The purpose of this study is to examine the effects of food additives on children with ADHD. This study could potentially answer an important question which still remains unanswered as to whether certain food additives may be able to cause behavioral changes in children with ADHD.

### Condition
- Attention Deficit Hyperactivity Disorder

### Intervention
- Other: Monosodium Glutamate
- Other: Artificial Food Coloring
- Other: Placebo
- Other: MSG and AFC Challenge

**Study Type:** Interventional

**Study Design:**
- Allocation: Randomized
- Intervention Model: Crossover Assignment

**Intervention Model Description:**
Participants will be exposed to all challenge mixtures with adequate washout periods between exposures.

**Masking:** Double (Participant, Investigator)

**Masking Description:**
The investigators and the participants will be masked as to contents of the juice mixtures provided during the challenge periods. One research assistant will be unblinded and will not have contact with the participants.

**Primary Purpose:** Treatment
Further study details as provided by Kathleen Holton, American University:

Primary Outcome Measures:
- Conners 3-P and 3-T Assessment [Time Frame: Once a week for 6 weeks]
  The Conners Assessment quantifies behavioral symptoms. It yields T-scores of 0-100 for the sub-scales of inattention, hyperactivity/impulsivity, learning problems, executive function, aggression, and peer relations. A score of >63 is indicative of ADHD.
- Electroencephalogram (EEG) [Time Frame: Once a week for 6 weeks.]
  The participants will have small disks placed on their scalp that are connected to electrodes which in turn are connected to a computer. The participants will sit still with their eyes closed while the computer records their brain wave data
- Cognitive Testing [Time Frame: Once a week for 6 weeks]
  The participant will complete computerized cognitive testing designed for ADHD.

Secondary Outcome Measures:
- Nutrient and Food Additive Intake [Time Frame: 6 weeks]
  Participants will keep a food log.
- Symptom Diary [Time Frame: 6 weeks]
  Parents of the participant will keep a symptom diary.
- Hemoglobin [Time Frame: Baseline]
  A small finger pricked will be completed to test iron levels in the blood.

Estimated Enrollment: 60
Actual Study Start Date: January 1, 2017
Estimated Study Completion Date: August 2018
Estimated Primary Completion Date: August 2018 (Final data collection date for primary outcome measure)

<table>
<thead>
<tr>
<th>Arms</th>
<th>Assigned Interventions</th>
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<tbody>
<tr>
<td>Active Comparator: Monosodium Glutamate Challenge</td>
<td>Other: Monosodium Glutamate Monosodium glutamate (MSG) Other Name: MSG</td>
</tr>
<tr>
<td>1.59g of monosodium glutamate (MSG) will be mixed with 12 oz of a fruit juice mixture and consumed consecutively over three days (Monday, Tuesday, and Wednesday). The participants will not be able to see juice as a stainless steel cup and opaque straw will be used.</td>
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<tr>
<td>Active Comparator: Artificial Food Colorings Challenge</td>
<td>Other: Artificial Food Coloring</td>
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<tr>
<td>A high consumer child dose totaling of 450 mg of the six most common artificial food</td>
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</table>
colors (Red 40, Red 3, Yellow 5, Yellow 6, Blue 1, and Blue 2) and 0.53g of salt (to match the salt flavor of MSG in other challenges) will be mixed with 12 oz of a fruit juice mixture and consumed consecutively over three days (Monday, Tuesday, Wednesday). The participants will not be able to see the juice as a stainless steel cup and opaque straw will be used.

Active Comparator: MSG and AFC Challenge
A combination of 1.59g of MSG and 450 mg of the six most common artificial food colors (high consumer child dose of each) will be mixed with 12 oz of a fruit juice mixture and consumed consecutively over three days (Monday, Tuesday, Wednesday). The participants will not be able to see the juice as a stainless steel cup and opaque straw will be used.

