R01-FBS: Task EF x Risk Status Paper

Contents

1 Participant Characteristics (Demographics Database)

Table 1: Demographic Characteristics

Characteristic	**Low Risk**, N = 53	**High Risk**, N = 41	**Test Statistic**	**p-value**
Age, yr	7.8 [6.0 - 9.0]	7.8 [7.0 - 8.9]	0.41	0.7
Sex			1.5	0.2
Male	30 (57%)	18 (44%)		
Female	23 (43%)	23 (56%)		
Ethnicity				>0.9
Hispanic/Lantinx	0 (0%)	0 (0%)		
Not Hispanic/Lantinx	53 (100%)	41 (100%)		
Race				0.3
Asian	3 (5.7%)	0 (0%)		
Black/AA	0 (0%)	0 (0%)		
White/Caucasian	50 (94%)	41 (100%)		
Income			9.2	0.010
< $51,000	4 (7.7%)	8 (21%)		
>$100,000	26 (50%)	8 (21%)		
$51,000 - $100,000	22 (42%)	23 (59%)		
Unknown	1	2		
Mother's Education				0.006
> Bachelor Degree	23 (44%)	6 (15%)		
AA/Technical Degree	3 (5.8%)	8 (20%)		
Bachelor Degree	23 (44%)	21 (51%)		
High School/GED	3 (5.8%)	6 (15%)		
Unknown	1	0		
Father's Education				<0.001
> Bachelor Degree	29 (55%)	4 (11%)		
AA/Technical Degree	3 (5.7%)	12 (33%)		
Bachelor Degree	15 (28%)	14 (39%)		
High School/GED	6 (11%)	5 (14%)		
Other/NA	0 (0%)	1 (2.8%)		
Unknown	0	5		
BMI %tile	41.7 [3.9 - 86.8]	56.7 [9.4 - 97.3]	-3.0	0.004
Total Body Fat %	27.1 [19.9 - 35.7]	30.6 [23.6 - 38.9]	-4.1	<0.001
Unknown	0	1		
Total Fat Mass	6,818.7 [4,524.0 - 11,510.0]	8,127.7 [5,784.0 - 12,677.0]	-3.7	<0.001
Unknown	0	1		
Visceral Fat Mass	157.2 [57.9 - 286.0]	161.2 [52.1 - 245.0]	-0.36	0.7
Unknown	0	1		
Lean Fat Mass	17,420.5 [13,488.2 - 25,165.4]	17,337.7 [12,619.2 - 23,592.7]	0.17	0.9
Unknown	0	1		
IQ	116.1 [77.0 - 160.0]	110.4 [91.0 - 133.0]	1.7	0.085
Unknown	11	14		

[1] Mean [Range]; n (%)

[2] Welch Two Sample t-test; Pearson's Chi-squared test; Fisher's exact test

2 Effect of Risk Status

2.1 Go-NoGo

Table 2: Go-NoGo Performance Summary

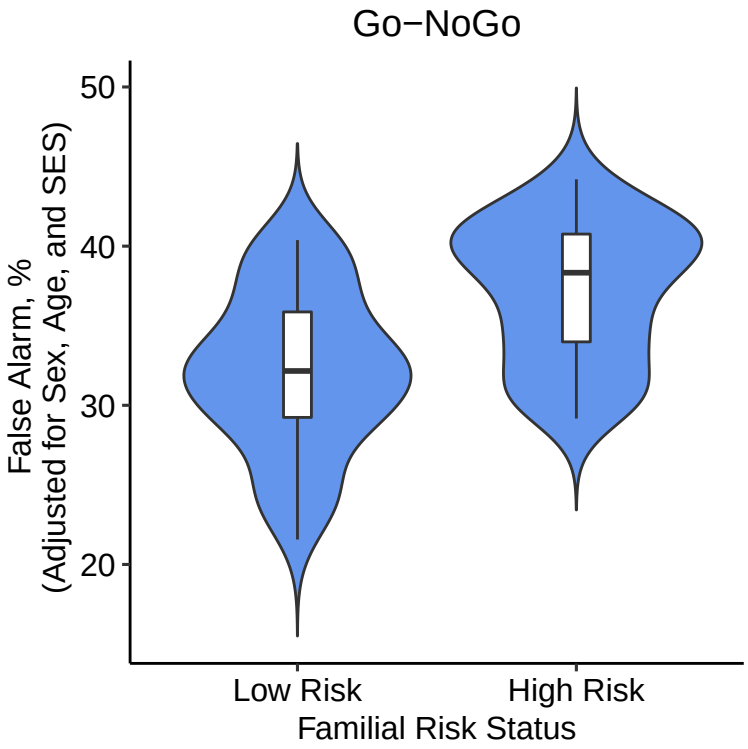
Characteristic	**Low Risk**, N = 53	**High Risk**, N = 39
Missed, N	4.6 (5.2)	3.9 (3.7)
False Alarm, N	16.0 (8.2)	18.9 (7.9)
Missed, %	3.1 (3.5)	2.6 (2.5)
False Alarm, %	32.0 (16.4)	37.8 (15.7)
Mean Hit RT, ms	543.6 (60.9)	544.9 (61.6)
Mean False Alarm RT, ms	432.5 (53.2)	426.6 (53.9)
d', loglinear	2.5 (0.7)	2.3 (0.6)

[1] Mean (SD)

2.1.1 Percent False Alarms

Table 3: Go-NoGo Percent False Alarms

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	437.242	145.747	0.596	0.619	NA
income	2	298.023	149.011	0.609	0.546	NA
sex	1	456.736	456.736	1.868	0.176	NA
age_yr	1	261.999	261.999	1.072	0.304	NA
risk_status_mom	1	998.965	998.965	4.086	0.047	*
Residuals	79	19315.354	244.498	NA	NA	NA



There was a significant effect of familial obesity risk such that children with high risk had a false alarm percentage that was 7.8 points higher than those with low risk. SES, age, and sex were not associated with false alarm percentage.

2.1.2 Percent Hits

Table 4: Go-NoGo - Percent Hits

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	30.828	10.276	1.045	0.378	NA
income	2	15.483	7.741	0.787	0.459	NA
sex	1	19.036	19.036	1.935	0.168	NA
age_yr	1	6.139	6.139	0.624	0.432	NA
risk_status_mom	1	0.093	0.093	0.009	0.923	NA
Residuals	79	777.131	9.837	NA	NA	NA

Correct responses to go stimuli did not differ by risk status, age, sex, or SES.

2.1.3 Go Reaction Time

Table 5: Go-NoGo - Go Reaction Time

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	3312.644	1104.215	0.314	0.815	NA
income	2	3355.935	1677.967	0.477	0.622	NA
sex	1	3791.772	3791.772	1.078	0.302	NA
age_yr	1	21155.799	21155.799	6.013	0.016	*
risk_status_mom	1	170.210	170.210	0.048	0.826	NA
Residuals	79	277958.459	3518.462	NA	NA	NA

Correct responses to go stimuli did not differ by risk status, sex, or SES. However, older children responded more quickly than younger children.

2.1.4 d'

Table 6: Go-NoGo - d'

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	0.016	0.005	0.013	0.998	NA
income	2	0.093	0.047	0.110	0.896	NA
sex	1	1.103	1.103	2.608	0.110	NA
age_yr	1	0.733	0.733	1.732	0.192	NA
risk_status_mom	1	1.145	1.145	2.708	0.104	NA
Residuals	79	33.414	0.423	NA	NA	NA

Sensitivity indexed by d' did not differ by risk status, age, sex, or SES.

2.2 Stop-Signal Task

Table 7: Stop-Signal Task Performance Summary: Risk Status by Energy Density Condition

	Low ED		**High ED**	
Characteristic	**Low Risk**, N = 30	**High Risk**, N = 25	**Low Risk**, N = 30	**High Risk**, N = 25
Go RT, ms	673.6 (115.2)	668.9 (144.3)	677.1 (95.7)	656.5 (139.1)
L/R Response Error, N	2.6 (3.9)	2.3 (2.1)	1.6 (2.0)	2.3 (2.2)
Misses, N	1.6 (2.8)	2.9 (4.1)	1.3 (1.7)	2.4 (4.0)
SSD, ms	326.4 (97.1)	283.8 (98.9)	324.4 (77.9)	266.6 (87.1)
SSRT - Mean Method, ms	342.3 (49.2)	378.2 (92.5)	347.7 (49.3)	386.4 (92.5)
SSRT - Integration Method, ms	299.4 (70.1)	367.6 (174.6)	294.8 (46.0)	373.1 (111.5)

[1] Mean (SD)

Table 8: Stop-Signal Task Performance Summary: Risk Status by Portion Size Condition

	Small PS		**Large PS**	
Characteristic	**Low Risk**, N = 33	**High Risk**, N = 25	**Low Risk**, N = 33	**High Risk**, N = 25
Go RT, ms	664.1 (112.5)	664.8 (139.9)	672.4 (117.9)	666.0 (142.9)
L/R Response Error, N	2.4 (3.4)	1.9 (1.7)	1.8 (2.9)	2.8 (2.4)
Misses, N	1.8 (3.1)	2.9 (4.4)	1.5 (2.0)	2.4 (3.8)
SSD, ms	304.6 (95.9)	272.7 (90.0)	322.6 (92.0)	288.2 (86.6)
SSRT - Mean Method, ms	355.0 (53.5)	381.4 (92.3)	346.2 (60.4)	373.0 (90.2)
SSRT - Integration Method, ms	309.8 (66.4)	375.3 (121.6)	307.3 (67.9)	345.5 (113.8)

