

## Energy drinks mixed with alcohol: are there any risks?

There have now been a number of publications, including laboratory studies and surveys, on alcohol mixed with energy drinks. Some authors have highlighted problems associated with consumption of this beverage combination, including reduced perception of alcohol intoxication and greater alcohol consumption with more negative consequences as a result. For example, the recent article by Marcziński and Fillmore entitled “Energy drinks mixed with alcohol: what are the risks?” suggests that “consuming alcohol mixed with energy drinks is riskier than consuming alcohol alone and constitutes a public health concern.”<sup>1</sup> While some publications conclude that consumption of energy drinks mixed with alcohol is problematic, others do not support these claims and point out the methodological shortcomings of many studies in this area.

Many of these studies, including our own, have found an increase in alcohol consumption among consumers of alcohol mixed with energy drinks compared with alcohol-only consumers. However, this raises the possibility that this is underpinned by a third “trait” factor, i.e., individuals who are drawn to consume this beverage mix are also heavier alcohol consumers, higher risk-takers, more impulsive, etc. Indeed, comparing occasions when consumers of alcohol mixed with energy drinks consume alcohol alone rather than the combination reveals that the impact on the total amount of alcohol consumed is small or absent. Whereas some studies found small but statistically significant increases in alcohol consumption when alcohol was consumed with energy drinks,<sup>2,3</sup> other studies found small but statistically significant decreases in overall alcohol consumption with the combination.<sup>4–6</sup>

An increase in the prevalence of alcohol mixed with energy drink consumers attending US hospital emergency departments as described by Marcziński and Fillmore<sup>1</sup> would clearly be cause for concern. The key question to ask, of course, is whether consumption of this beverage combination is over-represented in adverse

outcomes including emergency room visits. The Drug Abuse Warning Network report regarding a doubling of emergency department visits associated with alcohol mixed with energy drinks between 2007 and 2011 needs to be given the perspective that energy drinks represented 0.2% of the total estimated 131 million emergency room visits in 2011 and that most of these were not serious.<sup>7–9</sup> Moreover, the total number of these emergency department visits was less than 4% of the number for drug- and alcohol-related visits for 2011.<sup>10</sup>

Marcziński and Fillmore<sup>1</sup> cite 2 studies, their own 2006 article<sup>11</sup> and one of Heinz et al.<sup>12</sup> as support for there being a reduced perception or awareness of alcohol intoxication when alcohol is consumed in combination with energy drinks. However, while they refer to some of the other studies that failed to find a reduced perception of intoxication with this beverage combination or with caffeinated alcoholic beverages,<sup>13,14</sup> they did not include others.<sup>15–17</sup> Subsequent to their publication,<sup>1</sup> another critical review and meta-analysis revealed that, despite the large range of caffeine doses and alcohol levels investigated, caffeine had no effect on the judgment of subjective intoxication.<sup>18</sup> This has been confirmed in a real life setting: an on-premise study among 997 Dutch bar patrons (N = 431 consumers of alcohol mixed with energy drinks) revealed no evidence supporting a masking effect across a whole range of alcohol and caffeine doses.<sup>19</sup>

Marcziński and Fillmore<sup>1</sup> propose other evidence for alcohol and energy drink consumption promoting more harmful alcohol consumption. In this context, increased subjective stimulation is seen as a negative experience with the implication that there is a link to decreased perception of intoxication and increased alcohol consumption. However, this is not established. First of all, the meta-analysis by Benson et al.<sup>18</sup> found no evidence that mixing alcohol with caffeinated beverages reduces the perception of intoxication. Second, “stimulation” per se does not link to a reduced perception of intoxication.<sup>20</sup> A recent systematic review has included the effect on

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subjective stimulation but concluded “At this stage it is unclear whether these changes in the nature of intoxication translate into greater alcohol intake and risk-taking behaviour.”<sup>21</sup> Clearly, the subjective state of participants after alcohol and alcohol mixed with energy drinks requires further research.

Marczinski and Fillmore<sup>1</sup> cite a number of studies that have found increased alcohol consumption, more frequent negative consequences including driving or being driven when intoxicated, or risky sex, for consumers of alcohol mixed with energy drinks compared to alcohol-only consumers. The key point to emphasize here is that the cited surveys use between groups designs, i.e., an alcohol mixed with energy drink group compared to an alcohol-only group. Using a more appropriate within-subjects designs, i.e., comparing consumption of alcohol mixed with energy drinks and alcohol-only consumption in the same subjects reveals that users of the combined beverages may drink less and do not experience more negative consequences.<sup>5</sup> This, again, supports the existence of a third causal “trait” variable. Indeed, users of alcohol mixed with energy drinks differ in aspects of personality including masculine identity,<sup>22</sup> level of risk-taking behavior and alcohol consumption, per se.<sup>5</sup> Clearly, between-groups surveys provide an inferior methodology that can lead to inappropriate conclusions.<sup>23</sup>

To conclude, on the basis of the currently available literature, we stand with the UK Committee on Toxicology in their conclusion that “the current balance of evidence does not support a harmful toxicological or behavioural interaction between caffeine and alcohol.”<sup>24</sup>

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