

Colorimetric reagent test kit use amongst a sample of people who regularly use ecstasy and/or other illegal stimulants in Australia, 2019-2021

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Key Findings:

- People who use illegal stimulants seek information about the contents and/or purity of their drugs, and are engaging in drug checking practices.
- There is a need for more education about the scope and limitations of colorimetric reagent test kits.
- Expanded access to more reliable information regarding the contents and/or dose of illegal substances is also needed.

Background

Due to the unregulated nature of illegal drug markets, the type and quality of substances that are available can vary widely, presenting different risks of harm (1). While there is evidence that people who use drugs engage in harm reduction practices based on their expectation of a substances' contents and dose (2), changes in drug markets, such as the emergence of new psychoactive substances (NPS; (3)), has impacted the capacity to reliably predict the contents of an illegal substance.

The most readily available technology that can provide information about the presence or absence of a nominated substance in drug samples are colorimetric reagent test kits (4). Such tests can be conducted by a layperson and provide presumptive drug identification, however their accuracy can vary depending on whether the test is performed accurately, and the subjective interpretation of results (4).

In Australia, there is limited experience of formal drug checking services within the public health system. As such, Australians who want to test their illegal drugs are reliant upon suboptimal technologies, such as colorimetric reagent test kits, without support and education from specialists and/or harm reduction experts.

We aimed to describe, amongst a convenience sample of people who regularly use MDMA/ecstasy and other illegal stimulants:

1. Past year engagement in drug checking, including use of colorimetric reagent test kits (2019-2021);
2. The sociodemographic, drug use, and other risk behavioural factors associated with use of colorimetric reagent test kits (2019-2021); and
3. Opinions regarding the scope and accuracy of reagent testing kits (2021).

This represents an update to our previous paper, which addressed similar aims (1 and 2) among a sample of people who regularly use MDMA/ecstasy and other illegal stimulants in 2019 (5).

Method

Study design and participants

This paper uses data from the Ecstasy and Related Drug Reported System (EDRS), an illicit drug monitoring system that surveys people who regularly use MDMA/ecstasy and other illegal stimulants in each capital city of Australia. Participants are recruited via social media and word of mouth, and eligible participants are 18 years or older (17 or older prior to 2020), have used MDMA/ecstasy at least monthly in the last 6 months, and have lived in the capital city of interview for 10 of the last 12 months.

Participants completed a one-hour interview and were reimbursed \$40 for their time. Historically, interviews have been conducted face-to-face, however in 2020, interviews were adapted to telephone and video call to comply with the different jurisdictional COVID-19 restrictions. In 2021, a hybrid approach was taken, with both face-to-face and telephone/video interviews conducted. Full details of the background and methods can be found elsewhere (6).

This paper uses data from the 2019 (N=797), 2020 (N=805) and 2021 (N=774) EDRS interviews.

Measures

Past year engagement in drug checking

Participants were asked whether they or someone else had tested the contents and/or purity of their illegal drugs. Those who reported doing so in the last 12 months were asked about their testing method on the most recent occasion of testing; response options included colorimetric or reagent test kit; testing strips (e.g., BTNX fentanyl strips or other immunoassay testing strips); Fourier Transform Infrared Spectroscopy or other method of spectroscopy/ chromatography (e.g., Gas Chromatography Mass Spectrometry); other; and don't know.

Factors associated with colorimetric reagent test kit use

Information on age (coded as under 25 or 25 and over) and gender (binary coded as male and female; participants who identified as non-binary or gender fluid (n=37) or another gender (n=4) were excluded from analysis due to small numbers) were collected. Participants were asked about their current employment status, with response options coded as full-time vs not full-time (not employed; part time/casual; self-employed; other), and attainment of tertiary qualifications (university/college; trade/technical qualifications).

Participants were asked about their past six-month use of a wide range of substances (e.g., LSD, ketamine, new psychoactive substances (NPS)). The full list of NPS included in analysis can be found elsewhere (7). For the purpose of these analyses, MDMA/ecstasy use was coded as < weekly vs \geq weekly, tobacco and cannabis use were coded as daily vs <daily, while any past six-month use of methamphetamine, LSD, ketamine, and NPS were also included.