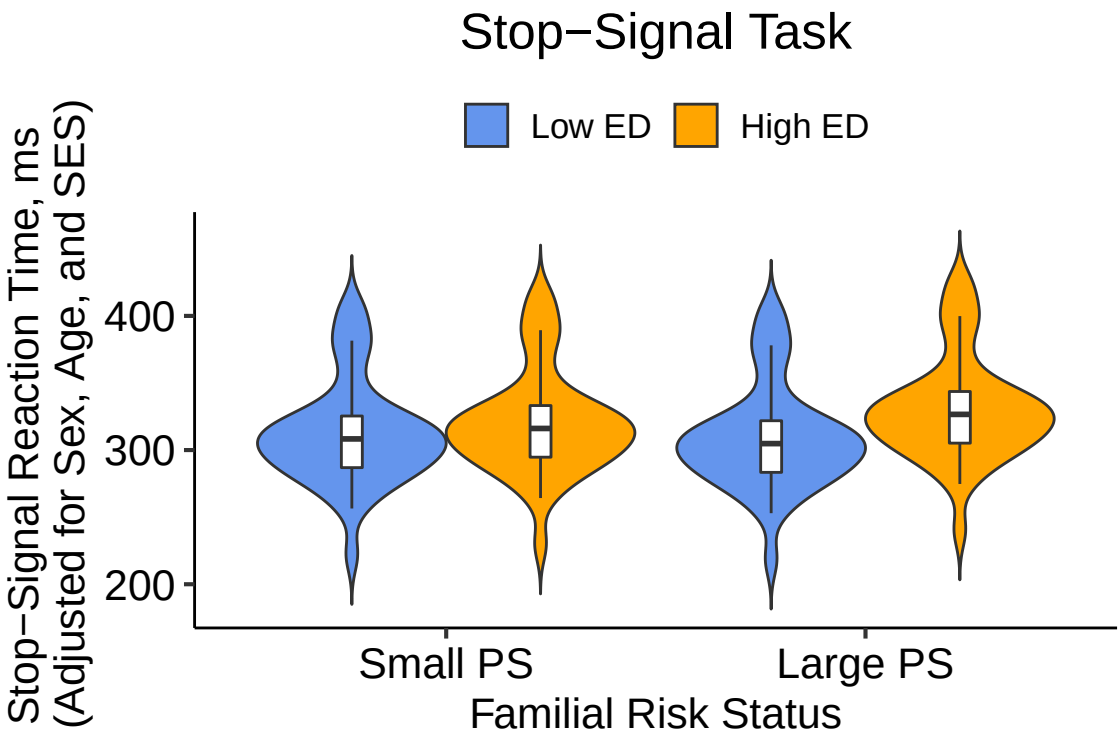
[1] Mean (SD)

2.2.1 Stop Signal Reaction Time

Table 9: Stop-Signal Task SSRT - ED x PS

	Sum.Sq	Mean.Sq	NumDF	DenDF	F.value	Pr..F.	sig
mom_ed	57550.250	19183.417	3	32	1.732	0.180	NA
income	44466.535	22233.267	2	32	2.008	0.151	NA
sex	8958.633	8958.633	1	32	0.809	0.375	NA
age_yr	13105.713	13105.713	1	32	1.183	0.285	NA
PS	488.021	488.021	1	117	0.044	0.834	NA
ED	8747.841	8747.841	1	117	0.790	0.376	NA
PS:ED	1956.921	1956.921	1	117	0.177	0.675	NA

2.2.1.1 Design

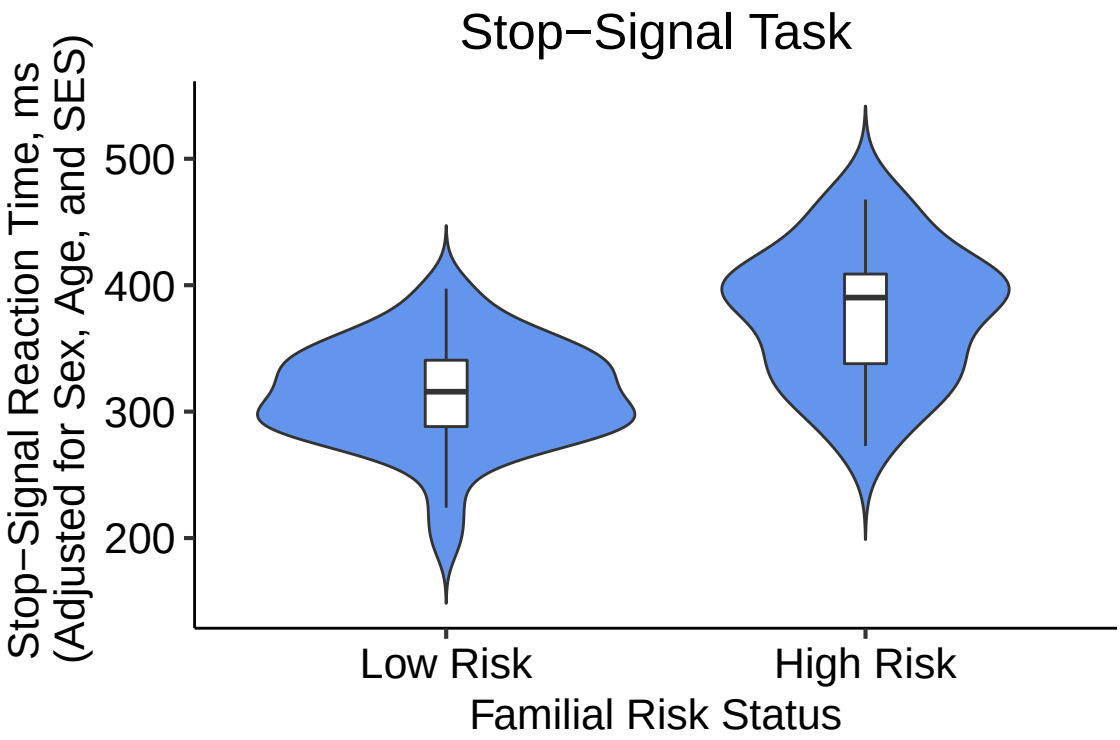


No effect of energy density, portion size, or interaction.

Table 10: Stop-Signal Task SSRT - Risk Status

	Sum.Sq	Df	F.value	Pr..F.	sig
mom_ed	46512.443	3	1.669	0.183	NA
income	1931.039	2	0.104	0.901	NA
sex	2949.795	1	0.318	0.575	NA
age_yr	45937.169	1	4.945	0.030	*
risk_status_mom	58526.380	1	6.300	0.015	*
Residuals	557375.397	60	NA	NA	NA

2.2.1.2 Overall



Across all trials, there was a significant effect of familial obesity risk on stop-signal reaction time (SSRT). SSRT was slower (worse) in children with high risk compared to those with low risk. Additionally, older children were showed faster SSRT. There was no association with sex or SES.

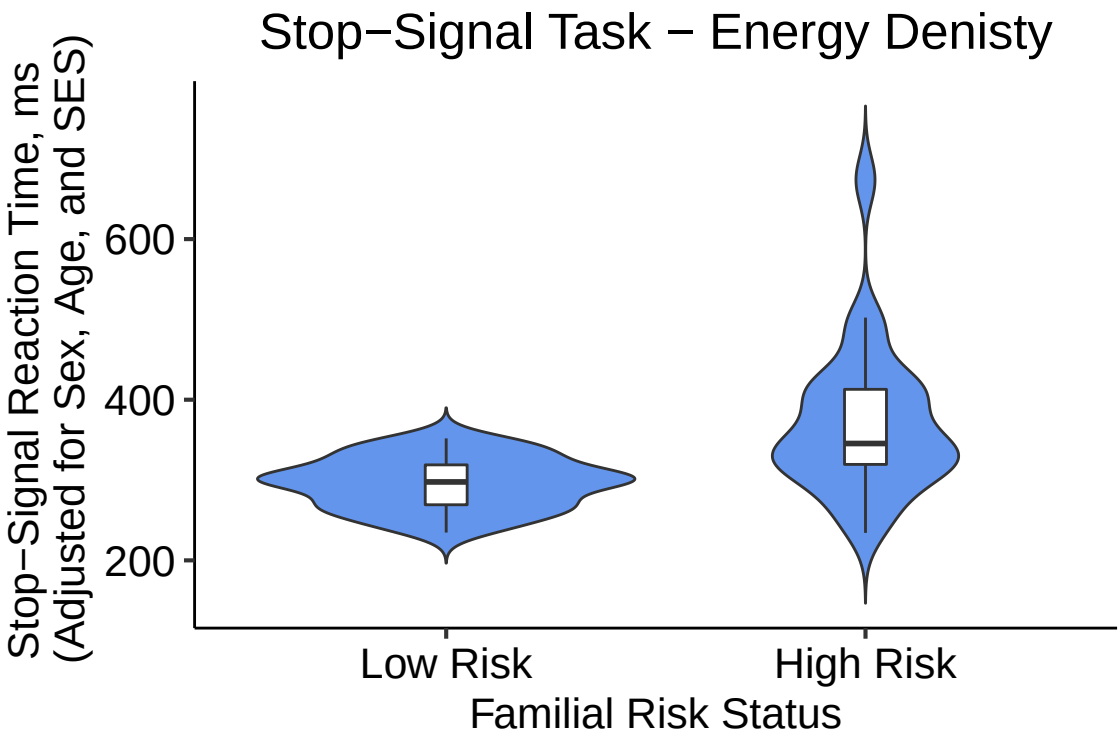
```
$emmeans
 risk_status_mom emmean   SE df lower.CL upper.CL
 Low Risk           315 20.1 60      274      355
 High Risk          384 22.3 60      339      428

Results are averaged over the levels of: mom_ed, income, sex
Confidence level used: 0.95

$contrasts
```

```
 contrast             estimate   SE df t.ratio p.value
 Low Risk - High Risk    -69.1 27.5 60  -2.510  0.0148

Results are averaged over the levels of: mom_ed, income, sex

 age_yr age_yr.trend SE df t.ratio p.value
   7.78        -44.5 20 60  -2.224  0.0299

Results are averaged over the levels of: mom_ed, income, sex, risk_status_mom
```

Table 11: Stop-Signal Task SSRT - ED x Risk Status

	F	Df	Df.res	Pr..F.	sig
mom_ed	2.795	3	43	0.052	.
income	0.195	2	43	0.823	NA
sex	0.016	1	43	0.899	NA
age_yr	3.275	1	43	0.077	.
ED	0.037	1	50	0.848	NA
risk_status_mom	10.147	1	43	0.003	**
ED:risk_status_mom	0.103	1	50	0.749	NA

2.2.1.3 Energy Density Trials



SSRT was slower (worse) in children with high risk compared to those with low risk.

