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# Exploring energy drink consumption in emerging adulthood in Uruguay

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To the Editor, Food Quality and Preference

I would like to submit an original research article entitled “Exploring energy drink consumption in emerging adulthood in Uruguay”, by authors M. Torres, G. Ares, L. Antúnez and G. Fernández-Theodulozand for its consideration and possible publication in Food Quality and Preference. The study provides insights into the motivations, perceptions, and patterns of energy drink consumption among emerging adults in Uruguay. The findings underscore the importance of implementing multifaceted, context-sensitive public health strategies that address both individual motivations and broader social and environmental influences on energy drink consumption.

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This manuscript has not been published and is not under consideration for publication elsewhere. The authors have no competing interests to declare. All authors are responsible for the research and have approved the submitted version.

I look forward to hearing from you.

Yours sincerely,

Lucía Antúnez

**Research highlights**

- Consumption of energy drinks among emerging adults in Uruguay was explored.
- 85.0% of participants had consumed energy drinks at some point in their lives.
- Consumption was associated with gender, activity status, attitudes towards the drinks, and risk-taking tendency.
- Intended effects, consumption occasions, and perceived negative effects were qualitatively explored.
- Multifaceted strategies are needed to discourage consumption.

# Exploring energy drink consumption in emerging adulthood in Uruguay

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**Abstract**

The rising popularity of energy drinks among adolescents and young adults has raised concerns about their potential health and psychological effects. This study explored energy drink consumption among emerging adults in Uruguay, a high-income country in Latin America. A cross-sectional online survey was conducted with 321 participants recruited via social media. The questionnaire included closed, multiple-choice, and open-ended questions grouped into six sections: (i) self-reported consumption, (ii) intended effects, consumption occasions, and perceived negative effects, (iii) attitudes, (iv) strategies to discourage consumption, (v) psychological traits, and (vi) socio-demographic information. Results showed that 85.0% of participants had consumed energy drinks at some point in their lives, 37.4% in the past 30 days, and 17.4% had mixed them with alcohol during that period. Logistic regression analyses revealed significant associations ($p < 0.05$) between consumption and gender, activity status, attitudes, and health/safety-related risk-taking tendency. Participants most frequently cited energy, wakefulness, and concentration as intended effects, often linked to demanding contexts such as studying late, working long hours, or going out at night, suggesting that energy drinks are commonly used as coping mechanisms. Participants suggested a range of strategies to reduce consumption, including educational campaigns, structural changes in academic and work environments, and regulatory measures. Overall, the findings underscore the importance of implementing multifaceted public health strategies that address both individual motivations and broader social and environmental influences on energy drink consumption.

**Keywords:** *energy drinks, emerging adults, young adults, public policy, food choice.*

## 1. Introduction

Energy drinks are non-alcoholic carbonated beverages that contain caffeine and other stimulants, such as taurine, glucuronolactone, ginseng extract, and B vitamins (Higgins et al., 2010). Since their introduction in the late 1990s, the global consumption of energy drinks has grown exponentially, particularly among adolescents and emerging adults (Ajibo et al., 2024; Aonso-Diego et al., 2024; Khouja et al., 2022; Mordor Intelligence, 2024).

Although the long-term health effects of energy drink consumption remain under-researched, growing concern has emerged regarding both their short- and long-term consequences (Ajibo et al., 2024; Aonso-Diego et al., 2024; Seifert et al., 2011). The available evidence suggests that regular consumption lead to a range of adverse outcomes, including tooth decay, tachycardia, arrhythmias, insulin resistance, hyperactivity, depression, sleep disturbances, and poor academic performance (Ajibo et al., 2024; Li et al., 2023). A particularly concerning pattern is the frequent combination of energy drinks with alcohol (Seifert et al., 2011). Research involving both animals and humans has shown that this combination diminishes the perceived effects of intoxication, increases arousal and the desire to continue drinking, and is associated with greater alcohol intake, increased risk of alcohol poisoning, and a higher likelihood of developing alcohol dependence (Marczinski & Fillmore, 2014). Additionally, energy drink consumption has been identified as a potential gateway to the use of other stimulants, including tobacco, marijuana, and alcohol (Li et al., 2023; Miller, 2008a).

This situation underscores the urgent need for effective public health strategies to reduce energy drink consumption (Breda et al., 2014; Rostami et al., 2024; Staples & Kalaitzandonakes, 2025). The development of such strategies must be grounded in a nuanced understanding of consumer behavior and perceptions related to these products. Recent studies have identified motivations such as increasing energy, enhancing concentration, staying awake, and improving alertness in demanding academic, social, or physical settings as key drivers of consumption (Ares, Torres, et al., 2023; Attila & Çakir, 2011; Higbee & Gipson, 2025; Kobik & Aryee, 2024; Manchester et al., 2017;

Thini et al., 2025). Marketing strategies, such as those associated with extreme sports, reinforce the idea that energy drinks can boost performance in high-pressure situations (Bleakley et al., 2022; Hammond & Reid, 2018; Staples & Kalaitzandonakes, 2025).

Despite growing evidence of health risks, young consumers often perceive energy drinks as low-risk products (Ajibo et al., 2024; Ares, Torres, et al., 2023; Van Beek et al., 2019). This disconnect between perceived and actual risk highlights the importance of understanding the psychological and cognitive processes that influence consumption behavior. Studies show that low risk perception is associated with higher consumption, while greater knowledge of health consequences tends to act as a deterrent (Arria et al., 2014; Jackson & Leal, 2018; Miller, 2008b; Osaba et al., 2019; Sánchez-Sánchez et al., 2025).

The relationship between energy drink consumption and psychological characteristics and symptoms such as stress, depression, and anxiety, is also increasingly recognized, though not yet fully understood. These psychological variables have been linked to greater engagement in health- and safety-related risk behaviors (Follett et al., 2023; Lu et al., 2024; Pailing & Reniers, 2018). In particular, previous research suggests that individuals experiencing higher levels of stress, anxiety, or depressive symptoms are more likely to consume energy drinks, particularly university students coping with academic demands (Kaur et al., 2020; Park et al., 2016; Pettit & DeBarr, 2011). Assessing these psychological variables alongside consumption behaviors may help identify subgroups that are more vulnerable to engaging in a broader pattern of health-compromising behaviors.

Although the global evidence base is growing, further research is needed to better understand the determinants of energy drink consumption, especially among understudied populations. In this context, the present study aims to contribute to the literature by exploring energy drink consumption in Uruguay, a high-income country in Latin America. The study focuses on emerging adulthood, a distinct life stage between adolescence and full adulthood, typically spanning ages 18 to 29 (Wood et al., 2018). This developmental period is characterized by

increased autonomy, identity exploration, and instability, particularly in work, education, and relationships (Hochberg & Konner, 2020). These characteristics make emerging adults especially prone to experimenting with health-related behaviors, including the use of energy drinks and alcohol. Understanding consumption patterns during this transitional phase is therefore essential for designing age-appropriate prevention and intervention strategies that address both immediate risks and long-term health outcomes.

Accordingly, the present study aimed to: (i) explore the motivations behind energy drink consumption; (ii) identify factors associated with the consumption of energy drinks; (iii) examine the perceived negative effects of energy drinks; and (iv) identify potential strategies to discourage their consumption in the country.

