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 = 51	**High Risk**, N = 36	**N = 87**
Sex			
Male	29 (57%)	16 (44%)	45 (52%)
Female	22 (43%)	20 (56%)	42 (48%)
Age, yr	7.8 (0.7)	7.7 (0.5)	7.8 (0.6)
Ethnicity			
Not Hispanic/Lantinx	51 (100%)	36 (100%)	87 (100%)
Race			
0	48 (94%)	36 (100%)	84 (97%)
2	3 (5.9%)	0 (0%)	3 (3.4%)
Income			
< $51,000	4 (8.0%)	7 (21%)	11 (13%)
>$100,000	24 (48%)	7 (21%)	31 (37%)
$51,000 - $100,000	22 (44%)	20 (59%)	42 (50%)
Unknown	1	2	3
BMI %tile	41.2 (24.1)	56.1 (24.3)	47.4 (25.2)
Mother's Education			
> Bachelor Degree	22 (44%)	5 (14%)	27 (31%)
AA/Technical Degree	3 (6.0%)	6 (17%)	9 (10%)
Bachelor Degree	22 (44%)	19 (53%)	41 (48%)
High School/GED	3 (6.0%)	6 (17%)	9 (10%)
Unknown	1	0	1
Father's Education			
> Bachelor Degree	28 (55%)	3 (9.4%)	31 (37%)
AA/Technical Degree	3 (5.9%)	11 (34%)	14 (17%)
Bachelor Degree	14 (27%)	12 (38%)	26 (31%)
High School/GED	6 (12%)	5 (16%)	11 (13%)
Other/NA	0 (0%)	1 (3.1%)	1 (1.2%)
Unknown	0	4	4

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

Age - t-test

```
    Welch Two Sample t-test

data:  age_yr by risk_status_mom
t = 0.45466, df = 82.635, p-value = 0.6505
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -0.1990168  0.3169580
sample estimates:
 mean in group Low Risk mean in group High Risk
               7.806471                7.747500
```

BMI Percentile - t-test

```
    Welch Two Sample t-test

data:  bmi_percentile by risk_status_mom
t = -2.8331, df = 75.193, p-value = 0.005914
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -25.46063  -4.43813
sample estimates:
 mean in group Low Risk mean in group High Risk
               41.16451                56.11389

 Low Risk High Risk
 24.14348  24.30838
```

Sex - χ^2

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

data:  r01_intake$sex and r01_intake$risk_status_mom
X-squared = 0.85345, df = 1, p-value = 0.3556
```

Income - χ^2

```
    Pearson's Chi-squared test

data:  r01_intake$income and r01_intake$risk_status_mom
X-squared = 7.459, df = 2, p-value = 0.024
```

Mom Education - Fisher test