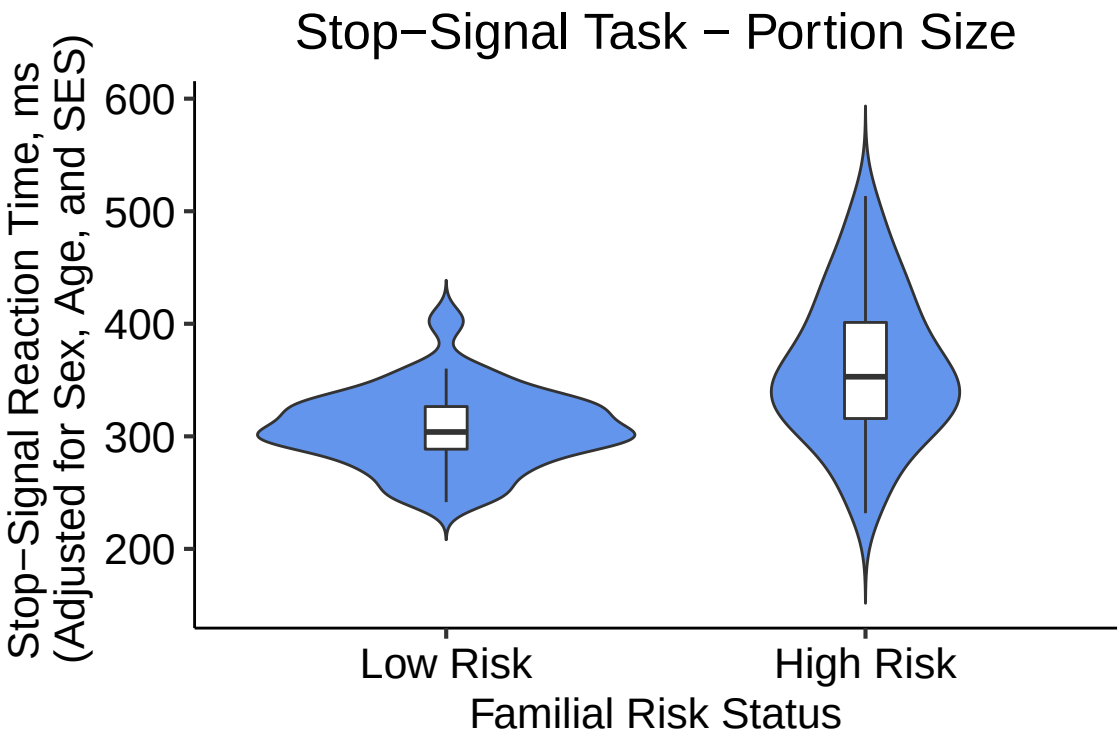
```
$emmeans
 risk_status_mom emmean   SE df lower.CL upper.CL
 Low Risk           301 22.4 43      256      346
 High Risk          392 22.6 43      346      438

Results are averaged over the levels of: mom_ed, income, sex, ED
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95

$contrasts
```

```
 contrast             estimate   SE df t.ratio p.value
 Low Risk - High Risk    -90.8 28.5 43  -3.185  0.0027

Results are averaged over the levels of: mom_ed, income, sex, ED
Degrees-of-freedom method: kenward-roger
```

Table 12: Stop-Signal Task SSRT - PS x Risk Status

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.550	3	45	0.215	NA
income	0.303	2	45	0.740	NA
sex	0.386	1	45	0.538	NA
age_yr	2.547	1	45	0.117	NA
PS	0.406	1	52	0.527	NA
risk_status_mom	6.676	1	45	0.013	*
PS:risk_status_mom	1.484	1	52	0.229	NA

2.2.1.4 Portion Size Trials



SSRT was slower (worse) in children with high risk compared to those with low risk.

```
$emmeans
 risk_status_mom emmean   SE df lower.CL upper.CL
 Low Risk           294 18.1 45      258      331
 High Risk          355 20.4 45      314      396

Results are averaged over the levels of: mom_ed, income, sex, PS
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95

$contrasts
```

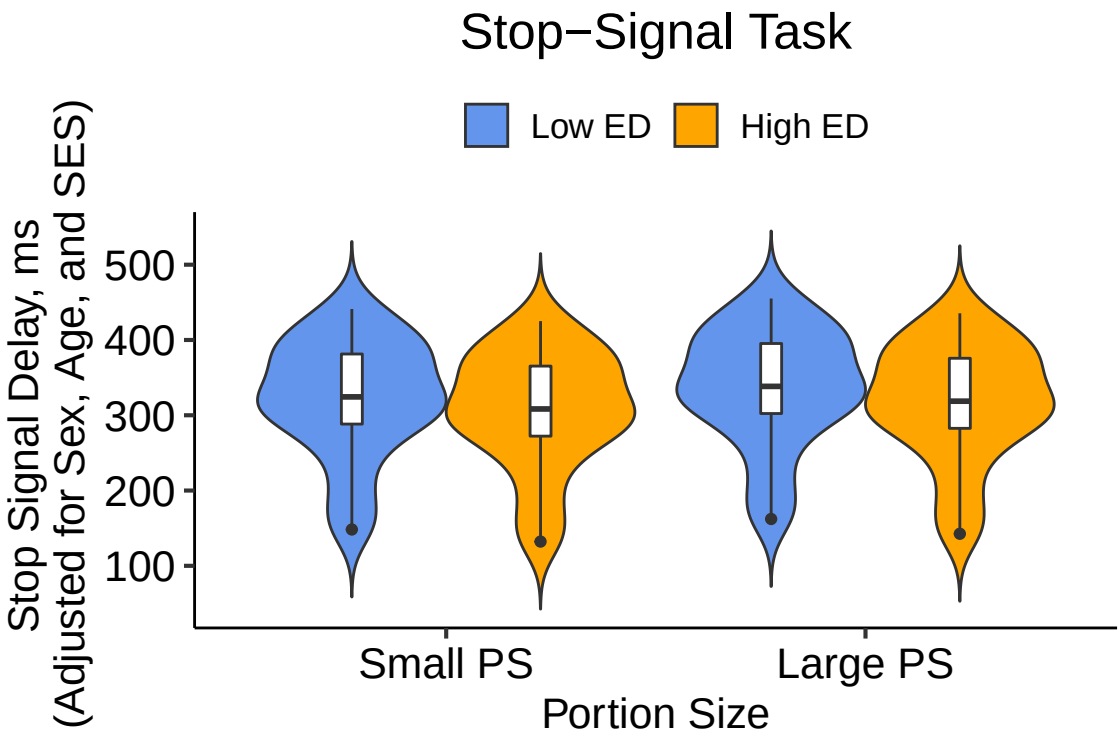
```
 contrast             estimate   SE df t.ratio p.value
 Low Risk - High Risk    -60.7 23.5 45  -2.584  0.0131

Results are averaged over the levels of: mom_ed, income, sex, PS
Degrees-of-freedom method: kenward-roger
```

2.2.2 Stop Signal Delay

Table 13: Stop-Signal Task SSD - ED x PS

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.282	3	32	0.297	NA
income	0.322	2	32	0.727	NA
sex	1.865	1	32	0.182	NA
age_yr	0.200	1	32	0.658	NA
PS	1.797	1	117	0.183	NA
ED	3.866	1	117	0.052	.
PS:ED	0.039	1	117	0.843	NA

2.2.2.1 Design



No effect of portion size or interaction. A trend for an effect of energy density such that there was a lower SSD (worse) for high ED compared to low ED blocks.

```
$emmeans
 ED       emmean   SE   df lower.CL upper.CL
 Low ED      316 18.5 36.2      279      354
 High ED     298 18.5 36.2      261      336

Results are averaged over the levels of: mom_ed, income, sex, PS
Degrees-of-freedom method: kenward-roger
```

```
Confidence level used: 0.95

$contrasts
 contrast         estimate   SE  df t.ratio p.value
 Low ED - High ED     17.8 9.07 117   1.966  0.0516

Results are averaged over the levels of: mom_ed, income, sex, PS
Degrees-of-freedom method: kenward-roger
```

