

The Effect of Spices and Herbs on Acceptance of Reduced Saturated Fat and Calorie Foods

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Background

- Reducing dietary calorie and saturated fat intake remain key goals for Americans to meet the Dietary Guidelines.
- Consumers need practical strategies to accomplish reducing calorie and sat fat intake without sacrificing flavor or convenience.
- Substituting herbs and spices for fat may be a promising strategy but has not been systematically studied.





Hill Disclosures

McCormick – research funding; travel expenses

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Objective

- Specific Aim: To test whether enhancing the flavor of reduced fat/calorie food through the use of spices can improve overall consumer liking.
- Hypothesis: A reduced fat meal with spices will be liked as much as a full fat meal and more than a reduced fat meal without spices.



Approach

- Two different test meal contexts
 - Lunch and Dinner
 - Meatloaf, Chicken (served with creamy pasta and mixed vegetables)
 - Breakfast
 - French Toast (served with turkey sausage)

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Design

- Single blind, randomized, three period, within-subjects crossover design
- Three different test meals; full fat, reduced fat and reduced fat plus spice (reduced fat meals were iso-caloric)
- 150 subjects; 6 groups of 25; all possible combinations of 3 treatments
- IRB approved



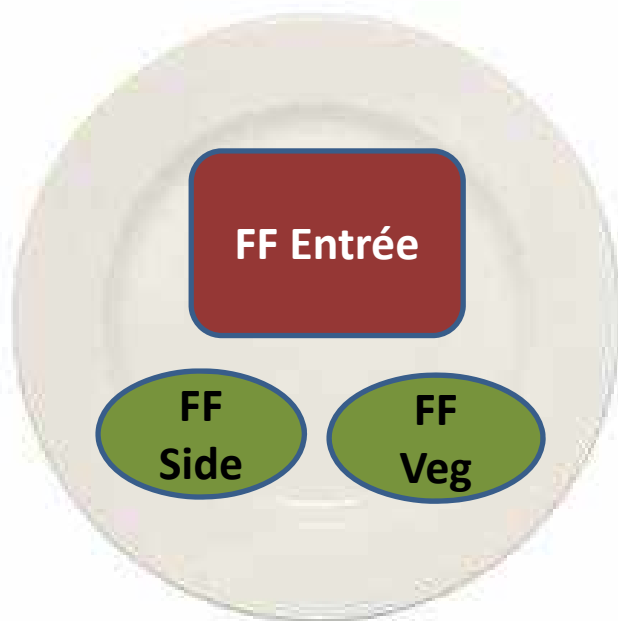
Subjects and screening

- Inclusion: Male and Female, 18 – 65 years
Dinner: N=149, 102 F, 47 M; Mean age 35.9 yr
Breakfast & Lunch: N=151, 104 F, 47 M age 36.5 yr
- Exclusion: taste and eating disorders, food ingredient allergies, dietary restrictions (e.g., vegetarian), and dislike of the test meal items.
- Informed consent
- Block food frequency questionnaire

