Caffeine Consumption Among Naval Aviation Candidates

Thomas E. Sather; Ronald D. Williams, Jr.; Donald R. Delorey; Conrad L. Woolsey

INTRODUCTION: Education frequently dictates students need to study for prolonged periods of time to adequately prepare for examinations. This is especially true with aviation preflight indoctrination (API) candidates who have to assimilate large volumes of information in a limited amount of time during API training. The purpose of this study was to assess caffeine consumption patterns (frequency, type, and volume) among naval aviation candidates attending API to determine the most frequently consumed caffeinated beverage and to examine if the consumption of a nonenergy drink caffeinated beverage was related to energy drink consumption.

METHODS: Data were collected by means of an anonymous 44-item survey administered and completed by 302 students enrolled in API at Naval Air Station Pensacola, FL.

RESULTS: Results indicated the most frequently consumed caffeinated beverage consumed by API students was coffee (86.4%), with daily coffee consumption being approximately 28% and the most frequent pattern of consumption being 2 cups per day (85%). The least frequently consumed caffeinated beverages reported were energy drinks (52%) and energy shots (29.1%). The present study also found that the consumption patterns (weekly and daily) of caffeinated beverages (coffee and cola) were positively correlated to energy drink consumption patterns.

DISCUSSION: Naval aviation candidates' consumption of caffeinated beverages is comparable to other college and high school cohorts. This study found that coffee and colas were the beverages of choice, with energy drinks and energy shots being the least frequently reported caffeinated beverages used. Additionally, a relationship between the consumption of caffeinated beverages and energy drinks was identified.

KEYWORDS: caffeine, military, aviation, energy drinks.

Sather TE, Williams RD, Delorey DR, Woolsey CL. *Caffeine consumption among naval aviation candidates*. Aerosp Med Hum Perform. 2017; 88(4):399–405.

Caffeine is a primary component of basic foods and beverages in the normal U.S. diet. Reports suggest that 85–90% of U.S. adults consume caffeine.[10,21] While there is a long history of regulatory actions in the U.S.,[2] the Food and Drug Administration does not provide a general recommendation on daily caffeine intake, but has reported that consumption of up to 400 mg · d^{-1} was not associated with major health implications in healthy adults.[8] Health Canada published similar standards for healthy adults 18 yr of age or older, with a recommendation to limit intake to less than 400 mg · d^{-1} in 2014.[12] For reference, caffeineinformer.com indicates that a 16-oz. cup of Starbucks grande coffee has 330 mg of caffeine, a 16-oz energy drink (Monster, Rockstar, NOS) has 160 mg of caffeine, 16 oz of iced tea has 120 mg, and 16 oz of Coca-Cola Classic has 45 mg.

Military members experience significant daily stressors, which often include sleep deprivation, cognitive stress, and extreme physical demands that can be somewhat alleviated through caffeine consumption on a short term basis.[20,21,22] Due to these unique occupational environments, researchers have explored caffeine consumption among U.S. military personnel. Lieberman et al.[17] reported that 82% of U.S. Army soldiers consumed caffeine daily, with an average of 347 mg · d^{-1} among regular caffeine consumers. Among regular consumers, men report higher quantities than women at 365 mg · d^{-1} vs. 216 mg · d^{-1}. It is important to note that consumption quantities reported is in absolute terms and does not factor in body mass. While there

From the Naval Aerospace Medical Institute and the Naval Aviation Schools Command, Pensacola, FL.

This manuscript was received for review in June 2016. It was accepted for publication in December 2016.

Address correspondence to: Thomas E. Sather, Director, Education and Training - Requirements and Oversight (M71), U.S. Navy Bureau of Medicine and Surgery, 7700 Arlington Blvd., Ste 5113, Falls Church, VA 22042-5113; navyaerophys@gmail.com.

DOI: https://doi.org/10.3357/AMHP.4693.2017

are reported health and ergogenic performance enhancement benefits possible from caffeine use,[32] about 10% of the U.S. Army population consumes over 1000 mg · d^{-1}, which exceeds the daily intake recommendation by the U.S. Department of Defense.[17] In addition to daily stressors, the demands of military training and study are extensive, particularly for aviation candidates who are expected to undergo exhaustive daily physical and psychological training, in addition to weekly comprehensive examinations. It is possible that the extensive aviation preflight indoctrination (API) schedule may increase aviation candidates' likelihood of using caffeinated products to assist with fatigue management during the 5-wk course.