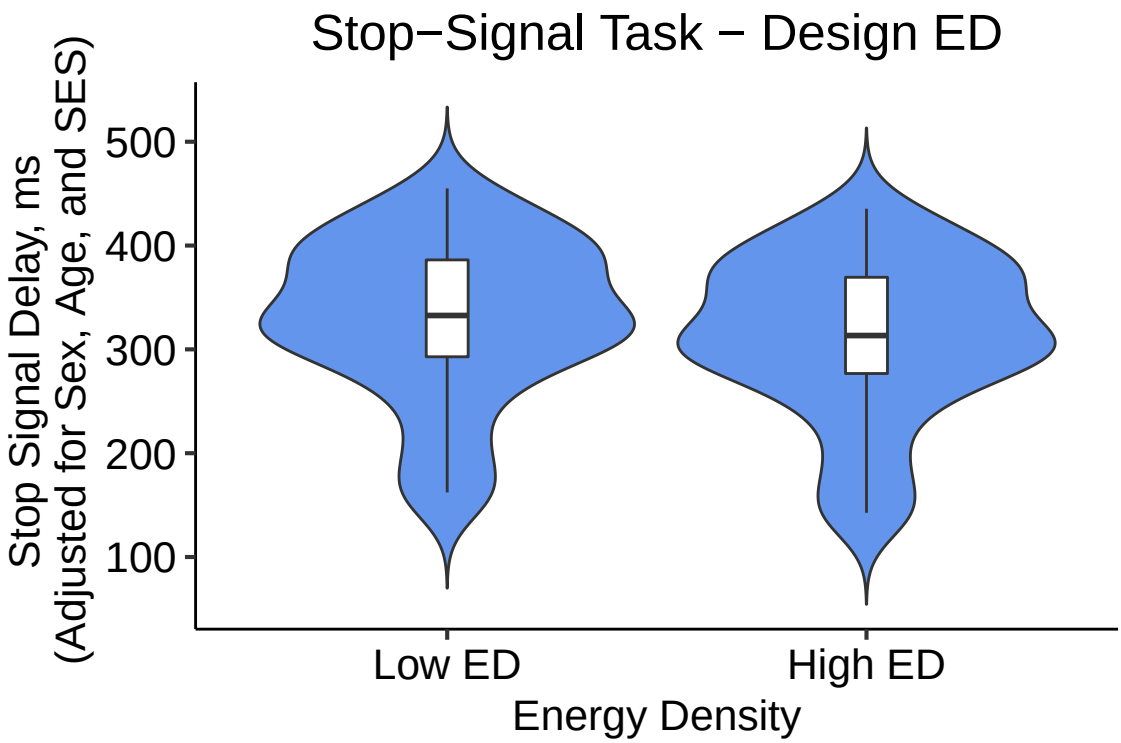
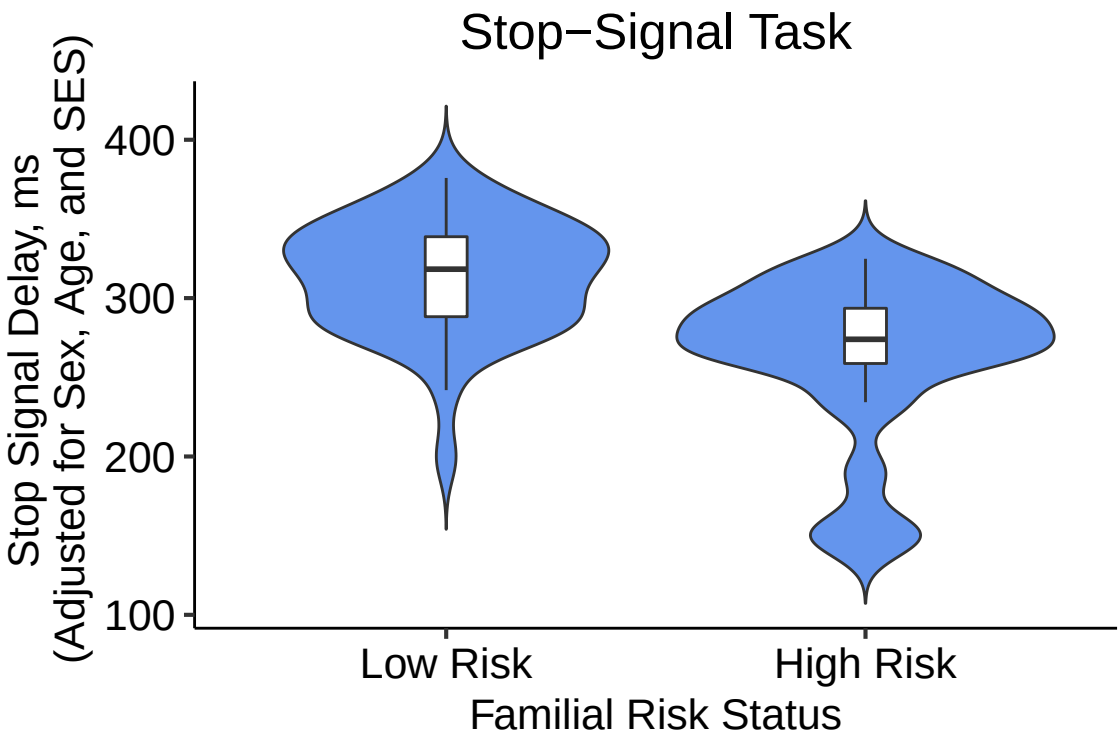


Table 14: Stop-Signal Task SSD - Risk Status

	Sum.Sq	Df	F.value	Pr..F.	sig
mom_ed	47936.657	3	2.549	0.064	.
income	2627.619	2	0.210	0.811	NA
sex	24615.871	1	3.927	0.052	.
age_yr	7383.444	1	1.178	0.282	NA
risk_status_mom	33313.459	1	5.315	0.025	*
Residuals	376072.969	60	NA	NA	NA

2.2.2.2 All Trials



Main effect of risk status such that children at high risk have shorter stop signal delays (worse) than children at low risk.

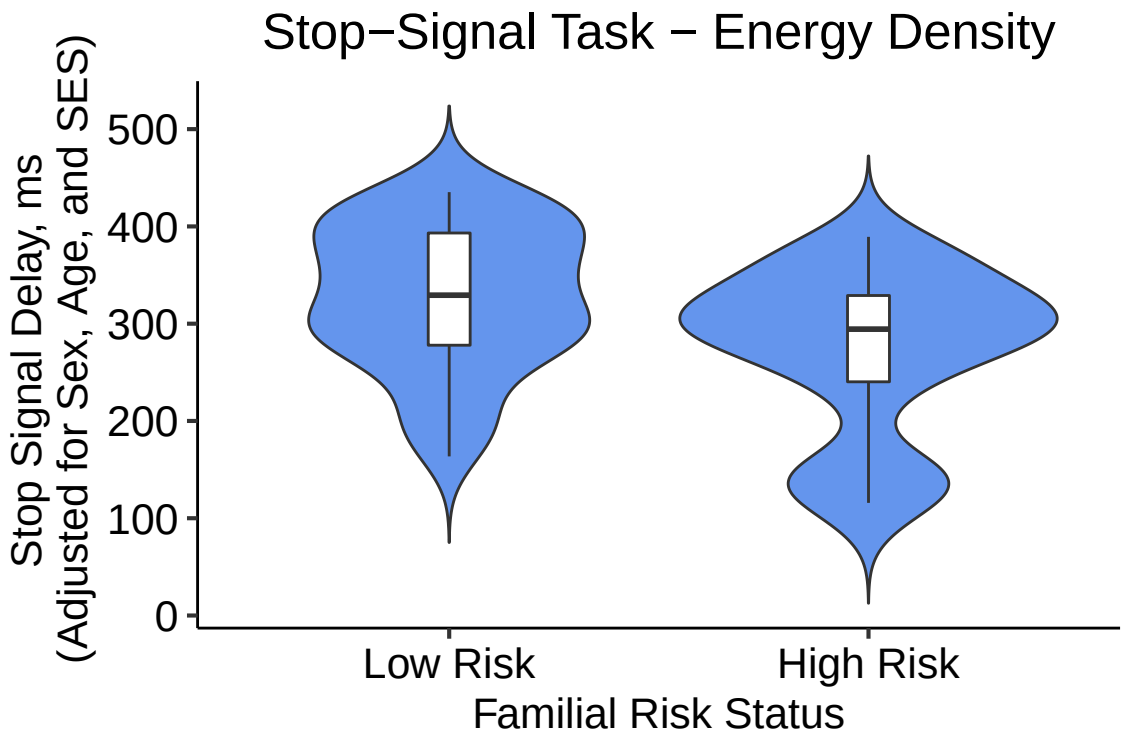
```
$emmeans
 risk_status_mom emmean   SE df lower.CL upper.CL
 Low Risk           300 16.5 60      267      333
 High Risk          248 18.3 60      211      285

Results are averaged over the levels of: mom_ed, income, sex
Confidence level used: 0.95

$contrasts
 contrast             estimate   SE df t.ratio p.value
```

```
 Low Risk - High Risk     52.1 22.6 60   2.305  0.0246

Results are averaged over the levels of: mom_ed, income, sex
```

Table 15: Stop-Signal Task SSD - Risk Status x ED

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.035	3	43	0.387	NA
income	0.133	2	43	0.876	NA
sex	5.052	1	43	0.030	*
age_yr	0.484	1	43	0.491	NA
ED	1.953	1	50	0.168	NA
risk_status_mom	6.238	1	43	0.016	*
ED:risk_status_mom	0.846	1	50	0.362	NA

2.2.2.3 Energy Density Trials



Main effect of risk status such that children at high risk have shorter stop signal delays (worse) than children at low risk. Boys also have shorter stop signal delays than girls.