## 2. Materials and Methods

The study relied on an exploratory, cross-sectional design, which was well-suited to the research objectives. Given the limited availability of in-depth data on energy drink consumption among emerging adults in Uruguay, an exploratory approach allowed for the identification of patterns, motivations, and perceptions that have not been extensively studied in this context. The cross-sectional design allowed for the examination of associations between socio-demographic characteristics, psychological characteristics and symptoms, attitudes, and consumption behaviors. The study was reviewed and approved by the Ethics Committee of the School of Psychology at Universidad de la República (Uruguay).

### 2.1. Participants

A convenience sample of participants was recruited using a paid advertisement on Facebook and Instagram, between February and March 2025. This methodological decision was informed by the widespread availability of internet access and social media use in the country, particularly among emerging adults (Instituto Nacional de Estadística, 2023). The advertisement included the

message: “Click the link and participate in the survey. We want to know your opinion,” accompanied by an image of a hand holding an energy drink can. It was targeted at users aged 18 to 29 residing in Uruguay. Individuals who clicked on the link were redirected to the online questionnaire, which was hosted on Compusense Cloud (Compusense Inc., Canada).

The minimum required sample size was calculated to estimate the proportion of participants who had consumed energy drinks in the 30 days prior to the survey, with a 5% margin of error and a 95% confidence level. Assuming an infinite population and an expected prevalence of 30% for recent consumption, the estimated minimum sample size was 322 participants.

### 2.2. Data collection

Participants who clicked on the link were presented with an information sheet and were asked to provide their informed consent to participate through an online form. Then, they were asked to complete the questionnaire, which included closed, multiple-choice, and open-ended questions. It included six main sections: i) self-reported consumption of energy drinks; ii) intended effects, consumption occasions and perceived negative effects of energy drink consumption; iii) attitudes towards energy drinks, iv) strategies to discourage energy drink consumption; v) psychological characteristic and symptoms; vi) socio-demographic questions.

Self-reported energy drink consumption was assessed using four items adapted from the National Survey on Drug Use among High School Students (Junta Nacional de Drogas, 2022). Participants were first asked whether they had ever consumed an energy drink (Yes/No). Those who responded affirmatively were then asked to indicate the age of first consumption (open-ended), whether they had consumed energy drinks in the 30 days prior to the survey (Yes/No), and whether they had consumed them mixed with alcohol during the same period.

In the second section, participants who reported having consumed energy drinks were asked two open-ended questions regarding the occasions in which they typically consume energy drinks and the intended effects. They were then asked whether they believed energy drinks could

have negative effects (Yes/No). Those who responded affirmatively were invited to describe these effects in an open-ended response.

The third section assessed attitudes toward energy drinks. Participants were presented with seven statements concerning the perceived risks and benefits of energy drink consumption, adapted from Van Beek et al. (2019). Responses were recorded on a 5-point Likert scale ranging from 1 (Completely disagree) to 5 (Completely agree).

The fourth section included a single open-ended question asking participants to suggest strategies for discouraging others from consuming energy drinks. Framing the question around "others" was intended to reduce social desirability bias and minimize defensive responses.

The fifth section focused on psychological characteristics and symptoms, using two validated scales. First, the Spanish version of the Domain-Specific Risk-Taking (DOSPERT-30) scale was used to assess risk-taking tendencies in the health/safety domain (Lozano et al., 2017). This short-form scale asked participants to rate the likelihood of engaging in six risk-related behaviors (1 = Very unlikely, 7 = Very likely). Second, emotional symptoms were measured using the Depression, Anxiety, and Stress Scale (DASS-21). The Spanish version of the DASS-21, consisting of 21 items, was used (Ruiz et al., 2017). Participants rated the frequency of experiencing each symptom on a 4-point scale (0 = Did not apply to me at all; 3 = Applied to me very much, or most of the time).

Finally, participants were asked to provide sociodemographic information, including gender (Male/Female/Other), age, city of residence, and activity status (Working, Studying, Both working and studying, Neither working nor studying).

The English version of the questionnaire is available in Supplementary Material Table 1. The questionnaire was tested with 103 participants in the context of a graduate thesis in Psychology prior to the study.

### 2.3. Data Analysis

Data analysis included only participants who met the inclusion criteria (Uruguayan residents aged between 18 and 29 years) and provided complete responses. Data quality checks were conducted to identify potential automated responses or interference by bots, using indicators such as survey completion time and coherence in responses to open-ended questions (Lawrence et al., 2023). However, no participants were excluded, as all completed the survey in more than four minutes and provided consistent, meaningful answers to the open-ended items. All analyses were performed using RStudio software (R Core Team, 2024).

#### *2.3.1. Descriptive statistics*

Descriptive statistics were used to summarize responses to the closed-ended questions, including absolute and relative frequencies. For the question regarding age at first energy drink consumption, the analysis included measures of central tendency and dispersion: mean, standard deviation, minimum, and maximum values.

#### *2.3.2. Analysis of attitudinal and psychographic scales*

Exploratory Factor Analysis (EFA) was conducted to examine the dimensional structure of the attitudes toward energy drinks scale and the DASS-21. The results are presented in Supplementary Material Tables 2 and 3, respectively.

For the attitudes scale, two distinct factors were identified: one reflecting perceived benefits of energy drinks (4 items) and the other reflecting perceived dependency (3 items). For each participant, mean scores were calculated for the items loading on each factor.

Regarding the DASS-21, the EFA revealed three factors corresponding to the original constructs of the scale: depression (7 items), anxiety (6 items), and stress (4 items). Four items did not load meaningfully onto any of the three factors and were therefore excluded from further analysis (Supplementary Material Table 3), consistent with findings from the preliminary study.

Average scores for each factor were computed for every participant to be used in subsequent analyses.

Cronbach's alpha was calculated to assess the internal consistency of the health/safety domain of the DOSPERT-30 scale. With a reliability coefficient of 0.70, the scale demonstrated acceptable one-dimensionality; therefore, the mean score across the six items was used as an indicator of participants' risk-taking tendency.

### *2.3.3. Logistic regression*

Logistic regressions were used to evaluate the association between consumption of energy drinks and participants' attitudes towards energy drinks, psychological characteristics and symptoms, and socio-demographic characteristics. Separate regressions were used for three dependent variables: consumption of energy drinks at any point in life, consumption in the 30 days preceding the survey, and consumption together with alcohol in the 30 days preceding the survey. The following independent variables were considered in the models: gender (male vs. female), age range (18-24 years old vs. 25-29 years old), activity status (neither studying nor working vs. studying vs. working vs. studying and working), perceived benefits of energy drinks, perceived dependency to energy drinks, depression, anxiety, stress and risk-taking tendency. The Hosmer-Lemeshow test was used to assess the goodness-of-fit of the models. A significance level of 5% was considered.

### *2.3.4. Open-ended questions*

Responses to the open-ended questions were analyzed using content analysis based on inductive coding (Krippendorf, 2004). One of the researchers grouped individual responses into thematic categories, which were identified through an inductive process based on repeated readings of the data. The initial coding was then reviewed by a second researcher, who proposed only minor revisions. For each category, binary variables were created to indicate whether or not

a participant had mentioned a response related to that category (coded as 1 = mentioned, 0 = not mentioned). The number and percentage of participants referencing each category were subsequently calculated. To illustrate the categories, a selection of responses was randomly chosen and translated from Spanish into English for publication.