Since energy drink production and sales are unregulated in the United States, caffeine content amounts within energy drink products range widely and may not be accurately reflected on container labels or easily interpreted with the inclusion of herbal forms of caffeine such as yerba mate and guarana.[2,5] Caffeineinformer.com lists energy drink and shot products caffeine content as ranging from 0 to 714.3 mg/fluid oz. As the popularity and use of energy drinks increases in the United States, public health researchers have explored the impact on overall behaviors and public health. Research has linked energy drink consumption with both personal and social health risks;[1,6,33] most studies examining energy drinks focus on adolescents and college students, with few studies exploring military personnel.

While some studies suggest military populations consume energy drinks at higher rates than comparable nonmilitary populations,[13] these results have been inconsistent among samples. A recent study indicated that 79% of subjects ($N = 239$) reported consuming energy beverages within the last year and that fatigue management was a primary purpose for consuming energy drinks among U.S. Navy and U.S. Marine Corps pilot and flight officer candidates.[24] Overall, energy drink usage rates were lower than similar ages of nonmilitary populations. Reporting lower frequency of consumption, U.S. Air Force members reported higher energy drink consumption prevalence when compared to general population samples.[26] Additional research has indicated that deployed military personnel are significantly more likely to consume energy drinks daily as compared to the civilian population. For example, approximately 45% of U.S. Army and Marine combat platoons deployed to Afghanistan reported daily energy drink use compared to 6% within civilian population samples tested.[29] Toblin et al.[29] also reported that 14% of the deployed service members consumed three or more energy drinks per day; however, a military sample ($N = 204$) studied by Sather et al.[25] reported no daily consumption of three or more energy drinks. Stephens[27] explored trends in energy drink consumption within multiple branches of the military, including active duty Army, Navy, Air Force, Marine Corps, Coast Guard, and Uniformed Public Health Service members and discovered that daily energy drink use was higher among lower ranked military members and that those with lower ranks were more likely to perceive energy drinks as safe. It has also been suggested that the energy drink use among military members may be linked to commonly self-reported health effects, including increased pulse, restlessness, and inadequate sleep.[27-29] Further exploration of energy drink use among other military populations has been suggested.[25]

The primary purpose of this study was to investigate caffeine consumption amounts and usage patterns of common caffeinated beverages (i.e., coffee, tea, or cola) among naval aviation candidates. A recent study of caffeine use in the U.S. population suggested that while overall caffeine intake has decreased among adults, the use of energy drinks has increased among young adults.[7] This study, however, did not examine the relationship between overall caffeine use and energy drinks. Therefore, the secondary purpose of the present study was to examine if a relationship exists between caffeine use and the use of energy drinks in the sampled military population. It was the goal of the researchers to determine if personnel who consumed energy drinks also consumed other caffeinated beverages, which may put personnel at risk for caffeine overdose. The specific goals of this research were to 1) identify the average daily quantity and weekly frequency of caffeinated beverage consumption; 2) to determine the consumption patterns of caffeinated beverages while operating motor vehicles and to stay alert; and 3) to investigate the relationship between the use of commonly consumed caffeinated beverages (coffee, colas, and teas) and the use of energy drinks.

METHODS

The sample for this study consisted of 302 naval aviation candidates enrolled in flight training at the Naval Air Station base in Pensacola, FL. The naval aviation candidates consisted of individuals who were either designated as U.S. Navy or U.S. Marine Corp Student Naval Aviators or Student Naval Flight Officers. A consecutive sampling technique was used to obtain subjects for this study from January to March of 2015, which led to a 100% response rate among those asked to participate. To protect subjects and increase reliability, no personally identifiable information was collected and all the volunteers' survey responses were completely anonymous with no link to the subjects' identity. All data were analyzed in aggregate form.

Subjects completed an anonymous 44-item beverage consumption survey which examined the use of energy drinks, coffee, tea, soda, and other caffeinated beverages. The survey issued was a modified version of the European Consortium Nomisma-Areté which has previously been validated and administered to 14,500 adults across 16 European countries.[34] Survey items asked about quantity and frequency of beverage consumption, brand preference, sugar content, and caffeine content. The survey instrument used an ordinal scale to determine average weekly consumption frequency of caffeinated beverages. The responses included: never, rarely (less than once a month), one to three times a month, once a week, 2 to 3 d/wk, 4 to 5 d/wk, and every day. The daily quantity of consumption also used a similar ordinal scale methodology to determine number of servings consumed per day when such beverages were consumed.