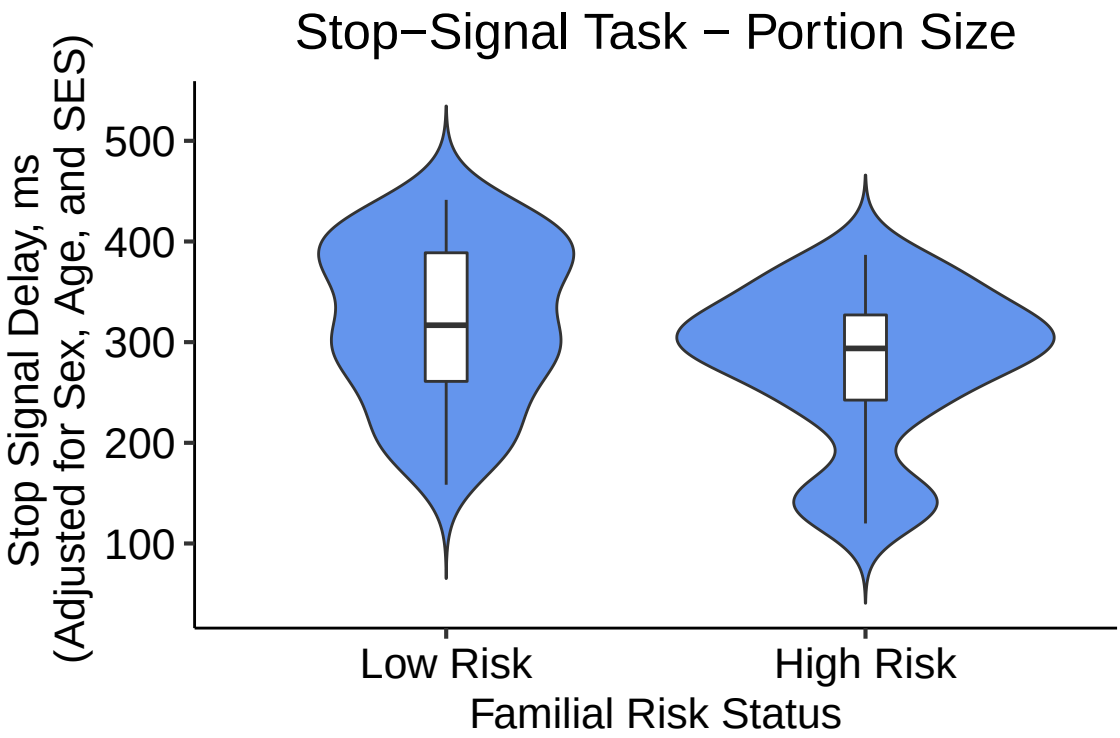
```
$emmeans
 risk_status_mom emmean   SE df lower.CL upper.CL
 Low Risk           321 21.1 43      278      363
 High Risk          254 21.3 43      211      297

Results are averaged over the levels of: mom_ed, income, sex, ED
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95
```

```
$contrasts
 contrast             estimate   SE df t.ratio p.value
 Low Risk - High Risk     67.1 26.9 43   2.498  0.0164

Results are averaged over the levels of: mom_ed, income, sex, ED
Degrees-of-freedom method: kenward-roger

$emmeans
 sex    emmean   SE df lower.CL upper.CL
 Male      259 21.0 43      217      302
 Female    316 20.2 43      275      356

Results are averaged over the levels of: mom_ed, income, ED, risk_status_mom
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95

$contrasts
 contrast      estimate SE df t.ratio p.value
 Male - Female    -56.1 25 43  -2.248  0.0298

Results are averaged over the levels of: mom_ed, income, ED, risk_status_mom
Degrees-of-freedom method: kenward-roger
```

Table 16: Stop-Signal Task SSD - Risk Status x PS

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.156	3	45	0.337	NA
income	0.052	2	45	0.949	NA
sex	4.172	1	45	0.047	*
age_yr	0.476	1	45	0.494	NA
PS	3.481	1	52	0.068	.
risk_status_mom	4.844	1	45	0.033	*
PS:risk_status_mom	0.016	1	52	0.901	NA

2.2.2.4 Portion Size Trials



Main effect of risk status such that children at high risk have shorter stop signal delays (worse) than children at low risk. Boys also have shorter stop signal delays than girls.

```
$emmeans
 risk_status_mom emmean   SE df lower.CL upper.CL
 Low Risk           317 20.1 45      277      358
 High Risk          260 22.6 45      214      305

Results are averaged over the levels of: mom_ed, income, sex, PS
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95
```

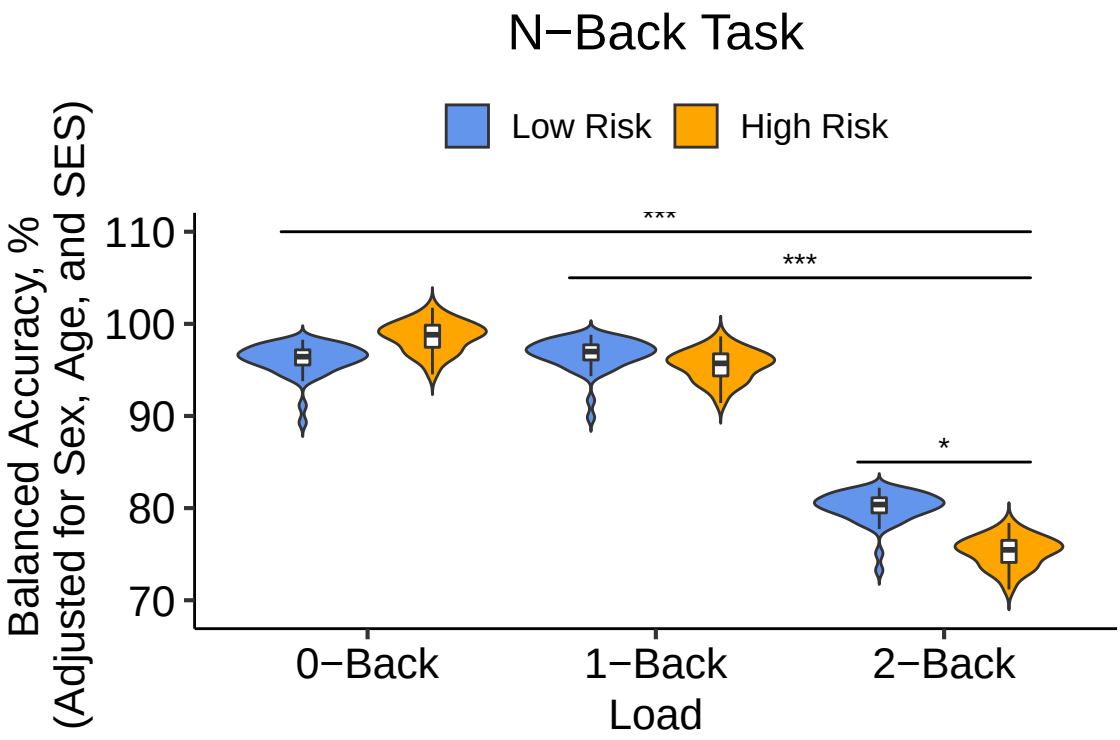
```
$contrasts
 contrast             estimate SE df t.ratio p.value
 Low Risk - High Risk     57.3 26 45   2.201  0.0329

Results are averaged over the levels of: mom_ed, income, sex, PS
Degrees-of-freedom method: kenward-roger

$emmeans
 PS       emmean   SE   df lower.CL upper.CL
 Small PS    281 17.4 50.5      246      316
 Large PS    296 17.4 50.5      261      331

Results are averaged over the levels of: mom_ed, income, sex, risk_status_mom
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95

$contrasts
 contrast            estimate   SE df t.ratio p.value
 Small PS - Large PS    -15.6 8.39 52  -1.864  0.0680

Results are averaged over the levels of: mom_ed, income, sex, risk_status_mom
Degrees-of-freedom method: kenward-roger

$emmeans
 sex    emmean   SE df lower.CL upper.CL
 Male      264 22.0 45      219      308
 Female    314 19.8 45      274      353

Results are averaged over the levels of: mom_ed, income, PS, risk_status_mom
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95

$contrasts
 contrast      estimate   SE df t.ratio p.value
 Male - Female      -50 24.5 45  -2.043  0.0470

Results are averaged over the levels of: mom_ed, income, PS, risk_status_mom
Degrees-of-freedom method: kenward-roger
```

2.3 N-back

2.3.1 Ballanced Accuracy

Table 17: Nback Balanced Accuracy - Risk Status x Load

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.248	3	74	0.299	NA
income	0.583	2	74	0.561	NA
sex	0.616	1	74	0.435	NA
age_yr	0.128	1	74	0.722	NA
block	166.810	2	162	0.000	***
risk_status_mom	0.196	1	74	0.659	NA
block:risk_status_mom	4.672	2	162	0.011	*



Interaction between risk and load shows that children at high familial risk for obesity perform worse at the highest working memory load compared to children at low risk.

