REMOTE BREATHALYZER PROCEDURES AND INCIDENCES OF OFF-CYCLE ALCOHOL CONSUMPTION

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Introduction

- Accurate alcohol monitoring is essential in research, clinical, and forensic contexts.
- SCRAM-CAM is a well-validated tool for transdermal alcohol monitoring (Marques & McKnight, 2007, 2009; van Egmond et al., 2021).
- Remote breathalyzers (e.g., Soberlink), which measure Breath Alcohol Concentration (BrAC), are increasingly being used for alcohol monitoring (Alessi & Petry, 2013).
- A potential limitation of breathalyzers is missed detection of off-cycle drinking, particularly between the last test at night and the first test in the morning (Hill-Kapturczak et al., 2015).

Key Definitions

SCRAM-CAM: An ankle bracelet that continuously records transdermal alcohol concentration (TAC) every 30 minutes, 24/7 (SCRAM Systems, n.d.).
Soberlink: A remote breathalyzer that measures BrAC via scheduled BrAC tests (Soberlink, n.d.).
Transdermal Alcohol Monitoring (TAM): A passive, continuous method that measures ethanol excreted through the skin.
Transdermal Alcohol Concentration (TAC): The quantitative output from TAM devices, indicating alcohol levels detected through the skin.
Phosphatidylethanol (PEth): A biomarker for alcohol consumption, often used as a supplementary method to detect alcohol use in clinical and research settings.
Breath Alcohol Concentration (BrAC): The amount of alcohol in a person's breath, typically measured using remote breathalyzers like Soberlink.
Off-Cycle Drinking: Alcohol consumption that occurs outside scheduled Soberlink test windows, typically overnight.

Purpose

This study compares Soberlink BrAC readings with SCRAM TAC data to assess undetected off-cycle drinking. Findings may support integrating supplementary methods like PEth testing to enhance alcohol detection in applied settings (Hill-Kapturczak et al., 2018).

Methods

- 36 light-to-heavy drinkers were recruited for a 4-week remote breathalyzer-based contingency management protocol.
- Participants were instructed to provide four daily BrAC samples while wearing a SCRAM-CAM to continuously measure TAC.
- Participants earned a $10 daily incentive for submitting all four compliant BrAC samples each day, a method previously used with non-treatment-seeking drinkers (Dougherty et al., 2014).
- Weekly onsite visits included: collection of TAC data, self-reported alcohol use, and PEth collection.
- Procedure mimicked forensic settings where abstinence is reinforced during monitored periods, but off-cycle drinking has no consequences.

