

THIRSTY

ADHD, Stimulant Medication, and Dehydration

by Elliott B. Martin, Jr., MD, and Paul G. Hammerness, MD

Recently, a concerned mother brought her preteen son, Alex, to the outpatient psychiatry clinic for an evaluation. His pediatrician had urged her to seek a second opinion on what appeared to be a worsening of his ADHD symptoms. Despite two increases in the dose of his previously effective stimulant medication, the symptoms persisted. Alex had been taking an amphetamine-based stimulant medication since the previous fall, when his primary doctor of many years diagnosed his ADHD. According to his family, doctor, and school, the fifth-grader's symptoms responded very well through the fall, winter, and early spring. He "blossomed," said his justly proud mother. His grades improved. He was making friends. He was successfully competing in athletics.

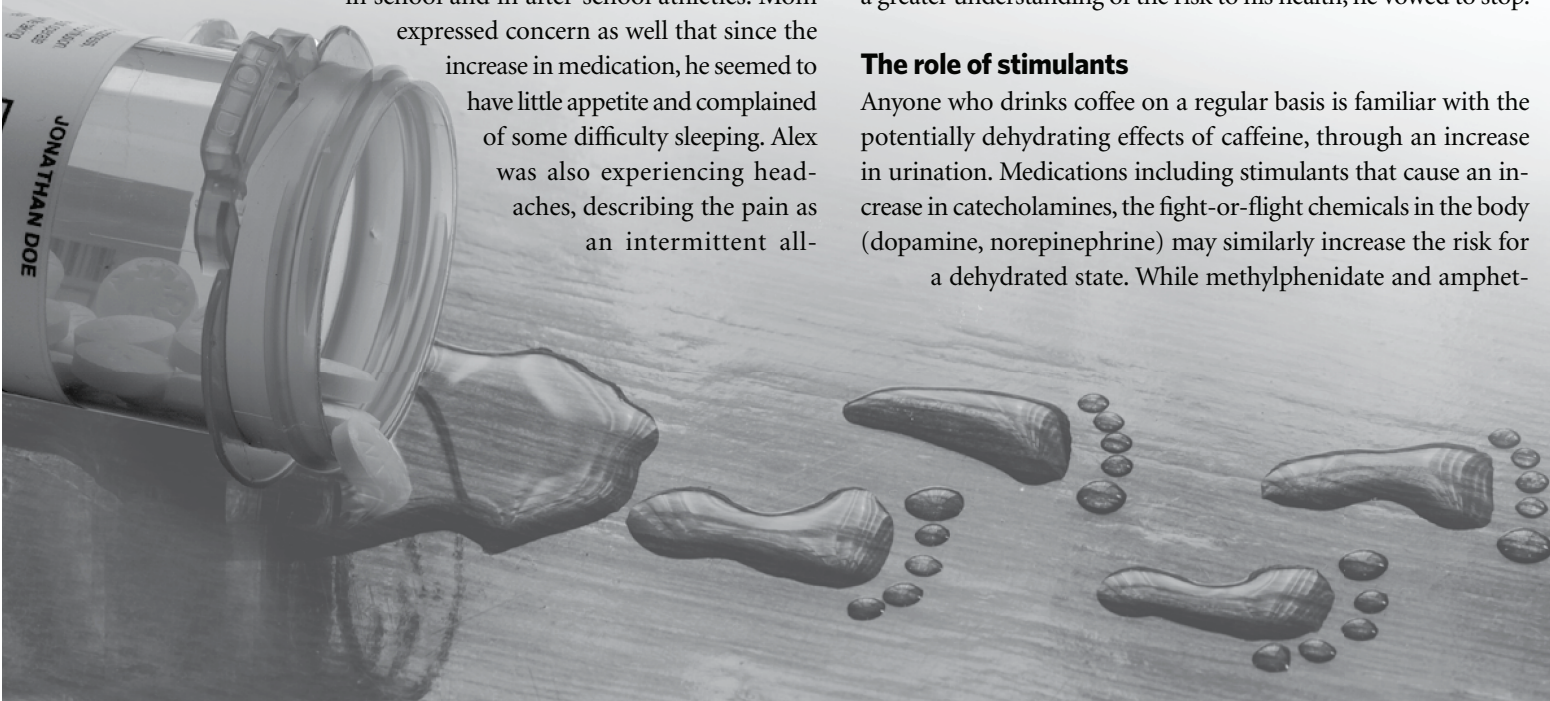
However, now the "new Alex" was beginning to show signs of the "old Alex." His grades were suffering, as was his behavior in school and in after-school athletics. Mom expressed concern as well that since the increase in medication, he seemed to have little appetite and complained of some difficulty sleeping. Alex was also experiencing headaches, describing the pain as an intermittent all-

over ache. His muscles felt "crampy" as well. He denied drinking energy drinks, coffee, or soda. During the office visit, Alex's heart rate was slightly elevated and he was mildly orthostatic, meaning his blood pressure dropped and his heart rate increased when he stood up after sitting. He felt a "head rush" upon standing.

