Comparison of Survey and Interview Methods for Collecting Recent Caffeine and Alcohol Use Data in College Students

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Background: The present study collected benchmark data on alternative methods for collecting quantity and frequency information about caffeine, alcohol, and caffeine and alcohol combined (CAFF+ALC) use.
Materials and Methods: Participants were $N = 50$ college students who completed computer-administered survey (COMPSURVEY) and Timeline Followback (TLFB) interviews in randomized order. COMPSURVEY and TLFB data were compared using *t*-tests, McNemar's tests, and Spearman's correlations.
Results: For alcohol, COMPSURVEY underestimated quantity consumed compared to TLFB. Similar patterns were found for caffeine, with every participant having ≥1 COMPSURVEY-TLFB self-report difference and 65.5% having a CAFF+ALC inconsistency. Over half (56%) of participants had ≥1 caffeine misreport, with 46% misclassifying a beverage as containing/not containing caffeine. Moderate to strong relationships were found for caffeine and alcohol quantity and frequency of use, but associations for CAFF+ALC were weak.
Conclusions: The largest inconsistencies were found for CAFF+ALC use, indicating that more research is needed to identify methods for collecting reliable and valid CAFF+ALC use data.

Keywords: alcohol combined with caffeine, caffeine, alcohol mixed with energy drink (AMED), alcohol, Timeline Followback (TLFB), college students

Introduction

CAFFEINE IS THE most commonly consumed psychoactive substance in the world, with 80–90% of U.S. adults reporting regular use.[1] Caffeine can be found naturally in coffee, tea, and chocolate. Categorized as a food additive, it is also present in various soft drinks (e.g., Coca Cola, Mountain Dew), foods (e.g., Wired Waffles, Energy Gummy Bears), and certain medicines (e.g., Excedrin).[2]

Heavy use of caffeine can lead to problems, including two caffeine-related disorders, Caffeine Intoxication and Caffeine Withdrawal. While Caffeine Use Disorder is not a DSM-5 diagnosis, this disruptive pattern of caffeine use characterized by clinically significant impairment or distress is categorized as a condition that merits further study.[3] Meredith *et al.* reviewed studies of caffeine-related disorders and found that the number of individuals meeting criteria ranged from 9% in a sample of U.S. adults to 79% in adults seeking help in reducing caffeine use.[4–6] More recently, Sweeney *et al.* reported that 8% of caffeine using individuals met criteria for DSM-5-proposed Caffeine Use Disorder.[7]

Almost all (95%) college students report daily caffeine consumption, with the average student consuming three to five times the daily recommended amount of caffeine (200–300 mg).[8] In particular, energy drinks (EDs) are heavily marketed to college students, and ED consumption has contributed to adverse health effects, prompting increased attention and cause for concern.[9] ED use in college students has been linked to increased licit substance use and problems,[10–15] other risky behaviors (e.g., driving while intoxicated),[16] sensation seeking,[10,17] and depression.[17] Similar patterns have been found between daily coffee drinking and alcohol use and problems in college females.[18]

Consumption of alcohol mixed with EDs has garnered substantive media attention. Among college students, about one-fourth to one-half report any past month alcohol mixed with ED use,[13,19] and approximately one-

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fourth to over one-third report regular alcohol mixed with ED use.[20,21] Compared to those consuming the same amount of alcohol by itself, individuals consuming alcohol mixed with EDs are more likely to experience negative consequences and/or engage in risk-taking behavior, such as driving while impaired,[19] being taken advantage of sexually,[20] and reporting increased drug use (marijuana, ecstasy, and cocaine).[10]

Compared to EDs, little to no attention has been paid to other caffeine sources and the consumption of caffeine and alcohol combined (CAFF+ALC) beverages.[22] More research is needed to better understand caffeine and CAFF+ALC use patterns and the factors that contribute to risk for abuse and negative consequences. Central to this field of study is the researcher/clinician ability to accurately measure quantity and frequency of caffeinated beverage consumption and, in particular, CAFF+ALC consumption. While standardized measures are available to assess alcohol use,[23] comparable measures do not exist for caffeine and CAFF+ALC use.