```
    Fisher's Exact Test for Count Data

data:  r01_intake$mom_ed and r01_intake$risk_status_mom
p-value = 0.008671
alternative hypothesis: two.sided
```

2 Meal Liking

Table 2: Regression Table: Portion Size for Liking

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	3.431	0.795	84.097	4.314	0.000
preFF	-0.002	0.001	308.792	-2.359	0.019
bmi	0.022	0.051	82.858	0.434	0.665
sexFemale	0.120	0.126	82.513	0.948	0.346
meal_order	0.015	0.014	256.591	1.065	0.288
risk_status_momHigh Risk	0.031	0.135	82.992	0.228	0.821
ps_prop	0.039	0.043	256.698	0.904	0.367

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 = 51	**High Risk**, N = 36	**N = 87**
ps1_total_g	407.3 (168.6)	408.9 (165.6)	408.0 (166.4)
ps1_total_kcal	473.1 (200.7)	493.7 (197.2)	481.7 (198.4)
ps1_avg_vas	3.8 (0.6)	3.9 (0.6)	3.8 (0.6)
ps2_total_g	467.8 (176.9)	402.7 (173.8)	440.9 (177.6)
ps2_total_kcal	543.3 (220.4)	508.7 (273.5)	529.0 (242.8)
ps2_avg_vas	3.8 (0.6)	3.8 (0.7)	3.8 (0.6)
ps3_total_g	490.1 (193.3)	432.7 (189.3)	466.3 (192.7)
ps3_total_kcal	602.0 (276.9)	530.2 (287.2)	572.3 (281.8)
ps3_avg_vas	3.8 (0.6)	3.8 (0.7)	3.8 (0.6)
ps4_total_g	496.1 (190.9)	425.3 (168.4)	466.8 (184.3)
ps4_total_kcal	619.1 (247.2)	568.9 (253.5)	598.3 (249.6)
ps4_avg_vas	3.8 (0.7)	3.9 (0.6)	3.9 (0.6)

[1] Mean (SD)

3.2 Intake by Food

Table 4: High Risk: Intake by Portion Size

Characteristic	**PS-1**, N = 36	**PS-2**, N = 36	**PS-3**, N = 36	**PS-4**, N = 36
chnug_grams	64.8 (45.8)	73.6 (80.0)	77.1 (62.2)	85.6 (65.3)
chnug_kcal	162.1 (114.6)	184.0 (200.1)	192.7 (155.6)	214.1 (163.2)
mac_grams	133.0 (106.3)	132.8 (112.4)	136.1 (132.4)	142.5 (125.3)
mac_kcal	226.1 (180.8)	225.7 (191.1)	231.4 (225.1)	242.2 (213.1)
grape_grams	84.1 (65.6)	93.4 (76.2)	96.3 (88.7)	104.5 (91.4)
grape_kcal	58.4 (45.6)	64.9 (53.0)	66.9 (61.7)	72.6 (63.5)
broc_grams	32.7 (53.7)	23.1 (29.3)	24.6 (38.1)	23.9 (37.6)
broc_kcal	32.8 (53.9)	23.1 (29.4)	24.7 (38.2)	24.0 (37.7)
mac_vas	4.2 (0.8)	3.9 (1.1)	3.9 (1.1)	4.0 (1.0)
chnug_vas	4.3 (1.0)	4.2 (1.0)	4.1 (1.2)	4.3 (0.9)
broc_vas	2.9 (1.7)	2.8 (1.5)	2.8 (1.5)	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 = 51	**PS-2**, N = 51	**PS-3**, N = 51	**PS-4**, N = 51
chnug_grams	68.8 (41.8)	83.0 (52.4)	99.3 (82.0)	105.4 (68.0)
chnug_kcal	172.0 (104.6)	207.5 (131.0)	248.3 (205.0)	263.5 (170.0)
mac_grams	115.9 (91.0)	130.4 (102.9)	140.5 (115.8)	132.4 (107.8)
mac_kcal	197.1 (154.8)	221.7 (175.0)	238.8 (196.8)	225.0 (183.2)
grape_grams	95.6 (81.7)	104.7 (86.7)	104.0 (93.4)	117.1 (104.3)
grape_kcal	66.5 (56.7)	72.7 (60.3)	72.3 (64.9)	81.4 (72.5)
broc_grams	27.4 (40.9)	29.7 (54.7)	29.8 (54.9)	36.3 (65.9)
broc_kcal	27.5 (41.0)	29.8 (54.8)	29.9 (55.1)	36.4 (66.1)
mac_vas	3.6 (1.0)	3.7 (1.0)	3.8 (1.1)	3.7 (1.0)
chnug_vas	4.1 (0.9)	4.3 (0.7)	4.2 (0.7)	4.2 (0.9)
broc_vas	3.2 (1.2)	3.1 (1.1)	3.2 (1.2)	3.3 (1.3)
grape_vas	4.2 (0.9)	4.2 (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 4323.5 4362.0 -2151.7   4303.5
grams_psquad_mod   11 4320.8 4363.1 -2149.4   4298.8 4.7133  1    0.02993 *
---
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)	69.979	294.510	86.112	0.238	0.813
preFF	-0.352	0.222	319.570	-1.587	0.114
bmi	21.336	13.113	81.536	1.627	0.108
sexFemale	-21.747	34.013	81.658	-0.639	0.524
age_yr	-14.244	27.915	81.170	-0.510	0.611
avg_vas	38.489	15.707	335.359	2.450	0.015
meal_order	-5.292	4.221	254.527	-1.254	0.211
ps_prop	149.249	44.562	254.288	3.349	0.001
ps_prop2	-93.578	43.356	254.614	-2.158	0.032

*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 4586.3 4624.8 -2283.1   4566.3
kcal_psquad_mod   11 4587.4 4629.7 -2282.7   4565.4 0.8767  1     0.3491
```

Table 7: Regression Table: Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	82.682	376.104	87.003	0.220	0.827
preFF	-0.927	0.331	334.493	-2.802	0.005
bmi	36.020	16.657	81.813	2.162	0.034
sexFemale	-27.770	43.211	81.940	-0.643	0.522
age_yr	-45.184	35.442	81.348	-1.275	0.206
avg_vas	56.091	22.702	313.574	2.471	0.014
meal_order	8.113	6.462	255.941	1.255	0.210
ps_prop	115.698	19.643	255.951	5.890	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 4320.8 4363.1 -2149.4   4298.8
grams_psxrisk_psquad_mod    13 4313.4 4363.4 -2143.7   4287.4 11.364  2
                          Pr(>Chisq)
grams_psquad_mod
grams_psxrisk_psquad_mod   0.003407 **
---
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)	-8.158	291.590	85.545	-0.028	0.978
preFF	-0.359	0.220	317.295	-1.631	0.104
bmi	29.423	13.533	81.163	2.174	0.033
sexFemale	-13.429	33.683	81.062	-0.399	0.691
age_yr	-19.036	27.536	80.540	-0.691	0.491
avg_vas	38.192	15.499	332.829	2.464	0.014
meal_order	-5.085	4.172	253.870	-1.219	0.224
risk_status_momHigh Risk	-36.791	37.928	102.594	-0.970	0.334
ps_prop	177.939	45.317	253.648	3.927	0.000
ps_prop2	-94.175	42.839	253.948	-2.198	0.029
risk_status_momHigh Risk:ps_prop	-68.591	25.560	253.653	-2.684	0.008