To discover what caffeinated beverages were consumed while operating a motor vehicle, subjects were asked to self-report

what beverages that they consumed before/during operating motor vehicles or heavy equipment (driving, boating, flying) by checking those beverage categories that applied. Likewise, in order to determine caffeine consumption patterns on a long-duration trip, subjects were asked to identify beverages that they routinely use to stay alert. The choices of interest were coffee, tea, cola, energy drinks, and energy shots.

This study was approved by the Naval Aerospace Medical Institute, the Naval Operational Medical Training Center, and the Institutional Review Board at the Naval Medical Research Unit–Dayton. All subjects who participated provided informed consent by completing the survey and an exemption of collecting informed consent documentation was approved by the IRB.

RESULTS

Results indicated that coffee (86.4%, $N = 261$) was the most frequently reported caffeinated beverage consumed in an average week over the last year, followed by colas (70.1%, $N = 214$), with tea (67.5%, $N = 204$) and energy drinks (67.5%, $N = 204$) being the least. Among subjects, 28.2% reported daily coffee consumption, while 20.9% reported consuming coffee on most days of the week. Among the reported coffee consumers, the most frequently reported amount of coffee consumed per day was two cups per day (32.6%, $N=85$). Of the subjects, 49% ($N =148$) met the operational definition of high chronic consumer by "drinking coffee four to five days per week or more" and 5.4% of the coffee drinkers ($N=14$) were classified as high acute consumers by "drinking four or more per day." In determining the frequency of caffeinated beverages consumed in an average week, participant responses were recorded as the following: 0 = never, 1 = rarely (less than once a month), 2 = one to three times a month, 3 = once a week, 4 = 2–3 per week, 5 = 4–5 per week, 6 = every day. Results indicated that coffee was consumed the most ($\overline{X} = 3.82$, SD = 2.11), followed by tea ($\overline{X} = 1.97$, SD = 1.82) and colas ($\overline{X} = 1.92$, SD = 1.75), with energy drinks identified as having the lowest frequency of consumption ($\overline{X} = 1.10$, SD = 1.17). **Fig. 1** and **Fig. 2** present the frequency and quantity distribution of coffee consumption responses.

Following the model of the European Consortium Nomisma-Areté survey,[34] the coding for quantity of energy drinks, coffee, and tea consumed used the following scoring system to quantify consumption quantity: 0 = none, 1 = less than one, 2 = one, 3 = two, 4 = three, 5 = four, 6 = more than 4. Colas were scored with a modified scale as a means in an attempt to keep caffeine content uniform. Colas used the following scoring system: 0 = none, 1 = less than one, 2 = between 1 and 2 cans, 3 = approximately 3 cans (1 L), 4 = between 4 and 6 cans (1–2 L), 5 = between 7 to 10 cans (2–3 L), and 6 = more than 10 cans. Results indicated that coffee was again consumed the most ($\overline{X} = 2.21$, SD = 1.41), followed by colas ($\overline{X} = 1.39$, SD = 1.28) and tea ($\overline{X} = 1.08$, SD = 1.00), with energy drinks identified as having the lowest consumption ($\overline{X} = 0.79$, SD = 0.65).

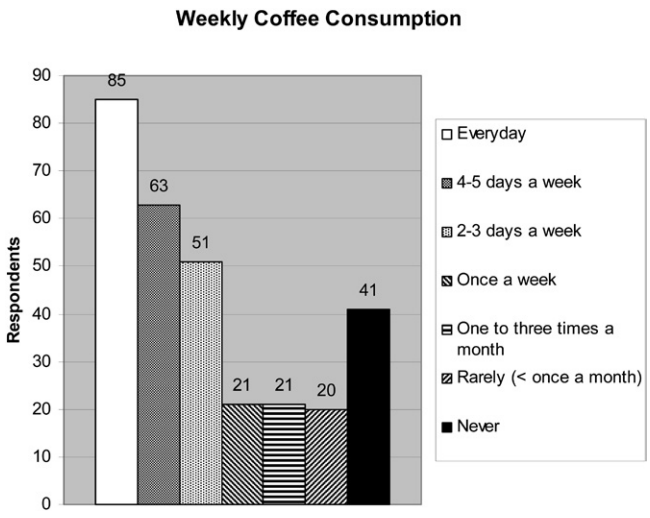

Fig. 1. Weekly coffee consumption frequency ($N = 302$).