Assessing the amount of caffeine consumed has proven to be difficult because caffeine content varies by product type (e.g., coffee vs. tea); serving size (e.g., 6 oz cup vs. 12 oz can); method of preparation (e.g., brewed vs. instant coffee); and brand. As the number and types of caffeine sources have increased, accurate measurement has grown even more challenging. In studies of caffeine, researchers have generally relied upon nonstandardized self-report measures that often do not distinguish between types of caffeine (e.g., brewed and instant coffee) and variations in serving size (e.g., 6 oz vs. 8 oz cup). Approximations are often the norm, with a cup of coffee said to have 100 mg of caffeine, tea 40 mg, and soft drinks 40 mg.[24,25] The same is true for EDs where frequency of use is the primary measure, and much less attention is paid to quantity of use.[22,26]

Similarly, CAFF+ALC use is also often assessed using unstandardized questions.[27] In addition, CAFF+ALC items often focus specifically on alcohol combined with EDs, leaving out other caffeinated beverages.[28,29] Recent findings have shown that participants are often unaware or mistaken as to which beverages do and do not contain caffeine,[30] leading to errors in measurement of caffeine and CAFF+ALC use. The purpose of the present study was to compare interview and survey methods for the measurement of caffeine, alcohol, and CAFF+ALC use and to describe the number and types of errors made by participants in self-characterizations of their caffeine use in a sample of college students reporting recent regular use of caffeine and alcohol.

Methods

Participants

Participants ($N = 50$) were college students at an urban university who were 18 years or older and reported recent (past 30 days) regular (at least weekly) alcohol use and recent (past 30 days) regular (at least 2 days per week) caffeine use.

Procedures

Recruitment took place from October to December 2015 in the Student Health Center. Students who were eligible and gave informed consent were escorted to a private area to complete the study. Participation involved completion of two assessments of caffeine and alcohol use and related behaviors. One was an interview and the other a computer-administered survey (COMPSURVEY). To control for order of administration effects, half of the participants were randomly assigned to begin with the interview and the other half to begin with the COMPSURVEY. All participants completed the assessments using both formats. Participants were compensated 20 dollars for completing the two assessments. The study was reviewed and approved by the Virginia Commonwealth University Institutional Review Board.

Measures

Computer-administered survey. The COMPSURVEY asked about recent (past 30 days) alcohol, caffeine, and CAFF+ALC use, as well as demographics (see Supplementary Data to view COMPSURVEY questions).

Frequency of use. For alcohol, participants were asked the following question: ''During the past 30 days, on how many days did you have any beverage containing alcohol (including beer, wine, or liquor)?'' For each type of caffeine, participants were asked: ''In the past 30 days, how many days per week in a typical week did you have [coffee, caffeinated tea, caffeinated soda, or caffeinated energy drinks/shots]?'' For CAFF+ALC, participants were asked: ''During the past 30 days, how many days did you drink either a caffeinated alcoholic product or a caffeinated beverage in combination with alcohol?''

Quantity of use. For alcohol, caffeine overall and separately for each beverage type, and CAFF+ALC, participants were asked: ''During the past 30 days, on days when you did drink [alcohol, caffeinated beverages, caffeine combined with alcohol, coffee, caffeinated tea, caffeinated soda, or caffeinated energy drinks/shots] how many drinks did you usually have?''

Timeline Followback interview. A Timeline Followback (TLFB) interview assessed recent (past 30 days) caffeine, alcohol, and other drug use (in that order). The TLFB is a widely-used semistructured interview that uses a calendar to retrospectively collect daily information about substance use. The TLFB has long been considered the gold standard for the collection of quantity and frequency of alcohol use data and research

has found it to be a reliable method for collecting other drug use data,[3,1] as well as other behaviors (domestic partner violence[32] and employment[33,34]).

TLFB: caffeine use. Participants were asked to describe the number, type, and volume of all caffeinated beverages they consumed. If a noncaffeine containing beverage was described, this information was also recorded and used to describe participant errors made in classification of caffeine-containing beverage consumption.

TLFB: alcohol use. The number, type, and volume of alcoholic drinks consumed were recorded and then converted into standard drink units. They were also asked whether the alcohol they consumed was mixed with other beverages, and this information was used to characterize CAFF+ALC use.