Past six-month bingeing (use of illegal stimulant drugs for 48hrs or more without sleep), and past 12-month stimulant overdose (defined as the experience of symptoms like nausea, vomiting, chest pain that are outside their normal drug experience) were recorded. Participants were asked how often they had sold drugs for cash profit in the past month (coded as \geq weekly vs <weekly).

Scope and accuracy of reagent test kits

In 2021, participants were also asked to rate how much they agreed or disagreed with four statements regarding the scope and accuracy of personal reagent test kits (see Figure 2 for wording of statements), with the response options being: strongly agree; agree; disagree; strongly disagree; don't know.

Analysis

Data were analysed in Stata (Version 16). Descriptive statistics were used to examine engagement in drug checking (aim 1) and opinions regarding the scope and accuracy of reagent test kits (aim 3).

Binary logistic regression was conducted to identify factors associated with colorimetric reagent test kit use on the last occasion of testing (aim 2). As per complete case analysis, participants who did not respond to the module (or the variables included in the regression model) were excluded, and numbers of respondents are reported for each variable. Variables which were associated with the outcome at a significance level of $p < 0.10$ were retained in the adjusted model, as more traditional cut-off levels of 0.05 may exclude variables known to be important (8); adjusted results are reported in-text. Multicollinearity was assessed by calculating the variance inflation factor (VIF); no covariates were considered highly collinear ($VIF > 10$). To account for repeat participation, 2021 and 2020 participants were excluded from the regression model if they reported participating in the survey in other included years (2020 or 2019): 2128 participants were included in the regression analysis following removal of repeat participants.

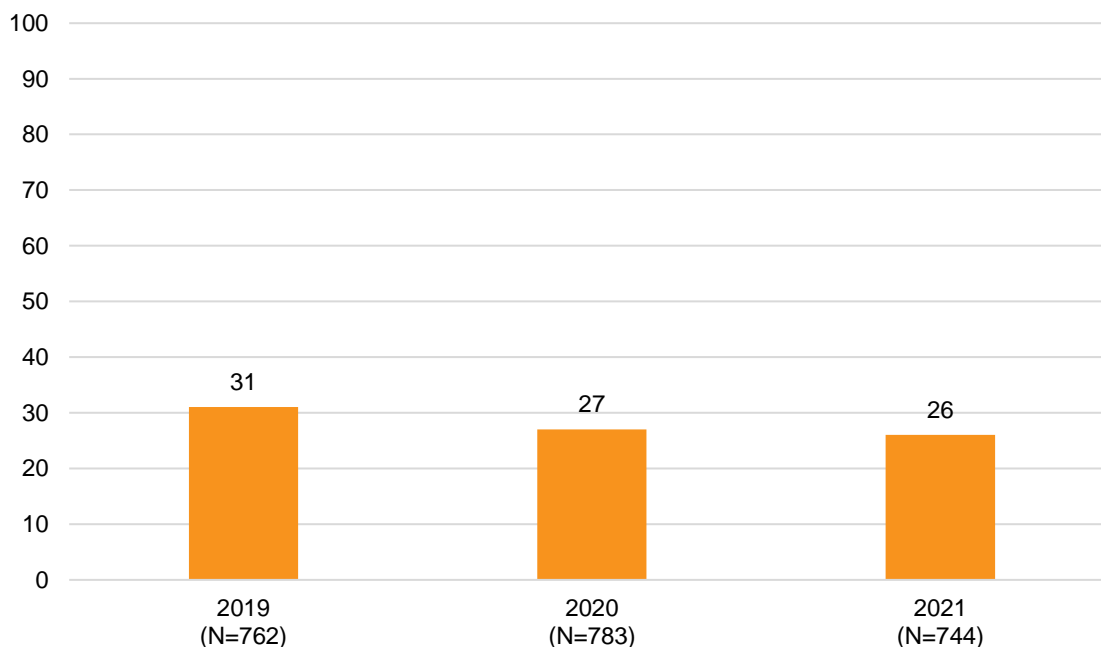
Results

Past year engagement in drug checking

In each year from 2019-2021, approximately one-third of the sample reported having tested the content and/or purity of their illegal drugs in Australia in the past year (2019: 276, 35%; 2020: 254, 32%; 2021: 251, 33%).