Caffeinated beverages were regularly reported as being consumed during the operation of a motorized vehicle whether it be driving, boating, or flying. The results were that coffee (83.1%, $N = 251$) was the mostly reported caffeinated beverage consumed, followed by colas (73.8%, $N = 223$), tea (63.6%, $N = 192$), energy drinks (52%, $N = 157$), and finally energy shots (29.1%, $N = 88$). When asked what caffeinated beverages subjects used to stay alert during a long-distance trip, the respondents reported that coffee was again used the most to stay alert (67.2%, $N = 203$), followed by energy drinks (33.4%, $N = 101$), then colas (27.2%, $N = 82$), tea (18.9%, $N = 57$), and energy shots (10.3%, $N = 31$).

Results indicated that coffee and cola consumption patterns on a weekly frequency basis as well as daily quantity of consumption were positively correlated to energy drink consumption patterns. Tea was not significant in either condition. Results are presented in **Table I**.

Using the relationship found between coffee, colas, and energy drinks, the researchers investigated if the positive

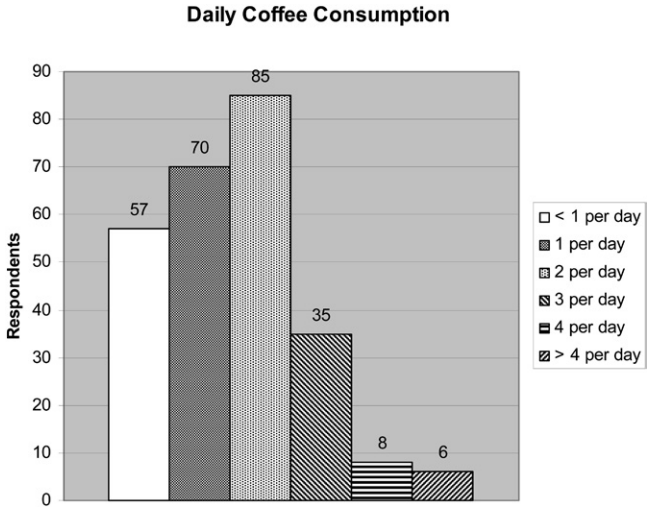

Fig. 2. Daily coffee consumption patterns ($N = 261$).

Table I. Average Weekly and Daily Consumption Correlations of Energy Drinks to Coffee, Tea, and Cola ($N = 302$).

		COFFEE	TEA	COLA
In an average week over the last year, what best describes your consumption pattern of energy drinks/shots?	Pearson Correlation	0.166**	−0.044	0.173**
	Sig. (2-tailed)	0.004	0.449	0.003
	Sum of Squares and Cross-products	123.543	−28.179	106.566
	Covariance	0.410	−0.094	0.354
In an average day, what best describes your consumption pattern of energy drinks/shots?	Pearson Correlation	0.165**	−0.035	0.171**
	Sig. (2-tailed)	0.004	0.543	0.003
	Sum of Squares and Cross-products	45.563	−6.914	42.795
	Covariance	0.151	−0.023	0.142

** Correlation is significant at the 0.01 level (2-tailed).

correlation between coffee and cola consumption had any relationship with the maximum number of energy drinks consumed on a single occasion. In this study, single occasion was operationally defined as "time frame of a couple of hours (e.g., a night out, during study session, or sport session."

A paired samples *t*-test revealed a statistically significant difference between the frequency of coffee consumption and frequency of energy drink consumption [$t(301) = 21.16$; $P < 0.001$; 95% CI 2.97–2.47], indicating that coffee was consumed more frequently than energy drinks. **Table II** presents the comparison of coffee and energy drink consumption frequency data. Analyses also revealed that a positive correlation existed between the maximum consumption of energy drinks on a single occasion and average daily coffee consumption ($r = 0.141$; $P = 0.045$). However, no correlations were found between maximum consumption of energy drinks on a single occasion and weekly coffee consumption frequency.