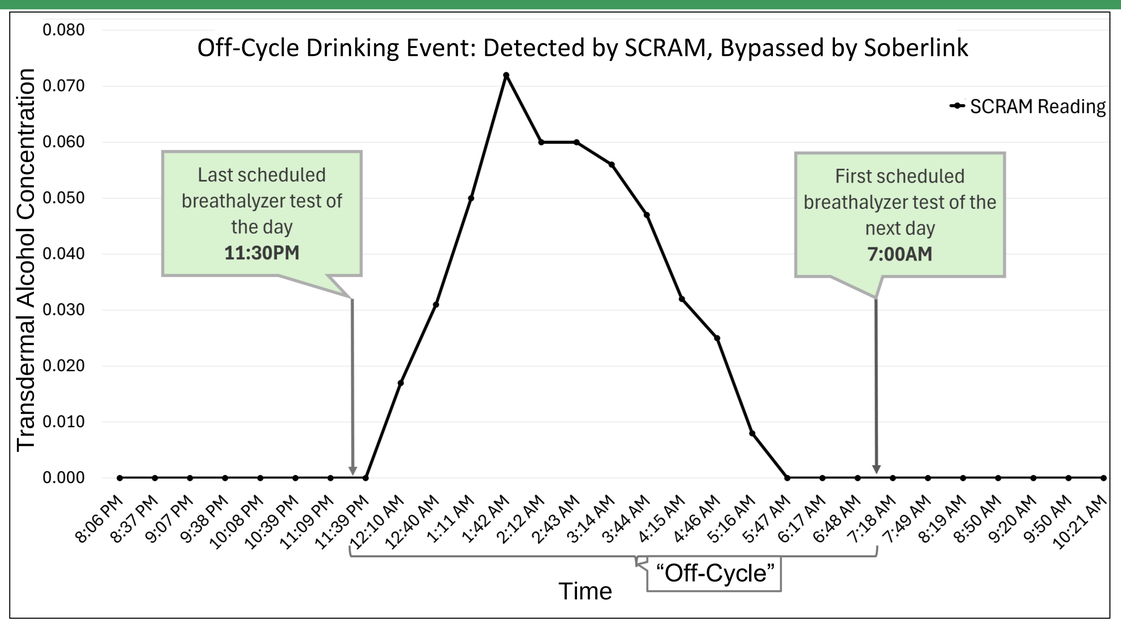

Figure 1: SCRAM data from Participant 104 showing an off-cycle drinking event between scheduled Soberlink tests (11:30 PM and 7:00 AM) on 6/4–6/5/2023. Both Soberlink tests were compliant, but SCRAM detected alcohol use through TAC during the unmonitored off-cycle period.

Results

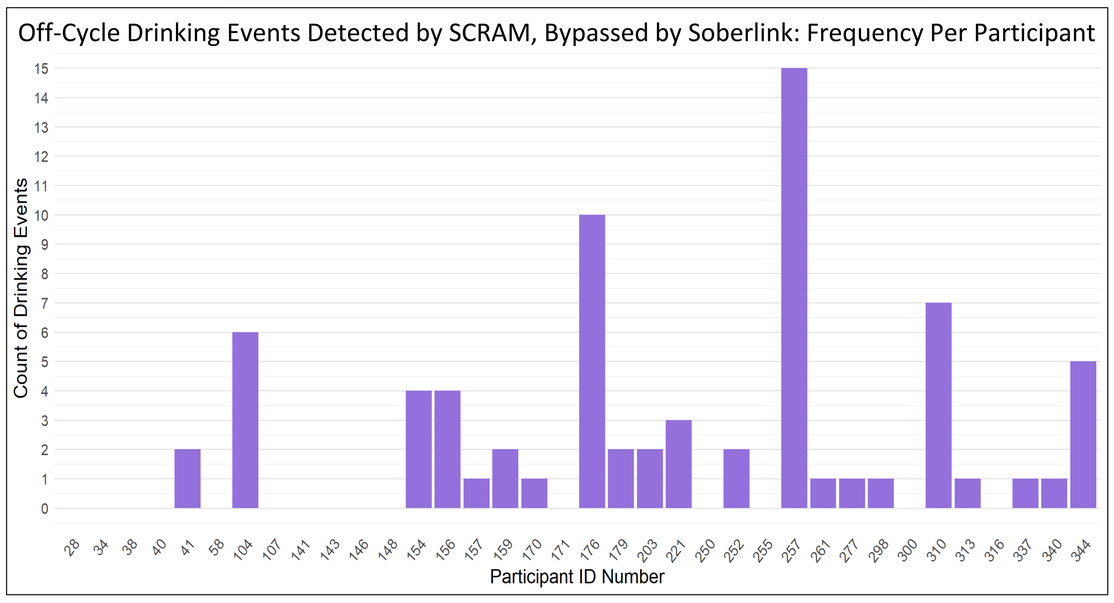

Figure 2: Bar graph showing the frequency of off-cycle drinking events detected by SCRAM across participants, highlighting events where SCRAM detected drinking, but Soberlink did not.

Description	Count
Total off-cycle drinking events detected by SCRAM	203
Total off-cycle drinking events detected by SCRAM and Soberlink	131
Off-cycle drinking events detected by SCRAM, bypassed by Soberlink	72
Participants who bypassed Soberlink at least once	21
Total number of days observed	999
Total number of participants	36

Figure 3: Summary table of SCRAM-detected off-cycle drinking events including: total events, events where SCRAM and Soberlink agreed, events bypassed by Soberlink, participants who bypassed Soberlink, total days observed, and total participants.