Of those who had tested their drugs in the last year and who commented (2019 N=259; 2020 N=241; 2021 N=227), the majority (2019: 236, 91%; 2020: 208, 86%; 2021: 192, 85%) reported using a colorimetric reagent test kit on the most recent occasion (Figure 1).

Figure 1: Use of personal reagent test kit last time drugs were tested, amongst all those who responded to drug checking items, 2019-2021



Factors associated with colorimetric reagent test kit use

Multivariable logistic regression indicated that participants who reported last using a colorimetric reagent kit when they last tested their drugs were younger (<25 years) (AOR 1.90; 95% CI 1.45-2.48; $p < 0.001$) and more likely to be male (AOR 1.70; 95% CI 1.35-2.15; $p < 0.001$) when compared with those who had not. They were more likely to report past 6-month use of LSD (AOR 1.35; 95% CI 1.08-1.69; $p = 0.008$), ketamine (AOR 1.24; 95% CI 0.98-1.56; $p = 0.08$), and NPS (AOR 2.03; 95% CI 1.60-2.59; $p < 0.001$), and to report having sold drugs for cash profit in the last 4 weeks (AOR 1.60; 95% CI 1.25-2.02; $p < 0.001$). Participants in the NT were significantly less likely to report having used a colorimetric reagent test kit last time they tested their drugs than those in the NSW (AOR 0.42; 95% CI 0.25-0.68; $p < 0.001$), whereas those in ACT (AOR 1.47; 95% CI 0.98-2.20; $p = 0.061$), SA (AOR 1.70; 95% CI 1.12-2.58; $p = 0.01$) and WA (AOR 2.37; 95% CI 1.58-3.54; $p < 0.001$) were significantly more likely to report having used a colorimetric reagent test kit than those in NSW.

Table 1: Factors associated with use of personal reagent test kit, 2019-2021 (repeat participants removed)