Analysis between the consumption quantities of colas and energy drinks indicate there is a statistical difference between the two. A paired samples *t*-test indicates a statistically significant difference between average quantity of cola and energy drink consumption [$t(301) = 7.80$; $P < 0.001$; 95% CI 0.75–0.45], indicating that colas were consumed in greater quantities than energy drinks. **Table III** presents the consumption quantity of colas and energy beverages consumed at one time. Likewise, a paired samples *t*-test revealed a statistically significant difference in overall frequency of cola and energy drink consumption [$t(301) = 7.33$; $P < 0.001$; 95% CI 1.03–0.60], signifying that cola was consumed more frequently than energy drinks. **Table IV** presents the cola and energy drink consumption frequency data. A positive correlation was found between the frequency of cola consumption and the maximum consumption of energy drinks imbibed on a single occasion ($r = 0.226$, $P = 0.001$) and between the maximum number of energy drinks consumed on a single occasion and the quantity of colas consumed ($r = 0.236$; $P = 0.001$). While the linear correlation may be weak, the present study indicates a possible relationship between consumption of these two caffeinated beverages during aviation preflight indoctrination.

DISCUSSION

The consumption of caffeine is universal. It is the most widely consumed drug in the history of humans, used by more than 80% of the world's population.[9,10,21] Caffeine's widespread consumption may be the result of it having been positively associated with a multitude of health and performance benefits such as improved long-term memory, improved performance of vigilance tasks and fewer lapses of attention, and increased alertness.[2,9] Military training frequently dictates that military personnel need to study for prolonged periods of time to adequately prepare for tests or examinations. This is particularly true with aviation candidates who are expected to assimilate a large volume of information in a limited amount of time during aviation preflight indoctrination training. API is an extensive 5-wk academic course which covers five different aviation related topics. As part of the API learning experience, students are exposed to a variety of psychological and physical stressors on a daily basis while completing comprehensive written examinations on a weekly basis. To complicate matters, the start time for the five comprehensive written examinations is at 07:00. The extensive API schedule lays the foundation for aviation candidates to use caffeinated products to assist with fatigue management.

Research of the U.S. general public indicates that the prevalence of workers experiencing fatigue ranges from 7 to 45% of the workforce.[22] In the military, fatigue is recognized as a major safety issue that has caused significant impairment of performance, alertness, and even mental health. In civilian aviation, fatigue is one of the most frequently cited factors in crashes.[16] The salubrious benefits (i.e., improving alertness when experiencing fatigue) associated with caffeine make the consumption of caffeine an attractive option for military personnel who are constantly experiencing a myriad of fatigue inducing events like deployments, training exercises, and support of combat operations.

Based upon the high response rate of this study (100%), results are considered indicative of the target population. Results indicated that 86.4% of the 302 subjects consumed coffee. This is consistent with the notion that caffeine is one of the most widely consumed substances in history.[3,24] Previous research by Lee et al.[15] yielded similar results, indicating that 93.6% of 360 medical students consumed caffeine, while Valek et al.[31] found that only 10% of subjects of high school students did not consume caffeine-containing products.

This study provides findings that may be a concern to aviation as these API candidates matriculate forward. Given that the Navy and U.S. Marine Corp have a prohibition from flying after consuming energy drinks and other nonapproved

Table II. Comparison of Coffee and Energy Drink Consumption Frequency.

		IN AN AVERAGE WEEK, OVER THE LAST YEAR, WHAT BEST DESCRIBES YOUR CONSUMPTION PATTERN OF COFFEE OR BEVERAGES WITH COFFEE (E.G., CAPPUCCINO)?							
		NEVER	RARELY	1-3 PER MONTH	ONCE A WEEK	2-3 PER WEEK	4-5 PER WEEK	EVERY DAY	TOTAL
IN AN AVERAGE WEEK, OVER THE LAST YEAR, WHAT BEST DESCRIBES YOUR CONSUMPTION PATTERN OF ENERGY DRINKS/SHOTS?	NEVER	24	8	7	4	17	14	24	98
	RARELY	12	10	10	14	18	28	42	134
	1-3 PER MONTH	2	1	3	3	12	6	11	38
	ONCE A WEEK	1	0	0	0	3	7	2	13
	2-3 PER WEEK	1	1	0	0	1	7	2	12
	4-5 PER WEEK	0	0	1	0	0	1	4	6
	EVERY DAY	1	0	0	0	0	0	0	1
TOTAL		41	20	21	21	51	63	85	302

nutritional supplements,[30] the findings that 81% of respondents reported operating a vehicle while consuming energy drinks/shots and 44% reported using these energy products to stay alert during a long-distance trip may be indicative that API candidates may be more inclined to use these products during flight operations based upon their prior history. Add to this the increased use of caffeine products by those deployed,[29] it is speculated that these persons may be even more likely to use higher quantities of caffeine than reported in this study. Further study on these behaviors in this specific population is needed.