Figure 1: Grams Consumed: Risk Status x Portion Size

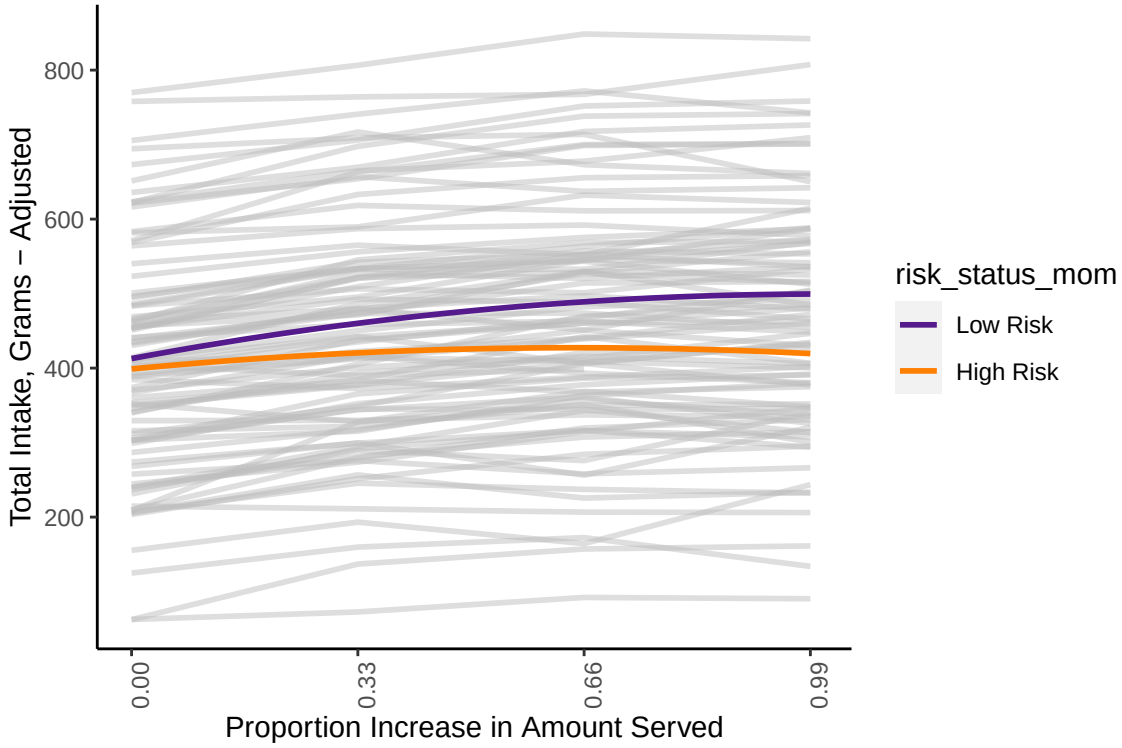

Table 9: Estimated Simple Slopes: Risk Status x Linear Portion Size for Grams

risk_status_mom	ps_prop.trend	SE	df	t.ratio	p.value
Low Risk	177.939	45.318	254.483	3.926	0.000
High Risk	109.348	46.462	254.427	2.354	0.019

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

	Low Risk	High Risk
0	412.815	397.896
0.33	460.033	423.267
0.66	489.099	424.511
0.99	499.366	420.439

```
    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 0.4547, df = 78.28, p-value = 0.6506
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -50.39785  80.23597
sample estimates:
```

```
 mean in group Low Risk mean in group High Risk
              412.8149                397.8959


    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 1.1154, df = 76.943, p-value = 0.2682
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -28.87265 102.40452
sample estimates:
 mean in group Low Risk mean in group High Risk
              460.0330                423.2671


    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 1.9385, df = 76.389, p-value = 0.05625
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
  -1.765298 130.942013
sample estimates:
 mean in group Low Risk mean in group High Risk
              489.0993                424.5110


    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 2.3874, df = 76.56, p-value = 0.01943
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
  13.0908 144.7642
sample estimates:
 mean in group Low Risk mean in group High Risk
              499.3660                420.4385
```

3.4.1.1 No Plate Cleaners

Table 11: Regression Table: No Plate Cleaners - Risk x Portion Size for grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-27.371	284.472	83.398	-0.096	0.924
preFF	-0.338	0.217	310.780	-1.555	0.121
bmi	23.134	13.446	78.905	1.721	0.089
sexFemale	-1.257	33.070	78.944	-0.038	0.970
age_yr	-4.757	27.314	78.389	-0.174	0.862
avg_vas	36.727	15.410	322.728	2.383	0.018
meal_order	-5.674	4.167	247.756	-1.362	0.175
risk_status_momHigh Risk	-35.327	37.548	100.295	-0.941	0.349
ps_prop	167.020	45.276	247.682	3.689	0.000
ps_prop2	-80.431	42.819	248.090	-1.878	0.061
risk_status_momHigh Risk:ps_prop	-66.268	25.561	247.649	-2.593	0.010

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 4586.3 4624.8 -2283.1   4566.3
kcal_psxrisk_mod   12 4583.5 4629.7 -2279.7   4559.5 6.8203  2    0.03304 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 12: Regression Table: Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	6.666	376.832	86.417	0.018	0.986
preFF	-0.929	0.330	331.755	-2.813	0.005
bmi	43.500	17.403	81.520	2.500	0.014
sexFemale	-19.988	43.310	81.360	-0.462	0.646
age_yr	-49.668	35.383	80.718	-1.404	0.164
avg_vas	55.632	22.557	311.420	2.466	0.014
meal_order	8.377	6.417	255.257	1.306	0.193
risk_status_momHigh Risk	-23.081	49.994	112.969	-0.462	0.645
ps_prop	150.649	25.364	255.082	5.940	0.000
risk_status_momHigh Risk:ps_prop	-85.275	39.577	255.180	-2.155	0.032