Placebo Comparator: Placebo Challenge
Placebo juice will consist of 0.53g of salt mixed with 12 oz of the fruit juice mixture and consumed consecutively over three days (Monday, Tuesday, Wednesday). The salt will mimic the taste of MSG, and will provide the equivalent amount of sodium. The participants will not be able to see the juice as a stainless steel cup and opaque straw will be used.

Detailed Description:
Consent and assent will be obtained at the first visit. Baseline data will be collected on the children, including height, weight, hemoglobin levels, computerized cognitive functioning, and an EEG recording. The parent(s) and the child's teacher will be asked to complete a behavioral assessment over the next two days. The parent(s) will also be taught how to keep a detailed food and symptom diary over the following week. One week later, the parent(s) and child will return to the lab and turn in the food/symptom diary. Parent(s) will be trained on how to follow the dietary intervention. Detailed information on the diet will be given, including food additives to avoid, healthy foods which should be eaten, shopping tips and recipes. For the next week, the family will follow the dietary intervention at home with access to Dr. Holton to answer any questions. The parents and child will return to the lab after following the diet for one week and repeat assessments will be completed. The parent(s) and teacher will also fill out a post-diet behavioral assessment and information on dietary compliance will be collected. The third meeting will also mark the beginning of the first challenge period. For the challenges, the child will consume 12 ounces of mixed flavor juice every Monday, Tuesday, and Wednesday for four weeks. Each week, the juice will contain different food additives or will be a placebo juice. Every Wednesday repeat testing will be completed after the juice is consumed. The parents and the child's teacher will fill out a behavioral assessment on Thursday of each week. Children will be asked not to take ADHD medication on testing days. After four weeks of challenges the study will be completed. Parents will receive information on their child's performance and on the study results overall.

Eligibility

Information from the National Library of Medicine

Choosing to participate in a study is an important personal decision. Talk with your doctor and family members or friends about deciding to join a study. To learn more about this study, you or your doctor may contact the study research staff using the contacts provided below. For general information, Learn About Clinical Studies.

Ages Eligible for Study: 8 Years to 12 Years (Child)
Sexes Eligible for Study: All
Accepts Healthy Volunteers: Yes

Criteria

Inclusion Criteria:
- Generally good health
- 8-12 years old
- Currently attending school
- Physician's diagnosis of ADHD (unless control participant)
- Stable medication dose and frequency for 3 months before the study
- Willing to suspend ADHD medication administration on testing day and the day after testing

Exclusion Criteria:
- Presence of comorbid psychiatric condition other than comorbid depression or anxiety
- Autism
- Severe asthma requiring past hospitalization
- Seizure disorder

Contacts and Locations
Information from the National Library of Medicine
To learn more about this study, you or your doctor may contact the study research staff using the contact information provided by the sponsor.
Please refer to this study by its ClinicalTrials.gov identifier (NCT number): NCT03342469

Contacts
Contact: Anna Kirkland   (202) 885-6099   nutrneurolab@american.edu

Locations
United States, District of Columbia
American University   Recruiting
Washington, District of Columbia, United States, 20007
Contact: Anna Kirkland   202-885-6099   nutrneurolab@american.edu

Sponsors and Collaborators
American University

Investigators
Principal Investigator: Kathleen Holton, PhD   American University

More Information
Responsible Party: Kathleen Holton, Assistant Professor, American University
ClinicalTrials.gov Identifier: NCT03342469   History of Changes
Other Study ID Numbers: IRB-2017-151
First Submitted: November 9, 2017
First Posted: November 15, 2017
Last Update Posted: November 16, 2017
Last Verified: November 2017

Individual Participant Data (IPD) Sharing Statement:
Plan to Share IPD: No

Studies a U.S. FDA-regulated Drug Product: No
Studies a U.S. FDA-regulated Device Product: No

Keywords provided by Kathleen Holton, American University:
ADHD
Food Additives
Monosodium Glutamate
Artificial Food Coloring
Diet

Additional relevant MeSH terms:
Attention Deficit Disorder with Hyperactivity
Attention Deficit and Disruptive Behavior Disorders
Neurodevelopmental Disorders
Mental Disorders