Sather et al.[25] reported that caffeinated beverages used by API students were to combat the effects of fatigue. Research shows that caffeine consumption can alleviate the lack of sleep and low energy levels on a short-term basis;[18–20] however, additional research has shown that older adults are more susceptible to caffeine-related sleep disturbances than younger adults.[4] Many people do not appear to fully consider the long-term low energy level or metabolic consequences of continued regular caffeine use. For example, Lieberman et al.[17] reported that 82% of U.S. Army soldiers consumed daily caffeine, with an average of 347 mg $\cdot$ d^{-1} among regular caffeine consumers. With 85–90% of adults consuming caffeine on a regular basis,[10,21] people's endocrine systems rarely have the opportunity to fully recover, which may result in a myriad of metabolic consequences, including adrenal issues. As these candidates move along the flight training pipeline and through their respective careers, further studies may be needed on the long-term metabolic effects of regular caffeine use in aviation.

In this study, coffee was consumed in the highest quantity, with energy drinks identified as having the lowest quantity of consumption. While the reasons for coffee's popularity are somewhat unknown, there have been several possible explanations, including historical social acceptance, widespread availability, low cost, and perceived safety.[11] It is known that high levels of caffeine consumption can pose health risks and cause adverse reactions.[14] This may be of significance, particularly with the popularity of highly caffeinated beverages such as coffee and energy drinks. Since energy drink production and sales are unregulated in the United States, the specific caffeine content amounts within energy drink products vary widely and may not be accurately reflected on container labels or easily interpreted with the inclusion of herbal forms of caffeine such as yerba mate and guarana.[2,5]

The present study determined that coffee and cola consumption patterns (weekly and daily) were positively correlated to energy drink consumption patterns. While there is limited research on coffee-energy drink relationship, prior studies have indicated a possible correlation between energy drink use and increased consumption of other stimulants. While Drewnowski

Table III. Comparison of Cola and Energy Drink Consumption Quantity.

		IN AN AVERAGE WEEK, OVER THE LAST YEAR, HOW MANY CANS OF COLAS (E.G., COCA-COLA®, PEPSI®) HAVE YOU CONSUMED?						
		NONE	< 1 CAN	1-2 CANS	~3 CANS	4-6 CANS	7-10 CANS	TOTAL
IN AN AVERAGE DAY, WHAT BEST DESCRIBES YOUR CONSUMPTION PATTERN OF ENERGY DRINKS/SHOTS?	NONE	39	32	12	9	3	3	98
	< 1 PER DAY	42	58	44	15	11	4	174
	1 PER DAY	7	4	8	4	3	0	26
	2 PER DAY	0	0	3	0	1	0	4
TOTAL		88	94	67	28	18	7	302

Table IV. Cola and Energy Drink Consumption Frequency.

		IN AN AVERAGE WEEK, OVER THE LAST YEAR, WHAT BEST DESCRIBES YOUR CONSUMPTION PATTERN OF COLAS (E.G., COCA-COLA®, PEPSI®)?							
		NEVER	RARELY	1-3 PER MONTH	ONCE A WEEK	2-3 PER WEEK	4-5 PER WEEK	EVERY DAY	TOTAL
IN AN AVERAGE WEEK, OVER THE LAST YEAR, WHAT BEST DESCRIBES YOUR CONSUMPTION PATTERN OF ENERGY DRINKS/SHOTS?	NEVER	39	19	9	12	12	5	2	98
	RARELY	33	33	28	13	19	3	5	134
	1-3 PER MONTH	10	5	7	5	6	2	3	38
	ONCE A WEEK	2	0	2	4	2	2	1	13
	2-3 PER WEEK	3	2	2	0	3	2	0	12
	4-5 PER WEEK	1	0	0	4	1	0	0	6
	EVERY DAY	0	0	1	0	0	0	0	1
TOTAL		88	59	49	38	43	14	11	302

and Rehm[7] suggested that the increase in energy drink consumption was not related to the decrease in soda consumption among U.S. children, there are no known studies to examine this correlation among adults, particularly a military population. While the effect sizes are small, the present study indicates a possible relationship between consumption of these two caffeinated beverages during API. Further research is needed to more thoroughly examine these consumption behaviors.

