Background

- While transdermal alcohol monitors provide continuous transdermal alcohol concentration (TAC) measurements, stigma associated with wearing them may reduce acceptability in non-forensic settings (Villalba et al., 2020).
- Previous studies from our lab have demonstrated promising use of other monitoring technologies, such as remote breathalyzer devices that capture breath alcohol concentration (BrAC) measurements, in community and clinical settings (Dougherty et al., 2012). However, these devices may fail to detect drinking that occurs outside of sample collection windows.
- Another approach to measuring alcohol use over time employs the use of retrospective self-report methods, such as the Timeline Follow-back interview (TLFB; Sobell & Sobell, 1992), but these methods are often vulnerable to recall bias and underreporting, particularly in contexts where drinking is tied to external contingencies (Kaplan & Koffarnus, 2019).

Purpose

The purpose of the current study was to evaluate:

- How accurately the breathalyzer devices and TLFB identify days with/without TAC-confirmed alcohol consumption
- The likelihood of alcohol detection by the breathalyzer devices and TLFB in relation to TAC-confirmed drinking events
- Whether breaking down breathalyzer non-compliance into distinct subtypes, specifically missed/skipped and positive samples, offers additional insight into the detection of TAC-confirmed drinking events

Methods

We examined the correspondence among three monitoring methods over a four-week period in 35 non-treatment seeking individuals.

- BrAC measurements were submitted four times daily, approximately five hours apart, via Soberlink Connect breathalyzer devices. Participants were offered a daily \$10 financial incentive contingent upon the submission of four compliant samples per day. Non-Compliant BrAC samples were defined as those that met any of the following criteria: failure to verify identity through facial recognition software, a BrAC reading of \geq 0.02 g/210L (equivalent to ~0.02 g/100mL BAC; **Positive BrAC**), or failure to submit a sample altogether (**Missed BrAC**).
- TAC measurements were recorded roughly every 30 minutes throughout the duration of the study via Secure Continuous Remote Alcohol Monitoring devices (SCRAM CAM). Drinking events were confirmed as described previously (Roache et al., 2019).
- The TLFB was administered at study completion.

Data Analysis:

- Sensitivity and specificity were estimated using intercept-only generalized linear mixed models (GLMMs) with a binomial distribution and logit link. Random intercepts for participants accounted for repeated measures to provide population-level estimates of how well each method detected TAC-confirmed drinking (sensitivity) and non-drinking (specificity) days.
- Separate GLMMs were fit with single binary predictors (e.g., TLFBreported drinking), allowing estimation of odds ratios comparing days with TAC-confirmed drinking (Positive TAC) versus days without (Negative TAC).

Assessing the Reliability of Self-Report, Breathalyzer, and Transdermal Alcohol **Monitoring Methods for Detecting Alcohol Consumption**

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Estimated Sensitivity and Specificity vs. TAC



BrAC

Missed BrAC

Sensitivity - True Positives (N = 300)			Specificity - True Negatives (N = 674)		
Method	Est. Prop.	n	Method	Est. Prop.	n
TLFB	0.286	106	TLFB	0.952	605
Non-Compliant BrAC	0.596	184	Non-Compliant BrAC	0.709	458
Missed BrAC	0.518	164	Missed BrAC	0.755	476
Positive BrAC	0.053	28	Positive BrAC	1.000	667

Odds Ratios Relative to TAC



Odds Ratios - Likelihood of Detection with Positive TAC vs. Negative TAC						
Method	Odds Ratio	95% CI	<i>p</i> value			
TLFB	2.982	[1.895, 4.693]	<i>p</i> <0.001***			
Non-Compliant BrAC	2.843	[1.904, 4.245]	<i>p</i> <0.001***			
Missed BrAC	2.675	[1.781, 4.018]	<i>p<0.001***</i>			
Positive BrAC	4.124	[1.550, 10.968]	<i>p<0.01**</i>			

Positive BrAC

- days when TAC did not.
- but showed a false positive rate of 29.1%.
- positive rate of 24.5%.
- most drinking events were not detected

- a larger portion of days when drinking occurred.
- negative days.

Together, these findings demonstrate the distinct strengths of the TLFB and different breathalyzer indicators. They also support the need for extended or supplemental alcohol monitoring approaches that capture a broader range of drinking behavior, particularly when drinking is tied to external contingencies.

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Results

The **TLFB** only identified 28.6% of days with TAC-confirmed drinking events, but correctly identified 95.2% of non-drinking days. It was nearly three times more likely to indicate alcohol use on days when TAC also detected drinking when compared to

Non-Compliant BrAC (a composite including both **Positive BrAC** and **Missed BrAC**) had the highest population-level sensitivity, identifying 59.6% of days with TAC-confirmed drinking,

Days where individuals missed/skipped BrAC sample submission (**Missed BrAC**) were ~2.6x more likely to occur on days with TAC-confirmed drinking than days without. They aligned with about 52% of TAC-confirmed drinking days and had a false

Days with BrAC samples ≥ 0.02 g/210L (equivalent to ~ 0.02 g/100mL BAC; **Positive BrAC**) were ~4.1x more likely to align with TAC-confirmed drinking days when compared to days without, and showed perfect population-level specificity (100%). However, days with Positive BrAC samples corresponded with only 5.3% of days with TAC-confirmed drinking, indicating that

Conclusion

• Non-Compliant BrAC samples were significantly associated with TAC-confirmed alcohol use. Within this multifaceted category, **Positive BrAC** samples more accurately identified days with TACconfirmed drinking events, while **Missed BrAC** samples captured

• Although the **TLFB** often missed days with TAC-confirmed alcohol intake, it reliably confirmed abstinence and was significantly more likely to detect drinking on TAC-positive days than on TAC-

References