Teacher's Key

The Effect of Sugar on Your Brain: What the Evidence Shows (Level C1)

Vocabulary Matching

1 dispel = **N**
2 meta-analysis = **A**
3 placebo = **H**
4 fatigue = **L**
5 transient = **G**
6 cohort = **M**
7 hippocampus = **I**
8 proxy = **E**
9 reverse causation = **D**
10 modest = **O**
11 extrapolate = **J**
12 persistent = **K**
13 intermittent = **B**
14 palatable = **C**
15 contested = **F**

Fill in the Blank

1 dispel
2 placebo
3 fatigue
4 transient
5 cohort
6 hippocampus
7 proxy
8 modest
9 extrapolate
10 persistent
11 intermittent
12 palatable
13 contested
14 meta-analysis

True or False

1 **True.** The reading states that glucose is the brain's main fuel.

2 **False.** It found no effect of sugar on children's behavior or thinking.

3 **True.** Only the mothers' beliefs differed. The boys all received the same sweetener.

4 **False.** It found no mood improvement, and more fatigue within the first hour.

5 **True.** It reported a transient improvement, for example in immediate recall.

6 **False.** The study found an association. A single snapshot cannot show which came first.

7 **True.** The reading says no such link appeared in women.

8 **False.** The difference had disappeared at the three-week follow-up.

9 **True.** This is the finding the reviewers called tentative.

10 **False.** The reading says the question remains contested and that a 2016 review found little evidence in humans.

Language Focus: Cleft Sentences for Emphasis

Example answer: **What** limits the conclusion **is** the size of the study. Also correct: **It is** the size of the study **that** limits the conclusion.

Comprehension Questions: Model Answers

1 Glucose is the brain's main fuel, and the brain uses about a fifth of the body's energy at rest. The writer says this fact does not show whether extra sugar helps or harms, because needing fuel is different from benefiting from more of it.

2 It compared sugar with a placebo (usually a sweetener without sugar) in 23 controlled experiments on children. It found that sugar did not change the children's behavior or thinking.

3 All 35 boys received a sweetener without sugar, but half of their mothers were told that their sons had had a large dose of sugar. Those mothers rated their sons as more hyperactive, which suggests expectation, not sugar, changed what they saw.

4 Across 31 studies and 1,259 participants, carbohydrates produced no mood improvement at any point, and more fatigue and less alertness within the first hour. The reading says why this happens is not yet explained.

5 In the short term, glucose can give a transient improvement in some memory tasks, such as immediate recall. Over longer periods, all three cohort studies and eight of nine cross-sectional studies linked added sugar to a higher risk of cognitive impairment.

6 A cohort study follows the same people over time. A cross-sectional study measures people once. A single snapshot cannot show which came first, for example whether high sugar intake or poorer brain health came first.

7 They wanted to know whether low mood leads people to eat more sugar, which could explain the link the other way round. They found no sign of it, but the association was modest and appeared in men only.

8 The diet was high in both added sugar and saturated fat, so the trial cannot separate the two. The memory difference had disappeared at the three-week follow-up.

9 Open answer. A strong answer notes that in people, memory scores recovered within three weeks after one week of a sugar-and-fat-rich diet, while in rodents recovery after sugar-containing diets was incomplete. The findings involve different species, diets, and time periods, so they cannot be combined until longer human studies exist.

10 False. The reading says the authors used drinks as a proxy and that a single snapshot cannot show which came first. Daily fruit juice drinkers did have a smaller hippocampus, but the study shows an association, not proof.

11 No. The writer describes several harms as possible or associated, but also reports a transient benefit of glucose for some memory tasks and says craving and reward are real. The writer does not say sugar is harmless or that it is proven harmful.

12 Best answer: to show what remains unknown. The sentence names a specific untested question. Accept a reasoned answer about warning readers only if it acknowledges that the sentence is stated as a gap in the evidence.