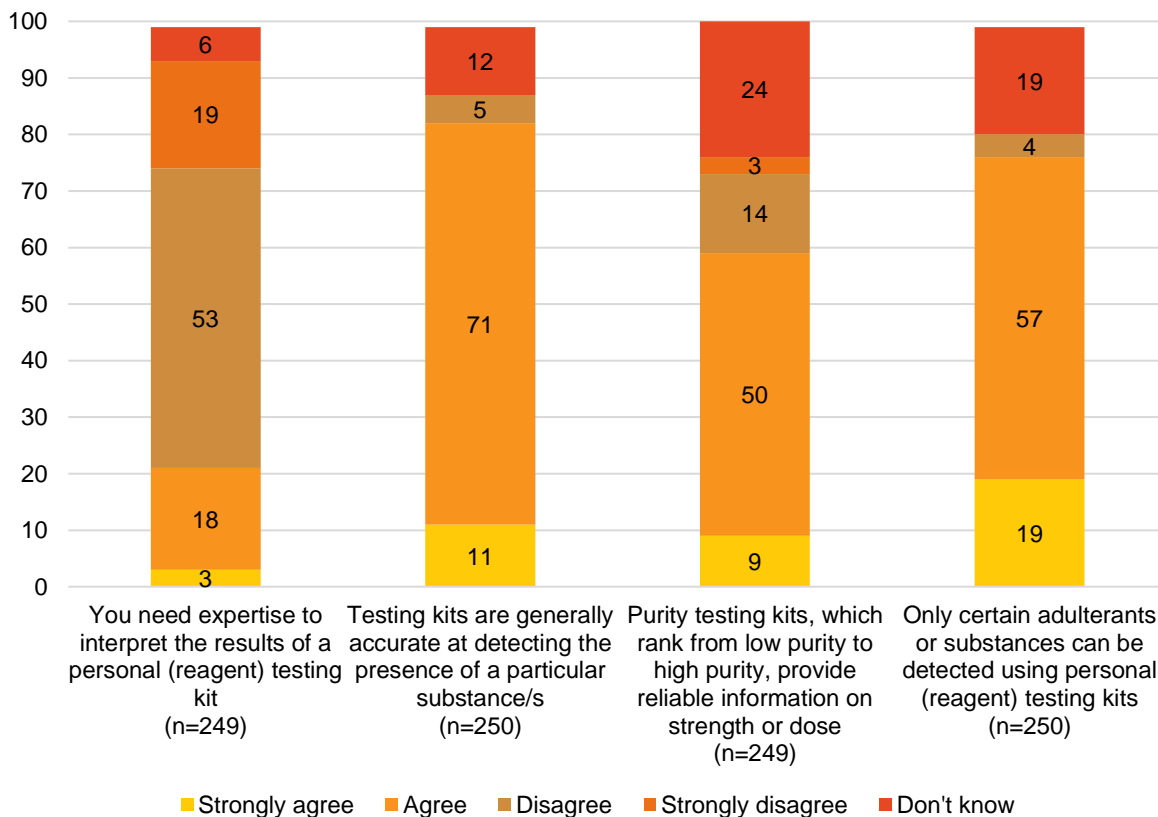
	Total sample N=2128 % (n)	Colorimetric Reagent Test Kit use in the past 12 months		OR (95% CI, p)	AOR (95% CI, p)
		No ^a N=1528 % (n)	Yes N=600 % (n)		
Year of interview					
2019	36 (762)	69 (526)	31 (762)	Ref	
2020	34 (725)	74 (533)	26 (192)	0.80 (0.64-1.01; 0.06)	0.89 (0.69-1.14; 0.35)
2021	30 (641)	73 (469)	27 (172)	0.82 (0.65-1.03; 0.01)	0.95 (0.72-1.24; 0.69)
Jurisdiction of interview					
NSW	13 (278)	73 (204)	27 (74)	Ref	
ACT	13 (275)	67 (183)	33 (92)	1.39 (0.96-2.0; 0.08)	1.47 (0.98-2.20; 0.061)
Vic	14 (286)	73 (209)	27 (77)	1.02 (0.70-1.47; 0.94)	1.11 (0.98-1.69; 0.63)
Tas	12 (252)	79 (200)	21 (52)	0.72 (0.48-1.07; 0.11)	0.95 (0.60-1.48; 0.81)
SA	12 (260)	67 (175)	33 (85)	1.34 (0.92-1.94; 0.11)	1.70 (1.12-2.58; 0.01)
WA	13 (268)	56 (149)	44 (119)	2.20 (1.54-3.15; <0.001)	2.37 (1.58-3.54; <0.001)
NT	12 (261)	88 (230)	12 (31)	0.37 (0.23-0.59; <0.001)	0.42 (0.25-0.68; <0.001)
QLD	12 (248)	72 (178)	28 (70)	1.10 (0.74-1.60; 0.68)	1.03 (0.67-1.60; 0.89)
Sociodemographic characteristics					
Age <25 years	62 (1315)	66 (865)	34 (450)	2.31 (1.86-2.85; <0.001)	1.90 (1.45-2.48; <0.001)
Male ^b	62 (1304)	67 (873)	33 (431)	1.97 (1.60-2.43; <0.001)	1.70 (1.35-2.15; <0.001)
Heterosexual	82 (1674)	71 (1191)	29 (483)	1.17 (0.22-1.52; 0.22)	-
Completed tertiary qualification ^c	56 (1183)	75 (889)	25 (294)	0.69 (0.57-0.83; <0.001)	1.03 (0.81-1.30; 0.83)
Full time employment	25 (527)	76 (400)	24 (127)	0.76 (0.60-0.95; 0.017)	0.94 (0.72-1.22; 0.65)
Past six-month drug use					
Ecstasy/MDMA use ≥weekly	23 (480)	68 (324)	33 (156)	1.26 (1.01-1.57; 0.039)	1.00 (0.77-1.30; 0.97)
AUDIT score ≥16 ^d	33 (700)	73 (513)	27 (187)	0.89 (0.73-1.09; 0.27)	-
Tobacco use ≥daily	35 (735)	73 (535)	27 (200)	0.93 (0.76-1.13; 0.47)	-
Cannabis use ≥daily	23 (419)	68 (283)	32 (136)	1.20 (0.95-1.52; 0.12)	-
Any methamphetamine use	28 (596)	75 (447)	25 (149)	0.80 (0.64-1.0; 0.04)	0.77 (0.60-1.02; 0.07)
Any LSD use	50 (1056)	66 (699)	34 (357)	1.74 (1.44-2.11; <0.001)	1.35 (1.08-1.69; 0.008)
Any ketamine use	45 (961)	67 (648)	33 (313)	1.49 (1.23-1.81; <0.001)	1.24 (0.98-1.56; 0.08)
Any NPS use	26 (558)	56 (314)	44 (244)	2.65 (2.16-3.26; <0.001)	2.03 (1.60-2.59; <0.001)
Drug use behaviour					
Used stimulant drug ≥48 hours without sleep (past 6m)	30 (629)	68 (430)	32 (199)	1.27 (1.04-1.56; 0.02)	1.20 (0.93-1.56; 0.16)
Stimulant overdose (past 12m)	19 (413)	68 (279)	32 (134)	1.29 (1.02-1.62; 0.033)	1.20 (0.92-1.56; 0.18)
Sold drugs for cash profit ≥ weekly (past 4 weeks)	24 (516)	60 (311)	40 (205)	2.05 (1.66-2.53; <0.001)	1.60 (1.25-2.02; <0.001)

