Portion Size Effect for Children at High and Low Familial Risk for Obesity (Food and Brain Study)

Contents

1 Demographics

Table 1: Demographics

Characteristic	Risk Groups		Overall
	Low Risk, N = 53	High Risk, N = 40	N = 93
Sex			
Male	30 (57%)	18 (45%)	48 (52%)
Female	23 (43%)	22 (55%)	45 (48%)
Age, yr	7.8 (0.7)	7.8 (0.6)	7.8 (0.6)
Ethnicity			
Not Hispanic/Lantinx	53 (100%)	40 (100%)	93 (100%)
Race			
0	50 (94%)	40 (100%)	90 (97%)
2	3 (5.7%)	0 (0%)	3 (3.2%)
Income			
< $51,000	4 (7.7%)	8 (21%)	12 (13%)
>$100,000	26 (50%)	7 (18%)	33 (37%)
$51,000 - $100,000	22 (42%)	23 (61%)	45 (50%)
Unknown	1	2	3
BMI %tile	41.7 (23.9)	55.7 (23.6)	47.7 (24.7)
Mother's Education			
> Bachelor Degree	23 (44%)	6 (15%)	29 (32%)
AA/Technical Degree	3 (5.8%)	7 (18%)	10 (11%)
Bachelor Degree	23 (44%)	21 (52%)	44 (48%)
High School/GED	3 (5.8%)	6 (15%)	9 (9.8%)
Unknown	1	0	1
Father's Education			
> Bachelor Degree	29 (55%)	4 (11%)	33 (38%)
AA/Technical Degree	3 (5.7%)	11 (31%)	14 (16%)
Bachelor Degree	15 (28%)	14 (40%)	29 (33%)
High School/GED	6 (11%)	5 (14%)	11 (12%)
Other/NA	0 (0%)	1 (2.9%)	1 (1.1%)
Unknown	0	5	5

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

Age - t-test

```
    Welch Two Sample t-test

data:  age_yr by risk_status_mom
t = 0.44031, df = 89.66, p-value = 0.6608
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -0.1989028  0.3121669
sample estimates:
 mean in group Low Risk mean in group High Risk
              7.841132                7.784500
```

BMI Percentile - t-test

```
    Welch Two Sample t-test

data:  bmi_percentile by risk_status_mom
t = -2.8098, df = 84.587, p-value = 0.006157
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -23.873036  -4.086775
sample estimates:
 mean in group Low Risk mean in group High Risk
               41.73509                55.71500

 Low Risk High Risk
 23.89437  23.64924
```

Sex - χ^2

```
    Pearson's Chi-squared test with Yates' continuity correction

data:  r01_intake$sex and r01_intake$risk_status_mom
X-squared = 0.80831, df = 1, p-value = 0.3686
```

Income - χ^2

```
    Pearson's Chi-squared test

data:  r01_intake$income and r01_intake$risk_status_mom
X-squared = 10.368, df = 2, p-value = 0.005605
```

Mom Education - Fisher test

```
    Fisher's Exact Test for Count Data

data:  r01_intake$mom_ed and r01_intake$risk_status_mom
p-value = 0.008449
alternative hypothesis: two.sided
```

2 Meal Liking

Table 2: Regression Table: Portion Size for Liking

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	3.393	0.773	90.323	4.392	0.000
preFF	-0.002	0.001	321.687	-2.381	0.018
bmi	0.025	0.049	89.043	0.500	0.618
sexFemale	0.099	0.121	88.885	0.820	0.415
meal_order	0.014	0.014	267.062	1.011	0.313
risk_status_momHigh Risk	0.029	0.127	89.401	0.227	0.821
ps_prop	0.027	0.042	266.468	0.654	0.514

3 Portion Size Effect

Note - Portion Size was coded in ps_prop as the proportion increase in amount served: Portion Size 1 = 0, Portion Size 2 = 0.33, Portion Size 3 = 0.66, and Portion Size 4 = 0.99. This means that a 1 unit increase is equal to a 100% increase in amount served – the difference between Portion Size 1 and Portion Size 4.

3.1 Total Intake

Table 3: Intake by Portion Size

	Risk Groups		Overall
Characteristic	Low Risk, N = 53	High Risk, N = 40	N = 93
ps1_total_g	407.1 (167.0)	402.2 (164.2)	405.0 (164.9)
ps1_total_kcal	475.6 (199.5)	485.2 (196.6)	479.7 (197.2)
ps1_avg_vas	3.8 (0.6)	3.9 (0.6)	3.8 (0.6)
ps2_total_g	465.0 (176.3)	404.4 (171.7)	439.8 (176.0)
ps2_total_kcal	542.6 (218.3)	513.9 (271.5)	530.7 (240.8)
ps2_avg_vas	3.8 (0.6)	3.9 (0.6)	3.8 (0.6)
ps3_total_g	488.9 (191.1)	433.1 (191.2)	465.6 (192.1)
ps3_total_kcal	602.7 (271.9)	534.3 (292.1)	574.1 (281.0)
ps3_avg_vas	3.8 (0.6)	3.8 (0.7)	3.8 (0.6)
ps4_total_g	496.4 (189.0)	416.4 (166.6)	462.1 (183.2)
ps4_total_kcal	620.1 (244.9)	556.4 (249.4)	592.8 (247.5)
ps4_avg_vas	3.8 (0.7)	3.9 (0.6)	3.8 (0.6)

[1] Mean (SD)

3.2 Intake by Food

Table 4: High Risk: Intake by Portion Size

Characteristic	PS-1, N = 40	PS-2, N = 40	PS-3, N = 40	PS-4, N = 40
chnug_grams	66.3 (45.1)	74.9 (79.3)	77.5 (60.7)	87.0 (63.9)
chnug_kcal	165.8 (112.7)	187.3 (198.3)	193.7 (151.8)	217.4 (159.7)
mac_grams	126.1 (105.4)	132.7 (110.9)	139.4 (134.9)	134.1 (123.9)
mac_kcal	214.3 (179.2)	225.6 (188.5)	237.0 (229.4)	228.0 (210.7)
grape_grams	85.5 (65.5)	94.8 (75.6)	93.6 (87.4)	103.7 (88.7)
grape_kcal	59.4 (45.5)	65.9 (52.6)	65.1 (60.8)	72.1 (61.7)
broc_grams	31.3 (51.8)	23.7 (29.2)	23.6 (37.3)	22.6 (36.4)
broc_kcal	31.4 (52.0)	23.8 (29.2)	23.7 (37.4)	22.7 (36.5)
mac_vas	4.1 (0.8)	3.9 (1.0)	3.9 (1.1)	3.9 (1.0)
chnug_vas	4.3 (1.0)	4.3 (1.0)	4.2 (1.2)	4.3 (0.9)
broc_vas	2.9 (1.6)	2.8 (1.5)	2.7 (1.4)	2.9 (1.6)
grape_vas	4.2 (0.8)	4.4 (0.9)	4.4 (0.9)	4.4 (0.8)