Notes on the Evidence

- Sources checked. Sugar rush: Wolraich, Wilson, and White (1995, JAMA 274:1617-1621) combined 23 controlled studies of sugar and children's behavior or cognition. Hoover and Milich (1994, Journal of Abnormal Child Psychology 22:501-515): the abstract gives 35 boys aged 5 to 7 whose mothers described them as sugar sensitive. Some popular accounts give 31; the unit follows the abstract. Mood in adults: Mantantzis and colleagues (2019, Neuroscience and Biobehavioral Reviews 101:45-67), 31 studies, 176 effect sizes, 1,259 participants. The analysis covers carbohydrates, not sugar alone, and the authors did not test the mechanism.
- Memory and brain studies. Gillespie and colleagues (2023, Nutrients 16:75): 77 studies, of which 65 experimental (n = 3,831), 9 cross-sectional (n = 11,456), and 3 cohort (n = 2,059). The recall result comes from a meta-analysis of a subset of the trials. Framingham: Pase and colleagues (2017, Alzheimer's and Dementia 13:955-964), 4,276 adults with memory tests and 3,846 with MRI, cross-sectional. The hippocampal finding was reported for daily fruit juice, not for all sugary drinks. Whitehall II: Knuppel and colleagues (2017, Scientific Reports 7:6287): men in the highest tertile had 23 percent higher odds of new common mental disorder after five years (95 percent CI 1.02 to 1.48). Women showed no such link. The recurrent depression result (OR 1.47, CI 0.98 to 2.22) lost significance after adjustment and is not in the reading.
- Experiments. Stevenson and colleagues (2020, Royal Society Open Science 7:191338): 110 healthy lean adults, one-week Western-style diet against usual diet, hippocampal-dependent memory declined (d = 0.43) and did not differ at three weeks. The diet was high in both sugar and saturated fat. The 2026 rodent review (Nutritional Neuroscience, 27 studies, senior author Michael Kendig, University of Technology Sydney) was read through a Medical News Today report of 31 May 2026 and the authors' comments there, not through the paper. Its finding that memory did not recover after diets containing sugar was called tentative by the authors and needs replication.
- Addiction and guidelines. Westwater, Fletcher, and Ziauddeen (2016, European Journal of Nutrition) concluded there is little evidence for sugar addiction in humans. A 2026 review titled Is sugar addictive? Integrating evidence across addiction frameworks (Taylor and Francis) also calls the topic controversial. Avena's TED-Ed video represents the opposing view. WHO (2015): free sugars under 10 percent of energy, with under 5 percent as a conditional recommendation; the evidence base was body weight and dental caries, and sugars in fresh fruit, vegetables, and milk were excluded. The brain uses about 20 percent of the body's energy at rest (BrainFacts; the figure for glucose use is often given as similar).
- Corrections to the source draft. The draft said researchers in 2026 were uncovering a sinister reality and that sugar impairs the mental processes needed for academic success. The evidence is mixed: short-term glucose can help some memory tasks, and the long-term human evidence is observational. The claim that studies over the past year show a strong correlation with reduced neuroplasticity in the hippocampus had no source and could not be found; it was replaced with the Framingham, 2020 trial, and 2026 review evidence. The insulin crash explanation was not supported as stated; the meta-analysis found fatigue but the mechanism is unclear. Sugar acting like addictive drugs is contested, and the reading now says so. The draft's inflammation and gut-brain claims were left out: a 2025 review (Zhang and colleagues, Gut Microbes) describes the mechanisms as proposed and the microbiota findings as inconsistent. Statements about students, mental fitness as a competitive advantage, and intellectual sovereignty were opinion and were removed.
- Resources in the draft. The Harvard Health link was a Google search redirect to a 2015 blog address, labeled 2025; the BDNF claim was not checked and not used. The Nature link (d41586-026-00123-x) could not be found. The Blaylock video link was a Google redirect that could not be verified. The TED-Ed video by Nicole Avena was found and kept, with a note that it presents one side of a contested question. Vocabulary: the draft had 20 words; neuroplasticity, cascade, and sovereignty were dropped with the sentences that used them. Where sources disagree: the Wolraich meta-analysis is described as 23 studies in its abstract and in a letter to JAMA, and as 16 in one popular account; the unit follows 23.