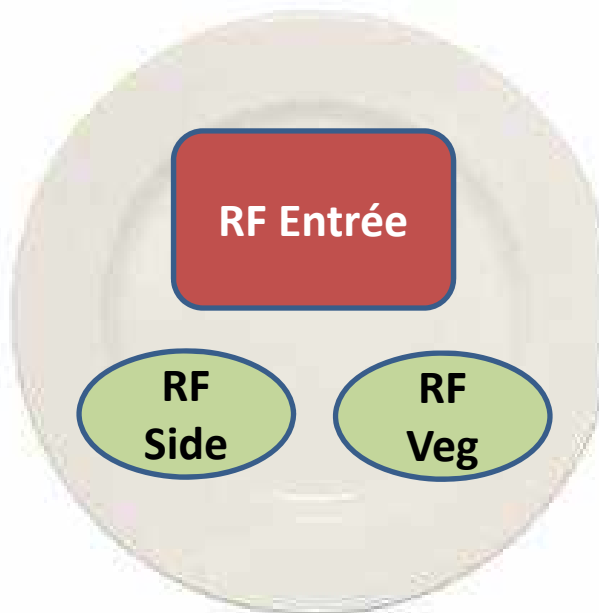


Treatments

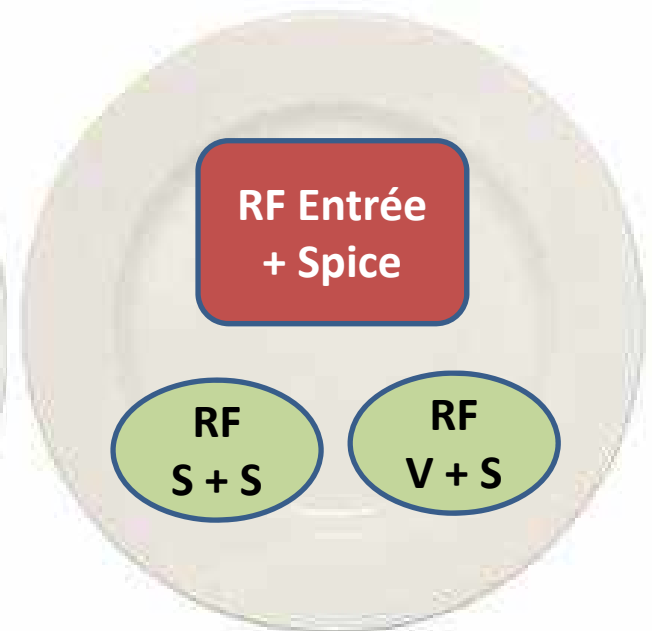
Full Fat



Reduced Fat No Spice



Reduced Fat Plus Spice



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Impact of fat reduction on overall dinner meal

	Full Fat	Reduced Fat	Reduced Fat + Spice	Reduction from FF
Total calories	610	395	395	35%
Total fat (g)	38	12	12	68%
Total sat fat (g)	18.5	6	6	68%

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Dinner Entrée and Side Items

	FF	RF	RF+S	Reduction from FF
<i>Meatloaf</i>				
Total calories	310	200	200	35%
Total fat	21	7	7	67%
Total sat fat	8	3	3	63%
<i>Vegetables</i>				
Total calories	70	45	45	36%
Total fat	4	1.5	1.5	63%
Total sat fat	2.5	1	1	60%
<i>Pasta</i>				
Total calories	230	150	150	35%
Total fat	13	3.5	3.5	73%
Total sat fat	8	2	2	75%

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Breakfast and Lunch

	FF	RF	RF+S	Reduction from FF
<i>French Toast</i>				
Total calories	280	250	250	11%
Total fat	8	4.5	4.5	44%
Total sat fat	4	2	2	50%
<i>Sausage</i>				
Total calories	130	100	100	23%
Total fat	10	6	6	40%
Total sat fat	4	2	2	50%
<i>Chicken</i>				
Total calories	220	180	180	18%
Total fat	10	6	6	40%
Total sat fat	2.5	1.5	1.5	40%

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Recipe Herbs and Spices

Food	Base Spices	Spices Added
Meatloaf	Salt, black pepper	Basil, Oregano, McCormick Perfect Pinch Garlic & Herb Salt-Free Seasoning
Pasta	Salt, black pepper	Garlic Powder, Onion Powder, McCormick Italian Seasoning, Chervil, Chives
Vegetable	Salt, black pepper	Garlic Powder, Onion Powder, Dill

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Recipe Herbs and Spices – breakfast and lunch

Food	Base Spices	Spices Added
French Toast	Salt, black pepper	Cinnamon, nutmeg, cinnamon extract, vanilla extract
Sausage	Salt, black pepper, sage	Rosemary, thyme, red ground pepper
Chicken	Salt, black pepper	Garlic powder, onion powder, fennel seed, smoked paprika, parsley granules

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Study Procedures

- Each subject served on same day of three consecutive weeks
- Subjects had 30 minutes to consume meal
- 12 ounces of water provided with meal
- Liking measured on 9 point Likert scale