Caffeine misreports. To determine rates of misreporting (i.e., noncaffeinated beverages reported as caffeinated ones), caffeine use reports on the caffeine TLFB were examined.

Caffeine inconsistencies. To determine inconsistent caffeine reporting (i.e., reporting a caffeinated beverage as part of a CAFF+ALC consumption that was not previously reported on the caffeine TLFB), CAFF+ALC use reports on the alcohol TLFB were examined.

COMPSURVEY-TLFB inconsistencies. COMPSURVEY and TLFB inconsistencies in reports of alcohol, caffeine, and CAFF+ALC use were examined in three ways. First, the number of inconsistencies was recorded and evaluated. In this case, any difference between the two assessment methods was tallied as an inconsistency, regardless of magnitude. This tally of COMPSURVEY-TLFB inconsistencies was examined overall, as well as separately for caffeine, CAFF+ALC, and alcohol use. Second, magnitude of COMPSURVEY-TLFB differences was examined, looking at the absolute value of the difference between COMPSURVEY and TLFB reports. Third, inconsistencies were characterized as over- or underestimates (for COMPSURVEY compared to TLFB) and summarized.

Data analysis

COMPSURVEY and TLFB reports of alcohol, caffeine, and CAFF+ALC use were compared using *t*-tests for continuous variables and McNemar's tests for categorical variables. To assess if lack of knowledge about what contains caffeine was responsible for some reporting errors, overall number and proportion of caffeine errors were examined. The number of people with caffeine errors and the number of COMPSURVEY-TLFB inconsistencies for caffeine, alcohol, and CAFF+ALC

use were calculated. For each type of substance, we compared COMPSURVEY and TLFB quantity and frequency of use. We also identified total number of inconsistencies, magnitude of these differences, and direction of the inconsistency (i.e., COMPSURVEY under or overestimate compared to TLFB). This was done both per participant and overall across caffeine, alcohol, and CAFF+ALC use. We conducted Spearman's correlations between COMPSURVEY and TLFB for caffeine, alcohol, and CAFF+ALC quantity and frequency of use. Individuals with missing data for specific questions were not included in applicable analyses. All analyses were carried out using SPSS 22.

Results

Sample demographics

Mean age of participants was 21.2 years (standard deviation [SD] = 3.4), and almost three-fourths (72%) were female. The sample was predominantly White (48%), followed by Black/African American (22%), Asian/Pacific Islander (14%), Hispanic (8%), Mixed (6%), and Don't Know (2%). Nearly all (98%) were full-time students, with mean of 14.3 (SD = 1.7) years of education.

Caffeine use

Recent (past month) caffeine use prevalence by COMPSURVEY and TLFB is summarized in Table 1. For all four caffeine beverage types, percent of participants categorized as "users" did not differ by method of administration (COMPSURVEY or TLFB; all McNemar's tests $p > 0.05$). As shown in Table 2, on both COMPSURVEY and TLFB, participants consumed caffeine on about 2 out of every 3 days, with around 2 drinks per day on the days they used.

Alcohol use

Table 3 displays quantity and frequency of recent alcohol use and problems for both administration methods.

TABLE 1. RECENT CAFFEINE USE PREVALENCE
BY COMPUTER-ADMINISTERED SURVEY
AND TIMELINE FOLLOWBACK

Caffeine category	No. (%) of users		χ^2 p-Value
	COMPSURVEY	TLFB	
Overall	50 (100%)	50 (100%)	N/A
Coffee	39 (78%)	40 (80%)	1.00
Caffeinated tea	27 (54%)	21 (42%)	0.07
Caffeinated soda	28 (56%)	23 (46%)	0.23
Caffeinated energy drink/shot	14 (28%)	10 (20%)	0.34

COMPSURVEY, computer-administered survey; TLFB, Timeline Followback.