Figure 2: kCal Consumed: Risk Status x Portion Size

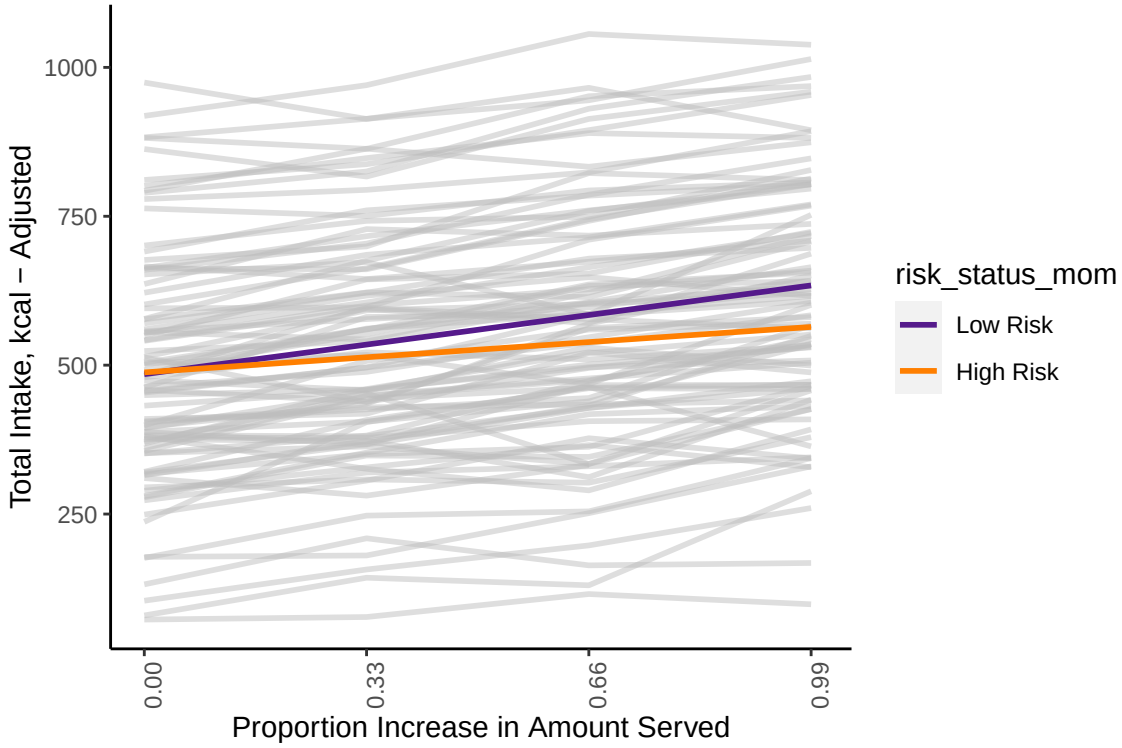

Table 13: Estimated Simple Slopes: Risk Status x Linear Portion Size for kcal

risk_status_mom	ps_prop.trend	SE	df	t.ratio	p.value
Low Risk	150.649	25.364	255.575	5.939	0.000
High Risk	65.374	30.430	255.846	2.148	0.033

Table 14: Estimated Marginal Means: Risk Status x Portion Size for kcal

	Low Risk	High Risk
0	484.344	491.669
0.33	533.787	512.962
0.66	587.434	527.885
0.99	632.002	571.722

```
    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = -0.16856, df = 72.4, p-value = 0.8666
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -93.94789  79.29763
sample estimates:
```

```
 mean in group Low Risk mean in group High Risk
               484.3436                491.6688


    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 0.49462, df = 73.75, p-value = 0.6223
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -63.07247 104.72293
sample estimates:
 mean in group Low Risk mean in group High Risk
               533.7869                512.9616


    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 1.3305, df = 70.935, p-value = 0.1876
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -29.69283 148.78887
sample estimates:
 mean in group Low Risk mean in group High Risk
               587.4335                527.8855


    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 1.3929, df = 73.814, p-value = 0.1678
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -25.9537 146.5141
sample estimates:
 mean in group Low Risk mean in group High Risk
               632.0019                571.7217
```

3.4.2.1 No Plate Cleaners

Table 15: Regression Table: No Plate Cleaners - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-13.363	371.018	84.269	-0.036	0.971
preFF	-0.919	0.327	324.155	-2.812	0.005
bmi	36.553	17.452	79.296	2.094	0.039
sexFemale	-6.264	42.925	79.320	-0.146	0.884
age_yr	-33.671	35.429	78.643	-0.950	0.345
avg_vas	53.859	22.444	300.161	2.400	0.017
meal_order	6.138	6.414	249.184	0.957	0.340
risk_status_momHigh Risk	-18.711	49.910	110.124	-0.375	0.708
ps_prop	154.406	25.306	249.183	6.102	0.000
risk_status_momHigh Risk:ps_prop	-89.388	39.596	249.266	-2.257	0.025

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 16: Regression Table: BMI and Risk Status