Plates weighed and photographed before and after meal consumption



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Food liking assessment

Meatloaf Test Meal					Approved NOV 30 2012 GCMIRB																																																																											
Participant ID # _____					Tray # _____																																																																											
<p>Thank you for participating in this study. We would like to get your opinion about the meal you have just eaten. Please answer the following questions to best of your ability.</p> <p>How much do you like or dislike this meal?</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Dislike extremely</td> <td>Dislike very much</td> <td>Dislike moderately</td> <td>Dislike slightly</td> <td>Neither like nor dislike</td> <td>Like slightly</td> <td>Like moderately</td> <td>Like very much</td> <td>Like extremely</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table> <p>How much do you like or dislike this meatloaf dish?</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Dislike extremely</td> <td>Dislike very much</td> <td>Dislike moderately</td> <td>Dislike slightly</td> <td>Neither like nor dislike</td> <td>Like slightly</td> <td>Like moderately</td> <td>Like very much</td> <td>Like extremely</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table> <p>How much do you like or dislike this pasta side dish?</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Dislike extremely</td> <td>Dislike very much</td> <td>Dislike moderately</td> <td>Dislike slightly</td> <td>Neither like nor dislike</td> <td>Like slightly</td> <td>Like moderately</td> <td>Like very much</td> <td>Like extremely</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table> <p>How much do you like or dislike this vegetable side dish?</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Dislike extremely</td> <td>Dislike very much</td> <td>Dislike moderately</td> <td>Dislike slightly</td> <td>Neither like nor dislike</td> <td>Like slightly</td> <td>Like moderately</td> <td>Like very much</td> <td>Like extremely</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>									Dislike extremely	Dislike very much	Dislike moderately	Dislike slightly	Neither like nor dislike	Like slightly	Like moderately	Like very much	Like extremely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dislike extremely	Dislike very much	Dislike moderately	Dislike slightly	Neither like nor dislike	Like slightly	Like moderately	Like very much	Like extremely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dislike extremely	Dislike very much	Dislike moderately	Dislike slightly	Neither like nor dislike	Like slightly	Like moderately	Like very much	Like extremely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dislike extremely	Dislike very much	Dislike moderately	Dislike slightly	Neither like nor dislike	Like slightly	Like moderately	Like very much	Like extremely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Self-Reported BMI+Habitual Diet