TABLE 2. QUANTITY AND FREQUENCY OF RECENT CAFFEINE USE BY BEVERAGE TYPE AND METHOD
OF ADMINISTRATION

		Mean (SD) of users	
Beverage type	Caffeine use domain	COMPSURVEY	TLFB
Total	Frequency (days of use)	21.44 (8.75)	20.94 (9.79)
	Quantity (No. of drinks on typical day)	1.93 (2.24)	2.29 (2.99)
	Total drinks consumed (past month)[a]	46.95 (67.78)	45.06 (70.94)
Coffee	No. of use days (typical week)	5.18 (4.60)	3.93 (2.44)
	No. of drinks (typical day)	1.35 (0.80)	1.30 (0.59)
Caffeinated tea	No. of use days (typical week)	6.67 (9.04)	2.71 (2.71)
	No. of drinks (typical day)	1.61 (1.39)	1.89 (2.68)
Caffeinated soda	No. of use days (typical week)	4.21 (4.43)	2.20 (2.07)
	No. of drinks (typical day)	1.59 (0.99)	1.33 (0.77)
Caffeinated energy drink/shot	No. of use days (typical week)	3.71 (2.92)	0.75 (0.61)
	No. of drinks (typical day)	1.21 (0.58)	1.08 (0.18)

[a]Product of past month caffeine frequency and quantity.
SD, standard deviation.

CAFF+ALC use

CAFF+ALC use was reported by almost half (48%) of
participants by COMPSURVEY and less than one-third
(30%) by TLFB. A McNemar's test determined that no
differences existed in number of CAFF+ALC users
based on COMPSURVEY and TLFB ($p = 0.06$). The ma-
jority of CAFF+ALC mixers were caffeinated soda
(66.67%), followed by ED (20%), caffeinated tea
(20%), and finally, coffee (6.67%). Table 3 summarizes
quantity and frequency of recent CAFF+ALC use by ad-
ministration method.

TLFB caffeine misreports and inconsistencies

Over half (56%) of participants had at least one caf-
feine misreport with almost half (46%) involving
whether a particular product did/did not contain caffeine.
About one-fourth (26%) of participants reported on a
noncaffeinated beverage that they believed to contain
caffeine. The average number of such misreports was
7.31 (SD = 9.54). In addition, 30% of participants classi-
fied a noncaffeinated beverage as one that contained caf-

feine. Beverage types most frequently associated with
misconceptions (what does/does not have caffeine)
were sodas, followed by tea, and finally other beverages.

Inconsistencies in CAFF+ALC reporting were found
among almost half (44.8%) of participants who reported
CAFF+ALC use on either the COMPSURVEY and/or
TLFB, but not both. Among those with inconsistencies,
the mean number of inconsistencies was 13.46
(SD = 41.94), with 92.3% reporting using a caffeinated
beverage in combination with alcohol on the alcohol
TLFB that they had not previously noted when reporting
caffeine use on the caffeine TLFB.

Agreement between COMPSURVEY and TLFB reports

Overall, all participants had at least one inconsis-
tency between COMPSURVEY and TLFB reporting
with a mean of 7.90 total inconsistencies (SD = 2.77)
across all three beverage types (caffeine, alcohol, and
CAFF+ALC). Table 4 displays Spearman's correla-
tions between COMPSURVEY and TLFB for caffeine,

TABLE 3. QUANTITY AND FREQUENCY OF RECENT ALCOHOL USE AND PROBLEMS AND CAFFEINE AND ALCOHOL
COMBINED USE BY ADMINISTRATION METHOD

	Mean (SD) of users	
Measure	COMPSURVEY	TLFB
Alcohol use		
Frequency (days of use)	8.91 (6.52)	7.46 (6.11)
Quantity (No. of drinks on typical day)	3.89 (2.77)	5.12 (4.24)
Total drinks consumed (past month)[a]	40.20 (62.78)	49.63 (121.45)
CAFF+ALC use		
Frequency (days of use)[b]	8.63 (9.26)	3.43 (7.13)
No. of CAFF+ALC (typical day)[b]	3.25 (2.05)	4.51 (6.61)
Total drinks consumed (past month)[a]	30.46 (38.03)	52.53 (185.23)

[a]Product of past month frequency and quantity.
[b]Only those who reported any CAFF+ALC use were included.
CAFF+ALC, caffeine and alcohol combined.

alcohol, and CAFF+ALC quantity and frequency of use. While there were moderate to strong relationships between COMPSURVEY and TLFB for caffeine and alcohol quantity and frequency of use, there were weak associations for CAFF+ALC quantity and frequency of use. Table 5 summarizes *t*-test comparisons of COMPSURVEY and TLFB measures of caffeine, alcohol, and CAFF+ALC use and problems.

