BROMATOLOGICAL DATA ANALYSIS OF CAFFEINE-BASED ENERGY DRINKS IN PORTUGAL AND FRANCE

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INTRODUCTION

Energy drinks (EDs) are non-alcoholic beverages marketed to temporarily increase physical and/or mental energy that pose health risks to university students, containing caffeine as their main active constituent combined with taurine, B vitamins, D-glucuronolactone, sugars or sweeteners, and plant extracts in heterogeneous compositions across brands and countries [1,2]. University students use them to extend study time or compensate for sleep deprivation, often with limited knowledge of their risks [3]. Their consumption is associated with sleep disturbances, anxiety and cardiovascular changes [2,4]. EFSA considers single doses up to 200 mg and daily intakes up to 400 mg of caffeine as safe for healthy adults [5]. Generally, university students are vulnerable young adults experiencing major lifestyle and consumption habits that can compromise their long-term health [6,7].

OBJECTIVES

This study analysed ED bromatological data from an online food retailer in Portugal and France to enhance health literacy and risk awareness, and to estimate the potential caffeine exposure of young adults (18–25 years).

MATERIAL AND METHODS

EDs were identified via search functions on Portuguese ("Bebidas energéticas") and French ("Boissons énergisantes") platforms (July–August 2026). Exclusion criteria omitted caffeine-free and alcohol-containing beverages. Product profile data, container volume, variants and usage recommendations were recorded directly or via linear extrapolation. Descriptive statistics (Microsoft Excel) were used to evaluate market differences and were compared with EFSA reference values [5] and sleep-effect thresholds [8].

RESULTS AND DISCUSSION

Results identified 19 brands (8 in PT; 14 in FR; 3 in both) and 154 commercial references (54 in PT; 100 in FR) (Figure 1), mostly in 250 mL (42.9%) and 500 mL (38.3%) formats (Figure 2). Mean caffeine ± SD per unit ranged from 70.6 ± 15.5 to 180.0 ± 0.0 mg (PT) and from 70.8 ± 15.9 to 160.0 ± 0.0 mg (FR) (Figure 3).

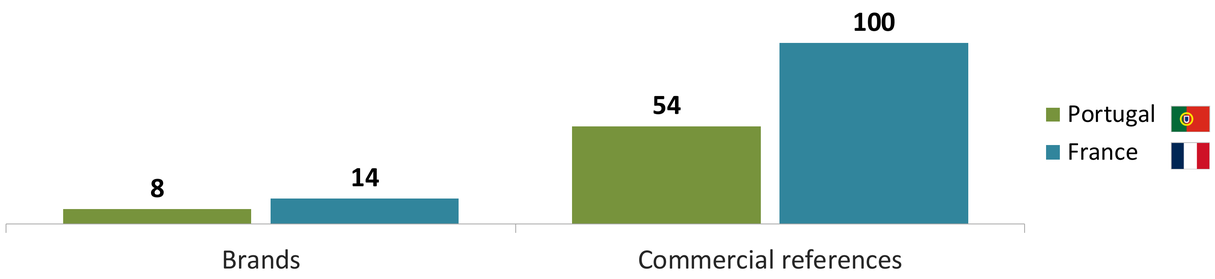

Figure 1 – Energy Drink Brands and Commercial References Identified by Country

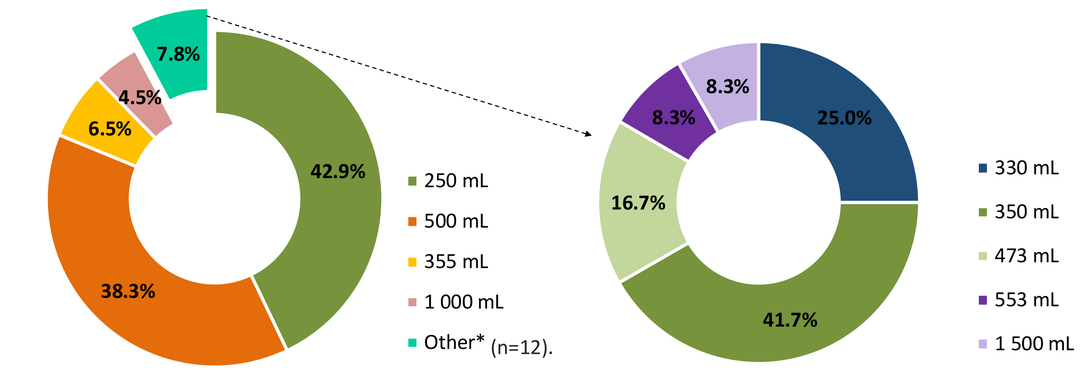

Figure 2 – Energy Drink Net Volume Distribution by Brand – PT & FR (mL)