This study found that coffee and colas were the beverages of choice for most Navy and Marine Corps aviation candidates. For this study, energy drinks and energy shots were the least frequently reported caffeinated beverages used. This study also showed patterns of consumption of commonly used caffeinated beverages during the operation of vehicles and at times of general fatigue. In light of the relatively innocuous quantities of energy beverages consumed as well as the low frequency of use, it does not appear that these beverages pose a significant risk to naval aviation for this population. While much is known about caffeine, more research is needed into the specific effects of energy drinks and energy shots on piloting skills before these beverages can be deemed as generally accepted as safe for use in aviation.

ACKNOWLEDGMENTS

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.

Authors and affiliations: Thomas E. Sather, Ed.D., M.S.S., Bureau of Medicine and Surgery, Falls Church, VA; Ronald D. Williams, Jr., Ph.D., CHES, Department of Health and Human Performance, Texas State University, San Marcos, TX; Donald R. Delorey, Ph.D., M.A.S., Naval Aviation Schools Command, Pensacola, FL; and Conrad L. Woolsey, Ph.D., CC-AASP, Director of Sport and Performance Psychology, University of Western States, Portland, OR.

REFERENCES

1. Arria AM, Caldeira KM, Kasperski SJ, Vincent KB, Griffiths RR, O'Grady KE. Energy drink consumption and increased risk for alcohol dependence. Alcohol Clin Exp Res. 2011; 35(2):365–375.
2. Bailey RL, Saldanha LG, Gahche JJ, Dwyer JT. Estimating caffeine intake from energy drinks and dietary supplements in the United States. Nutr Rev. 2014; 72(Suppl. 1):9–13. Erratum in Nutr Rev. 2014; 72(11):735.
3. Bray RM, Pemberton MR, Hourani LL, Witt M, Olmstead KLR, et al. 2008 Department of Defense Survey of Health Related Behaviors Among Active Duty Military Personnel. 2009. [Accessed April 20, 2016]. Available from http://prhome.defense.gov/Portals/52/Documents/RFM/Readiness/DDRP/docs/2009.09%202008%20DoD%20Survey%20of%20Health%20Related%20Behaviors%20Among%20Active%20Duty%20Military%20Personnel.pdf.
4. Clark I, Landolt HP. Coffee, caffeine, and sleep: a systematic review of epidemiological studies and randomized controlled trials. Sleep Med Rev. 2017; 31:70–78.
5. Consumer Reports. The buzz on energy-drink caffeine. 2012. [Accessed April 20, 2016]. Available from www.consumerreports.org/cro/magazine/2012/12/the-buzz-on-energy-drink-caffeine/index.htm.
6. Cotter BV, Jackson DA, Merchant RC, Babu KM, Baird JR, et al. Energy drink and other substance use among adolescent and young adult emergency department patients. Pediatr Emerg Care. 2013; 29(10):1091–1097.
7. Drewnowski A, Rehm CD. Sources of caffeine in diets of US children and adults: trends by beverage type and purchase location. Nutrients. 2016; 8(3):154.
8. Food and Drug Administration. Letter to the Honorable Richard J. Durbin, United States Senate. 2012. [Accessed April 2016.] Available from: http://www.durbin.senate.gov/imo/media/doc/09112012FDA.pdf.
9. Fredholm BB, Battig K, Holmen J, Nehlig A, Zvartau EE. Actions of caffeine in the brain with special reference to factors that contribute to its widespread use. Pharmacol Rev. 1999; 51(1):83–133.
10. Fulgoni VL, Keast DR, Lieberman HR. Trends in intake and sources of caffeine in the diets of US adults: 2001-2010. Am J Clin Nutr. 2015; 101:1081–1087.
11. Good J. Coffee. University of Minnesota Libraries. [Accessed April 20, 2016]. Available from https://www.lib.umn.edu/bell/tradeproducts/coffee.
12. Health Canada. Health Canada reminds Canadians to manage their caffeine consumption. 2013. [Accessed Apr. 2016]. Available from: http://healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2013/34021a-eng.php.
13. Johnson LA, Foster D, McDowell JC. Energy drinks: review of performance benefits, health concerns, and use by military personnel. Mil Med. 2014; 179(4):375–380.