Caffeine. As shown on Table 6, every participant had at least one caffeine inconsistency with mean number of inconsistencies at 4.48 (SD = 1.84; range: 1–9). Inconsistencies between reports on type of caffeinated beverage questions were also examined. In no case did magnitude of TLFB estimates exceed survey estimates, with survey overestimates ranging from 50% (quantity of caffeine and quantity of coffee use) to 100% (frequency of ED use). Of the 42 individuals with coffee inconsistencies, 5 (11.9%) indicated use on only 1 of the 2 administration methods (COMPSURVEY or TLFB). Over one-fourth (28.6%) of those with tea inconsistencies reported such use on either the COMPSURVEY or TLFB, but not both. More than one-third (35.5%) of those with caffeinated soda inconsistencies endorsed use on only the COMPSURVEY or TLFB. Over half (58.8%) of those with ED use inconsistencies indicated use on only COMPSURVEY or TLFB.

Caffeine and alcohol combined. Over half (58%) of the sample had CAFF+ALC inconsistencies, and the mean number was 1.90 (SD = 0.31). Of the 29 individuals endorsing CAFF+ALC use, 19 (65.5%) reported such use on only TLFB or COMPSURVEY. For frequency of CAFF+ALC use, 58% of the sample had an inconsistency between COMPSURVEY and TLFB reports with a mean inconsistency magnitude of 6.34 (SD = 8.01) CAFF+ALC use days. Four-fifths (79.3%) of these inconsistencies were survey overestimates. About half (52%) of participants had a quantity of CAFF+ALC use inconsistency with the mean inconsistency magnitude being 3.51 (SD = 3.96) CAFF+ALC beverages. In addition, almost three-fourths (73.1%) of these inconsistencies were survey overestimates.

Discussion

Principal findings

The present study compared alternate methods (a more streamlined and practical assessment [COMPSURVEY] to the rigorous TLFB), for collecting recent caffeine, alcohol, and CAFF+ALC use information from a sample of self-identified regular caffeine and alcohol using college students. While participants consistently reported greater frequency of use on the COMPSURVEY compared to the TLFB, quantity measures were more varied across beverage types. Agreement between COMPSURVEY and TLFB reports at the individual level revealed consistent patterns of inconsistencies within substance type (alcohol vs. caffeine vs. CAFF+ALC) and by what was assessed (e.g., quantity vs. frequency), with the majority of participants having inconsistencies in caffeine self-reports. The magnitude of differences and proportion of participants with COMPSURVEY overestimates (compared to TLFB) also varied by substance type (alcohol vs. caffeine vs. CAFF+ALC). While the agreement between COMPSURVEY and TLFB was moderate to strong for quantity and frequency of both caffeine and alcohol use, there was weak agreement and the trend was in the opposite direction for CAFF+ALC quantity and frequency of use. Our findings present benchmark data on alternate methods for assessment of caffeine, alcohol, and CAFF+ALC use and inform future research and public policy development.

Alcohol

Consistent with the literature on measurement of college drinking, the present study found underestimates in quantity consumed by COMPSURVEY compared to TLFB.[35] This may be due, in part, to how alcohol quantity was measured on the COMPSURVEY. Asking about average drinks per occasion may not capture important variability, particularly in college students, where alcohol use varies for weekdays compared to weekends.[36,37]

These findings suggest that when the full TLFB is impractical, alternatives such as the graduated frequency (GF) approach should be considered.[38] Instruments that adhere to the GF approach ask how often during a period

TABLE 4. SPEARMAN'S CORRELATIONS BETWEEN COMPUTER-ADMINISTERED SURVEY AND TIMELINE FOLLOWBACK FOR CAFFEINE, ALCOHOL, AND CAFFEINE AND ALCOHOL COMBINED FREQUENCY (DAYS OF USE) AND QUANTITY OF USE