## 3. Results

The final sample consisted of 321 participants aged between 18 and 29 years (M = 23.3, SD = 4.3). Of these, 67.9% identified as female, 31.8% as male, and 0.3% identified with other gender identities. In terms of activity status, the majority were students (44.9%) or both studying and working (26.2%). Participants' characteristics are shown in Table 1.

### *3.1. Self-reported consumption of energy drinks*

The vast majority of participants (n = 273, 85.0%) reported having consumed energy drinks at some point in their lives. Additionally, 37.4% (n = 120) had consumed them within the 30 days preceding the survey, and 17.4% (n = 56) had consumed energy drinks mixed with alcohol during that same period. The average age of first consumption was 17.3 years (SD = 4.2), ranging 8 to 29 years.

### *3.2. Associations of self-reported consumption of energy drinks with attitudes, psychological characteristics and symptoms and socio-demographic characteristics*

Table 2 presents the results of logistic regression models examining associations between self-reported energy drink consumption and participants' attitudes toward energy drinks, psychological variables, and socio-demographic characteristics.

Gender was significantly associated with energy drink consumption. Compared to males, females were 81% less likely to report having consumed energy drinks at any point in their lives and 46% less likely to report consumption within the 30 days prior to the survey. Regarding activity

status, participants who were studying, working, or both studying and working were significantly more likely to have consumed energy drinks at some point compared to those who were neither working nor studying. Although the differences in odds ratios were not statistically significant across activity categories, the odds of consumption were nearly twice as high among those who both studied and worked compared to those who only worked or only studied.

In terms of attitudes toward energy drinks, each unit increase in the perceived benefits of energy drinks was associated with a 160% increase in the odds of lifetime consumption, while each unit increase in perceived dependency was associated with a 67% decrease in the odds. A similar pattern was observed for consumption within the past 30 days, with odds ratios of 1.90 and 0.54, respectively.

Among psychological characteristics and symptoms, no significant associations were found. However, a marginal association was observed for anxiety ($p = 0.076$) and stress ($p=0.061$). Higher anxiety scores were linked to a slight increase in the likelihood of lifetime consumption, whereas the opposite trend was found for stress.

Regarding energy drink consumption with alcohol in the past 30 days, three variables were significantly associated. Participants who both studied and worked were 213% more likely to report this behavior than those who neither studied nor worked. Additionally, each unit increase in risk-taking tendency in the health domain was associated with a 58% increase in the likelihood of co-consumption. Stress was negatively associated with energy drink consumption together with alcohol in the last 30 days, where a unit increase in stress scores were associated with a 48% lower consumption likelihood. Finally, a marginally significant association was also observed for anxiety ($p=0.052$) and depression ($p = 0.085$), indicating a potential link between higher anxiety and depression scores and energy drinks use with alcohol.

### *3.3. Intended effects of energy drink consumption*

When asked about the intended effects of energy drink consumption, 23.8% of participants who consumed energy drinks reported that they did not seek any specific effect. However, the remaining 76.2% referred to specific effects, which were mostly centered around energy and wakefulness. As shown in Table 3, 43.2% of participants indicated that they consumed energy drinks to increase energy, while 34.4% reported using them to stay awake, citing a variety of situations such as studying at night or going out to clubs.

Additional motivations included enhancing alertness and concentration (6.6%) and using energy drinks to have fun or boost mood (6.6%). A notable proportion of participants (20.9%) mentioned taste and pleasure as their main reason for consumption, stating that they drank energy drinks simply because they enjoyed the flavor. A smaller number (2.6%) reported drinking them to quench thirst.

Mixing with alcohol was a specific and intentional use for 11.0% of participants, who referred to particular cocktails or described energy drinks as useful for masking the taste of alcohol. In contrast, a small minority (1.1%, n = 3) mentioned using energy drinks as a strategy to avoid alcohol consumption altogether.

### *3.4. Energy drink consumption occasions*

Participants described a wide range of occasions for energy drink consumption (Table 4). The most frequently reported contexts included feeling tired (21.6%) and the need to cope with daily responsibilities such as working or studying (20.9%). A small proportion (1.1%) reported consuming energy drinks when feeling down or lacking motivation. Other participants associated consumption with physical activity, such as practicing sports (5.5%), or with leisure activities, including playing video games or listening to music (2.2%).

A significant number of responses related to social settings, including parties or nightclubs (18.0%) and going out with friends (9.2%). Alcohol consumption was identified as a specific occasion for energy drinks use by 11.8% of participants, while 1.4% reported consuming energy

drinks as an alternative to alcohol in social contexts. Additionally, cravings were mentioned as a trigger for consumption by 6.9% of participants. A smaller group reported drinking energy drinks with meals (2.2%), or, in one case (0.4% when feeling thirsty. Finally, some participants did not refer to specific consumption occasions but instead commented on their frequency of use, without linking it to particular contexts (Table 4).

### *3.5. Perceived negative effects of energy drinks*

When asked whether energy drink consumption could have negative effects, 84.1% of participants responded affirmatively. In follow-up questions about the specific effects they were aware of, participants mentioned a wide range of perceived health risks (Table 5).

Cardiovascular effects, such as tachycardia and high blood pressure, were the most frequently cited, mentioned by 41.7% of participants. The second most commonly reported category was psychological and behavioral effects (16.2%), which included symptoms such as anxiety, nervousness, and impulsivity. In addition, 15.0% of participants expressed concern about the sugar content of energy drinks, with some explicitly referencing the risk of diabetes. Sleep disorders were mentioned by 11.8% of participants, while nervous system-related symptoms, including headaches, dizziness, and shaking, were mentioned by 10.6%. Dependency was identified as a potential risk by 9.7% of participants.

Other less frequently mentioned negative effects included kidney problems, digestive issues, liver problems, metabolic disturbances, weight gain, reduced life expectancy, and tooth decay. A small proportion (2.5%) specifically emphasized the potential harms of energy drink consumption during childhood. Finally, 10.3% of participants who acknowledged negative effects did not identify any specific health consequences.

### *3.6. Strategies to discourage energy drink consumption*

Participants proposed a wide range of strategies to discourage energy drink consumption, which were categorized into three main dimensions: communication and educational strategies, changes in habits and environments, and regulatory measures (Table 6). The most frequently mentioned approaches fell under the first dimension, with 44.5% of participants suggesting the implementation of informational strategies focused on the negative health effects of energy drink consumption, and 16.5% providing more general responses related to communication and education. A smaller proportion, less than 5%, suggested other specific strategies within this category, including debunking perceived benefits, conducting educational activities in schools and/or health centers, raising awareness about the risks of mixing energy drinks with alcohol, and interventions involving families.

The second dimension encompassed behavioral and environmental changes aimed at reducing consumption. These included lifestyle modifications, such as improving sleep quality and adopting healthier eating habits; replacing energy drinks with alternative stimulants, such as mate (a traditional infusion commonly consumed in the country); and improving work and educational environments to reduce reliance on energy drinks for coping with fatigue or stress.

Lastly, some participants advocated for regulatory measures, such as advertising restrictions, health warnings on packaging and in promotional materials, and sales bans. Several participants explicitly drew parallels with existing regulations in Uruguay for other products, (including tobacco, alcohol, and foods high in sugar, fat, and/or sodium) suggesting that similar policy tools could be effective in addressing energy drink consumption.