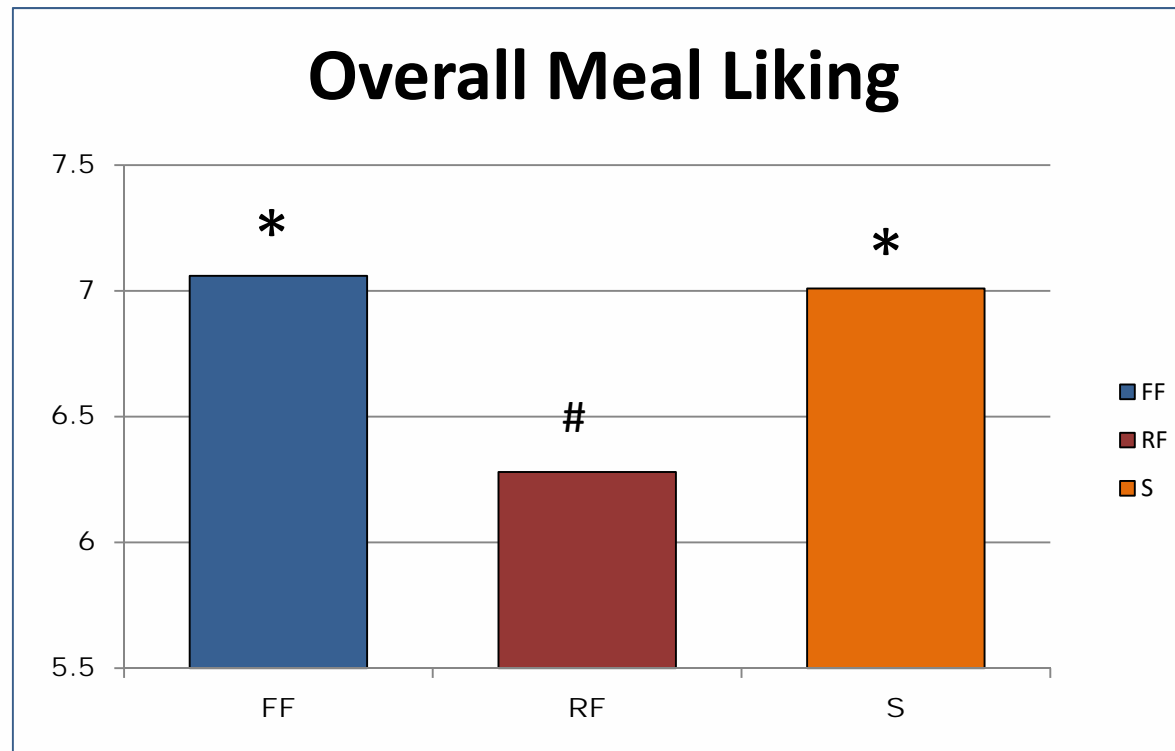
Block FFQ

Variable	N	Mean	SD	Median	% Kcal
BMI from FFQ	149	24.4	4.5	23.4	
Total calories/day	149	1628.2	691.6	1568.1	
Total fat/day	149	65.4	32.6	62.4	36.2
Total saturated fat/day	149	20.1	10.0	18.9	11.1

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Overall Dinner Meal

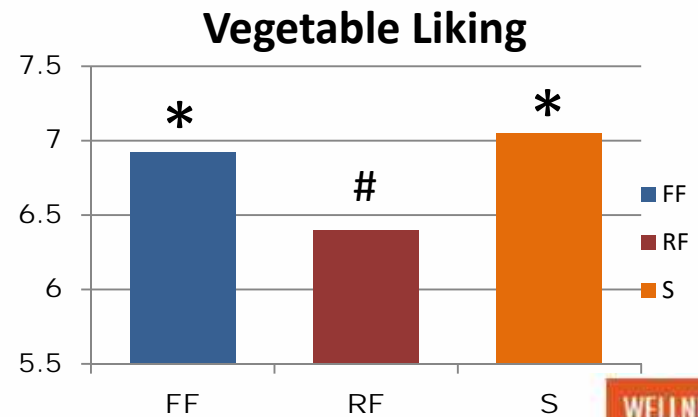
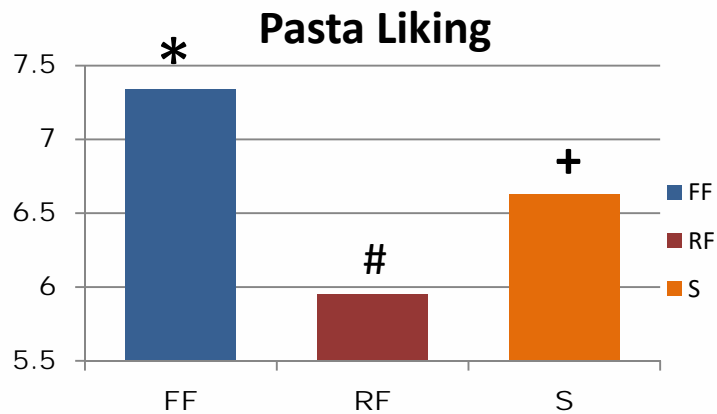
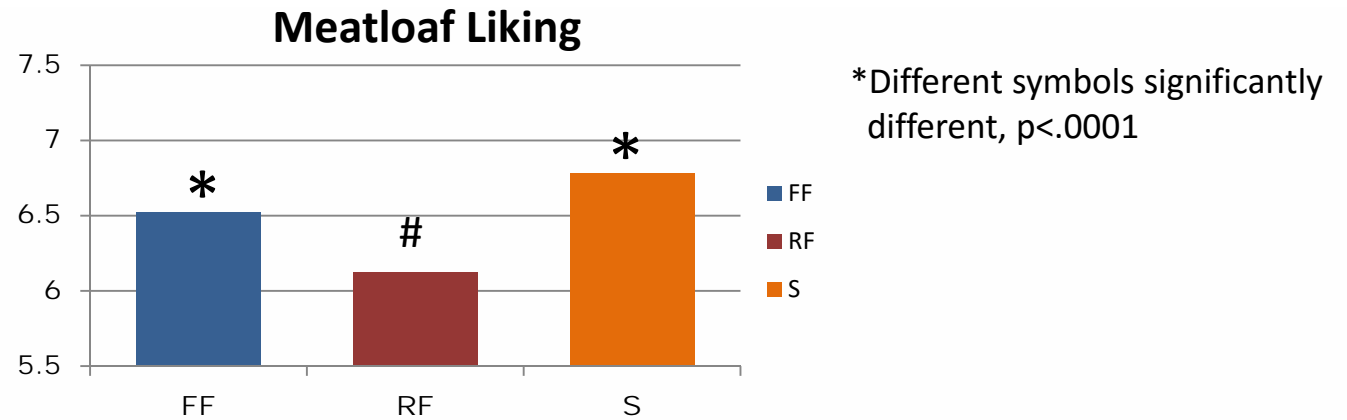