14. Kadi A. Reports: give us this day our daily caffeine. European Food and Feed Law Review. 2015; 10(2):129–134.
15. Lee KH, Human GP, Fourie JJ, Louw WAN, Larson CO, Joubert G. Medical students' use of caffeine for 'academic purposes' and their knowledge of its benefits, side-effects and withdrawal symptoms. South African Family Practice. 2009; 51(4):322–327.
16. Levin A. Fighting pilot fatigue on military charter flights. Bloomberg Business Week. 2011. [Accessed Apr. 2016]. Available from: http://www.businessweek.com/magazine/fighting-pilot-fatigue-on-military-charter-flights-10272011.html.
17. Lieberman HR, Stavinoha T, McGraw S, White A, Hadden L, Marriott BP. Caffeine use among active duty US Army soldiers. J Acad Nutr Diet. 2012; 112(6):902–912.
18. Lieberman HR, Tharion WJ, Shukitt-Hale B, Speckman KL, Tulley R. Effects of caffeine, sleep loss and stress on cognitive performance and mood during US Navy SEAL training. Psychopharmacology (Berl). 2002; 164(3):250–261.
19. McLellan TM, Bell DG, Kamimori GH. Caffeine improves physical performance during 24 hours of active wakefulness. Aviat Space Environ Med. 2004; 75(8):666–672.
20. McLellan TM, Kamimori GH, Bell DG, Smith IF, Johnson D, Belenky G. Caffeine maintains vigilance and marksmanship in simulated urban operations with sleep deprivation. Aviat Space Environ Med. 2005; 76(1):39–45.
21. Mitchell DC, Knight CA, Hockenberry J, Teplanshy R, Hartman TJ. Beverage caffeine intakes in the U.S. Food Chem Toxicol. 2014; 63: 136–142.
22. Ricci JA, Chee E, Lorandeau AL, Berger J. Fatigue in the U.S. workforce: prevalence and implications for lost productive work time. J Occup Environ Med. 2007; 49(1):1–10.
23. Rosenfeld LS, Mihalov JJ, Carlson SJ, Mattia A. Regulatory status of caffeine in the United States. Nutr Rev. 2014; 72(Suppl. 1):23–33.
24. Sather TE, Delorey DR. Energy beverage consumption among Naval aviation candidates. Aerosp Med Hum Perform. 2016; 87(6):557–564.
25. Sather TE, Woolsey CL, Williams RD, Evans MW, Cromartie F. Age of first use of energy beverages predicts future maximal consumption among naval pilot and flight officer candidates. Addictive Behaviors Report. 2016; 3:9–13.
26. Schmidt RM, Caldwell JA, Hallman C. Prevalence of energy-drink and supplement usage in a sample of Air Force personnel. 2008. [Accessed April 2016]. Available from: http://www.dtic.mil/dtic/tr/fulltext/u2/a514723.pdf.
27. Stephens MB. Energy drinks: lessons learned from military populations. 2013. [Accessed April 2016]. Available from: http://ods.od.nih.gov/pubs/energydrinks2013/Stephens.pdf.
28. Stephens MB, Attipoe S, Jones D, Ledford CJ, Deuster PA. Energy drink and energy shot use in the military. Nutr Rev. 2014; 72(Suppl. 1):72–77.
29. Toblin RL, Clarke-Walper K, Kok BC, Sipos ML, Thomas JL. Energy drink consumption and its association with sleep problems among U.S. service members on a combat deployment – Afghanistan, 2010. MMWR Morb Mortal Wkly Rep. 2012; 61(44):895–898.
30. U.S. Navy Aeromedical Reference and Waiver Guide. [Accessed Aug. 2016]. Available from http://www.med.navy.mil/sites/nmotc/nami/arwg/Documents/WaiverGuide/19_Dietary_Supplements.pdf.
31. Valek M, Laslavia B, Laslavia Z. Daily caffeine intake among Osijek high school students: questionnaire study. Croat Med J. 2004; 45(1):72–75.
32. Vanderveen JE, Armstrong LW, Butterfield GE, Chenoweth WL, Dwyer JT, Fernstrom JD, et al. Caffeine for the sustainment of mental task performance. 2001. [Accessed April 2016]. Available from: https://iom.nationalacademies.org/~/media/Files/Report%20Files/2003/Caffeine-for-the-Sustainment-of-Mental-Task-Performance-Formulations-for-Military-Operations/caffeine1pager.pdf.
33. Woolsey CL, Williams RD, Jacobson BH, Housman JM, McDonald JD, et al. Increased energy drink use as a predictor for illicit prescription stimulant use. Subst Abus. 2015; 36(4):413–419.
34. Zucconi S, Volpato C, Adinolfi F, Gandini E, Gentile E, et al. External scientific report: gathering consumption data on specific consumer groups of energy drinks (EN-394). 2013. [Accessed April 2016]. Available from: http://www.efsa.europa.eu/en/supporting/pub/394e.htm.