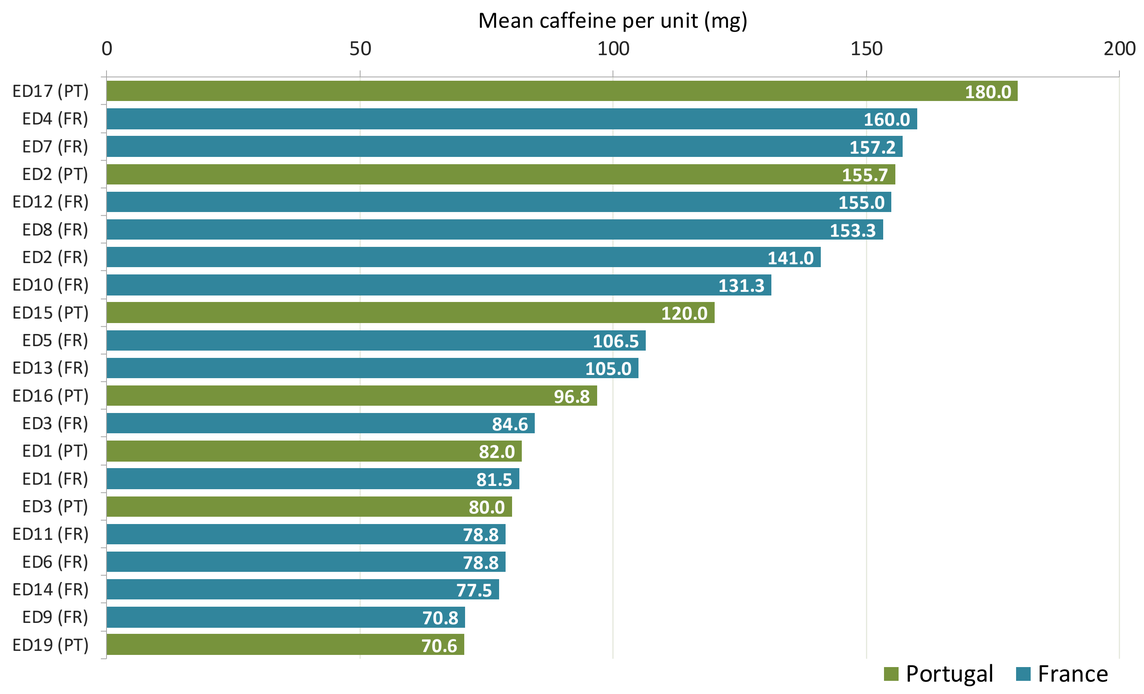

Figure 3 – Mean Caffeine Content per Unit by Energy Drink Brand and Country (mg)

Exposure depends mainly on container volume: a single 500 mL can exceed the 1.4 mg/kg threshold associated with effects on sleep at every body weight (bw) considered [8], and 1 000–1 500 mL formats reach or exceed the EFSA single dose [5] (Figure 4, Table 2). Two 500 mL cans (≈ 300 mg) with coffee or caffeine-containing medicines may exceed 400 mg/day, especially during exam periods. More than half of the references (**51.9%**) showed no usage recommendation online (75% in France) [9].