Beverage type	Measure	Spearman's correlations between COMPSURVEY and TLFB	p
Caffeine	Frequency (days of use)	0.80	<0.001
	Quantity (No. of drinks on typical day)	0.59	<0.001
Alcohol	Frequency (days of use)	0.86	<0.001
	Quantity (No. of drinks on typical day)	0.72	<0.001
CAFF+ALC	Frequency (days of use)	0.31	0.03
	Quantity (No. of drinks on typical day)	0.41	0.15

TABLE 5. COMPARISON OF COMPUTER-ADMINISTERED SURVEY AND TIMELINE FOLLOWBACK DATA FOR QUANTITY
AND FREQUENCY OF CAFFEINE, ALCOHOL, AND CAFFEINE AND ALCOHOL COMBINED USE AND PROBLEMS

Substance use domain		t-Value (p-value)
Caffeine	Frequency (days of use)	0.65 (0.52)
	Quantity (No. of drinks on typical day)	−0.85 (0.40)
Alcohol	Frequency (days of use)	3.24 (0.002)[a]
	Quantity (No. of drinks on typical day)	−2.76 (0.01)[a]
CAFF+ALC	Frequency (days of use)	3.15 (0.003)[a]
	No. of CAFF+ALCs (typical day)	−1.58 (0.14)

[a]Denotes a statistically significant t-value ($p < 0.05$).

of time participants consumed amounts of standard drinks (e.g., 1–2 drinks, 3–4 drinks, and so on), with the usual format consisting of a question about largest amount followed by a question of frequency of use of the applicable quantity categories. Comparisons between quantity frequency (QF) and GF measures have revealed that GF approaches typically result in greater amounts of drinks per drinking day reported.[35] One possible reason for this inconsistency is that the GF approach is more specific, requiring less averaging and consolidating of alcohol use compared to the QF approach.[35] For college students, another approach used to potentially better capture variability would be to ask participants to average weekday and weekend day typical amounts separately.[37]

Caffeine

Similar to alcohol, we found COMPSURVEY overestimates for number of use days across types of caffeine, with greater magnitudes and degrees of inconsistency than with alcohol. Schliep *et al.*, examining the validity of a food frequency survey compared with 24-hour dietary recall in a sample of premenopausal women, also found variations in caffeine reporting, with survey overestimates for caffeine overall and coffee drinks/cocoa and survey underestimates for soda intake.[39] We did not, however, find the same beverage-specific types of inconsistencies. This could be due to our small N or

our sample limited to college-age men and women and/or the fact that we did not have a daily prospective tracking component.[39]

From a research perspective, a single misclassifying error, if compounded over a longer window of assessment, can lead to significant under or over-reporting. This is cause for concern for studies where quantity and frequency of caffeine use are central to the research. As with alcohol, our results suggest that use of survey items that allow for varying patterns of use and capture more detailed quantity and frequency information is preferable when TLFB interviews are impractical.

Lack of knowledge on caffeine

In the present study, students often made errors regarding which beverages contained caffeine. Such misreports tended to occur with beverage categories where both caffeinated and noncaffeinated versions were available, such as soda and teas, compared to EDs. The lack of accurate knowledge about caffeine can also contribute to survey reporting errors, especially for commonly used beverages that have caffeinated and noncaffeinated alternatives (e.g., sodas). Such misreporting becomes especially problematic when screening for/assessing unhealthy, heavy caffeine consumption. From a health perspective, such knowledge gaps could lead practitioners to miss individuals at risk for caffeine-related negative

TABLE 6. COMPUTER-ADMINISTERED SURVEY AND TIMELINE FOLLOWBACK DISCREPANCY INFORMATION
FOR CAFFEINE QUANTITY AND FREQUENCY QUESTIONS