[1] Mean (SD)

Table 5: Low Risk: Intake by Portion Size

Characteristic	PS-1, N = 53	PS-2, N = 53	PS-3, N = 53	PS-4, N = 53
chnug_grams	69.6 (41.8)	83.2 (51.9)	98.5 (80.8)	104.0 (67.2)
chnug_kcal	174.0 (104.6)	208.0 (129.8)	246.2 (202.1)	260.0 (168.1)
mac_grams	116.5 (90.3)	130.7 (101.9)	143.4 (115.5)	135.0 (108.4)
mac_kcal	198.1 (153.4)	222.2 (173.3)	243.8 (196.3)	229.5 (184.3)
grape_grams	95.2 (80.9)	102.9 (86.9)	102.0 (92.7)	116.1 (102.9)
grape_kcal	66.1 (56.2)	71.5 (60.4)	70.9 (64.4)	80.7 (71.5)
broc_grams	27.0 (40.6)	29.2 (54.2)	29.0 (54.0)	35.2 (64.9)
broc_kcal	27.1 (40.7)	29.3 (54.4)	29.1 (54.2)	35.3 (65.1)
mac_vas	3.7 (1.0)	3.8 (1.0)	3.8 (1.1)	3.8 (1.0)
chnug_vas	4.1 (0.9)	4.3 (0.7)	4.2 (0.7)	4.2 (0.9)
broc_vas	3.2 (1.3)	3.0 (1.1)	3.2 (1.2)	3.2 (1.4)
grape_vas	4.2 (0.9)	4.1 (1.0)	4.1 (1.1)	4.1 (1.0)

[1] Mean (SD)

3.3 Base Model - Test Quadratic Effect

All intake models are currently controlling for: pre-meal Freddy Fullness, child BMI, average VAS liking rating for the meal foods conducted at each meal, and meal order.

3.3.1 Grams

```
Data: intake_long
Models:
grams_ps_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + (1 | sub)
grams_psquad_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + ps_prop2 + (1 |
                 npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
grams_ps_mod       10 4494.0 4532.9 -2237.0   4474.0
grams_psquad_mod   11 4490.7 4533.5 -2234.4   4468.7 5.2663  1    0.02174 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 6: Regression Table: Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-28.233	280.024	94.218	-0.101	0.920
preFF	-0.318	0.218	330.796	-1.460	0.145
bmi	22.485	12.838	87.621	1.751	0.083
sexFemale	-24.987	32.510	87.866	-0.769	0.444
age_yr	-5.224	26.293	88.324	-0.199	0.843
avg_vas	40.593	15.335	349.845	2.647	0.008
meal_order	-4.666	4.136	263.995	-1.128	0.260
ps_prop	149.635	43.457	263.714	3.443	0.001
ps_prop2	-96.593	42.336	264.027	-2.282	0.023

*To calculate effect of portion size by 0.33 proportion increase need to first get total quadratic effect. The β coefficient for a quadratic effect is half the change in the linear slope for a unit increase, so total change in linear slope = 2 x ps_prop2. Since a 1 unit increase = 100% increase in portion, can then multiply the total effect by 0.33. Therefore, change in linear slope for each 33% increase in amount served = (ps_prop2

x 2) x 0.33. To calculate where the slope switches from positive to negative, need to find the vertex = -ps_prop/(ps_prop2 x 2)

3.3.2 kcal

```
Data: intake_long
Models:
kcal_ps_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + (1 | sub)
kcal_psquad_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + ps_prop2 + (1 | su
                npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
kcal_ps_mod       10 4766.6 4805.5 -2373.3   4746.6
kcal_psquad_mod   11 4767.5 4810.3 -2372.8   4745.5 1.1408  1     0.2855
```

Table 7: Regression Table: Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-129.987	360.878	94.858	-0.360	0.720
preFF	-0.897	0.324	346.568	-2.765	0.006
bmi	39.822	16.428	87.241	2.424	0.017
sexFemale	-40.470	41.618	87.605	-0.972	0.334
age_yr	-25.531	33.678	88.191	-0.758	0.450
avg_vas	57.951	22.189	329.776	2.612	0.009
meal_order	8.517	6.316	265.300	1.348	0.179
ps_prop	112.868	19.068	264.265	5.919	0.000

3.4 Risk Status x Portion Size (linear effect)

3.4.1 Grams

Adding an interaction between Risk Status and Portion Size significantly improved model fit.

```
Data: intake_long
Models:
grams_psquad_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + ps_prop2 + (1 |
grams_psxrisk_psquad_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom *
                         npar    AIC    BIC  logLik deviance  Chisq Df
grams_psquad_mod           11 4490.7 4533.5 -2234.4   4468.7
grams_psxrisk_psquad_mod   13 4482.5 4533.1 -2228.3   4456.5 12.178  2
                         Pr(>Chisq)
grams_psquad_mod
grams_psxrisk_psquad_mod   0.002268 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 8: Regression Table: Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-99.187	276.591	93.315	-0.359	0.721
preFF	-0.331	0.216	328.787	-1.535	0.126
bmi	30.399	13.179	86.991	2.307	0.023
sexFemale	-16.831	32.161	87.151	-0.523	0.602
age_yr	-10.206	25.915	87.609	-0.394	0.695
avg_vas	39.704	15.127	347.269	2.625	0.009
meal_order	-4.564	4.085	263.151	-1.117	0.265
risk_status_momHigh Risk	-35.761	36.079	111.663	-0.991	0.324
ps_prop	178.857	44.235	262.738	4.043	0.000
ps_prop2	-96.695	41.818	263.170	-2.312	0.022
risk_status_momHigh Risk:ps_prop	-68.500	24.716	262.311	-2.771	0.006