## 4. Discussion

This study contributes to the growing body of literature on energy drink consumption by offering a comprehensive examination of its prevalence, motivations, risk perceptions, and strategies for discouraging use among emerging adults in Uruguay. The findings provide valuable

insight into how these beverages are integrated into the daily routines and social behaviors of young people in this context.

The high rate of lifetime consumption (85.0%) and substantial recent use (37.4% in the past 30 days) confirm that energy drinks are widely consumed among emerging adults in Uruguay. The prevalence of recent use aligns closely with national data from the most recent National Survey on Drug Use among High School Students, which reported a 30-day prevalence of 32.2% (Junta Nacional de Drogas, 2022). These findings are consistent with international studies in both high- and middle-income countries, indicating that energy drinks have become firmly embedded in youth culture (Ajibo et al., 2024; Aonso-Diego et al., 2024; Khouja et al., 2022; Mordor Intelligence, 2024).

Particularly noteworthy is the finding that 17.4% of participants reported consuming energy drinks mixed with alcohol in the previous month, a practice associated with increased risk-taking, reduced perception of intoxication, and heightened risk of alcohol-related harm (De Giorgi et al., 2022; McKetin et al., 2015; Scalese et al., 2023). The analysis of consumption occasions and intended effects reinforces this association, as participants mentioned using energy drinks in specific cocktails or to mask the taste of alcohol. Interestingly, a smaller group reported using energy drinks to avoid alcohol, highlighting the complex and sometimes contradictory roles these beverages play in individual behavior.

Gender and activity status emerged as significant predictors of consumption. Consistent with prior research, females were significantly less likely to report energy drink use (Dillon et al., 2019; Junta Nacional de Drogas, 2022; Miller, 2008b; Sánchez-Sánchez et al., 2025). Participants who were studying, working, or doing both reported higher levels of use, suggesting that energy drinks are often perceived as tools to cope with academic and occupational demands. This interpretation is supported by participants' self-reported motivations, which centered primarily on boosting energy, staying awake, and enhancing concentration.

The situational nature of these motivations, such as studying late, working long hours, or socializing, points to the use of energy drinks as coping mechanisms, particularly when rest or recovery is insufficient. These findings are consistent with previous studies identifying similar functional motivations among youth in various cultural contexts (Ares, Torres, et al., 2023; Attila & Çakir, 2011; Higbee & Gipson, 2025; Kobik & Aryee, 2024; Manchester et al., 2017; Thini et al., 2025). This reinforces the importance of understanding consumption not only as a matter of individual preference but also as a response to structural and situational pressures.

Attitudes toward energy drinks also played a significant role in shaping behavior. Perceived benefits emerged as a strong motivator for consumption, while perceptions of dependency appeared to serve as a deterrent. These findings reflect an ambivalent view in which energy drinks are simultaneously seen as helpful and potentially harmful. This duality echoes patterns observed in relation to other food and beverage products perceived to offer functional benefits despite health concerns (Liem & Russell, 2019; Luomala et al., 2015; Pahwa et al., 2023; Saba et al., 2019; Vidal et al., 2022). Public health messaging, therefore, must address not only risks but also challenge widely held beliefs about the effectiveness and necessity of energy drinks.

Although a large majority of participants (84.1%) acknowledged potential negative health effects, their understanding was often limited to more commonly known risks such as cardiovascular issues, anxiety, and sleep disturbances. Less frequently mentioned concerns, such as dependency, metabolic disorders, or harm to children, suggest important gaps in awareness that should be addressed through targeted education. The fact that over 10% of participants who acknowledged risks were unable to specify any particular effect further highlights the need for improved communication of evidence-based information.

The association between risk-taking tendencies in the health and safety domain and energy drink consumption was significant both for lifetime use and for co-consumption with alcohol. These results are in line with existing studies associating energy drink use with other risk behaviors such as alcohol consumption and smoking (Arria et al., 2014; Scalese et al., 2023). In

contrast, associations with psychological characteristics and symptoms were more limited. Contrary to previous findings (Kaur et al., 2020; Park et al., 2016; Pettit & DeBarr, 2011), higher stress levels were negatively associated with energy drink consumption, possibly reflecting avoidance due to concerns about stimulating effects. Marginal associations between anxiety and depression and co-use with alcohol suggest possible psychological pathways that merit further investigation. These results underscore the need for continued research into the roles of emotional regulation and self-medication in stimulant use among youth (Broman et al., 2019; Khantzian, 1997).

When asked how to discourage consumption, participants offered a range of responses that clustered into three main categories: communication and education, behavioral and environmental change, and regulation. The most frequently proposed strategies emphasized awareness campaigns focusing on health consequences, and to a lesser extent, the need to debunk perceived benefits. These suggestions are well aligned with the findings of the present study and with international policy discussions on reducing energy drink consumption (Breda et al., 2014; Rostami et al., 2024; Staples & Kalaitzandonakes, 2025). Participants also highlighted the importance of modifying the work and study environments that drive demand for energy drinks. Additionally, calls for regulatory measures, such as advertising restrictions, warning labels, and sales bans, reveal a public that is both aware of risks and receptive to stronger policy interventions (Staples & Kalaitzandonakes, 2025). Notably, several participants explicitly referenced existing policies on tobacco and alcohol, suggesting that energy drinks are increasingly viewed as a public health issue.

Taken together, the findings of this study have several implications. First, interventions aimed at reducing energy drink consumption must be multifaceted, addressing not only knowledge gaps but also the emotional, situational, and cultural drivers of consumption. Educational efforts should go beyond generic warnings and instead resonate with users' lived experiences, acknowledging the functional roles energy drinks play while offering healthier, realistic alternatives. Second, policy interventions should be grounded in evidence and include

regulatory approaches such as marketing restrictions, warning labels, age limits on sales, and limits on mixing with alcohol in licensed venues. Lessons from successful regulation of sugary beverages, alcohol, and tobacco worldwide provide a strong foundation for action (Andreyeva et al., 2022; Ares, Antúnez, et al., 2023; Crosbie et al., 2018; Moodie et al., 2013; Peruga et al., 2021).

Finally, further research is needed to explore long-term consumption trajectories, co-use with other substances, and mental health correlates, particularly within the life stage of emerging adulthood, when experimentation and risk-taking are most pronounced. Future studies should also investigate gender and socioeconomic differences in energy drink consumption, and assess the effectiveness of prevention and intervention strategies across different cultural and policy contexts.

## 5. Conclusion

This study provided insights into the motivations, perceptions, and patterns of energy drink consumption among emerging adults in Uruguay. The findings highlight high prevalence rates, particularly among individuals managing academic and occupational demands, and reveal that consumption is often driven by perceived functional benefits despite awareness of health risks. Participants' suggestions for reducing consumption emphasize the importance of educational, environmental, and regulatory interventions. Taken together, these findings point to the need for comprehensive, context-sensitive approaches that address both the individual and structural drivers of energy drink use. Future research should continue to explore these dynamics across diverse populations to inform effective prevention and policy efforts.

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**Conflict of interest statement**

The authors declare no conflicting interests.