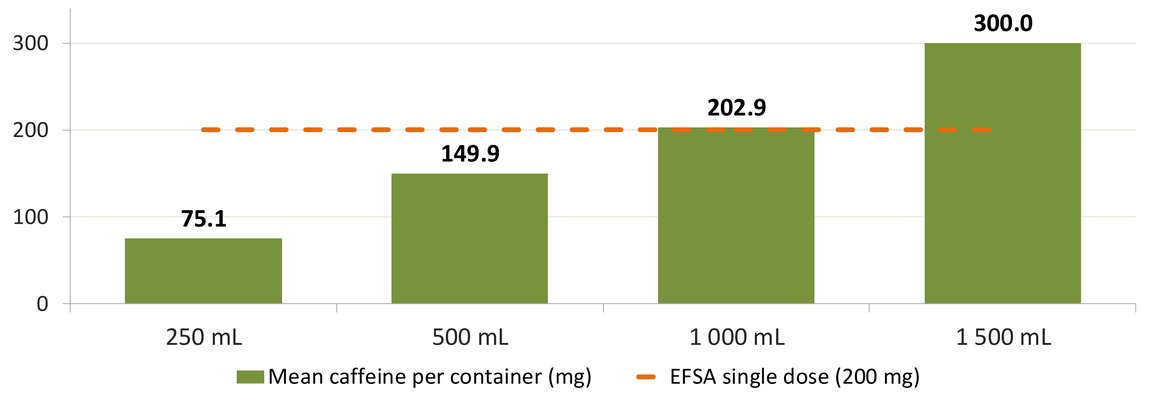

Figure 4 – Energy Drink Mean Caffeine per Unit by Format & Net Volume vs. EFSA Guidelines (PT & FR, mg)

Table 2 – Estimated Caffeine Exposure per Full Package by Format (mg/kg bw, effects on sleep and % of EFSA Single Dose)

Format	Mean caffeine (mg)	% EFSA single dose	mg/kg bw 50 kg	mg/kg bw 60 kg	mg/kg bw 70 kg	mg/kg bw 80 kg
250 mL	75.1	37.5%	**1.50**	1.25	1.07	0.94
500 mL	149.9	75.0%	**3.00**	**2.50**	**2.14**	**1.87**
1 000 mL	202.9	**101.4%**	**4.06**	**3.38**	**2.90**	**2.54**
1 500 mL	300.0	**150.0%**	**6.00**	**5.00**	**4.29**	**3.75**

< 1.4 mg/kg ≥ 1.4 mg/kg (effects on sleep) [8] ≥ 3 mg/kg or ≥ EFSA single dose (200 mg) [5,8]

Taurine was declared at 0.4% (400 mg/100 mL) in the main brands, and "Zero"/"Sugar free" versions kept the same caffeine (0.03%) and taurine content as the regular ones. Overall, 130 references (84.4%) contained taurine and 33 (21.4%) D-glucuronolactone, the latter in 8 brands, mainly ED2, ED5 and ED16 [8]. Flavoured references represented 65.0% of the Normal and 74.1% of the "Zero"/"Sugar free" variants, mainly sold in 500 mL (46.7%) and 250 mL (37.1%) containers (Table 2). The dominant brand (ED2), sold almost exclusively in 500 mL cans, provides on average **141 mg (FR)** and **156 mg (PT)** of caffeine per unit – about twice the amount of ED1 and ED3, mostly sold in 250 mL (Figure 3).

Table 2 – Additional Key Characteristics of Energy Drinks Identified in Portugal and France (July–August 2026)

Indicator	Portugal	France
Mean Caffeine ± SD (mg/100 mL)	**31.7 ± 5.1**	**28.4 ± 4.3**
Caffeine content, min–max (mg/100 mL)	**19.0–54.5**	**20.0–35.0**
Mean Taurine content ± SD (mg/100 mL)*	**390.0 ± 56.6**	**314.4 ± 140.3**
Taurine content, min–max (mg/100 mL)*	**29.0–400.0**	**20.0–400.0**
Comercial References with taurine, n (%)	**44 (81.5%)**	**86 (86.0%)**
Comercial References with D-glucuronolactone, n (%)	**15 (27.8%)**	**18 (18.0%)**
Comercial Flavoured references, Normal / "Zero" or "Sugar free" (n)	**20 / 16**	**45 / 24**
"Zero" / "Sugar free" variants (%)	**42.6%**	**31.0%**
No usage recommendation online (%)	**9.3%**	**75.0%**

* References declaring a taurine content (PT n = 43; FR n = 85). Caffeine per 100 mL not available for 1 PT reference.

Promoting responsible energy drink consumption among university students requires education on excessive caffeine risks and label literacy, where pharmacists can play a pivotal role in guiding informed choices [10].

CONCLUSION

The risk associated with energy drink consumption by young adults depends less on formulation than on **container volume**, frequency of use and **cumulative caffeine intake**. Sugar-free variants only reduce sugar-related risks. Clear labelling of caffeine per container and better online information are needed. Pharmacists, as accessible health professionals, are well placed to improve health literacy among young adults, particularly during exam periods.

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