Figure 1: Grams Consumed: Risk Status x Portion Size

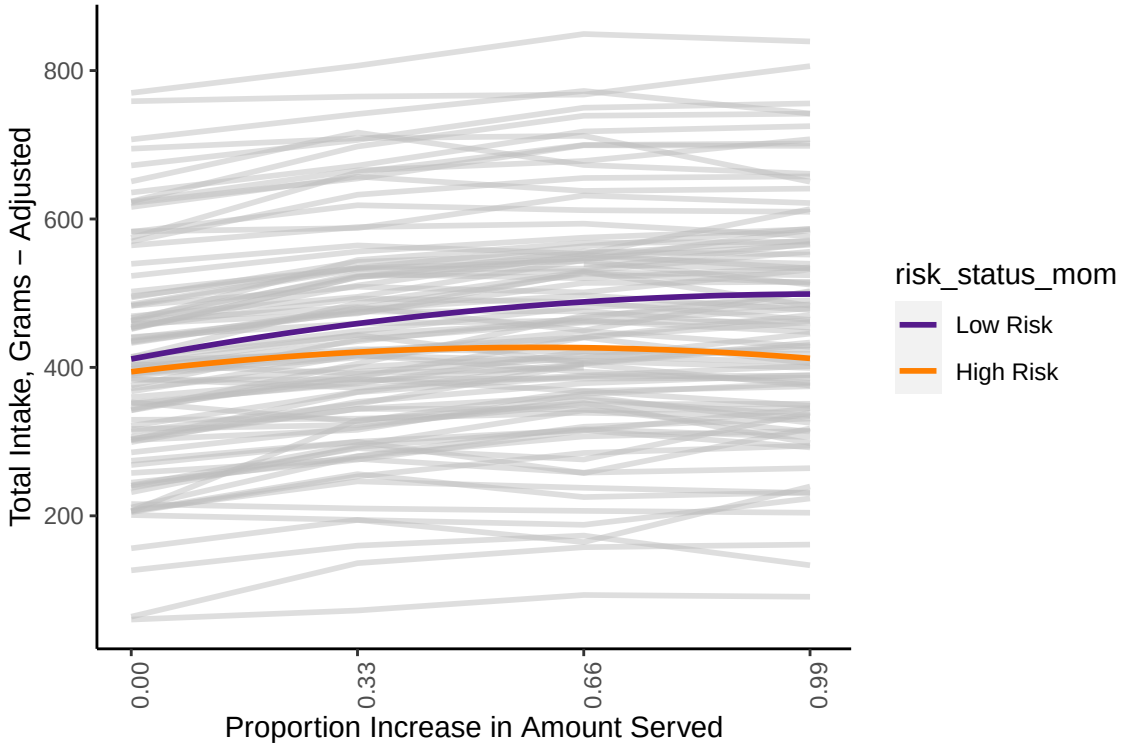

Table 9: Estimated Simple Slopes: Risk Status x Linear Portion Size for Grams

risk_status_mom	ps_prop.trend	SE	df	t.ratio	p.value
Low Risk	178.857	44.238	263.427	4.043	0.000
High Risk	110.358	45.162	263.605	2.444	0.015

Table 10: Estimated Marginal Means: Risk Status x Portion Size for Grams

	Low Risk	High Risk
0	411.393	393.109
0.33	458.768	423.761
0.66	488.546	423.405
0.99	498.740	413.233

```
    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 0.57914, df = 84.923, p-value = 0.564
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -44.48714  81.05440
sample estimates:
```

```
 mean in group Low Risk mean in group High Risk
              411.3927                393.1090


    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 1.0871, df = 79.465, p-value = 0.2803
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -29.08150  99.09491
sample estimates:
 mean in group Low Risk mean in group High Risk
              458.7678                423.7611


    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 1.9856, df = 78.731, p-value = 0.05056
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
  -0.1640152 130.4464035
sample estimates:
 mean in group Low Risk mean in group High Risk
              488.5457                423.4045


    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 2.6926, df = 83.109, p-value = 0.008573
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
  22.34566 148.66905
sample estimates:
 mean in group Low Risk mean in group High Risk
              498.7399                413.2325
```