## References


Ajibo, C., Van Griethuysen, A., Visram, S., & Lake, A. A. (2024). Consumption of energy drinks by children and young people: a systematic review examining evidence of physical effects and consumer attitudes. *Public Health*, *227*, 274–281. https://doi.org/10.1016/j.puhe.2023.08.024

Andreyeva, T., Marple, K., Moore, T. E., & Powell, L. M. (2022). Evaluation of Economic and Health Outcomes Associated With Food Taxes and Subsidies. *JAMA Network Open*, *5*(6), e2214371. https://doi.org/10.1001/jamanetworkopen.2022.14371

Aonso-Diego, G., Krotter, A., & García-Pérez, Á. (2024). Prevalence of energy drink consumption world-wide: A systematic review and meta-analysis. *Addiction*, *119*(3), 438–463. https://doi.org/10.1111/add.16390

Ares, G., Antúnez, L., Curutchet, M. R., & Giménez, A. (2023). Warning labels as a policy tool to encourage healthier eating habits. *Current Opinion in Food Science*, 101011. https://doi.org/10.1016/j.cofs.2023.101011

Ares, G., Torres, M., Machin, L., & Antunez, L. (2023). Caffeine warning labels may increase young adults' intention to purchase energy drinks. *Food Quality and Preference*, *112*, 105003. https://doi.org/10.1016/j.foodqual.2023.105003

Arria, A. M., Bugbee, B. A., Caldeira, K. M., & Vincent, K. B. (2014). Evidence and knowledge gaps for the association between energy drink use and high-risk behaviors among adolescents and young adults. *Nutrition Reviews*, *72*, 87–97. https://doi.org/10.1111/nure.12129

Attila, S., & Çakir, B. (2011). Energy-drink consumption in college students and associated factors. *Nutrition*, *27*(3), 316–322. https://doi.org/10.1016/j.nut.2010.02.008

Bleakley, A., Ellithorpe, M. E., Jordan, A. B., Hennessy, M., & Stevens, R. (2022). A content analysis of sports and energy drink advertising. *Appetite*, *174*, 106010. https://doi.org/10.1016/j.appet.2022.106010

Breda, J. J., Whiting, S. H., Encarnação, R., Norberg, S., Jones, R., Reinap, M., & Jewell, J. (2014). Energy Drink Consumption in Europe: A Review of the Risks, Adverse Health Effects, and Policy Options to Respond. *Frontiers in Public Health*, *2*. https://doi.org/10.3389/fpubh.2014.00134

Broman, C. L., Wright, M. K., Broman, M. J., & Bista, S. (2019). Self-Medication -and Substance Use: A Test of the Hypothesis. *Journal of Child & Adolescent Substance Abuse*, *28*(6), 494–504. https://doi.org/10.1080/1067828X.2020.1789526

Crosbie, E., Sosa, P., & Glantz, S. A. (2018). Defending strong tobacco packaging and labelling regulations in Uruguay: Transnational tobacco control network versus Philip Morris International. *Tobacco Control*, *27*(2), 185–193. https://doi.org/10.1136/tobaccocontrol-2017-053690

De Giorgi, A., Valeriani, F., Gallè, F., Ubaldi, F., Bargellini, A., Napoli, C., Liguori, G., Romano Spica, V., Vitali, M., & Protano, C. (2022). Alcohol Mixed with Energy Drinks (AmED) Use among University Students: A Systematic Review and Meta-Analysis. *Nutrients*, *14*(23), 4985. https://doi.org/10.3390/nu14234985

Dillon, P., Kelpin, S., Kendler, K., Thacker, L., Dick, D., & Svikis, D. (2019). Gender Differences in Any-Source Caffeine and Energy Drink Use and Associated Adverse Health Behaviors. *Journal of Caffeine and Adenosine Research*, *9*(1), 12–19. https://doi.org/10.1089/caff.2018.0008

Follett, D., Hitchcock, C., Dalgleish, T., & Stretton, J. (2023). Reduced social risk-taking in depression. *Journal of Psychopathology and Clinical Science*, *132*(2), 156–164. https://doi.org/10.1037/abn0000797

Hammond, D., & Reid, J. L. (2018). Exposure and perceptions of marketing for caffeinated energy drinks among young Canadians. *Public Health Nutrition*, *21*(03), 535–542. https://doi.org/10.1017/S1368980017002890

Higbee, M. R., & Gipson, C. S. (2025). Exploring energy drink consumption among nursing students: A qualitative study. *Teaching and Learning in Nursing*. https://doi.org/10.1016/j.teln.2025.02.030

Higgins, J. P., Tuttle, T. D., & Higgins, C. L. (2010). Energy Beverages: Content and Safety. *Mayo Clinic Proceedings*, *85*(11), 1033–1041. https://doi.org/10.4065/mcp.2010.0381

Hochberg, Z., & Konner, M. (2020). Emerging Adulthood, a Pre-adult Life-History Stage. *Frontiers in Endocrinology*, *10*. https://doi.org/10.3389/fendo.2019.00918

Instituto Nacional de Estadística. (2023). *Encuesta de Usos de Tecnologías de la Información 2022*. Instituto Nacional de Estadística.

Jackson, D. B., & Leal, W. E. (2018). Energy drink consumption and the perceived risk and disapproval of drugs: Monitoring the Future, 2010–2016. *Drug and Alcohol Dependence*, *188*, 24–31. https://doi.org/10.1016/j.drugalcdep.2018.03.022

Junta Nacional de Drogas. (2022). *IX Encuesta Nacional sobre consumo de drogas en estudiantes de enseñanza media - 2022*. Junta Nacional de Drogas.

Kaur, S., Christian, H., Cooper, M. N., Francis, J., Allen, K., & Trapp, G. (2020). Consumption of energy drinks is associated with depression, anxiety, and stress in

young adult males: Evidence from a longitudinal cohort study. *Depression and Anxiety*, *37*(11), 1089–1098. https://doi.org/10.1002/da.23090

Khantzian, E. J. (1997). The Self-Medication Hypothesis of Substance Use Disorders: A Reconsideration and Recent Applications. *Harvard Review of Psychiatry*, *4*(5), 231–244. https://doi.org/10.3109/10673229709030550

Khouja, C., Kneale, D., Brunton, G., Raine, G., Stansfield, C., Sowden, A., Sutcliffe, K., & Thomas, J. (2022). Consumption and effects of caffeinated energy drinks in young people: an overview of systematic reviews and secondary analysis of UK data to inform policy. *BMJ Open*, *12*(2), e047746. https://doi.org/10.1136/bmjopen-2020-047746

Kobik, W., & Aryee, P. A. (2024). Energy drinks in Tamale: Understanding youth perceptions, consumption patterns, and related factors. *PLOS ONE*, *19*(4), e0289391. https://doi.org/10.1371/journal.pone.0289391

Krippendorf, K. (2004). *Content Analysis: An introduction to its methodology*. Sage.

