     -0.0089595  0.0083592  -1.072   0.2866
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.005475 on 92 degrees of freedom
## Multiple R-squared:  0.1311, Adjusted R-squared:  0.09335
## F-statistic: 3.471 on 4 and 92 DF,  p-value: 0.01094

beta.coef(lm.full);

##
## Beta Coefficients for: lm.full
##
##      mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coeff           0.2444302           0.1304575   0.06631398   -0.1115797

#####
mreg.tbl <- get.tbl("UNR", "load", "Visual", "0and2back");
mreg.tbl <- mreg.tbl[which(!is.na(mreg.tbl$dprime.1) & !is.na(mreg.tbl$dprime.2)),]; # complete cases only
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min        1Q      Median        3Q      Max
## -0.039197 -0.003043  0.000108  0.003481  0.014247
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.0004939  0.0035754  -0.138   0.890
## mreg.tbl$dprime.1 -0.0001543  0.0008574  -0.180   0.858
## mreg.tbl$dprime.2 -0.0003624  0.0008073  -0.449   0.655
## mreg.tbl$q.1     -0.0082003  0.0073096  -1.122   0.265
## mreg.tbl$q.2     -0.0142187  0.0072522  -1.961   0.053 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.006729 on 91 degrees of freedom
## Multiple R-squared:  0.05341, Adjusted R-squared:  0.0118
## F-statistic: 1.284 on 4 and 91 DF,  p-value: 0.2823
```

## Category, FrontoParietal

```
mreg.tbl <- get.tbl("MZ", "picture", "FrontoParietal", "0and2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.077795 -0.010147 -0.001184  0.010828  0.059789
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.0037745   0.0068723   -0.549    0.584
## mreg.tbl$dprime.1 -0.0003788   0.0022545   -0.168    0.867
## mreg.tbl$dprime.2 -0.0003508   0.0024951   -0.141    0.889
## mreg.tbl$q.1     -0.0065955   0.0246884   -0.267    0.790
## mreg.tbl$q.2     -0.1102434   0.0146300   -7.535 3.86e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01863 on 89 degrees of freedom
## Multiple R-squared:  0.4067, Adjusted R-squared:  0.38
## F-statistic: 15.25 on 4 and 89 DF, p-value: 1.56e-09

beta.coef(lm.full); # standardized b values (betas)

##
## Beta Coefficients for: lm.full
##
##           mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coeff      -0.01547692      -0.01296605  -0.02213853  -0.6343888

#####
mreg.tbl <- get.tbl("DZ", "picture", "FrontoParietal", "0and2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # full model not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.026618 -0.006698 -0.000581  0.006196  0.037037
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.002567   0.005552   0.462    0.645
## mreg.tbl$dprime.1 0.001764   0.001498   1.178    0.243
## mreg.tbl$dprime.2 0.000226   0.001758   0.129    0.898
## mreg.tbl$q.1     0.003960   0.017778   0.223    0.824
## mreg.tbl$q.2     0.017490   0.017952   0.974    0.333
##
## Residual standard error: 0.0115 on 70 degrees of freedom
## Multiple R-squared:  0.03011, Adjusted R-squared: -0.02531
## F-statistic: 0.5434 on 4 and 70 DF, p-value: 0.7044
```

```
#####
mreg.tbl <- get.tbl("SIB", "picture", "FrontoParietal", "Oand2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);      # full model not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.026357 -0.006438 -0.000198  0.003950  0.034375
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.0066888  0.0037611   1.778   0.0786 .
## mreg.tbl$dprime.1  0.0005117  0.0011159   0.459   0.6476
## mreg.tbl$dprime.2 -0.0017515  0.0013056  -1.342   0.1830
## mreg.tbl$q.1     -0.0051238  0.0129622  -0.395   0.6935
## mreg.tbl$q.2      0.0035409  0.0081748   0.433   0.6659
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.009964 on 92 degrees of freedom
## Multiple R-squared:  0.02485, Adjusted R-squared:  -0.01755
## F-statistic: 0.5861 on 4 and 92 DF,  p-value: 0.6735