3.4.2 kcal

Adding an interaction between Risk Status and Portion Size (linear effect) significantly improved model fit.

```
Data: intake_long
Models:
kcal_ps_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + (1 | sub)
kcal_psxrisk_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom * ps_prop +
                 npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
kcal_ps_mod        10 4766.6 4805.5 -2373.3   4746.6
kcal_psxrisk_mod   12 4763.2 4809.9 -2369.6   4739.2 7.3876  2    0.02488 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 11: Regression Table: Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-199.070	360.713	93.851	-0.552	0.582
preFF	-0.908	0.324	343.921	-2.805	0.005
bmi	47.183	17.076	86.645	2.763	0.007
sexFemale	-32.866	41.680	86.878	-0.789	0.433
age_yr	-30.249	33.604	87.452	-0.900	0.371
avg_vas	56.824	22.039	327.352	2.578	0.010
meal_order	8.646	6.269	264.368	1.379	0.169
risk_status_momHigh Risk	-22.171	47.917	121.915	-0.463	0.644
ps_prop	149.324	24.939	263.579	5.988	0.000
risk_status_momHigh Risk:ps_prop	-85.760	38.203	263.454	-2.245	0.026

Figure 2: kCal Consumed: Risk Status x Portion Size

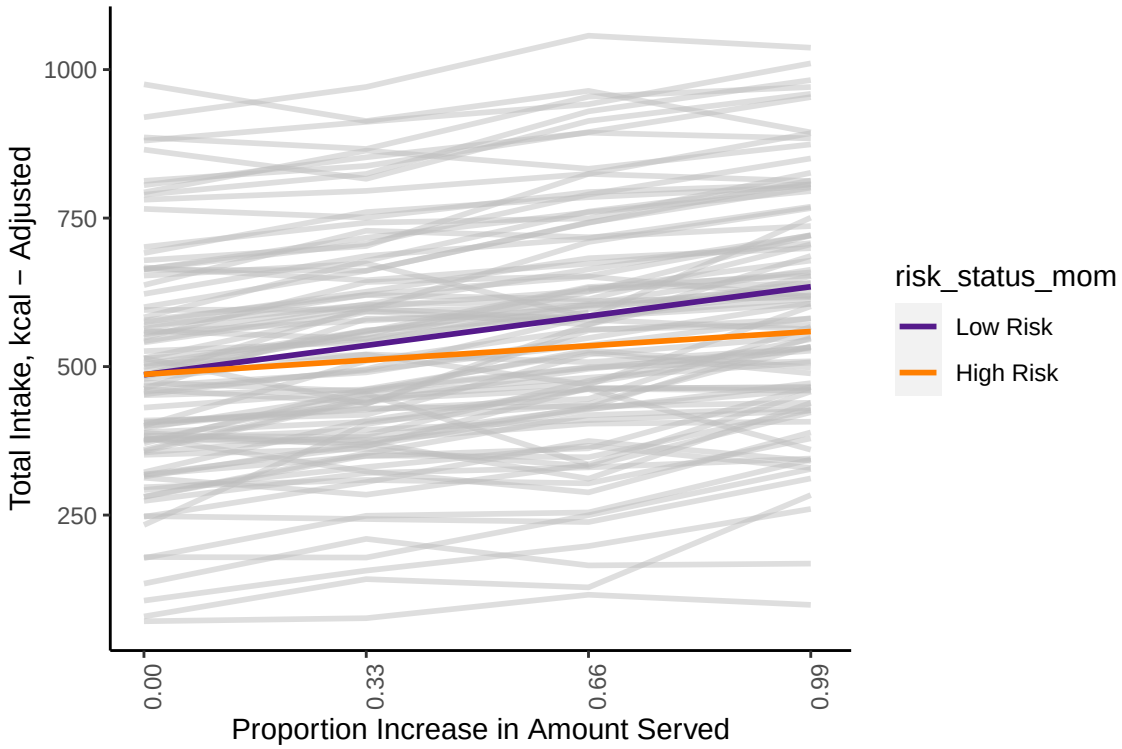

Table 12: Estimated Simple Slopes: Risk Status x Linear Portion Size for kcal

risk_status_mom	ps_prop.trend	SE	df	t.ratio	p.value
Low Risk	149.324	24.94	264.482	5.987	0.000
High Risk	63.564	28.99	264.129	2.193	0.029

Table 13: Estimated Marginal Means: Risk Status x Portion Size for kcal

	Low Risk	High Risk
0	485.748	485.751
0.33	534.560	516.052
0.66	588.442	528.555
0.99	632.444	561.650

```
    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = -6.7215e-05, df = 79.276, p-value = 0.9999
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -83.10103  83.09542
sample estimates:
 mean in group Low Risk mean in group High Risk
               485.7485                485.7513


    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 0.44911, df = 75.884, p-value = 0.6546
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -63.57096 100.58643
sample estimates:
 mean in group Low Risk mean in group High Risk
               534.5596                516.0519


    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 1.356, df = 72.77, p-value = 0.1793
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -28.13734 147.91064
sample estimates:
 mean in group Low Risk mean in group High Risk
               588.4416                528.5550
```

```
    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 1.6957, df = 80.359, p-value = 0.09382
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -12.28412 153.87232
sample estimates:
 mean in group Low Risk mean in group High Risk
               632.4437                561.6496
```

3.5 Exploratory Analyses: Effect of BMI

After controlling for age and sex, there was a difference in BMI by Risk Status such that the High Risk group had BMI that was 0.73 higher on average.

Table 14: Regression Table: BMI and Risk Status

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	13.615	1.622	8.395	0.000
age_yr	0.241	0.206	1.169	0.245
sexFemale	-0.073	0.258	-0.284	0.777
risk_status_momHigh Risk	0.749	0.260	2.877	0.005

Since BMI was associated with both total grams and kcal intake, I tested if adding a BMI x Poriton Size interaction improved the model.

3.5.1 Grams

Adding a BMI x Portion Size interaction did not improve the model for grams

```
Data: intake_long
Models:
grams_psxrisk_psquad_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom *
grams_psxrisk_psxbmi_psquad_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_statu
                                 npar    AIC    BIC  logLik deviance  Chisq Df
grams_psxrisk_psquad_mod           13 4482.5 4533.1 -2228.3   4456.5
grams_psxrisk_psxbmi_psquad_mod    14 4484.4 4538.9 -2228.2   4456.4 0.0904  1
                                 Pr(>Chisq)
grams_psxrisk_psquad_mod
grams_psxrisk_psxbmi_psquad_mod     0.7637
```

3.5.2 kcal

Adding a BMI x Portion Size interaction did not improve the model for kcal.

Data: intake_long Models: kcal_psxrisk_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom * ps_prop + (1 | sub) kcal_psxrisk_psxbmi_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom * ps_prop + bmi * ps_prop + ps_prop2 + (1 | sub) npar AIC BIC logLik deviance Chisq Df kcal_psxrisk_mod 12 4763.2 4809.9 -2369.6 4739.2 kcal_psxrisk_psxbmi_mod 14 4764.6 4819.0 -2368.3 4736.6 2.6742 2 Pr(>Chisq) kcal_psxrisk_mod kcal_psxrisk_psxbmi_mod 0.2626

4 Exploratory Analyses: Individual Foods

4.1 Chicken Nuggets

4.1.1 Grams

4.1.1.1 Base Model The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget gram intake with linear effect.

```
Data: intake_long
Models:
grams_chnug_ps_mod: chnug_grams ~ preFF + bmi + sex + age_yr + chnug_vas + meal_order + ps_prop + (1 | s
grams_chnug_ps_psquad_mod: chnug_grams ~ preFF + bmi + sex + age_yr + chnug_vas + meal_order + ps_prop +
                          npar    AIC    BIC  logLik deviance  Chisq Df
grams_chnug_ps_mod          10 3851.5 3890.4 -1915.8   3831.5
grams_chnug_ps_psquad_mod   11 3853.1 3895.9 -1915.5   3831.1 0.4389  1
                          Pr(>Chisq)
grams_chnug_ps_mod
grams_chnug_ps_psquad_mod     0.5076
```

Table 15: Chicken Nugget - Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-35.992	77.930	88.011	-0.462	0.645
preFF	-0.251	0.090	347.183	-2.783	0.006
bmi	4.050	3.533	79.763	1.147	0.255
sexFemale	-14.240	8.931	79.859	-1.594	0.115
age_yr	-4.659	7.273	81.678	-0.641	0.524
chnug_vas	20.431	3.896	285.932	5.245	0.000
meal_order	2.880	1.907	260.620	1.510	0.132
ps_prop	29.004	5.756	258.106	5.039	0.000

Table 16: Chicken Nugget - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-51.292	77.922	86.684	-0.658	0.512
preFF	-0.246	0.091	346.026	-2.719	0.007
bmi	5.683	3.673	78.857	1.547	0.126
sexFemale	-12.490	8.951	78.860	-1.395	0.167
age_yr	-5.798	7.260	80.553	-0.799	0.427
chnug_vas	20.372	3.881	281.925	5.249	0.000
meal_order	2.869	1.902	259.223	1.509	0.133
ps_prop	36.543	7.545	256.742	4.843	0.000
risk_status_momHigh Risk	-5.441	11.105	147.605	-0.490	0.625
ps_prop:risk_status_momHigh Risk	-17.921	11.607	257.037	-1.544	0.124

4.1.1.2 Risk x Portion Size

4.1.2 kcal

4.1.2.1 Base Model The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget kcal intake with linear effect.

