There is a widespread acceptance of the potential for alcohol intoxication to impair cognitive processes (Hedley et al., 1994). Yet, much remains to be specified and this is a particularly critical time because theorizing about the role of cognitive deficits in understanding intoxicated emotion (e.g., SRED effects) and behavior (e.g., aggressivity, impulsivity, sexual risk-taking) is gaining increasing visibility (Lang et al., 1999). In particular, inebriates have difficulty executing cognitive control required to inhibit dominant responses that are contextually inappropriate. The purpose of the experiment described here was to examine the effects of alcohol on ability to produce contextually adaptive behavioral response when pre-potent, but incorrect, responding must be inhibited.

Participants received either alcohol (target BAL = 0.08g/100ml) or no-alcohol. They performed 452 trials of the Stroop procedure. Stimuli consisted of color words (red, blue or green) presented in colored script on a computer monitor. Participants’ task was to attend and respond to only one dimension of the stimulus (either word or script color). Trials were blocked on task (same script color vs. read word), with task order counterbalanced across participants. Within each task type, trials were congruent (match between script color and word), neutral, or incongruent (mismatch between script color and word). Verbal response time and accuracy were measured to examine behavioral effects of alcohol during response competition and comparison conditions. Event-related potentials (ERPs) were utilized to index behavioral and task-condition effects on underlying cognitive mechanisms.

Behavioral data were consistent with predictions. Specifically, alcohol intoxication resulted in impaired performance only when the task required execution of the non-dominant response (i.e., script color naming) in the context of competing, incompatible word information (i.e., non-matching script color). Examination of ERPs provided information about potential cognitive processes and systems responsible for this failure in behavioral control. Results are interpreted with reference to recent models of cognitive control which highlight the vital roles of interactive executive and conflict monitoring systems when performing tasks which require inhibition of dominant response sets in favor of contextually more adaptive but weaker competing responses. Alcohol intoxication did not affect initial stimulus evaluation, but instead impaired inhibitory processes associated with the suppression of contextually inappropriate, pre-potent information during response selection.

Participants
- 48 social drinkers (24 male/24 female) assigned to 2 beverage groups
  - Alcohol (peak blood alcohol level of 0.080 g/100 ml)
  - No-alcohol

Description of Paradigm
- Participants performed an individual trial Stroop Color-Word Interference Task
- Stimuli were words presented in colored script (red, blue, or green)
- Participants performed each of two tasks in separate blocks:
  - Color naming: Participants named the color of the stimulus
  - Word reading: Participants read the stimulus word
- Within task, trials were presented in 3 conditions:
  - Congruent: Word and script color match (e.g., RED, GREEN)
  - Neutral: Only word or script color presented dependent on task (i.e., for color naming: TOL, WRIST; for word reading: BLUE, GREEN)
  - Incongruent: Word and script color did not match (e.g., RED, BLUE)

Method Details
- Stimuli were presented for 500 ms with a 2000 ms response window
- Participants completed 4 blocks (24 trials/block) of color naming and word reading (order counterbalanced)
- Congruent, Neutral and Incongruent trials were randomly ordered and equal probable within all blocks
- Verbal response time was recorded online with a digital VOT
- Three trial types (color, red, blue, green) were used in color naming blocks
- Three script trials (red, blue, green) were used in word reading blocks
- White script (on black background) were used in Neutral word reading condition

Dependent Measures
- Behavioral Response: Group task performance was assessed with two separate behavioral measures, Reaction time on correct trials and overall Error rate.
- Event Related Potential (ERP) Indices of Cognitive Processing: ERP response was sampled at 1000Hz during a 2000ms window initiating 500ms prior to stimulus onset. The ERP signal was bandpass filtered (0.025–100Hz), eyblinks and baseline corrected, and signals that exceed ±75 µV were rejected as artifact. Average ERP waveforms were computed for each condition (Congruent, Neutral, Incongruent) within the two Tasks (Color naming, Word reading).

Conclusions
- Alcohol significantly impaired context appropriate adaptive behavioral response when that response had to compete with an incompatible, relatively automatic, pre-potent response. Specifically, intoxicated behavioral impairment was evidenced as increased error rates when automatic, pre-potent response was incorrect (i.e., incongruent color naming) and as an overall relative slowing of response time when more controlled-processing was required (i.e., all color naming conditions).
- These behavioral deficits associated with intoxication did not appear to result from deficits in attentional allocation to initial stimulus evaluation. Specifically, alcohol did not reduce the magnitude or delay the latency of the P3 component of the ERP, an electrophysiological index of stimulus evaluation, regardless of task or condition.
- Alcohol intoxication produced impairment in a frontal inhibitory process required to suppress or attenuate the influence of contextually inappropriate but pre-potent word information on response selection processes during color naming. Specifically, intoxicated participants exhibited significantly less N400 inhibition of frontal positivity during color naming.