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	13.991	1.740	8.038	0.000
age_yr	0.186	0.223	0.833	0.407
sexFemale	0.002	0.273	0.009	0.993
risk_status_momHigh Risk	0.798	0.276	2.889	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 4313.4 4363.4 -2143.7   4287.4
grams_psxrisk_psxbmi_psquad_mod    14 4315.3 4369.2 -2143.6   4287.3 0.1126  1
                                 Pr(>Chisq)
grams_psxrisk_psquad_mod
grams_psxrisk_psxbmi_psquad_mod     0.7372
```

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 4583.5 4629.7 -2279.7 4559.5 kcal_psxrisk_psxbmi_mod 14 4585.0 4638.9 -2278.5 4557.0 2.4714 2 Pr(>Chisq) kcal_psxrisk_mod kcal_psxrisk_psxbmi_mod 0.2906

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 3698.4 3736.9 -1839.2   3678.4
grams_chnug_ps_psquad_mod   11 3700.0 3742.4 -1839.0   3678.0 0.3988  1
                          Pr(>Chisq)
grams_chnug_ps_mod
grams_chnug_ps_psquad_mod     0.5277
```

Table 17: Chicken Nugget - Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-39.029	80.261	80.113	-0.486	0.628
preFF	-0.262	0.092	327.863	-2.850	0.005
bmi	4.134	3.527	73.987	1.172	0.245
sexFemale	-13.300	9.121	73.619	-1.458	0.149
age_yr	-5.589	7.527	74.165	-0.743	0.460
chnug_vas	22.448	4.014	261.379	5.593	0.000
meal_order	2.851	1.974	248.470	1.444	0.150
ps_prop	29.577	5.987	247.692	4.940	0.000

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

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-60.852	79.889	79.553	-0.762	0.448
preFF	-0.253	0.092	326.546	-2.749	0.006
bmi	6.165	3.660	73.630	1.685	0.096
sexFemale	-11.159	9.078	72.973	-1.229	0.223
age_yr	-6.784	7.457	73.350	-0.910	0.366
chnug_vas	22.604	3.982	256.405	5.677	0.000
meal_order	2.906	1.967	247.645	1.478	0.141
ps_prop	38.041	7.759	246.488	4.903	0.000
risk_status_momHigh Risk	-7.384	11.383	138.735	-0.649	0.518
ps_prop:risk_status_momHigh Risk	-20.661	12.110	247.070	-1.706	0.089

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 4334.3 4372.8 -2157.2   4314.3
kcal_chnug_ps_psquad_mod   11 4335.9 4378.3 -2157.0   4313.9 0.3988  1
                         Pr(>Chisq)
kcal_chnug_ps_mod
kcal_chnug_ps_psquad_mod     0.5277
```

Table 19: Chicken - Nugget Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-97.574	200.652	80.113	-0.486	0.628
preFF	-0.656	0.230	327.863	-2.850	0.005
bmi	10.335	8.817	73.987	1.172	0.245
sexFemale	-33.249	22.804	73.619	-1.458	0.149
age_yr	-13.973	18.818	74.165	-0.743	0.460
chnug_vas	56.120	10.034	261.379	5.593	0.000
meal_order	7.128	4.935	248.470	1.444	0.150
ps_prop	73.943	14.968	247.692	4.940	0.000

Table 20: Chicken - Nugget Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-152.129	199.723	79.553	-0.762	0.448
preFF	-0.633	0.230	326.546	-2.749	0.006
bmi	15.414	9.150	73.630	1.685	0.096
sexFemale	-27.899	22.695	72.973	-1.229	0.223
age_yr	-16.960	18.643	73.350	-0.910	0.366
chnug_vas	56.511	9.955	256.405	5.677	0.000
meal_order	7.265	4.917	247.645	1.478	0.141
ps_prop	95.103	19.398	246.488	4.903	0.000
risk_status_momHigh Risk	-18.459	28.457	138.735	-0.649	0.518
ps_prop:risk_status_momHigh Risk	-51.652	30.274	247.070	-1.706	0.089

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 3894.3 3932.8 -1937.1   3874.3
grams_mac_ps_psquad_mod   11 3895.1 3937.4 -1936.5   3873.1 1.1733  1
                        Pr(>Chisq)
grams_mac_ps_mod
grams_mac_ps_psquad_mod     0.2787
```

Table 21: Mac and Cheese - Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	21.479	169.412	79.873	0.127	0.899
preFF	-0.119	0.118	308.228	-1.010	0.313
bmi	14.922	7.684	79.676	1.942	0.056
sexFemale	6.093	19.888	79.250	0.306	0.760
age_yr	-27.888	16.328	78.808	-1.708	0.092
mac_vas	20.867	4.632	328.485	4.505	0.000
meal_order	2.572	2.210	252.192	1.164	0.246
ps_prop	15.280	6.722	252.305	2.273	0.024

Table 22: Mac and Cheese - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	8.007	171.336	78.902	0.047	0.963
preFF	-0.116	0.119	305.245	-0.978	0.329
bmi	16.490	8.093	78.574	2.038	0.045
sexFemale	7.687	20.115	78.136	0.382	0.703
age_yr	-28.799	16.452	77.705	-1.751	0.084
mac_vas	20.822	4.666	326.930	4.463	0.000
meal_order	2.583	2.215	251.056	1.166	0.245
ps_prop	16.748	8.769	251.271	1.910	0.057
risk_status_momHigh Risk	-11.796	22.437	95.481	-0.526	0.600
ps_prop:risk_status_momHigh Risk	-3.581	13.742	252.168	-0.261	0.795