```
Data: intake_long
Models:
kcal_chnug_ps_mod: chnug_kcal ~ preFF + bmi + sex + age_yr + chnug_vas + meal_order + ps_prop + (1 | su
kcal_chnug_ps_psquad_mod: chnug_kcal ~ preFF + bmi + sex + age_yr + chnug_vas + meal_order + ps_prop + p
                         npar    AIC    BIC  logLik deviance  Chisq Df
kcal_chnug_ps_mod          10 4514.9 4553.8 -2247.5   4494.9
kcal_chnug_ps_psquad_mod   11 4516.5 4559.3 -2247.2   4494.5 0.4389  1
                         Pr(>Chisq)
kcal_chnug_ps_mod
kcal_chnug_ps_psquad_mod     0.5076
```

Table 17: Chicken - Nugget Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-89.980	194.824	88.011	-0.462	0.645
preFF	-0.628	0.226	347.183	-2.783	0.006
bmi	10.126	8.832	79.763	1.147	0.255
sexFemale	-35.599	22.328	79.859	-1.594	0.115
age_yr	-11.648	18.182	81.678	-0.641	0.524
chnug_vas	51.077	9.739	285.932	5.245	0.000
meal_order	7.201	4.768	260.620	1.510	0.132
ps_prop	72.509	14.390	258.106	5.039	0.000

Table 18: Chicken - Nugget Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-128.231	194.805	86.684	-0.658	0.512
preFF	-0.616	0.226	346.026	-2.719	0.007
bmi	14.208	9.184	78.857	1.547	0.126
sexFemale	-31.226	22.378	78.860	-1.395	0.167
age_yr	-14.495	18.149	80.553	-0.799	0.427
chnug_vas	50.931	9.703	281.925	5.249	0.000
meal_order	7.174	4.755	259.223	1.509	0.133
ps_prop	91.358	18.863	256.742	4.843	0.000
risk_status_momHigh Risk	-13.603	27.764	147.605	-0.490	0.625
ps_prop:risk_status_momHigh Risk	-44.802	29.017	257.037	-1.544	0.124

4.1.2.2 Risk x Portion Size

4.2 Mac and Cheese

4.2.1 Grams

4.2.1.1 Base Model The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget gram intake with linear effect.

```
Data: intake_long
Models:
grams_mac_ps_mod: mac_grams ~ preFF + bmi + sex + age_yr + mac_vas + meal_order + ps_prop + (1 | sub)
grams_mac_ps_psquad_mod: mac_grams ~ preFF + bmi + sex + age_yr + mac_vas + meal_order + ps_prop + ps_p
                        npar    AIC    BIC  logLik deviance  Chisq Df
grams_mac_ps_mod          10 4051.8 4090.7 -2015.9   4031.8
grams_mac_ps_psquad_mod   11 4052.1 4094.8 -2015.0   4030.1 1.7597  1
                        Pr(>Chisq)
grams_mac_ps_mod
grams_mac_ps_psquad_mod     0.1847
```

Table 19: Mac and Cheese - Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-92.806	163.779	84.777	-0.567	0.572
preFF	-0.115	0.116	316.319	-0.994	0.321
bmi	17.249	7.680	84.009	2.246	0.027
sexFemale	0.674	19.401	83.543	0.035	0.972
age_yr	-17.720	15.679	83.764	-1.130	0.262
mac_vas	21.430	4.564	339.558	4.696	0.000
meal_order	2.609	2.168	259.507	1.203	0.230
ps_prop	14.797	6.547	259.007	2.260	0.025

Table 20: Mac and Cheese - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-109.470	165.098	83.553	-0.663	0.509
preFF	-0.113	0.117	313.671	-0.964	0.336
bmi	19.279	8.040	82.717	2.398	0.019
sexFemale	2.781	19.583	82.365	0.142	0.887
age_yr	-18.969	15.770	82.622	-1.203	0.232
mac_vas	21.375	4.592	338.223	4.655	0.000
meal_order	2.608	2.171	258.222	1.201	0.231
ps_prop	16.979	8.647	257.826	1.964	0.051
risk_status_momHigh Risk	-15.217	21.698	101.008	-0.701	0.485
ps_prop:risk_status_momHigh Risk	-5.138	13.295	258.527	-0.386	0.699

4.2.1.2 Risk x Portion Size The interaction between Risk Status and Portion Size was not significant so it was removed from the model.

Table 21: Mac and Cheese - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-108.895	164.980	83.631	-0.660	0.511
preFF	-0.109	0.116	314.540	-0.940	0.348
bmi	19.270	8.035	82.810	2.398	0.019
sexFemale	2.778	19.570	82.459	0.142	0.887
age_yr	-18.970	15.759	82.716	-1.204	0.232
mac_vas	21.528	4.567	338.897	4.714	0.000
meal_order	2.597	2.168	259.313	1.198	0.232
ps_prop	14.800	6.548	258.831	2.260	0.025
risk_status_momHigh Risk	-17.813	20.617	82.735	-0.864	0.390

4.2.2 kcal

4.2.2.1 Base Model The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget kcal intake with linear effect.