*Different symbols significantly different, $p < .0001$

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Individual Item Scores – Dinner Meal



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Meal, entrée and side dish liking

Meal Item	FF	RF	S	FF:RF	P Values	
					FF:S	RF:S
Meatloaf meal	7.06	6.29	7.01	<.0001	0.7246	<.0001
Meatloaf entrée	6.52	6.14	6.78	0.0156	0.0985	<.0001
Vegetable side dish	6.91	6.42	7.05	0.0019	0.3879	<.0001
Pasta side dish	7.34	5.95	6.63	<.0001	<.0001	<.0001
% meal eaten	78.7	76.8	78.4	.1043	0.6473	0.2419

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Breakfast

Figure 1a

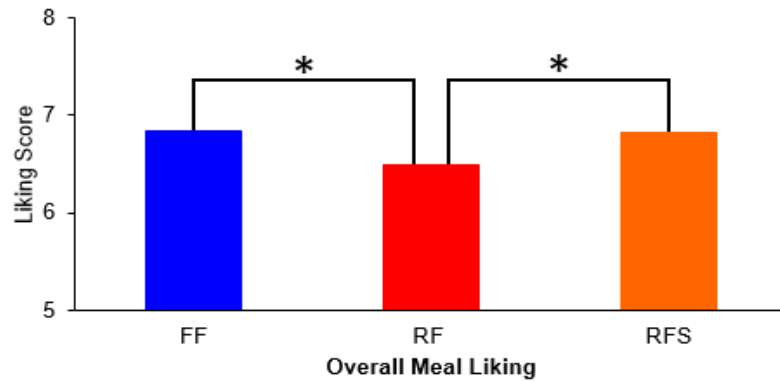


Figure 1b

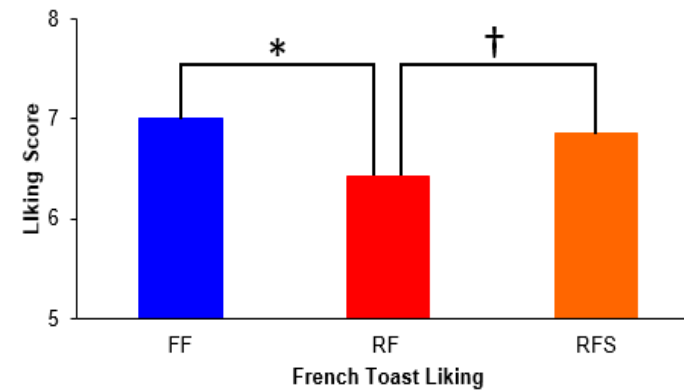
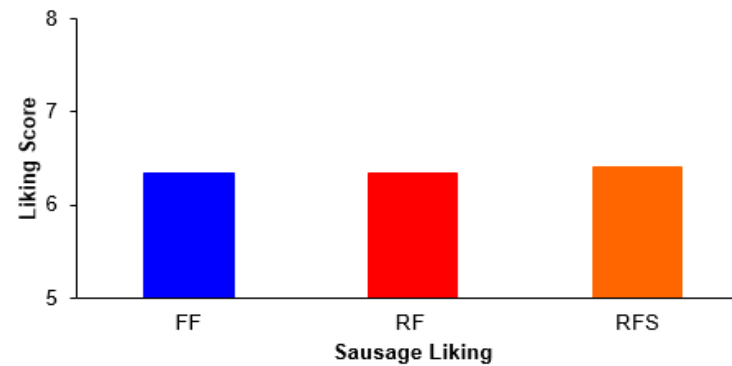