Lawrence, P. R., Osborne, M. C., Sharma, D., Spratling, R., & Calamaro, C. J. (2023). Methodological Challenge: Addressing Bots in Online Research. *Journal of Pediatric Health Care*, *37*(3), 328–332. https://doi.org/10.1016/j.pedhc.2022.12.006

Li, P., Haas, N. A., Dalla-Pozza, R., Jakob, A., Oberhoffer, F. S., & Mandilaras, G. (2023). Energy Drinks and Adverse Health Events in Children and Adolescents: A Literature Review. *Nutrients*, *15*(11), 2537. https://doi.org/10.3390/nu15112537

Liem, D. G., & Russell, C. G. (2019). The Influence of Taste Liking on the Consumption of Nutrient Rich and Nutrient Poor Foods. *Frontiers in Nutrition*, *6*. https://doi.org/10.3389/fnut.2019.00174

Lozano, L., Megías, A., Catena, A., Perales, J., Baltruschat, S., & Cándido, A. (2017). Spanish validation of the Domain-Specific Risk-Taking (DOSPERT-30) Scale. *Psicothema*, *1*(29), 111–118. https://doi.org/10.7334/psicothema2016.132

Lu, J., Zhao, X., Wei, X., & He, G. (2024). Risky decision-making in major depressive disorder: A three-level meta-analysis. *International Journal of Clinical and Health Psychology*, *24*(1), 100417. https://doi.org/10.1016/j.ijchp.2023.100417

Luomala, H., Jokitalo, M., Karhu, H., Hietaranta-Luoma, H. L., Hopia, A., & Hietamäki, S. (2015). Perceived health and taste ambivalence in food consumption. *Journal of Consumer Marketing*, *32*(4), 290–301. https://doi.org/10.1108/JCM-11-2014-1233

Manchester, J., Eshel, I., & Marion, D. W. (2017). The Benefits and Risks of Energy Drinks in Young Adults and Military Service Members. *Military Medicine*, *182*(7), e1726–e1733. https://doi.org/10.7205/MILMED-D-16-00339

Marczinski, C. A., & Fillmore, M. T. (2014). Energy drinks mixed with alcohol: what are the risks? *Nutrition Reviews*, *72*, 98–107. https://doi.org/10.1111/nure.12127

McKetin, R., Coen, A., & Kaye, S. (2015). A comprehensive review of the effects of mixing caffeinated energy drinks with alcohol. *Drug and Alcohol Dependence*, *151*, 15–30. https://doi.org/10.1016/j.drugalcdep.2015.01.047

Miller, K. E. (2008a). Energy drinks, race, and problem behaviors among college students. *The Journal of Adolescent Health : Official Publication of the Society for Adolescent Medicine*, *43*(5), 490–497. https://doi.org/10.1016/j.jadohealth.2008.03.003

Miller, K. E. (2008b). Wired: Energy Drinks, Jock Identity, Masculine Norms, and Risk Taking. *Journal of American College Health*, *56*(5), 481–490. https://doi.org/10.3200/JACH.56.5.481-490

Moodie, R., Stuckler, D., Monteiro, C., Sheron, N., Neal, B., Thamarangsi, T., Lincoln, P., & Casswell, S. (2013). Profits and pandemics: Prevention of harmful effects of tobacco, alcohol, and ultra-processed food and drink industries. *The Lancet*, *381*(9867), 670–679. https://doi.org/10.1016/S0140-6736(12)62089-3

Mordor Intelligence. (2024). *Energy drinks market size & share analysis – growth trends & forecasts up to 2030.* . https://www.mordorintelligence.com/industry-reports/energy-drinks-market

Osaba, E. B., Cid Galán, M. L., & Martin Salinas, C. (2019). The use of energy drinks in adolescents: a risky behaviour. *International Journal of Family & Community Medicine*, *3*(5). https://doi.org/10.15406/ijfcm.2019.03.00160

Pahwa, R., Arora, S., & Kaur, S. (2023). *Health–Taste Trade-Off in Consumer Decision-Making for Functional Foods* (pp. 127–141). https://doi.org/10.1108/S1877-636120230000031011

Pailing, A. N., & Reniers, R. L. E. P. (2018). Depressive and socially anxious symptoms, psychosocial maturity, and risk perception: Associations with risk-taking behaviour. *PLOS ONE*, *13*(8), e0202423. https://doi.org/10.1371/journal.pone.0202423

Park, S., Lee, Y., & Lee, J. H. (2016). Association between energy drink intake, sleep, stress, and suicidality in Korean adolescents: energy drink use in isolation or in combination with junk food consumption. *Nutrition Journal*, *15*(1), 87. https://doi.org/10.1186/s12937-016-0204-7

Peruga, A., López, M. J., Martinez, C., & Fernández, E. (2021). Tobacco control policies in the 21st century: achievements and open challenges. *Molecular Oncology*, *15*(3), 744–752. https://doi.org/10.1002/1878-0261.12918

Pettit, M. L., & DeBarr, K. A. (2011). Perceived Stress, Energy Drink Consumption, and Academic Performance Among College Students. *Journal of American College Health*, *59*(5), 335–341. https://doi.org/10.1080/07448481.2010.510163

R Core Team. (2024). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing.

Rostami, M., Babashahi, M., Ramezani, S., & Dastgerdizad, H. (2024). A scoping review of policies related to reducing energy drink consumption in children. *BMC Public Health*, *24*(1), 2308. https://doi.org/10.1186/s12889-024-19724-y

Ruiz, F. J., García Martín, M. B., Suárez Falcón, J. C., & Odriozola González, P. (2017). The Hierarchical Factor Structure of the Spanish Version of Depression Anxiety and Stress Scale -21. *International Journal of Psychology and Psychological Therapy*, *17*(1), 97–105.

Saba, A., Sinesio, F., Moneta, E., Dinnella, C., Laureati, M., Torri, L., Peparaio, M., Saggia Civitelli, E., Endrizzi, I., Gasperi, F., Bendini, A., Gallina Toschi, T., Predieri, S., Abbà, S., Bailetti, L., Proserpio, C., & Spinelli, S. (2019). Measuring consumers attitudes towards health and taste and their association with food-related life-styles and preferences. *Food Quality and Preference*, *73*(June 2018), 25–37. https://doi.org/10.1016/j.foodqual.2018.11.017

Sánchez-Sánchez, E., Trujillo-Garrido, N., Díaz-Jimenez, J., García-García, A., Rosety, M. A., Bandez, M., Rosety-Rodriguez, M., Ordonez, F. J., Rosety, I., & Diaz, A. J. (2025). Attitudes and consumption habits of energy drinks among adolescents and young adults in a Spanish population. *AIMS Public Health*, *12*(1), 16–32. https://doi.org/10.3934/publichealth.2025002

Scalese, M., Benedetti, E., Cerrai, S., Colasante, E., Fortunato, L., & Molinaro, S. (2023). Alcohol versus combined alcohol and energy drink consumption: Risk behaviors and consumption patterns among European students. *Alcohol*, *110*, 15–21. https://doi.org/10.1016/j.alcohol.2023.02.001

Seifert, S. M., Schaechter, J. L., Hershorin, E. R., & Lipshultz, S. E. (2011). Health Effects of Energy Drinks on Children, Adolescents, and Young Adults. *Pediatrics*, *127*(3), 511–528. https://doi.org/10.1542/peds.2009-3592

Staples, A. J., & Kalaitzandonakes, M. (2025). What's the Buzz? Preferences and perceptions of policies to reduce childhood energy drink consumption. *Food Policy*, *131*, 102799. https://doi.org/10.1016/j.foodpol.2025.102799

Thini, K. D., Mokwena, K. E., & Malebatja, M. F. (2025). Factors Influencing Energy Drink Usage Amongst Pupils in the Mahikeng Sub-District, Northwest. *Nutrients*, *17*(5), 770. https://doi.org/10.3390/nu17050770