```
Data: intake_long
Models:
kcal_mac_ps_mod: mac_kcal ~ preFF + bmi + sex + age_yr + mac_vas + meal_order + ps_prop + (1 | sub)
kcal_mac_ps_psquad_mod: mac_kcal ~ preFF + bmi + sex + age_yr + mac_vas + meal_order + ps_prop + ps_pro
                        npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
kcal_mac_ps_mod           10 4434.9 4473.8 -2207.5   4414.9
kcal_mac_ps_psquad_mod    11 4435.2 4478.0 -2206.6   4413.2 1.7597  1     0.1847
```

Table 22: Mac and Cheese - Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-157.770	278.424	84.777	-0.567	0.572
preFF	-0.196	0.197	316.319	-0.994	0.321
bmi	29.324	13.057	84.009	2.246	0.027
sexFemale	1.145	32.981	83.543	0.035	0.972
age_yr	-30.124	26.654	83.764	-1.130	0.262
mac_vas	36.431	7.758	339.558	4.696	0.000
meal_order	4.435	3.685	259.507	1.203	0.230
ps_prop	25.155	11.130	259.007	2.260	0.025

Table 23: Mac and Cheese - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-186.099	280.666	83.553	-0.663	0.509
preFF	-0.192	0.199	313.671	-0.964	0.336
bmi	32.774	13.668	82.717	2.398	0.019
sexFemale	4.728	33.291	82.365	0.142	0.887
age_yr	-32.247	26.809	82.621	-1.203	0.232
mac_vas	36.338	7.806	338.223	4.655	0.000
meal_order	4.434	3.691	258.222	1.201	0.231
ps_prop	28.865	14.699	257.826	1.964	0.051
risk_status_momHigh Risk	-25.870	36.887	101.008	-0.701	0.485
ps_prop:risk_status_momHigh Risk	-8.734	22.601	258.527	-0.386	0.699

4.2.2.2 Risk x Portion Size The interaction between Risk Status and Portion Size was not significant so it was removed from the model.

Table 24: Mac and Cheese - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-185.121	280.466	83.631	-0.660	0.511
preFF	-0.186	0.198	314.540	-0.940	0.348
bmi	32.759	13.659	82.811	2.398	0.019
sexFemale	4.722	33.269	82.459	0.142	0.887
age_yr	-32.249	26.791	82.716	-1.204	0.232
mac_vas	36.597	7.764	338.897	4.714	0.000
meal_order	4.414	3.686	259.313	1.198	0.232
ps_prop	25.161	11.132	258.831	2.260	0.025
risk_status_momHigh Risk	-30.283	35.049	82.735	-0.864	0.390

4.3 Grapes

4.3.1 Grams

4.3.1.1 Base Model The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget gram intake with linear effect.

```
Data: intake_long
Models:
grams_grape_ps_mod: grape_grams ~ preFF + bmi + sex + age_yr + grape_vas + meal_order + ps_prop + (1 | s
grams_grape_ps_psquad_mod: grape_grams ~ preFF + bmi + sex + age_yr + grape_vas + meal_order + ps_prop +
                          npar    AIC    BIC  logLik deviance Chisq Df
grams_grape_ps_mod          10 3929.8 3968.7 -1954.9   3909.8
grams_grape_ps_psquad_mod   11 3931.8 3974.6 -1954.9   3909.8 0.033  1
                          Pr(>Chisq)
grams_grape_ps_mod
grams_grape_ps_psquad_mod     0.8558
```

Table 25: Grapes - Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	48.418	132.639	86.343	0.365	0.716
preFF	-0.051	0.097	321.469	-0.521	0.603
bmi	-8.872	6.181	83.809	-1.435	0.155
sexFemale	-11.029	15.651	84.010	-0.705	0.483
age_yr	21.132	12.655	84.374	1.670	0.099
grape_vas	8.907	3.970	341.834	2.244	0.025
meal_order	-4.954	1.817	261.212	-2.727	0.007
ps_prop	16.143	5.489	260.643	2.941	0.004

Table 26: Grapes - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	44.024	134.162	85.484	0.328	0.744
preFF	-0.051	0.098	318.329	-0.527	0.599
bmi	-8.485	6.493	82.931	-1.307	0.195
sexFemale	-10.650	15.843	83.056	-0.672	0.503
age_yr	20.868	12.768	83.501	1.634	0.106
grape_vas	9.072	4.001	339.767	2.267	0.024
meal_order	-4.953	1.820	260.139	-2.721	0.007
ps_prop	18.117	7.230	259.594	2.506	0.013
risk_status_momHigh Risk	-1.167	17.610	103.097	-0.066	0.947
ps_prop:risk_status_momHigh Risk	-4.693	11.159	260.261	-0.420	0.674

4.3.1.2 Risk x Portion Size The interaction between Risk Status and Portion Size was not significiant so it was removed from the model.

Table 27: Grapes - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	45.403	134.276	85.472	0.338	0.736
preFF	-0.049	0.097	319.243	-0.503	0.615
bmi	-8.473	6.501	83.001	-1.303	0.196
sexFemale	-10.605	15.861	83.124	-0.669	0.506
age_yr	20.884	12.782	83.570	1.634	0.106
grape_vas	8.879	3.979	340.317	2.231	0.026
meal_order	-4.957	1.817	261.209	-2.728	0.007
ps_prop	16.146	5.489	260.673	2.942	0.004
risk_status_momHigh Risk	-3.486	16.738	83.861	-0.208	0.836

4.3.2 kcal

4.3.2.1 Base Model The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget kcal intake with linear effect.