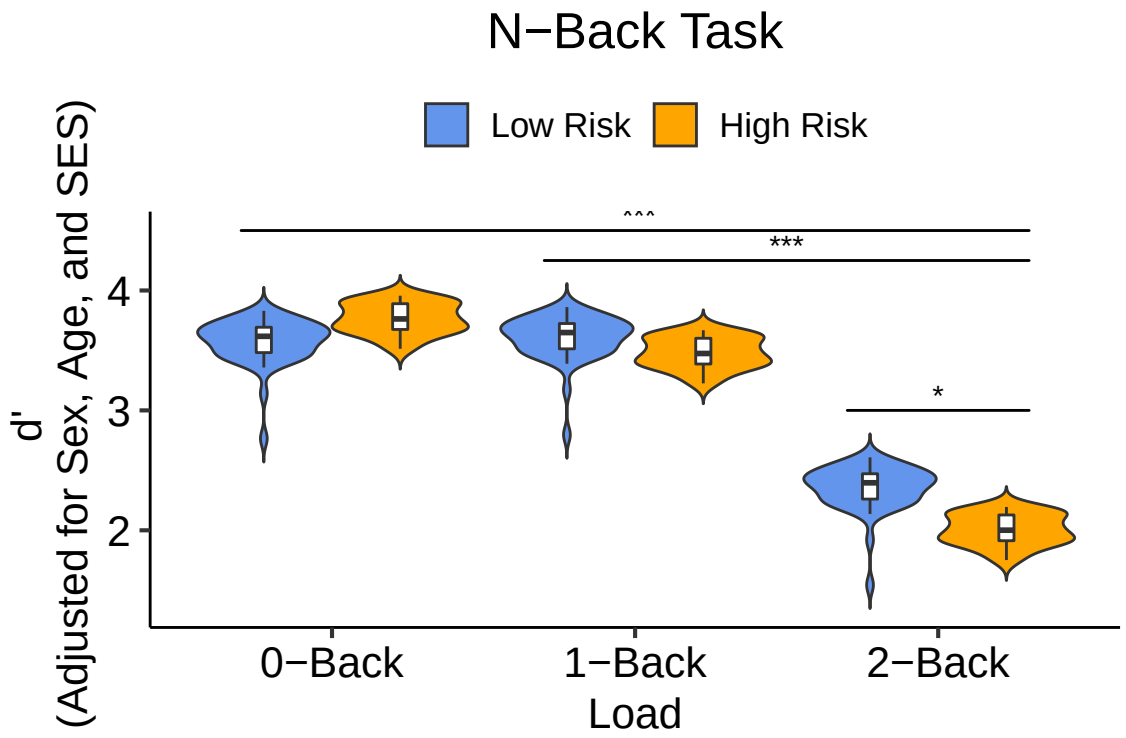
```
$emmeans
 block  emmean   SE  df lower.CL upper.CL
 0-Back   96.4 1.01 191     94.4     98.4
 1-Back   95.1 1.01 191     93.1     97.1
 2-Back   76.7 1.01 191     74.7     78.7

Results are averaged over the levels of: mom_ed, income, sex, risk_status_mom
Degrees-of-freedom method: kenward-roger
```

```
Confidence level used: 0.95

$contrasts
 contrast            estimate   SE  df t.ratio p.value
 (0-Back) - (1-Back)     1.28 1.19 162   1.072  0.2854
 (0-Back) - (2-Back)    19.70 1.19 162  16.501  <.0001
 (1-Back) - (2-Back)    18.42 1.19 162  15.429  <.0001

Results are averaged over the levels of: mom_ed, income, sex, risk_status_mom
Degrees-of-freedom method: kenward-roger
P value adjustment: fdr method for 3 tests

$emmeans
 block  risk_status_mom emmean   SE  df lower.CL upper.CL
 0-Back Low Risk          94.9 1.31 194     92.3     97.4
 1-Back Low Risk          95.4 1.31 194     92.8     98.0
 2-Back Low Risk          78.8 1.31 194     76.2     81.4
 0-Back High Risk         98.0 1.44 213     95.1    100.8
 1-Back High Risk         94.8 1.44 213     92.0     97.7
 2-Back High Risk         74.6 1.44 213     71.8     77.4

Results are averaged over the levels of: mom_ed, income, sex
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95

$contrasts
 contrast                                  estimate   SE  df t.ratio p.value
 (0-Back Low Risk) - (1-Back Low Risk)    -0.54908 1.55 162  -0.354  0.8200
 (0-Back Low Risk) - (2-Back Low Risk)    16.05248 1.55 162  10.352  <.0001
 (0-Back Low Risk) - (0-Back High Risk)   -3.10395 1.85 218  -1.675  0.1301
 (0-Back Low Risk) - (1-Back High Risk)    0.00482 1.85 218   0.003  0.9979
 (0-Back Low Risk) - (2-Back High Risk)   20.24836 1.85 218  10.924  <.0001
 (1-Back Low Risk) - (2-Back Low Risk)    16.60156 1.55 162  10.706  <.0001
 (1-Back Low Risk) - (0-Back High Risk)   -2.55487 1.85 218  -1.378  0.2119
 (1-Back Low Risk) - (1-Back High Risk)    0.55390 1.85 218   0.299  0.8200
 (1-Back Low Risk) - (2-Back High Risk)   20.79745 1.85 218  11.221  <.0001
 (2-Back Low Risk) - (0-Back High Risk)  -19.15643 1.85 218 -10.335  <.0001
 (2-Back Low Risk) - (1-Back High Risk)  -16.04766 1.85 218  -8.658  <.0001
 (2-Back Low Risk) - (2-Back High Risk)    4.19588 1.85 218   2.264  0.0410
 (0-Back High Risk) - (1-Back High Risk)   3.10877 1.82 162   1.712  0.1301
 (0-Back High Risk) - (2-Back High Risk)  23.35231 1.82 162  12.859  <.0001
 (1-Back High Risk) - (2-Back High Risk)  20.24354 1.82 162  11.147  <.0001

Results are averaged over the levels of: mom_ed, income, sex
Degrees-of-freedom method: kenward-roger
P value adjustment: fdr method for 15 tests
```

2.3.2 d'

Table 18: Nback Balanced Accuracy - Risk Status x Load

	F	Df	Df.res	Pr..F.	sig
mom_ed	0.798	3	74	0.499	NA
income	0.331	2	74	0.720	NA
sex	0.001	1	74	0.972	NA
age_yr	0.001	1	74	0.973	NA
block	150.661	2	162	0.000	***
risk_status_mom	0.446	1	74	0.506	NA
block:risk_status_mom	4.143	2	162	0.018	*



Interaction between risk and load shows that children at high familial risk for obesity perform worse at the highest working memory load compared to children at low risk.

```
$emmeans
 block  risk_status_mom emmean    SE  df lower.CL upper.CL
 0-Back Low Risk          3.50 0.108 181     3.29     3.71
 1-Back Low Risk          3.53 0.108 181     3.32     3.74
 2-Back Low Risk          2.28 0.108 181     2.07     2.49
 0-Back High Risk         3.72 0.118 201     3.48     3.95
 1-Back High Risk         3.43 0.118 201     3.20     3.66
 2-Back High Risk         1.95 0.118 201     1.72     2.19

Results are averaged over the levels of: mom_ed, income, sex
```

```
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95

$contrasts
 contrast                                  estimate    SE  df t.ratio p.value
 (0-Back Low Risk) - (1-Back Low Risk)    -0.0313 0.123 162  -0.255  0.7990
 (0-Back Low Risk) - (2-Back Low Risk)     1.2217 0.123 162   9.972  <.0001
 (0-Back Low Risk) - (0-Back High Risk)   -0.2157 0.152 207  -1.419  0.2148
 (0-Back Low Risk) - (1-Back High Risk)    0.0725 0.152 207   0.477  0.6791
 (0-Back Low Risk) - (2-Back High Risk)    1.5461 0.152 207  10.168  <.0001
 (1-Back Low Risk) - (2-Back Low Risk)     1.2530 0.123 162  10.227  <.0001
 (1-Back Low Risk) - (0-Back High Risk)   -0.1844 0.152 207  -1.213  0.2831
 (1-Back Low Risk) - (1-Back High Risk)    0.1038 0.152 207   0.683  0.5719
 (1-Back Low Risk) - (2-Back High Risk)    1.5773 0.152 207  10.374  <.0001
 (2-Back Low Risk) - (0-Back High Risk)   -1.4374 0.152 207  -9.453  <.0001
 (2-Back Low Risk) - (1-Back High Risk)   -1.1492 0.152 207  -7.558  <.0001
 (2-Back Low Risk) - (2-Back High Risk)    0.3244 0.152 207   2.133  0.0568
 (0-Back High Risk) - (1-Back High Risk)   0.2882 0.143 162   2.009  0.0693
 (0-Back High Risk) - (2-Back High Risk)   1.7618 0.143 162  12.280  <.0001
 (1-Back High Risk) - (2-Back High Risk)   1.4735 0.143 162  10.271  <.0001

Results are averaged over the levels of: mom_ed, income, sex
Degrees-of-freedom method: kenward-roger
P value adjustment: fdr method for 15 tests

$emmeans
 block  emmean     SE  df lower.CL upper.CL
 0-Back   3.61 0.0838 178     3.44     3.77
 1-Back   3.48 0.0838 178     3.31     3.65
 2-Back   2.12 0.0838 178     1.95     2.28

Results are averaged over the levels of: mom_ed, income, sex, risk_status_mom
Degrees-of-freedom method: kenward-roger
Confidence level used: 0.95

$contrasts
 contrast            estimate     SE  df t.ratio p.value
 (0-Back) - (1-Back)    0.128 0.0943 162   1.362  0.1751
 (0-Back) - (2-Back)    1.492 0.0943 162  15.814  <.0001
 (1-Back) - (2-Back)    1.363 0.0943 162  14.452  <.0001

Results are averaged over the levels of: mom_ed, income, sex, risk_status_mom
Degrees-of-freedom method: kenward-roger
P value adjustment: fdr method for 3 tests
```

3 Effect of Total Body Fat Percentage

3.1 Go-NoGo

3.1.1 Percent False Alarms

Table 19: Go-NoGo Percent False Alarms - Body Fat Percentage

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	437.242	145.747	0.574	0.634	NA
income	2	298.023	149.011	0.586	0.559	NA
sex	1	456.736	456.736	1.797	0.184	NA
age_yr	1	261.999	261.999	1.031	0.313	NA
dxa_total_body_perc_fat	1	240.168	240.168	0.945	0.334	NA
Residuals	79	20074.151	254.103	NA	NA	NA

3.1.2 Percent Hits

Table 20: Go-NoGo - Percent Hits - Body Fat Percentage

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	30.828	10.276	1.046	0.377	NA
income	2	15.483	7.741	0.788	0.458	NA
sex	1	19.036	19.036	1.938	0.168	NA
age_yr	1	6.139	6.139	0.625	0.432	NA
dxa_total_body_perc_fat	1	1.306	1.306	0.133	0.716	NA
Residuals	79	775.918	9.822	NA	NA	NA

Correct responses to go stimuli did not differ by risk status, age, sex, or SES.