#####
mreg.tbl <- get.tbl("UNR", "picture", "FrontoParietal", "Oand2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full);      # full model not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.0313974 -0.0078766  0.0008342  0.0077762  0.0260617
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.0098386  0.0063044   1.561   0.122
## mreg.tbl$dprime.1 -0.0022481  0.0014462  -1.555   0.124
## mreg.tbl$dprime.2 -0.0003369  0.0014572  -0.231   0.818
## mreg.tbl$q.1     -0.0036457  0.0131217  -0.278   0.782
## mreg.tbl$q.2      0.0053317  0.0151964   0.351   0.727
##
## Residual standard error: 0.01204 on 91 degrees of freedom
## Multiple R-squared:  0.02985, Adjusted R-squared:  -0.0128
## F-statistic: 0.7 on 4 and 91 DF,  p-value: 0.594
```

## Category, Visual, MZ twins.

```
mreg.tbl <- get.tbl("MZ", "picture", "Visual", "Oand2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # only qs predict

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.069442 -0.013383  0.001982  0.015416  0.060070
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.046993   0.009039   5.199 1.27e-06 ***
## mreg.tbl$dprime.1 -0.002575   0.002912  -0.884   0.379
## mreg.tbl$dprime.2  0.004552   0.003054   1.490   0.140
## mreg.tbl$q.1      0.095471   0.018099   5.275 9.24e-07 ***
## mreg.tbl$q.2      0.098632   0.017043   5.787 1.05e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02316 on 89 degrees of freedom
## Multiple R-squared:  0.5305, Adjusted R-squared:  0.5094
## F-statistic: 25.14 on 4 and 89 DF, p-value: 6.006e-14

beta.coef(lm.full); # standardized b values (betas)

##
## Beta Coefficients for: lm.full
##
##              mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coeff      -0.07525471      0.1203755      0.4236487      0.4561818

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # model significant, but not either predictor

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.069323 -0.019939 -0.005095  0.023730  0.082396
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.080146   0.011490   6.975 4.77e-10 ***
## mreg.tbl$dprime.1 0.005848   0.003822   1.530   0.129
## mreg.tbl$dprime.2 0.006058   0.004225   1.434   0.155
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03209 on 91 degrees of freedom
## Multiple R-squared:  0.07868, Adjusted R-squared:  0.05843
## F-statistic: 3.886 on 2 and 91 DF, p-value: 0.02403

anova(lm.full, lm.d12); # full MUCH better than just d primes

## Analysis of Variance Table
##
```

```
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
##   Res.Df      RSS Df Sum of Sq      F      Pr(>F)
## 1      89 0.047744
## 2      91 0.093691 -2 -0.045947 42.826 9.359e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12); # significant, as are both predictors

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.069551 -0.014445  0.001776  0.014536  0.060548
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.052099   0.006414   8.123 2.13e-12 ***
## mreg.tbl$q.1  0.094366   0.017498   5.393 5.44e-07 ***
## mreg.tbl$q.2  0.098882   0.016788   5.890 6.42e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0232 on 91 degrees of freedom
## Multiple R-squared:  0.5182, Adjusted R-squared:  0.5077
## F-statistic: 48.95 on 2 and 91 DF,  p-value: 3.703e-15

anova(lm.full, lm.q12); # full NOT better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df      RSS Df Sum of Sq      F Pr(>F)
## 1      89 0.047744
## 2      91 0.048990 -2 -0.0012467 1.162 0.3176
```

## Category, Visual, DZ twins.