```
Data: intake_long
Models:
kcal_grape_ps_mod: grape_kcal ~ preFF + bmi + sex + age_yr + grape_vas + meal_order + ps_prop + (1 | su
kcal_grape_ps_psquad_mod: grape_kcal ~ preFF + bmi + sex + age_yr + grape_vas + meal_order + ps_prop + p
                         npar    AIC    BIC  logLik deviance Chisq Df
kcal_grape_ps_mod          10 3666.4 3705.3 -1823.2   3646.4
kcal_grape_ps_psquad_mod   11 3668.4 3711.2 -1823.2   3646.4 0.033  1
                         Pr(>Chisq)
kcal_grape_ps_mod
kcal_grape_ps_psquad_mod     0.8558
```

Table 28: Grapes - Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	33.651	92.184	86.343	0.365	0.716
preFF	-0.035	0.067	321.469	-0.521	0.603
bmi	-6.166	4.296	83.809	-1.435	0.155
sexFemale	-7.665	10.877	84.010	-0.705	0.483
age_yr	14.687	8.795	84.374	1.670	0.099
grape_vas	6.190	2.759	341.834	2.244	0.025
meal_order	-3.443	1.263	261.212	-2.727	0.007
ps_prop	11.220	3.815	260.643	2.941	0.004

Table 29: Grapes - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	30.596	93.243	85.484	0.328	0.744
preFF	-0.036	0.068	318.329	-0.527	0.599
bmi	-5.897	4.513	82.931	-1.307	0.195
sexFemale	-7.402	11.011	83.056	-0.672	0.503
age_yr	14.503	8.873	83.501	1.634	0.106
grape_vas	6.305	2.781	339.767	2.267	0.024
meal_order	-3.442	1.265	260.139	-2.721	0.007
ps_prop	12.591	5.025	259.594	2.506	0.013
risk_status_momHigh Risk	-0.811	12.239	103.097	-0.066	0.947
ps_prop:risk_status_momHigh Risk	-3.261	7.756	260.261	-0.420	0.674

4.3.2.2 Risk x Portion Size The interaction between Risk Status and Portion Size was not significant so it was removed from the model.

Table 30: Grapes - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	31.555	93.322	85.472	0.338	0.736
preFF	-0.034	0.068	319.243	-0.503	0.615
bmi	-5.888	4.518	83.001	-1.303	0.196
sexFemale	-7.371	11.023	83.124	-0.669	0.506
age_yr	14.514	8.883	83.570	1.634	0.106
grape_vas	6.171	2.765	340.317	2.231	0.026
meal_order	-3.445	1.263	261.209	-2.728	0.007
ps_prop	11.221	3.815	260.673	2.942	0.004
risk_status_momHigh Risk	-2.423	11.633	83.861	-0.208	0.836

4.4 Broccoli

4.4.1 Grams

4.4.1.1 Base Model The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget gram intake with linear effect.

```
Data: intake_long
Models:
grams_broc_ps_mod: broc_grams ~ preFF + bmi + sex + age_yr + broc_vas + meal_order + ps_prop + (1 | sub
grams_broc_ps_psquad_mod: broc_grams ~ preFF + bmi + sex + age_yr + broc_vas + meal_order + ps_prop + ps
                         npar    AIC    BIC  logLik deviance  Chisq Df
grams_broc_ps_mod          10 3609.8 3648.8 -1794.9   3589.8
grams_broc_ps_psquad_mod   11 3611.2 3654.0 -1794.6   3589.2 0.6809  1
                         Pr(>Chisq)
grams_broc_ps_mod
grams_broc_ps_psquad_mod     0.4093
```

Table 31: Broccoli - Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-51.879	74.007	80.642	-0.701	0.485
preFF	0.005	0.064	339.887	0.082	0.935
bmi	-1.222	3.429	77.749	-0.356	0.723
sexFemale	8.334	8.665	77.619	0.962	0.339
age_yr	11.484	7.011	78.137	1.638	0.105
broc_vas	2.345	2.198	292.808	1.067	0.287
meal_order	-0.997	1.229	255.112	-0.811	0.418
ps_prop	0.786	3.718	255.008	0.211	0.833

Table 32: brocs - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-56.359	75.038	79.370	-0.751	0.455
preFF	-0.001	0.064	335.404	-0.014	0.989
bmi	-0.787	3.616	76.762	-0.218	0.828
sexFemale	8.883	8.819	76.865	1.007	0.317
age_yr	11.123	7.106	77.277	1.565	0.122
broc_vas	1.985	2.203	296.040	0.901	0.368
meal_order	-0.982	1.220	253.971	-0.805	0.422
ps_prop	7.366	4.849	254.032	1.519	0.130
risk_status_momHigh Risk	3.370	10.033	105.098	0.336	0.738
ps_prop:risk_status_momHigh Risk	-15.533	7.451	253.531	-2.085	0.038

4.4.1.2 Risk x Portion Size Unlike other models, none of the control variables were associated with broccoli intake.

There was a significant interaction between Risk Status and Portion Size.

Table 33: Estimated Simple Slopes: Risk Status x Portion Size for Broccoli grams

risk_status_mom	ps_prop.trend	SE	df	t.ratio	p.value
Low Risk	7.366	4.849	265.661	1.519	0.130
High Risk	-8.167	5.670	265.080	-1.440	0.151

contrast	estimate	SE	df	t.ratio	p.value
Low Risk - High Risk	15.533	7.451	265.198	2.085	0.038

4.4.2 kcal

4.4.2.1 Base Model The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget kcal intake with linear effect.

```
Data: intake_long
Models:
kcal_broc_ps_mod: broc_kcal ~ preFF + bmi + sex + broc_vas + age_yr + meal_order + ps_prop + (1 | sub)
kcal_broc_ps_psquad_mod: broc_kcal ~ preFF + bmi + sex + age_yr + broc_vas + meal_order + ps_prop + ps_
                        npar    AIC    BIC  logLik deviance  Chisq Df
kcal_broc_ps_mod          10 3612.0 3650.9 -1796.0   3592.0
kcal_broc_ps_psquad_mod   11 3613.3 3656.1 -1795.7   3591.3 0.6809  1
                        Pr(>Chisq)
kcal_broc_ps_mod
kcal_broc_ps_psquad_mod     0.4093
```

Table 34: Broccoli - Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-52.034	74.229	80.642	-0.701	0.485
preFF	0.005	0.064	339.887	0.082	0.935
bmi	-1.225	3.440	77.749	-0.356	0.723
sexFemale	8.359	8.691	77.619	0.962	0.339
broc_vas	2.352	2.205	292.808	1.067	0.287
age_yr	11.519	7.032	78.137	1.638	0.105
meal_order	-1.000	1.233	255.112	-0.811	0.418
ps_prop	0.788	3.729	255.008	0.211	0.833

Table 35: brocs - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-56.528	75.263	79.370	-0.751	0.455
preFF	-0.001	0.064	335.404	-0.014	0.989
bmi	-0.789	3.627	76.762	-0.218	0.828
sexFemale	8.909	8.846	76.865	1.007	0.317
age_yr	11.156	7.127	77.277	1.565	0.122
broc_vas	1.991	2.209	296.040	0.901	0.368
meal_order	-0.985	1.224	253.971	-0.805	0.422
ps_prop	7.388	4.863	254.032	1.519	0.130
risk_status_momHigh Risk	3.380	10.063	105.098	0.336	0.738
ps_prop:risk_status_momHigh Risk	-15.580	7.473	253.531	-2.085	0.038

4.4.2.2 Risk x Portion Size Unlike other models, none of the control variables were associated with broccoli intake.

There was a significant interaction between Risk Status and Portion Size.

Table 36: Estimated Simple Slopes: Risk Status x Portion Size for Broccoli kcal

risk_status_mom	ps_prop.trend	SE	df	t.ratio	p.value
Low Risk	7.388	4.864	265.661	1.519	0.130
High Risk	-8.191	5.687	265.080	-1.440	0.151

contrast	estimate	SE	df	t.ratio	p.value
Low Risk - High Risk	15.58	7.473	265.198	2.085	0.038

5 Exploratory Analyses: Mediated Moderation

Since broccoli was the only food showing a Risk Status x Portion Size interaction, I tested whether broccoli intake mediates the overall Risk x Potion Size interaction using a mediated moderation model.

5.1 Grams