Van Beek, A. R., Weier, M. E., Williams, K. R., Abraham, S. P., & Gillum, D. R. (2019). College Students' Caffeine Intake Habits and Their Perception of Its Effects. *Journal of Education and Development*, *3*(2), 42. https://doi.org/10.20849/jed.v3i2.607

Vidal, L., Iragola, V., Machín, L., Brunet, G., Girona, A., Curutchet, M. R., de León, C., & Ares, G. (2022). A Qualitative Exploration of Parents' Food Choices During Early Childhood. *Journal of Nutrition Education and Behavior*, *54*(8), 764–775. https://doi.org/10.1016/j.jneb.2022.03.006

Wood, D., Crapnell, T., Lau, L., Bennett, A., Lotstein, D., Ferris, M., & Kuo, A. (2018). Emerging Adulthood as a Critical Stage in the Life Course. In *Handbook of Life Course Health Development* (pp. 123–143). Springer International Publishing. https://doi.org/10.1007/978-3-319-47143-3_7

## Tables

**Table 1.** Socio-demographic characteristics and summary scores for attitudes toward energy drinks and psychological characteristics and symptoms (n = 321).

| **Characteristic** | |
|---|---|
| *Gender (%)* | |
| Female | 67.9 |
| Male | 31.8 |
| Other | 0.3 |
| *Age (%)* | |
| 18-24 years old | 66.4 |
| 25-29 years old | 33.6 |
| *Activity status (%)* | |
| Not working nor studying | 14.3 |
| Studying | 44.9 |
| Working | 14.6 |
| Studying and working | 26.2 |
| *Depression, Anxiety and Stress Scale* | |
| Depression | 0.7 (0.8) |
| Anxiety | 0.6 (0.7) |
| Stress | 1.3 (0.9) |
| *Domain-specific Risk-Taking Scale* | |
| *Risk-taking tendency in the health domain* | 2.5 (1.2) |
| Attitudes towards energy drinks | |
| Perceived benefits | 2.4 (0.9) |
| Perceived dependency | 1.4 (0.7) |

Note: Means (and standard deviations) are shown for Depression, Anxiety and Stress; Domain-Specific Risk taking; and Attitudes towards energy drinks.

**Table 2.** Results of the logistic regression models analyzing the association between self-reported consumption of energy drinks with attitudes, psychological characteristics and symptoms and socio-demographic characteristics, expressed as odd-ratios with 95% confidence intervals and p-values.

| | **Consumption at some point in their life** | | **Consumption within the 30 days preceding the survey** | | **Consumption together with alcohol within the 30 days preceding the survey** | |
|---|---|---|---|---|---|---|
| **Variable** | **Odds-ratio** | **p-value** | **Odds-ratio** | **p-value** | **Odds-ratio** | **p-value** |
| *Gender* | | | | | | |
| Male | 1 | - | 1 | - | 1 | - |
| Female | **0.19 (0.06-0.51)** | **0.002**** | **0.54 (0.31-0.96)** | **0.035*** | 0.66 (0.33-1.33) | 0.247 |
| *Age range* | | | | | | |
| 18-24 years old | 1 | - | 1 | - | 1 | - |
| 25-29 years old | 0.88 (0.34-2.33) | 0.795 | 0.98 (0.52-1.85) | 0.959 | 0.83 (0.38-1.80) | 0.646 |
| *Activity status* | | | | | | |
| Neither studying nor working | 1 | - | 1 | - | 1 | - |
| Studying | **3.93 (1.23-12.60)** | **0.020*** | 1.36 (0.57-3.31) | 0.488 | 1.67 (0.56-5.67) | 0.378 |
| Working | **4.53 (1.28-18.00)** | **0.023*** | 1.69 (0.68-4.30) | 0.264 | 1.00 (0.26-3.78) | 0.999 |
| Studying and working | **8.50 (2.46-32.16)** | **0.001**** | 0.77 (0.32-1.90) | 0.577 | **3.13 (1.05-10.58)** | **0.050*** |
| *Attitudes towards energy drinks* | | | | | | |
| Perceived benefits | **2.60 (1.67-4.26)** | **<0.001***** | **1.90 (1.43-1.55)** | **<0.001***** | 1.36 (0.95-1.95) | 0.093 |
| Perceived dependency | **0.33 (0.21-0.52)** | **<0.001***** | **0.54 (0.35-0.80)** | **0.004**** | 0.54 (0.43-1.20) | 0.257 |
| *Depression, Anxiety, and Stress Scale* | | | | | | |
| Depression | 0.81 (0.43-1.52) | 0.499 | 1.35 (0.85-2.17) | 0.203 | 1.76 (1.00-3.15) | 0.052 |
| Anxiety | 1.96 (0.94-4.21) | 0.076 | 0.93 (0.53-1.61) | 0.792 | 1.79 (0.93-3.54) | 0.085 |
| Stress | 0.55 (0.30-1.03) | 0.061 | 1.02 (0.68-1.51) | 0.932 | **0.52 (0.28-0.93)** | **0.031*** |
| *Domain-Specific Risk-Taking Scale* | | | | | | |
| Risk-taking tendency | **1.70 (1.16-2.61)** | **0.010**** | 1.10 (0.86-2.56) | 0.430 | **1.58 (1.20-2.09)** | **0.001**** |
| Hosmer-Lemeshow Goodness-of-Fit Test (p-value) | 0.292 | | 0.143 | | 0.063 | |

Notes: The participant who self-reported a gender identity different from male or female (n=1) was not included in the model. Odd-ratios highlighted in bold were significant at 0.05 (*), 0.01 (**) or 0.001 (***).

**Table 3.** Intended effects of energy drink consumption identified through content analysis of participant responses (n = 273). Percentages indicate the proportion of participants who mentioned each effect. Representative examples are provided for each category.

| Effect | Examples of responses | Percentage of participants (%) |
|---|---|---|
| Energy | 'More energy and alertness in certain situations', 'To keep myself energized', 'To replenish energy', 'To activate myself' | 43.2 |
| Staying awake | 'Not to sleep', 'Mainly to avoid falling asleep while studying at night', 'To stay awake at the club' | 34.4 |
| No specific effect | 'They don't have any effect on me', 'I don't look for any specific effect' | 23.8 |
| Taste and pleasure | 'I like them', 'I like the taste', 'As a treat for myself' | 20.9 |
| Mixing with alcohol | 'They taste good in cocktails', 'When I drink with jager [Jägermeister], it takes out the taste of alcohol', 'The cocktail that already comes like that' | 11.0 |
| Alertness and concentration | 'To stay alert', 'To be more attentive', 'To be more attentive and focused in order to be able to study' | 6.6 |
| Having fun or mood enhancement | 'Uplifting my mood', 'Adrenaline' | 6.6 |
| Hydration | 'Just to quench thirst', 'To hydrate myself' | 2.6 |
| Curiosity | 'Just for curiosity', 'The times I had energy drinks it were just for the sake of trying' | 2.2 |
| Alternative to alcohol | 'To avoid drinking alcohol', 'They have a similar effect to alcohol' | 1.1 |
| Relaxing | 'To relax' | 0.7 |

Note: Only participants who reported consuming energy drinks answered the question. Percentages do not sum up to 100% because some participants mentioned more than intended effect.