```
mreg.tbl <- get.tbl("DZ", "picture", "Visual", "Oand2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # only qs predict

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.044050 -0.014475  0.001666  0.013334  0.053723
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.0302516  0.0098804   3.062  0.00312 **
## mreg.tbl$dprime.1 0.0035348  0.0023793   1.486  0.14187
## mreg.tbl$dprime.2 -0.0004074  0.0031917  -0.128  0.89879
## mreg.tbl$q.1      0.0884379  0.0181564   4.871 6.66e-06 ***
## mreg.tbl$q.2      0.0900441  0.0186685   4.823 7.96e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01958 on 70 degrees of freedom
## Multiple R-squared:  0.5091, Adjusted R-squared:  0.481
## F-statistic: 18.15 on 4 and 70 DF, p-value: 2.882e-10

beta.coef(lm.full);

##
## Beta Coefficients for: lm.full
##
##              mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coeff      0.1303434      -0.01193948      0.4228271      0.4496157

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # significant, as are both predictors

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05406 -0.01449 -0.00094  0.01109  0.07391
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.053632  0.012104   4.431 3.29e-05 ***
## mreg.tbl$dprime.1 0.005981  0.003071   1.948  0.0554 .
## mreg.tbl$dprime.2 0.008184  0.003865   2.118  0.0376 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02567 on 72 degrees of freedom
## Multiple R-squared:  0.1321, Adjusted R-squared:  0.108
## F-statistic: 5.478 on 2 and 72 DF, p-value: 0.006099

anova(lm.full, lm.d12); # full MUCH better than just d primes

## Analysis of Variance Table
##
```

```
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
##   Res.Df      RSS Df Sum of Sq      F    Pr(>F)
## 1      70 0.026846
## 2      72 0.047462 -2 -0.020616 26.879 2.18e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12); # significant, as are both predictors

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.046876 -0.016011  0.000746  0.014658  0.048046
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.03673    0.00701   5.240 1.53e-06 ***
## mreg.tbl$q.1   0.08916    0.01793   4.973 4.33e-06 ***
## mreg.tbl$q.2   0.09554    0.01717   5.565 4.24e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01961 on 72 degrees of freedom
## Multiple R-squared:  0.4935, Adjusted R-squared:  0.4795
## F-statistic: 35.08 on 2 and 72 DF,  p-value: 2.313e-11

anova(lm.full, lm.q12); # full NOT better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df      RSS Df Sum of Sq      F    Pr(>F)
## 1      70 0.026846
## 2      72 0.027697 -2 -0.00085116 1.1097 0.3354
```



## Category, Visual, SIB.

```
mreg.tbl <- get.tbl("SIB", "picture", "Visual", "0and2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # only qs predict

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.040355 -0.012354 -0.002048  0.012504  0.054964
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.040402   0.009031   4.474  2.2e-05 ***
## mreg.tbl$dprime.1 0.001456   0.002174   0.669  0.504864
## mreg.tbl$dprime.2 0.002811   0.002749   1.022  0.309266
## mreg.tbl$q.1     0.073632   0.018165   4.054  0.000105 ***
## mreg.tbl$q.2     0.051351   0.015083   3.405  0.000983 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02032 on 92 degrees of freedom
## Multiple R-squared:  0.3068, Adjusted R-squared:  0.2766
## F-statistic: 10.18 on 4 and 92 DF,  p-value: 7.231e-07

beta.coef(lm.full);

##
## Beta Coefficients for: lm.full
##
##              mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coeff      0.06178332      0.09743839      0.3568729      0.3118903

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # significant; dprime.2 is as a predictor

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.041316 -0.015150 -0.000753  0.011328  0.062653
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.067911   0.008527   7.964  3.8e-12 ***
## mreg.tbl$dprime.1 0.002746   0.002471   1.111   0.2693
## mreg.tbl$dprime.2 0.006105   0.003026   2.017   0.0465 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02322 on 94 degrees of freedom
## Multiple R-squared:  0.07435, Adjusted R-squared:  0.05466
## F-statistic: 3.775 on 2 and 94 DF,  p-value: 0.02648

anova(lm.full, lm.d12); # full MUCH better than just d primes

## Analysis of Variance Table
##
```

```
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2
##   Res.Df      RSS Df Sum of Sq      F      Pr(>F)
## 1      92 0.037971
## 2      94 0.050703 -2 -0.012732 15.424 1.672e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12); # significant, as are both predictors