3.1.3 Go Reaction Time

Table 21: Go-NoGo - Go Reaction Time

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	3312.644	1104.215	0.314	0.815	NA
income	2	3355.935	1677.967	0.477	0.623	NA
sex	1	3791.772	3791.772	1.077	0.303	NA
age_yr	1	21155.799	21155.799	6.010	0.016	*
dxa_total_body_perc_fat	1	24.649	24.649	0.007	0.934	NA
Residuals	79	278104.020	3520.304	NA	NA	NA

3.1.4 d'

Table 22: Go-NoGo - d'

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	0.016	0.005	0.012	0.998	NA
income	2	0.093	0.047	0.107	0.898	NA
sex	1	1.103	1.103	2.541	0.115	NA
age_yr	1	0.733	0.733	1.688	0.198	NA
dxa_total_body_perc_fat	1	0.262	0.262	0.603	0.440	NA
Residuals	79	34.297	0.434	NA	NA	NA

3.2 Stop-Signal Task

3.2.1 Stop Signal Reaction Time

Table 23: Stop-Signal Task SSRT - Body Fat Percentage

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	87695.947	29231.982	2.940	0.040	*
income	2	612.013	306.007	0.031	0.970	NA
sex	1	13169.986	13169.986	1.325	0.254	NA
age_yr	1	44152.297	44152.297	4.441	0.039	*
dxa_total_body_perc_fat	1	19377.644	19377.644	1.949	0.168	NA
Residuals	60	596524.133	9942.069	NA	NA	NA

3.2.1.1 Overall

3.2.2 Energy Density Trials

Table 24: Stop-Signal Task SSRT - ED x Body Fat Percentage

	F	Df	Df.res	Pr..F.	sig
mom_ed	2.496	3	43	0.072	.
income	0.252	2	43	0.778	NA
sex	0.006	1	43	0.937	NA
age_yr	1.015	1	43	0.319	NA
ED	0.038	1	50	0.847	NA
bfp_center	2.882	1	43	0.097	.
ED:bfp_center	0.903	1	50	0.347	NA

3.2.3 Portion Size Trials

Table 25: Stop-Signal Task SSRT - PS x Body Fat Percentage

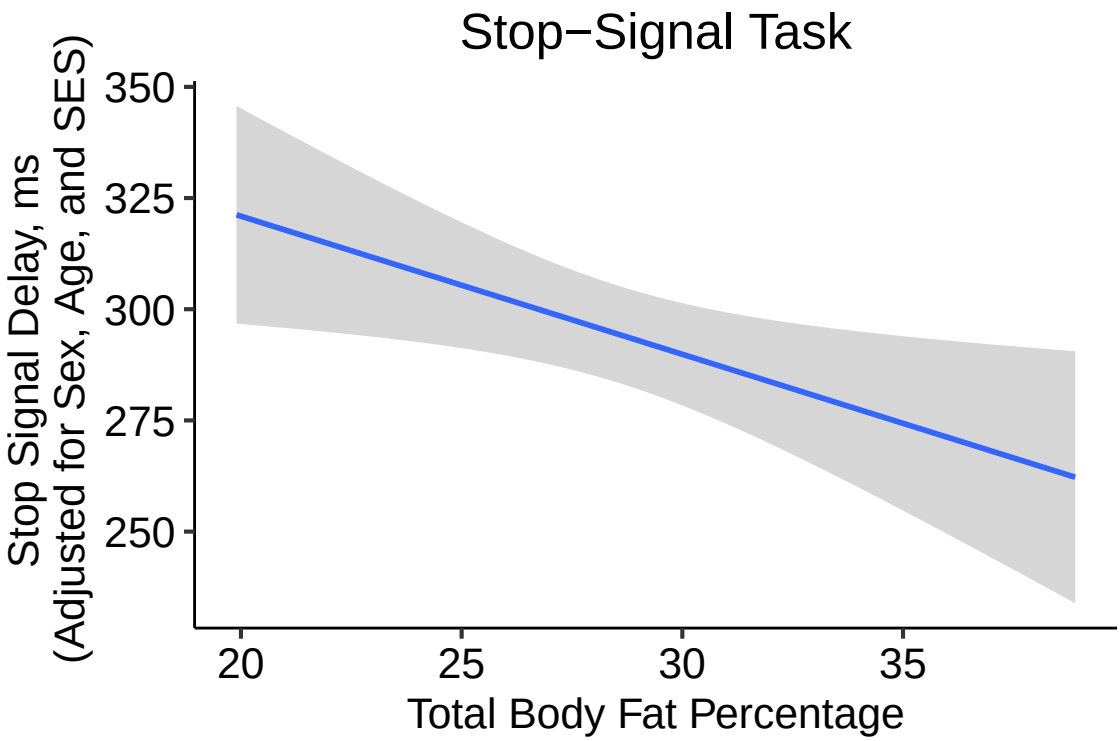
	F	Df	Df.res	Pr..F.	sig
mom_ed	1.383	3	45	0.260	NA
income	0.655	2	45	0.524	NA
sex	0.253	1	45	0.617	NA
age_yr	0.934	1	45	0.339	NA
PS	0.397	1	52	0.531	NA
dxa_total_body_perc_fat	2.762	1	45	0.103	NA
PS:dxa_total_body_perc_fat	0.305	1	52	0.583	NA

3.2.4 Stop Signal Delay

Table 26: Stop-Signal Task SSD - Body Fat Percentage

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	104030.326	34676.775	5.415	0.002	**
income	2	1098.668	549.334	0.086	0.918	NA
sex	1	13376.764	13376.764	2.089	0.154	NA
age_yr	1	6846.368	6846.368	1.069	0.305	NA
dxa_total_body_perc_fat	1	25134.473	25134.473	3.925	0.052	.
Residuals	60	384251.954	6404.199	NA	NA	NA

3.2.4.1 Overall

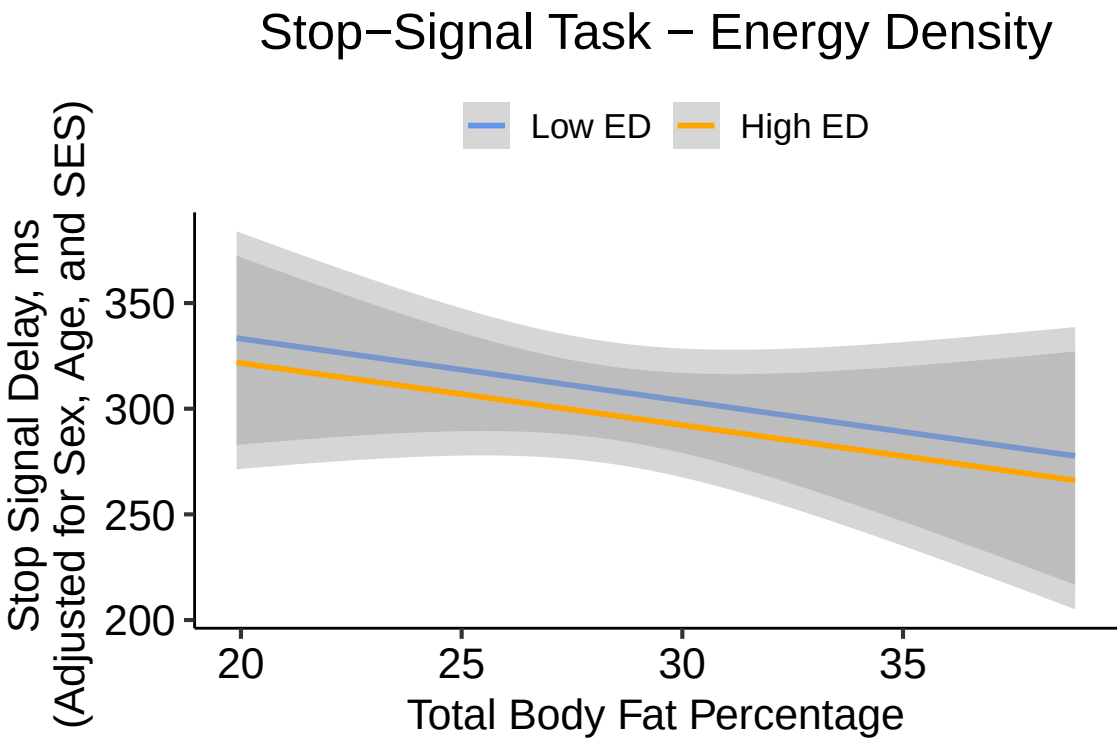


There was an effect of of body fat percentage such that higher body fat percentage was associated with shorter stop signal delays (worse).

3.2.4.2 Energy Density Trials

Table 27: Stop-Signal Task SSD - Body Fat Percentage x ED

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.333	3	42	0.276	NA
income	0.117	2	42	0.890	NA
sex	7.344	1	42	0.010	**
age_yr	0.138	1	42	0.712	NA
ED	1.959	1	51	0.168	NA
risk_status_mom	3.276	1	42	0.077	.
dxa_total_body_perc_fat	2.459	1	42	0.124	NA



There was no interaction between energy density and body fat percentage. There was, however, an effect of energy density and an effect of body fat percentage. Children had shorter stop signal delays (worse) during high energy dense blocks compared to low energy density blocks. Higher body fat percentage was associated with shorter stop signal delays (worse).

Table 28: Stop-Signal Task SSD - Body Fat Percentage x PS

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.285	3	44	0.291	NA
income	0.087	2	44	0.917	NA
sex	5.736	1	44	0.021	*
age_yr	0.107	1	44	0.745	NA
PS	3.547	1	53	0.065	.
risk_status_mom	2.707	1	44	0.107	NA
dxa_total_body_perc_fat	1.623	1	44	0.209	NA

Table 29: Stop-Signal Task SSD - Body Fat Percentage + PS

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.285	3	44	0.291	NA
income	0.087	2	44	0.917	NA
sex	5.736	1	44	0.021	*
age_yr	0.107	1	44	0.745	NA
PS	3.547	1	53	0.065	.
risk_status_mom	2.707	1	44	0.107	NA
dxa_total_body_perc_fat	1.623	1	44	0.209	NA