Comparison question	No. (%) with discrepancies	Mean (SD) magnitude of discrepancies	No. (%) survey overestimates
Overall	50 (100%)	N/A	N/A
Frequency of caffeine use	37 (74%)	4.62 (4.32)	19 (51.4%)
Quantity of caffeine use	24 (48%)	2.33 (3.65)	12 (50%)
Frequency of coffee use (typical week)	16 (32%)	3.03 (5.32)	10 (62.5%)
Quantity coffee use	10 (20%)	1.23 (0.97)	5 (50%)
Frequency of tea use (typical week)	23 (46%)	5.33 (8.21)	21 (91.3%)
Quantity of tea use	17 (34%)	1.26 (1.08)	12 (70.6%)
Frequency of caffeinated soda use (typical week)	26 (52%)	2.91 (3.74)	23 (88.5%)
Quantity of caffeinated soda use	18 (36%)	1.24 (0.87)	13 (72.2%)
Frequency energy drink use (typical week)	12 (24%)	3.75 (2.92)	12 (100%)
Quantity of energy drink use	13 (26%)	1.01 (0.34)	9 (69.2%)

health effects. Individuals themselves could also be less able to accurately gauge healthy consumption amounts. For example, someone unaware of the caffeine content of Mountain Dew could miss how it might contribute to trouble sleeping.

Caffeine and alcohol combined

Another common error was a failure to include CAFF+ALC beverages in reports of caffeine consumption overall. Almost half of CAFF+ALC users had inconsistencies, with over 90% of these individuals reporting consuming a caffeine-containing beverage on the CAFF+ALC TLFB that they had not previously reported on the caffeine TLFB. This disconnect in reporting potentially indicates that individuals frequently do not consider CAFF+ALCs to be caffeinated beverages.

Our findings about CAFF+ALC inconsistencies being larger compared to caffeine and alcohol by themselves suggest that CAFF+ALC measurement is particularly vulnerable to discrepant reporting and, thus, increased inaccuracy of survey reports. This could be at least partially explained by the fact that CAFF+ALC survey questions have not been validated, while alcohol and, to some extent, caffeine questions have been. However, it is also important to be cautious when comparing across alcohol, caffeine, and CAFF+ALC categories as there could be important base rate differences (e.g., if the number of caffeine use days is higher than alcohol use days, then there may be more opportunities for larger numbers of caffeine inconsistencies).

This study represents a first step in much needed research on measurement of caffeine and CAFF+ALC use. Based on the information about caffeine inconsistencies gathered here, a quiz could be developed to help as part of patient education. TLFB procedures specifically developed/validated for caffeine use could be created after more extensive research has been done on caffeine assessment, such as establishing caffeine unit standardization.

Limitations

There are several limitations to the present study. First, the sample consisted of college students that were regular caffeine and alcohol users, potentially limiting the generalizability of our findings. Second, analyses relied on retrospective self-report data. Measuring caffeine saliva levels could help affirm accuracy or promote accurate responding.[40] Third, only caffeine-containing beverages were assessed. While other sources of caffeine (e.g., foods, medications) generally represent a smaller proportion of overall caffeine use, these sources of caffeine may be important to measure in future studies. Fourth, the assessment period was limited to the past 30 days. Patterns may differ over longer windows of time or with prospective assessment. Fifth, this study did not include a direct

method comparison. The intent of this study was to compare a shorter survey (representative of those used in clinical and research settings) to the gold standard for the collection of quantity and frequency of use data (TLFB). Finally, while this study captured many instances of caffeine misreports, study methods likely did not capture all such errors.

Conclusions

To our knowledge, this is the first study to investigate caffeine and CAFF+ALC inconsistencies. Patterns of discrepant reporting across and within type of substance were found and affirmed the need to focus more attention on measure development, determination of causes of inconsistencies, and use of these findings for education and for raising substance use awareness in college students. Moderate to strong relationships were found for caffeine and alcohol quantity and frequency of use, but associations for CAFF+ALC were weak, indicating that more research is needed to identify methods for collecting reliable and valid CAFF+ALC use data. In addition, further research is warranted to better understand caffeine, alcohol, and CAFF+ALC use patterns and the factors that contribute to risk for abuse and negative consequences. This study and future studies will inform and guide development and testing of screening and assessment measures that can aid clinicians and researchers alike in the identification of college students at risk for development of problems related to caffeine and CAFF+ALC use.

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Supplementary Material

Supplementary Data

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