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.042960 -0.013780 -0.000242  0.011683  0.058219
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.048430   0.007089   6.832 8.25e-10 ***
## mreg.tbl$q.1  0.076336   0.018058   4.227 5.48e-05 ***
## mreg.tbl$q.2  0.057508   0.014410   3.991 0.00013 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02032 on 94 degrees of freedom
## Multiple R-squared:  0.2913, Adjusted R-squared:  0.2762
## F-statistic: 19.32 on 2 and 94 DF,  p-value: 9.39e-08

anova(lm.full, lm.q12); # full NOT better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df      RSS Df Sum of Sq      F Pr(>F)
## 1      92 0.037971
## 2      94 0.038821 -2 -0.00085009 1.0298 0.3611
```

## Category, Visual, UNR.

```
mreg.tbl <- get.tbl("UNR", "picture", "Visual", "0and2back");
lm.full <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 + mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.full); # only qs predict

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##     mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.053049 -0.010255 -0.001797  0.015126  0.053746
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.023574   0.010575   2.229  0.02826 *
## mreg.tbl$dprime.1 0.001016   0.002401   0.423  0.67314
## mreg.tbl$dprime.2 0.003998   0.002427   1.647  0.10292
## mreg.tbl$q.1     0.077240   0.013870   5.569 2.58e-07 ***
## mreg.tbl$q.2     0.041370   0.014416   2.870  0.00511 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01907 on 91 degrees of freedom
## Multiple R-squared:  0.3425, Adjusted R-squared:  0.3136
## F-statistic: 11.85 on 4 and 91 DF, p-value: 8.566e-08

beta.coef(lm.full);

##
## Beta Coefficients for: lm.full
##
##           mreg.tbl$dprime.1 mreg.tbl$dprime.2 mreg.tbl$q.1 mreg.tbl$q.2
## Beta.Coeff      0.04093326      0.1626418      0.5053713      0.2716084

lm.d12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2);
summary(lm.d12); # model not significant

##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.045561 -0.010553 -0.002242  0.013510  0.067170
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.047043   0.011779   3.994  0.00013 ***
## mreg.tbl$dprime.1 0.003887   0.002714   1.432  0.15547
## mreg.tbl$dprime.2 0.005299   0.002688   1.971  0.05165 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02273 on 93 degrees of freedom
## Multiple R-squared:  0.04558, Adjusted R-squared:  0.02505
## F-statistic: 2.221 on 2 and 93 DF, p-value: 0.1143

lm.q12 <- lm(mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2);
summary(lm.q12); # significant, as are both predictors
```

```
##
## Call:
## lm(formula = mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.054052 -0.011785 -0.002128  0.013563  0.050970
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.035032   0.005822   6.017 3.48e-08 ***
## mreg.tbl$q.1  0.074839   0.013078   5.723 1.27e-07 ***
## mreg.tbl$q.2  0.049888   0.013033   3.828 0.000234 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01914 on 93 degrees of freedom
## Multiple R-squared:  0.3229, Adjusted R-squared:  0.3084
## F-statistic: 22.18 on 2 and 93 DF,  p-value: 1.332e-08

anova(lm.full, lm.q12);  # full NOT better than just single-subject q scores

## Analysis of Variance Table
##
## Model 1: mreg.tbl$q.pairwise ~ mreg.tbl$dprime.1 + mreg.tbl$dprime.2 +
##      mreg.tbl$q.1 + mreg.tbl$q.2
## Model 2: mreg.tbl$q.pairwise ~ mreg.tbl$q.1 + mreg.tbl$q.2
##   Res.Df    RSS Df Sum of Sq   F Pr(>F)
## 1      91 0.033086
## 2      93 0.034072 -2 -0.00098675 1.357 0.2626
```