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 23: Mac and Cheese - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	8.319	171.256	78.968	0.049	0.961
preFF	-0.114	0.118	306.057	-0.964	0.336
bmi	16.486	8.089	78.649	2.038	0.045
sexFemale	7.666	20.106	78.209	0.381	0.704
age_yr	-28.792	16.444	77.781	-1.751	0.084
mac_vas	20.922	4.638	327.544	4.511	0.000
meal_order	2.571	2.211	252.125	1.163	0.246
ps_prop	15.284	6.723	252.238	2.273	0.024
risk_status_momHigh Risk	-13.594	21.337	78.464	-0.637	0.526

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 4262.5 4301.0 -2121.3   4242.5
kcal_mac_ps_psquad_mod    11 4263.4 4305.7 -2120.7   4241.4 1.1733  1     0.2787
```

Table 24: Mac and Cheese - Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	36.514	288.000	79.873	0.127	0.899
preFF	-0.202	0.200	308.228	-1.010	0.313
bmi	25.368	13.063	79.676	1.942	0.056
sexFemale	10.358	33.810	79.250	0.306	0.760
age_yr	-47.409	27.758	78.808	-1.708	0.092
mac_vas	35.474	7.875	328.485	4.505	0.000
meal_order	4.373	3.758	252.192	1.164	0.246
ps_prop	25.977	11.428	252.305	2.273	0.024

Table 25: Mac and Cheese - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	13.612	291.271	78.902	0.047	0.963
preFF	-0.197	0.202	305.245	-0.978	0.329
bmi	28.033	13.758	78.574	2.038	0.045
sexFemale	13.068	34.196	78.136	0.382	0.703
age_yr	-48.959	27.968	77.705	-1.751	0.084
mac_vas	35.398	7.932	326.930	4.463	0.000
meal_order	4.390	3.765	251.056	1.166	0.245
ps_prop	28.471	14.907	251.271	1.910	0.057
risk_status_momHigh Risk	-20.053	38.143	95.481	-0.526	0.600
ps_prop:risk_status_momHigh Risk	-6.088	23.362	252.168	-0.261	0.795

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 26: Mac and Cheese - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	14.142	291.135	78.968	0.049	0.961
preFF	-0.194	0.201	306.057	-0.964	0.336
bmi	28.027	13.752	78.649	2.038	0.045
sexFemale	13.033	34.180	78.209	0.381	0.704
age_yr	-48.946	27.956	77.781	-1.751	0.084
mac_vas	35.568	7.884	327.544	4.511	0.000
meal_order	4.370	3.758	252.125	1.163	0.246
ps_prop	25.982	11.429	252.238	2.273	0.024
risk_status_momHigh Risk	-23.111	36.273	78.464	-0.637	0.526

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 3770.1 3808.5  -1875   3750.1
grams_grape_ps_psquad_mod   11 3772.0 3814.4  -1875   3750.0 0.0116  1
                          Pr(>Chisq)
grams_grape_ps_mod
grams_grape_ps_psquad_mod     0.9143
```

Table 27: Grapes - Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	20.060	140.883	79.443	0.142	0.887
preFF	-0.055	0.099	309.040	-0.558	0.577
bmi	-8.481	6.358	77.913	-1.334	0.186
sexFemale	-11.591	16.487	77.998	-0.703	0.484
age_yr	24.251	13.541	77.656	1.791	0.077
grape_vas	8.917	4.058	327.228	2.197	0.029
meal_order	-5.270	1.853	250.981	-2.844	0.005
ps_prop	17.578	5.637	251.125	3.118	0.002

Table 28: Grapes - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	16.090	142.768	78.715	0.113	0.911
preFF	-0.055	0.099	305.695	-0.553	0.581
bmi	-8.104	6.711	77.125	-1.207	0.231
sexFemale	-11.219	16.700	77.000	-0.672	0.504
age_yr	24.023	13.666	76.701	1.758	0.083
grape_vas	9.005	4.090	325.276	2.202	0.028
meal_order	-5.261	1.857	249.962	-2.833	0.005
ps_prop	18.756	7.350	250.084	2.552	0.011
risk_status_momHigh Risk	-1.895	18.622	94.163	-0.102	0.919
ps_prop:risk_status_momHigh Risk	-2.880	11.520	250.924	-0.250	0.803

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

Table 29: Grapes - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	16.999	142.831	78.708	0.119	0.906
preFF	-0.053	0.099	306.626	-0.540	0.590
bmi	-8.096	6.716	77.192	-1.206	0.232
sexFemale	-11.197	16.712	77.069	-0.670	0.505
age_yr	24.031	13.675	76.772	1.757	0.083
grape_vas	8.875	4.066	325.831	2.183	0.030
meal_order	-5.270	1.853	251.032	-2.844	0.005
ps_prop	17.582	5.636	251.175	3.119	0.002
risk_status_momHigh Risk	-3.304	17.755	77.602	-0.186	0.853