Figure 1c



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Lunch

Figure 2a

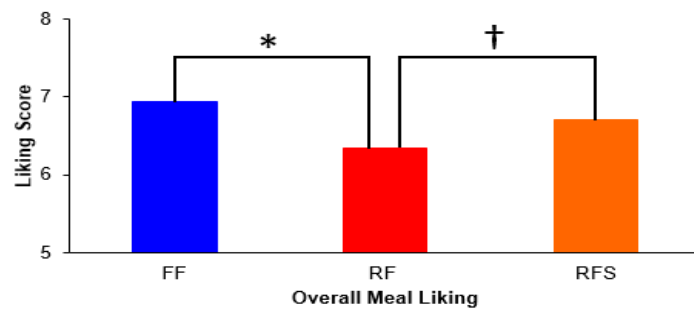


Figure 2b

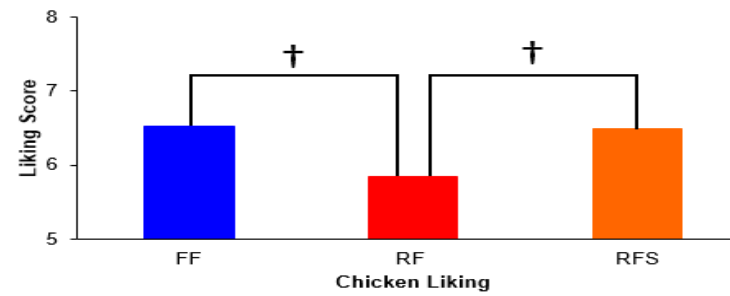


Figure 2c

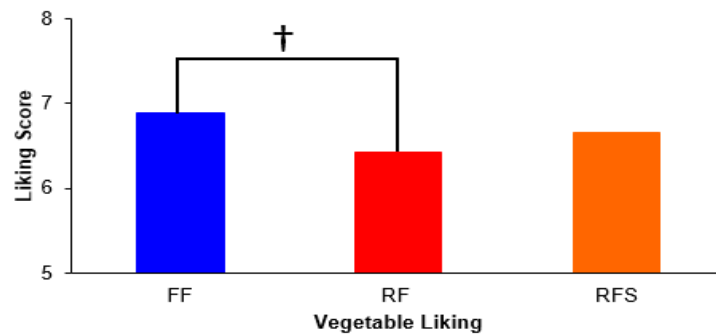
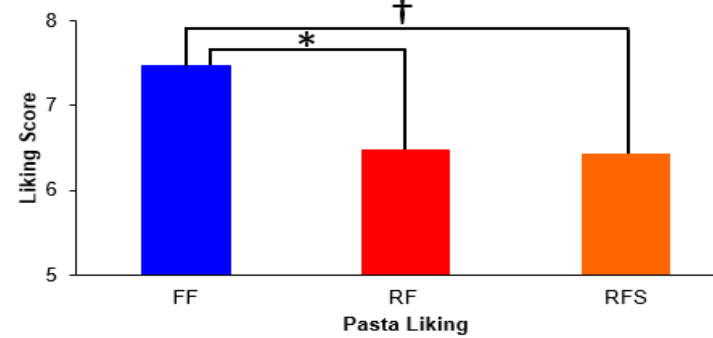


Figure 2d



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Conclusions

- Using spices in place of fat may provide a practical tool to help Americans meet the dietary guidelines
- The impact of the substitution appears to depend on the characteristics of the food –eg. Meatloaf vs Pasta

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OUR TEAM



Thanks to our fantastic faculty and staff!

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