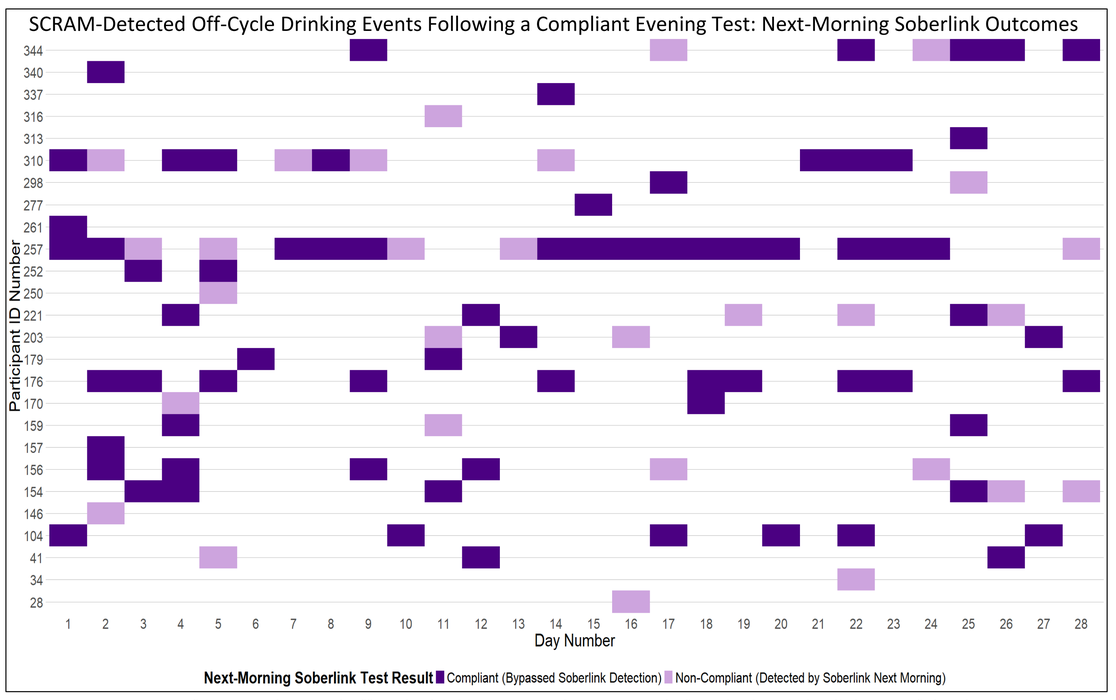

Figure 4: Heat map of SCRAM-detected off-cycle drinking events that occurred after the last Soberlink test of the day was compliant. Color differentiation represents the outcome of the first Soberlink test of the next day, or the day after the off-cycle drinking event. Light purple indicates that the first test following SCRAM-detected off-cycle drinking was compliant, dark purple indicates that it is was non-compliant.

Description	Count
Events with SCRAM-detected off-cycle drinking following a compliant Soberlink test	101
Events with compliant first test next morning (Soberlink bypassed)	72
Events with non-compliant first Soberlink test next morning (Soberlink detected after compliant evening test)	29

Figure 5: This table describes the total number of SCRAM-detected off-cycle drinking events that occurred after a compliant Soberlink test was received as the last test of the day (101). Further, 72 of these SCRAM-detected off-cycle drinking events were followed by a compliant first test on the next day in addition to the compliant Soberlink test prior to the drinking event. Lastly, 29 of the SCRAM-detected off-time drinking events were preceded by a compliant Soberlink test, but followed by a non-compliant on the first test of the next morning.

Results

- Out of the 999 days observed, 203 days (20.3%) had off-cycle drinking events detected by SCRAM, with 72 of those events (35.5%) going completely undetected by Soberlink (see Figure 3).
- 131 off-cycle drinking events (64.5%) were detected by both SCRAM and Soberlink, indicating events that Soberlink detected drinking the night before, the morning after, or both (see Figure 3).
- A total of 21 participants (58.3%) successfully bypassed Soberlink detection at least once, with their off-cycle drinking events detected by SCRAM but missed by Soberlink (see Figures 2 & 3).
- The highest frequency of off-cycle drinking events detected by SCRAM but undetected by Soberlink for a single participant was 15 events (see Figure 2).
- Among the 101 off-cycle drinking events detected by SCRAM following a compliant Soberlink test the previous evening:
  - 72 of these events (71.3%) had a compliant Soberlink test the following morning (see Figure 4).
  - 29 of these events (28.7%) had a non-compliant Soberlink test on the first test the next morning, indicating that Soberlink detected drinking after a compliant evening test (see Figure 4).

Conclusion

- Off-cycle drinking events were missed by Soberlink despite being clearly detected by SCRAM.
- These missed detections were not limited to isolated cases; 21 participants bypassed Soberlink detection at least once.
- In settings where comprehensive monitoring is essential, continuous systems like SCRAM offer an advantage over scheduled testing methods.
- Future research may explore the use of random or unscheduled breathalyzer tests rather than evenly staggered testing times, which may be more effective in detecting nighttime or "off-cycle" alcohol use.
- Additional biomarkers, such as PEth, could complement existing monitoring strategies by detecting alcohol consumption over longer windows and improving detection accuracy (Hill-Kapturczak et al., 2018).

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