3.2.4.3 Portion Size Trials

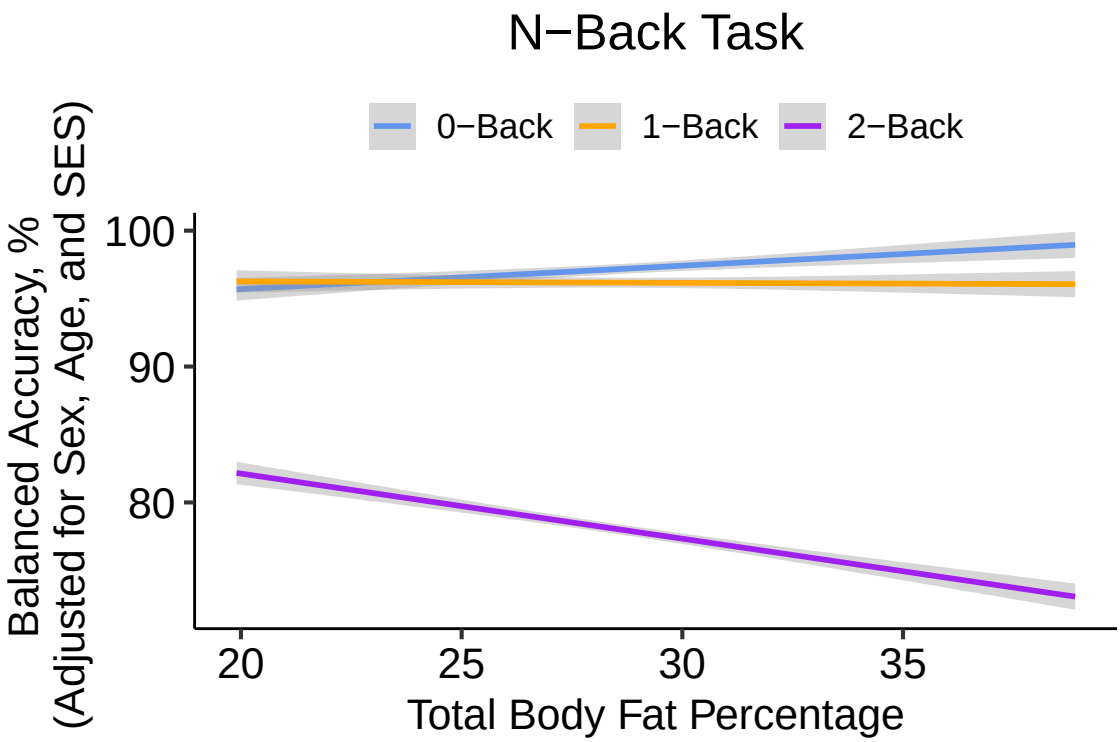
There was no interaction between portion size and body fat percentage. There was, however, an effect of portion size and an effect of body fat percentage. Children had longer stop signal delays (better) during blocks where 80% of stop trials were large portion compared to small portion. Higher body fat percentage was associated with shorter stop signal delays (worse).

3.3 N-back

3.3.1 Ballanced Accuracy

Table 30: Nback Balanced Accuracy - Body Fat Percentage x Load

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.299	3	74	0.281	NA
income	0.659	2	74	0.520	NA
sex	0.345	1	74	0.559	NA
age_yr	0.085	1	74	0.771	NA
block	163.314	2	162	0.000	***
dxa_total_body_perc_fat	0.273	1	74	0.603	NA
block:dxa_total_body_perc_fat	2.876	2	162	0.059	.



Interaction between total body fat percentage and load shows that higher body fat percentages are associated with worse working memory at the highest load (2-back)

```
$emmeans
 block  emmean   SE  df lower.CL upper.CL
 0-Back   96.2 1.01 191     94.2     98.2
 1-Back   95.2 1.01 191     93.2     97.2
 2-Back   77.0 1.01 191     75.0     79.0

Results are averaged over the levels of: mom_ed, income, sex
Degrees-of-freedom method: kenward-roger
```

```
Confidence level used: 0.95

$contrasts
 contrast            estimate   SE  df t.ratio p.value
 (0-Back) - (1-Back)    0.993 1.19 162   0.834  0.6828
 (0-Back) - (2-Back)   19.131 1.19 162  16.052  <.0001
 (1-Back) - (2-Back)   18.137 1.19 162  15.218  <.0001

Results are averaged over the levels of: mom_ed, income, sex
Degrees-of-freedom method: kenward-roger
P value adjustment: tukey method for comparing a family of 3 estimates

 block  dxa_total_body_perc_fat dxa_total_body_perc_fat.trend    SE  df t.ratio
 0-Back                   28.5                        0.2011 0.219 216   0.919
 1-Back                   28.5                        0.0181 0.219 216   0.083
 2-Back                   28.5                       -0.4503 0.219 216  -2.058
 p.value
  0.3592
  0.9343
  0.0408

Results are averaged over the levels of: mom_ed, income, sex
Degrees-of-freedom method: kenward-roger
```

3.3.2 d'

Table 31: Nback Balanced Accuracy - Body Fat Percentage x Load

	F	Df	Df.res	Pr..F.	sig
mom_ed	0.863	3	74	0.464	NA
income	0.372	2	74	0.691	NA
sex	0.019	1	74	0.891	NA
age_yr	0.000	1	74	0.986	NA
block	144.138	2	162	0.000	***
dxa_total_body_perc_fat	0.312	1	74	0.578	NA
block:dxa_total_body_perc_fat	0.457	2	162	0.634	NA

4 Exploratory Analyses: relative impact of risk and body fat percentage

4.1 Go-NoGo

4.1.1 Percent False Alarms

Table 32: Go-NoGo Percent False Alarms - Body Fat Percentage + Risk Status

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	437.242	145.747	0.589	0.624	NA
income	2	298.023	149.011	0.603	0.550	NA
sex	1	456.736	456.736	1.847	0.178	NA
age_yr	1	261.999	261.999	1.060	0.307	NA
risk_status_mom	1	998.965	998.965	4.040	0.048	*
dxa_total_body_perc_fat	1	27.440	27.440	0.111	0.740	NA
Residuals	78	19287.914	247.281	NA	NA	NA

4.2 Stop-Signal Task

4.2.1 Stop Signal Reaction Time

Table 33: Stop-Signal Task SSRT - Body Fat Percentage + Risk Status

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	87695.947	29231.982	3.121	0.033	*
income	2	612.013	306.007	0.033	0.968	NA
sex	1	13169.986	13169.986	1.406	0.240	NA
age_yr	1	44152.297	44152.297	4.714	0.034	*
dxa_total_body_perc_fat	1	19377.644	19377.644	2.069	0.156	NA
risk_status_mom	1	43934.923	43934.923	4.691	0.034	*
Residuals	59	552589.210	9365.919	NA	NA	NA

4.2.1.1 Overall

4.2.2 Energy Density Trials

Table 34: Stop-Signal Task SSRT - ED + Body Fat Percentage + Risk Status

	F	Df	Df.res	Pr..F.	sig
mom_ed	2.859	3	42	0.048	*
income	0.189	2	42	0.828	NA
sex	0.157	1	42	0.694	NA
age_yr	2.600	1	42	0.114	NA
ED	0.038	1	51	0.847	NA
bfp_center	0.535	1	42	0.469	NA
risk_status_mom	7.270	1	42	0.010	*

4.2.3 Portion Size Trials

Table 35: Stop-Signal Task SSRT - PS + Body Fat Percentage + Risk Status

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.742	3	44	0.172	NA
income	0.349	2	44	0.708	NA
sex	0.043	1	44	0.836	NA
age_yr	1.674	1	44	0.203	NA
PS	0.402	1	53	0.529	NA
dxa_total_body_perc_fat	0.802	1	44	0.375	NA
risk_status_mom	4.473	1	44	0.040	*

4.2.4 Stop Signal Delay

Table 36: Stop-Signal Task SSD - Body Fat Percentage + Risk Status

	Df	Sum.Sq	Mean.Sq	F.value	Pr..F.	sig
mom_ed	3	104030.326	34676.775	5.616	0.002	**
income	2	1098.668	549.334	0.089	0.915	NA
sex	1	13376.764	13376.764	2.166	0.146	NA
age_yr	1	6846.368	6846.368	1.109	0.297	NA
dxa_total_body_perc_fat	1	25134.473	25134.473	4.070	0.048	*
risk_status_mom	1	19918.253	19918.253	3.226	0.078	.
Residuals	59	364333.701	6175.147	NA	NA	NA

4.2.4.1 Overall

4.2.4.2 Energy Density Trials

Table 37: Stop-Signal Task SSD - ED + Body Fat Percentage + Risk Status

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.333	3	42	0.276	NA
income	0.117	2	42	0.890	NA
sex	7.344	1	42	0.010	**
age_yr	0.138	1	42	0.712	NA
ED	1.959	1	51	0.168	NA
risk_status_mom	3.276	1	42	0.077	.
dxa_total_body_perc_fat	2.459	1	42	0.124	NA

Table 38: Stop-Signal Task SSD - PS + Body Fat Percentage + Risk Status

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.285	3	44	0.291	NA
income	0.087	2	44	0.917	NA
sex	5.736	1	44	0.021	*
age_yr	0.107	1	44	0.745	NA
PS	3.547	1	53	0.065	.
risk_status_mom	2.707	1	44	0.107	NA
dxa_total_body_perc_fat	1.623	1	44	0.209	NA

4.2.4.3 Portion Size Trials

4.3 N-back

4.3.1 Ballanced Accuracy

Table 39: Nback Balanced Accuracy - Body Fat Percentage x Load + Risk Status x Load

	F	Df	Df.res	Pr..F.	sig
mom_ed	1.235	3	73	0.303	NA
income	0.619	2	73	0.541	NA
sex	0.313	1	73	0.577	NA
age_yr	0.081	1	73	0.777	NA
block	167.014	2	160	0.000	***
risk_status_mom	0.086	1	73	0.770	NA
dxa_total_body_perc_fat	0.162	1	73	0.689	NA
block:risk_status_mom	2.836	2	160	0.062	.
block:dxa_total_body_perc_fat	1.099	2	160	0.336	NA

4.3.2 d'

Table 40: Nback Balanced Accuracy - Body Fat Percentage x Load + Risk Status x Load

	F	Df	Df.res	Pr..F.	sig
mom_ed	0.793	3	73	0.502	NA
income	0.352	2	73	0.705	NA
sex	0.031	1	73	0.861	NA
age_yr	0.001	1	73	0.979	NA
block	148.852	2	160	0.000	***
risk_status_mom	0.266	1	73	0.607	NA
dxa_total_body_perc_fat	0.135	1	73	0.715	NA
block:risk_status_mom	3.649	2	160	0.028	*
block:dxa_total_body_perc_fat	0.027	2	160	0.973	NA