```
lavaan 0.6-9 ended normally after 268 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
  Number of model parameters                        25

                                                  Used       Total
  Number of observations                           361         372
  Number of clusters [sub]                          93

Model Test User Model:
                                              Standard      Robust
  Test Statistic                                10.688       6.067
  Degrees of freedom                                 4           4
  P-value (Chi-square)                           0.030       0.194
  Scaling correction factor                                  1.762
       Yuan-Bentler correction (Mplus variant)

Parameter Estimates:

  Standard errors                           Robust.cluster
  Information                                     Observed
  Observed information based on                   Hessian

Regressions:
                   Estimate   Std.Err  z-value  P(>|z|)
  grams ~
    sub              -0.519    0.368   -1.410    0.159
    preFF            -0.989    0.359   -2.755    0.006
    bmi              24.568   13.062    1.881    0.060
    sex             -46.264   31.220   -1.482    0.138
    age_yr          -32.496   22.436   -1.448    0.148
    avg_vas          54.473   25.530    2.134    0.033
    meal_order       -4.852    4.364   -1.112    0.266
    rsk_stts_m      -25.248   35.142   -0.718    0.472
    ps_prop         200.816   49.851    4.028    0.000
    psxrisk_nt (c)  -57.886   23.682   -2.444    0.015
    ps_prop2       -124.824   46.449   -2.687    0.007
  broc_grams ~
    preFF            -0.078    0.072   -1.086    0.278
    bmi              -0.417    2.462   -0.169    0.866
    sex               6.230    7.841    0.795    0.427
    age_yr           12.671    7.993    1.585    0.113
    broc_vas         12.256    2.870    4.271    0.000
    meal_order       -0.949    1.431   -0.663    0.507
```

```
    rsk_stts_m         7.381    7.907    0.934    0.351
    ps_prop            6.061    5.450    1.112    0.266
    psxrisk_nt (a)   -14.482    7.155   -2.024    0.043
  grams ~
    broc_grams (b)     1.199    0.207    5.786    0.000

Intercepts:
                   Estimate   Std.Err  z-value  P(>|z|)
   .grams            216.029  297.161    0.727    0.467
   .broc_grams      -115.550   66.490   -1.738    0.082

Variances:
                   Estimate   Std.Err  z-value  P(>|z|)
   .grams          23259.471 2446.615    9.507    0.000
   .broc_grams      1967.220  683.868    2.877    0.004

Defined Parameters:
                   Estimate   Std.Err  z-value  P(>|z|)
    ab               -17.360    8.969   -1.936    0.053
    total            -75.245   25.352   -2.968    0.003
```

There was a significant level indirect effect (p = 0.036) indicating that broccoli intake mediated the interaction between risk status and portion size for gram intake.

5.2 kcal

```
lavaan 0.6-9 ended normally after 241 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
  Number of model parameters                        24

                                                  Used       Total
  Number of observations                           361         372
  Number of clusters [sub]                          93

Model Test User Model:
                                              Standard      Robust
  Test Statistic                                15.179       6.728
  Degrees of freedom                                 3           3
  P-value (Chi-square)                           0.002       0.081
  Scaling correction factor                                  2.256
      Yuan-Bentler correction (Mplus variant)

Parameter Estimates:

  Standard errors                          Robust.cluster
  Information                                    Observed
  Observed information based on                   Hessian

Regressions:
                   Estimate   Std.Err  z-value  P(>|z|)
```

```
  kcal ~
    sub               -0.357    0.534   -0.668    0.504
    preFF             -1.529    0.454   -3.367    0.001
    bmi               41.413   17.364    2.385    0.017
    sex              -55.320   43.797   -1.263    0.207
    age_yr           -55.000   31.362   -1.754    0.079
    avg_vas           70.058   29.848    2.347    0.019
    meal_order         7.533    6.795    1.109    0.268
    rsk_stts_m       -16.321   45.944   -0.355    0.722
    ps_prop          142.185   22.396    6.349    0.000
    psxrisk_nt (c)   -69.167   37.010   -1.869    0.062
  broc_kcal ~
    preFF             -0.078    0.072   -1.086    0.278
    bmi               -0.418    2.469   -0.169    0.866
    sex                6.248    7.864    0.795    0.427
    age_yr            12.709    8.017    1.585    0.113
    broc_vas          12.293    2.878    4.271    0.000
    meal_order        -0.952    1.436   -0.663    0.507
    rsk_stts_m         7.403    7.931    0.934    0.351
    ps_prop            6.080    5.466    1.112    0.266
    psxrisk_nt (a)   -14.526    7.176   -2.024    0.043
  kcal ~
    broc_kcal  (b)     1.232    0.332    3.713    0.000

Intercepts:
                   Estimate   Std.Err  z-value  P(>|z|)
   .kcal             128.447  416.610    0.308    0.758
   .broc_kcal       -115.897   66.690   -1.738    0.082

Variances:
                   Estimate   Std.Err  z-value  P(>|z|)
   .kcal           45174.008 5486.636    8.233    0.000
   .broc_kcal       1979.041  687.977    2.877    0.004

Defined Parameters:
                   Estimate   Std.Err  z-value  P(>|z|)
    ab               -17.895    9.697   -1.845    0.065
    total            -87.063   38.089   -2.286    0.022
```

There was a significant level indirect effect (p = 0.048) indicating that broccoli intake mediated the interaction between risk status and portion size for kcal intake.