After a thorough discussion, it was clear that Alex was not suffering from any new emotional problem. Nor was this an ADHD "relapse." With the coming of warmer weather, Alex was running track every afternoon; coupled with the increase in medication, he was eating less and had become moderately dehydrated. Some, if not all, of his behavioral problems could be a result of this state. The decision was to reduce the medication dose and to collaborate on a plan to keep Alex better hydrated. Fortunately, Alex later admitted to drinking energy drinks prior to practices on a regular basis. With a greater understanding of the risk to his health, he vowed to stop.

The role of stimulants

Anyone who drinks coffee on a regular basis is familiar with the potentially dehydrating effects of caffeine, through an increase in urination. Medications including stimulants that cause an increase in catecholamines, the fight-or-flight chemicals in the body (dopamine, norepinephrine) may similarly increase the risk for a dehydrated state. While methylphenidate and amphet-



amine, the stimulants for treating ADHD, are understood to work by increasing dopamine and norepinephrine in select regions of the brain, their effects may be felt throughout the body. Side effects may include increased heart rate, sweating, and shakiness.

Interestingly, however, there is a lack of scientific information regarding stimulant medications for ADHD and a heightened sympathetic or metabolic state resulting in dehydration. In addition, while package inserts for stimulant medications list low appetite and weight loss as common side effects, an increase in urination and/or dehydration is not routinely listed or commonly discussed in clinical reports. The comprehensive Canadian ADHD Resource Alliance guidelines for ADHD (caddra.ca) do list increased urination in one medication-monitoring template form.

As may be the case for the cardiovascular effects of stimulants, there may be a greater risk of dehydration when medications are taken together with highly caffeinated drinks, such as energy drinks. Without scientific evidence to guide, clinical experience suggests that a change of stimulant dose or formulation or a switch to a nonstimulant may lessen this experience, in addition to avoiding consumption of highly caffeinated drinks. Weight loss may be considered as indicative of a dehydrated state, particularly in warmer weather and in active youth. As the trend is to prescribe stimulants of longer duration and for lengthier periods of time, prescribers and patients will be well served by collaboratively monitoring for any changes in health or fitness.

Improved hydration hygiene

Both Mom and Alex were relieved at the recommendation to reduce the medication dose and rehydrate. They understood that Alex's dehydration was marked by headache, tachycardia, poor sleep, and muscle cramping. The picture had become more complicated when the effects of prolonged dehydration become apparent as well, potentially mimicking symptoms of ADHD itself.

With a written plan to drink enough fluids before, during, and after each workout, Alex's mother and coaches managed to keep him much better hydrated. Surprisingly, the majority of youth may be showing up to sporting activities already dehydrated. The use of caffeine-loaded energy drinks has likely contributed to a worsening of athlete fitness and a greater risk of dehydration and possible additional health problems.

When Alex returned for a follow-up consultation in two weeks, his appetite had returned and he was sleeping much better. His headaches and cramping were much less frequent, and he was performing up to his improved standards at school. Two weeks after that, Alex had learned by experience that thirst is not always the most reliable indicator of the need to hydrate, he had made hydration part of his routine, and his symptoms were only intermittent and fleeting. His performance both in the classroom and on the athletic field continued to improve.

Alex's story is not atypical. Many children, of all ages, require better hydration hygiene, whether or not they are on stimulant

medication. The good news is that mild to moderate dehydration can be managed with a prescription for plenty of fluids. Any uncertainty about the right balance of fluids—excess carries its own risk as well!—can be brought to your child's primary care physician. As with many health concerns, this risk is best addressed preventatively—staying appropriately hydrated every day. **A**

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The patient's identity has been altered for the purposes of this article.

FURTHER READING

Armstrong LE, Casa DJ, Maresh CM, Ganio MS. Caffeine, fluid-electrolyte balance, temperature regulation, and exercise-heat tolerance. *Exercise and Sport Sciences Reviews*. 2007 Jul;35(3):135-40).

Hammerness, Paul, et al. A cardiopulmonary study of lisdexamfetamine in adults with ADHD. *World Journal of Biological Psychiatry*, 2013, 14(4):299-306).

Jill Castle, "The Drinking Problem in Youth Sports," guest blog for the National Alliance for Youth Sports (6/27/2013).

Gayathri Kumar, Sohyun Park, and Stephen Onufrak (2014). Perceptions About Energy Drinks Are Associated With Energy Drink Intake Among U.S. Youth. *American Journal of Health Promotion* (in press).

The advertisement features a yellow background with a large puzzle piece graphic. The text 'ATTENTION TALK VIDEO' is at the top, with a small logo in the center. Below it is the website 'www.attentiontalkvideo.com'. The main text reads 'Your ADHD TALK SHOW Station!'. At the bottom, there is a red banner with the text 'Watch Attention Talk Video!' and 'Catch Us On You Tube Search: Attention Talk Video'. Silhouettes of people are visible at the bottom.