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 3517.5 3556.0 -1748.8   3497.5
kcal_grape_ps_psquad_mod   11 3519.5 3561.9 -1748.8   3497.5 0.0116  1
                         Pr(>Chisq)
kcal_grape_ps_mod
kcal_grape_ps_psquad_mod     0.9143
```

Table 30: Grapes - Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	13.942	97.914	79.443	0.142	0.887
preFF	-0.038	0.069	309.040	-0.558	0.577
bmi	-5.894	4.419	77.913	-1.334	0.186
sexFemale	-8.056	11.458	77.998	-0.703	0.484
age_yr	16.854	9.411	77.656	1.791	0.077
grape_vas	6.197	2.820	327.228	2.197	0.029
meal_order	-3.662	1.288	250.981	-2.844	0.005
ps_prop	12.217	3.918	251.125	3.118	0.002

Table 31: Grapes - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	11.183	99.224	78.714	0.113	0.911
preFF	-0.038	0.069	305.695	-0.553	0.581
bmi	-5.632	4.664	77.125	-1.207	0.231
sexFemale	-7.797	11.607	77.000	-0.672	0.504
age_yr	16.696	9.498	76.701	1.758	0.083
grape_vas	6.259	2.843	325.276	2.202	0.028
meal_order	-3.657	1.291	249.962	-2.833	0.005
ps_prop	13.035	5.108	250.084	2.552	0.011
risk_status_momHigh Risk	-1.317	12.942	94.163	-0.102	0.919
ps_prop:risk_status_momHigh Risk	-2.002	8.007	250.924	-0.250	0.803

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 32: Grapes - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	11.815	99.268	78.708	0.119	0.906
preFF	-0.037	0.069	306.626	-0.540	0.590
bmi	-5.627	4.668	77.192	-1.206	0.232
sexFemale	-7.782	11.615	77.069	-0.670	0.505
age_yr	16.702	9.504	76.772	1.757	0.083
grape_vas	6.168	2.826	325.831	2.183	0.030
meal_order	-3.663	1.288	251.032	-2.844	0.005
ps_prop	12.219	3.917	251.175	3.119	0.002
risk_status_momHigh Risk	-2.296	12.340	77.602	-0.186	0.853

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 3470.2 3508.7 -1725.1   3450.2
grams_broc_ps_psquad_mod   11 3471.3 3513.6 -1724.7   3449.3 0.8771  1
                         Pr(>Chisq)
grams_broc_ps_mod
grams_broc_ps_psquad_mod      0.349
```

Table 33: Broccoli - Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-69.293	78.980	74.016	-0.877	0.383
preFF	0.008	0.065	325.835	0.115	0.908
bmi	-1.197	3.568	73.022	-0.335	0.738
sexFemale	9.263	9.232	72.748	1.003	0.319
age_yr	14.109	7.587	72.556	1.860	0.067
broc_vas	1.575	2.299	287.640	0.685	0.494
meal_order	-1.192	1.265	245.875	-0.943	0.347
ps_prop	1.272	3.851	246.653	0.330	0.741

Table 34: brocs - Risk x Portion Size for Grams

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-74.837	80.171	73.097	-0.933	0.354
preFF	0.002	0.065	321.475	0.026	0.979
bmi	-0.769	3.775	72.258	-0.204	0.839
sexFemale	9.807	9.388	72.057	1.045	0.300
age_yr	13.854	7.679	71.684	1.804	0.075
broc_vas	1.284	2.303	290.493	0.557	0.578
meal_order	-1.139	1.256	244.972	-0.907	0.365
ps_prop	7.698	4.972	245.505	1.548	0.123
risk_status_momHigh Risk	3.597	10.702	96.483	0.336	0.738
ps_prop:risk_status_momHigh Risk	-15.622	7.754	245.222	-2.015	0.045

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 35: 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	7.698	4.972	255.898	1.548	0.123
High Risk	-7.924	5.964	255.841	-1.329	0.185

contrast	estimate	SE	df	t.ratio	p.value
Low Risk - High Risk	15.622	7.754	255.637	2.015	0.045