**Table 4.** Consumption occasions of energy drinks identified through content analysis of participant responses (n = 273). Percentages indicate the proportion of participants who mentioned each occasion. Representative examples are provided for each category.

| Occasion | Examples of responses | Percentage of participants (%) |
|---|---|---|
| Feeling tired | 'When I feel very tired early in the day', 'When I'm very tired' | 21.6 |
| Coping with daily activities | 'When I need to face the day', 'When I need to stay awake', 'Mostly during midterm season', 'The day before an exam so that I can stay awake studying', 'When I am very tired and I have to work' | 20.9 |
| At a party/clubs | 'Parties', 'Only when I go out at night' | 18.0 |
| Drinking alcohol | 'With alcohol', 'With jager [Jägermeister]', 'When drinking alcohol (I mix whisky with energy drinks)' | 11.8 |
| Going out with friends | 'When I go out with friends', 'With friends listening to music', 'When we are spending a special moment with a partner or friends' | 9.2 |
| Craving | 'When I feel like it', 'Whenever I want', 'As an eventual craving' | 8.1 |
| Occasionally | 'Occasionally', 'Once in a while' | 6.9 |
| Sports | 'Before going to the gym', 'Before a football match', 'Before weight training' | 5.5 |
| Curiosity | 'I drank them just for the sake of curiosity' | 5.2 |
| With meals | 'When I want to have something different on a Saturday with some pizzas' | 2.2 |
| Leisure activities | 'Sometimes recreationally', 'When I'm playing video games' | 2.2 |
| Alternative to alcohol | 'When I can't drink alcohol, for example when I go to a party, and I have to drive' | 1.4 |
| Weekends | 'On weekends', 'Only during the weekend' | 1.4 |
| Feeling down | 'When I feel discouraged', 'When I feel down' | 1.1 |
| Every day | 'Every day' | 0.7 |
| Warm days | 'Summer days', 'When it's hot' | 0.7 |
| Monthly | 'Once a month' | 0.7 |
| Feeling thirsty | 'When I'm feeling thirsty' | 0.4 |

Note: Only participants who reported consuming energy drinks answered the question. Percentages do not sum up to 100% because some participants mentioned more than consumption occasion.

**Table 5**. Negative effects of energy drink consumption identified through content analysis of participant responses (n = 321). Percentages indicate the proportion of participants who mentioned each effect. Representative examples are provided for each category.

| Effect | Examples of responses | Percentage of participants (%) |
|---|---|---|
| Cardiovascular effects | ‘Heart-related problems’, 'Tachycardia', ‘High blood pressure', 'Cardiovascular diseases', | 41.7 |
| Psychological and behavioral effects | ‘They generate a high stimulation’, 'Anxiety', 'Impulsivity', 'Nervousness' | 16.2 |
| Effects of excessive sugar consumption | ‘Diabetes’, ‘They have a lot of sugar, with this all the disadvantages of the excess of sugars’ | 15.0 |
| Sleep disorders | ‘Insomnia', 'Changes in sleep rhythms' | 11.8 |
| Dependency | ‘Addiction', 'Always needing energy drinks to get through your day for example' | 10.6 |
| Nervous system reactions | ‘Shaking’, ‘Headaches’, ‘Dizziness’ | 9.7 |
| Kidney problems | ‘Calcifications in the kidneys’, ‘Renal problems’ | 9.0 |
| Digestive issues | ‘Diarrhea’, ‘Digestive problems’, ‘Vomits’ | 6.5 |
| Liver problems | ‘Problems with the liver’, ‘They harm your liver’ | 4.0 |
| Excessive caffeine intake | 'Negative effects of excess caffeine', ‘High tolerance to caffeine’ | 4.0 |
| Metabolic disturbances | ‘Metabolic problems’ | 3.1 |
| Negative effects in childhood | ‘I think that they are too sweet, for example in young children it would alter and affect their growth’, ’Children who drink, from 7 to 10 years old, and I don't think it would do them any good’ | 2.5 |
| Weight gain | ‘Weight gain’, ‘Obesity’ | 1.9 |
| Reduced life expectancy | ‘Death’, ‘Reducing life expectancy’ | 1.2 |
| Excessive sodium intake | ‘The quantity of sodium', 'Excess of sodium in your body' | 1.2 |
| Tooth decay | ‘Problems with your teeth’, ‘Caries’ | 0.6 |
| Overdose | Overdose | 0.6 |
| Does not know/Unspecific response | ‘I know they are quite unhealthy but i don't know why’, ‘They aren't good but i don't know why’, ‘Deterioration of our organs’ | 10.3 |

Note: Percentages do not sum up to 100% because some participants did not believe energy drinks have negative health effects, while others mentioned more than one effect.

**Table 6.** Strategies to discourage energy drink consumption identified through content analysis of participant responses (n = 321). Percentages indicate the proportion of participants who mentioned each strategy. Representative examples are provided for each category.

| Dimension | Strategy | Examples of responses | Percentage of participants (%) |
|---|---|---|---|
| Communication and educational strategies | Informing about negative health effects | 'Showing long term effects', 'Showing how consuming an energy drink negatively affects your body' | 44.5 |
| | Communication and educational campaigns | 'Informing and educating', 'Communication campaigns (as for tobacco and alcohol)' | 16.2 |
| | Debunking perceived benefits | 'Debunking myths about the "cognitive benefits" of this type of beverage', 'Revealing where the advertising deception is' | 4.7 |
| | Educational activities in schools/health centers | 'Activities at health schools', 'Lectures at health centers' | 2.5 |
| | Informing about negative effects of mixing with alcohol | 'Raising awareness about the negative effects of mixing them with alcohol', 'Discouraging mixing these drinks with alcohol, as this is detrimental to health' | 2.0 |
| | Interventions involving families | 'Working with families' | 0.6 |
| Changes in habits and environments | Lifestyle changes | 'Resting more', 'Improving sleep cycles to improve performance without resorting to these alternatives', 'Eating more healthily' | 15.0 |
| | Replacing with other beverages | 'Replacing them with mate', 'Drinking water' | 7.8 |
| | Promotion of alternatives to energy drinks | 'Promoting other alternatives', 'Looking for an alternative that is a little less aggressive for the organism' | 4.7 |
| | Changes in work/educational environments | 'By improving the work or study environment, if one has time to do these activities calmly, does not need to overexert your body by, for example, studying all night', | 1.2 |
| Regulatory measures | Advertising restrictions | 'Not advertising them', 'Not making them so visible' | 5.3 |
| | Warnings on packaging/advertising | 'Forcing brands to have advertising that discourages use, as is the case with cigarette packages', 'Warnings on the package, as for cigarettes' | 4.0 |
| | Sales ban | 'Taking them out of the market', 'Not allowing to sell them in Uruguay' | 2.5 |
| | Ban on sales to minors | 'Limiting sales to minors', 'Prohibit its sale to minors' | 1.9 |
| | Ban on mixing with alcohol in bars | 'Not allowing them to be mixed with alcoholic beverages in bars' | 1.2 |
| No response/Does not know | - | - | 13.7 |

Note: Percentages do not sum up to 100% because participants could provide responses related to more than one strategy.

**Declaration of interests**

☒The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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Gastón Ares: Conceptualization, Methodology, Investigation, Formal Analysis, Writing – Original draft, Writing – Review & Editing.

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## Ethical Standards Disclosure

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects. The experimental protocol was approved by the Ethics Committee of the School of Psychology of Universidad de la República (Uruguay). Informed consent was obtained from all participants in an online form and formally recorded.