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 3472.3 3510.8 -1726.1   3452.3
kcal_broc_ps_psquad_mod   11 3473.4 3515.7 -1725.7   3451.4 0.8771  1
                        Pr(>Chisq)
kcal_broc_ps_mod
kcal_broc_ps_psquad_mod      0.349
```

Table 36: Broccoli - Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-69.501	79.217	74.016	-0.877	0.383
preFF	0.008	0.066	325.835	0.115	0.908
bmi	-1.200	3.578	73.022	-0.335	0.738
sexFemale	9.291	9.260	72.748	1.003	0.319
broc_vas	1.580	2.306	287.640	0.685	0.494
age_yr	14.151	7.609	72.556	1.860	0.067
meal_order	-1.196	1.268	245.875	-0.943	0.347
ps_prop	1.276	3.863	246.653	0.330	0.741

Table 37: brocs - Risk x Portion Size for kcal

	Estimate	Std. Error	df	t value	Pr(>|t|)
(Intercept)	-75.061	80.411	73.097	-0.933	0.354
preFF	0.002	0.066	321.475	0.026	0.979
bmi	-0.771	3.786	72.258	-0.204	0.839
sexFemale	9.836	9.417	72.057	1.045	0.300
age_yr	13.896	7.702	71.684	1.804	0.075
broc_vas	1.287	2.310	290.493	0.557	0.578
meal_order	-1.143	1.260	244.972	-0.907	0.365
ps_prop	7.721	4.987	245.505	1.548	0.123
risk_status_momHigh Risk	3.608	10.734	96.483	0.336	0.738
ps_prop:risk_status_momHigh Risk	-15.669	7.777	245.222	-2.015	0.045

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 38: 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	7.721	4.987	255.898	1.548	0.123
High Risk	-7.948	5.982	255.841	-1.329	0.185

contrast	estimate	SE	df	t.ratio	p.value
Low Risk - High Risk	15.669	7.778	255.637	2.015	0.045

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 0.6-12 ended normally after 129 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
  Number of model parameters                        25

                                                  Used       Total
  Number of observations                           347         348
  Number of clusters [sub]                          87

Model Test User Model:
                                              Standard      Robust
  Test Statistic                                11.320       6.339
  Degrees of freedom                                 4           4
  P-value (Chi-square)                           0.023       0.175
  Scaling correction factor                                  1.786
    Yuan-Bentler correction (Mplus variant)
  Information                                 Observed

Parameter Estimates:

  Standard errors                           Robust.cluster
  Information                                     Expected
  Information saturated (h1) model          Structured

Regressions:
                   Estimate   Std.Err  z-value  P(>|z|)
  grams ~
    sub              -0.545    0.380   -1.435    0.151
    preFF            -1.054    0.362   -2.915    0.004
    bmi              23.583   13.339    1.768    0.077
    sex             -47.693   32.057   -1.488    0.137
    age_yr          -40.283   23.458   -1.717    0.086
    avg_vas          54.770   27.048    2.025    0.043
    meal_order       -3.967    4.385   -0.905    0.366
    rsk_stts_m      -23.527   36.713   -0.641    0.522
    ps_prop         194.259   49.455    3.928    0.000
    psxrisk_nt (c)  -54.711   24.613   -2.223    0.026
    ps_prop2       -120.734   45.962   -2.627    0.009
  broc_grams ~
    preFF            -0.076    0.073   -1.039    0.299
    bmi              -0.485    2.506   -0.194    0.846
    sex               6.686    8.179    0.817    0.414
    age_yr           13.164    8.379    1.571    0.116
    broc_vas         11.982    2.827    4.239    0.000
```

```
    meal_order        -1.307    1.450   -0.901    0.367
    rsk_stts_m         7.764    8.311    0.934    0.350
    ps_prop            6.438    5.651    1.139    0.255
    psxrisk_nt (a)   -14.814    7.546   -1.963    0.050
  grams ~
    broc_grams (b)     1.225    0.219    5.581    0.000

Intercepts:
                   Estimate   Std.Err  z-value  P(>|z|)
   .grams            292.741  310.231    0.944    0.345
   .broc_grams      -117.609   69.190   -1.700    0.089

Variances:
                   Estimate   Std.Err  z-value  P(>|z|)
   .grams          23394.295 2522.011    9.276    0.000
   .broc_grams      2037.629  708.750    2.875    0.004

Defined Parameters:
                   Estimate   Std.Err  z-value  P(>|z|)
    ab               -18.140    9.640   -1.882    0.060
    total            -72.851   26.360   -2.764    0.006
```

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 0.6-12 ended normally after 128 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
  Number of model parameters                        24

                                                  Used       Total
  Number of observations                           347         348
  Number of clusters [sub]                          87

Model Test User Model:
                                              Standard      Robust
  Test Statistic                                12.712       5.603
  Degrees of freedom                                 3           3
  P-value (Chi-square)                           0.005       0.133
  Scaling correction factor                                  2.269
    Yuan-Bentler correction (Mplus variant)
  Information                                 Observed

Parameter Estimates:

  Standard errors                          Robust.cluster
  Information                                   Expected
  Information saturated (h1) model          Structured
```

```
Regressions:
                   Estimate   Std.Err  z-value  P(>|z|)
  kcal ~
    sub              -0.436    0.555   -0.787    0.431
    preFF            -1.587    0.457   -3.472    0.001
    bmi              38.455   17.680    2.175    0.030
    sex             -52.490   45.031   -1.166    0.244
    age_yr          -69.696   32.658   -2.134    0.033
    avg_vas          70.695   31.737    2.228    0.026
    meal_order        9.693    6.847    1.416    0.157
    rsk_stts_m      -12.563   48.047   -0.261    0.794
    ps_prop         140.291   22.029    6.369    0.000
    psxrisk_nt (c)  -65.833   38.434   -1.713    0.087
  broc_kcal ~
    preFF            -0.076    0.073   -1.039    0.299
    bmi              -0.487    2.514   -0.194    0.846
    sex               6.706    8.204    0.817    0.414
    age_yr           13.203    8.404    1.571    0.116
    broc_vas         12.018    2.835    4.239    0.000
    meal_order       -1.311    1.454   -0.902    0.367
    rsk_stts_m        7.787    8.336    0.934    0.350
    ps_prop           6.457    5.668    1.139    0.255
    psxrisk_nt (a)  -14.859    7.568   -1.963    0.050
  kcal ~
    broc_kcal  (b)    1.278    0.346    3.693    0.000

Intercepts:
                   Estimate   Std.Err  z-value  P(>|z|)
   .kcal            276.735  433.580    0.638    0.523
   .broc_kcal      -117.962   69.397   -1.700    0.089

Variances:
                   Estimate   Std.Err  z-value  P(>|z|)
   .kcal           45344.719 5628.033    8.057    0.000
   .broc_kcal       2049.873  713.009    2.875    0.004

Defined Parameters:
                   Estimate   Std.Err  z-value  P(>|z|)
    ab               -18.991   10.414   -1.824    0.068
    total            -84.824   39.521   -2.146    0.032
```

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.