Note: - Indicates that the variable was not included in the multivariable model as $p > 0.10$ at the univariate level. ^a Includes those who reported never having tested the purity and/or content of their illegal drugs, those who had tested them more than a year ago, and those who had tested within the last year but using other methods. ^b People who report another gender (n=4) and gender fluid/non-binary (n=37) were excluded from analyses due to low numbers reporting. ^c Includes university/college and trade/technical qualifications. ^d AUDIT: Alcohol Use Disorders Identification Test. Scores of 16 or more indicate moderate-severe alcohol use disorder.

Understanding of the scope and accuracy of reagent test kits, amongst those who had tested their drugs in the last 12 months, 2021

As can be seen in Figure 2, three quarters of participants (72%) either disagreed (53%) or strongly disagreed (18%) that expertise is needed to interpret colorimetric reagent test kit results. Four fifths of participants (82%) either agreed (71%) or strongly agreed (11%) that colorimetric reagent test kits are generally accurate at detecting the presence of a particular substance, or substances. Fifty-nine percent of participants either agreed (50%) or strongly agreed (9%) that purity test kits, which rank from low to high purity, provide reliable information on strength or dose of the tested drug. And finally, 76% of participants either agreed (57%) or strongly agreed (19%) that only certain adulterants or substances can be detected using a colorimetric reagent test kit.

Figure 2: Understanding of personal reagent test kits function and scope, amongst those who had tested their drugs in the last 12 months, 2021



Implications

This study aimed to examine the use of, and characteristics associated with, colorimetric reagent test kits in Australia (2019-2021), amongst a sample of people who regularly use MDMA/ecstasy and/or other illegal stimulants. Our findings show that people who regularly use these substances are already engaging in practices to identify the contents and/or dose of their illegal drugs, despite the near absence of formal testing services, and the suboptimal nature of the available testing methods.

This practice has remained relatively consistent throughout the last three years, despite considerable changes in drug use contexts and behaviours as a result of the COVID-19 pandemic and related restrictions (9).

Our analysis of the factors associated with colorimetric reagent test kit use identified that these individuals had twice the odds of reporting past six-month NPS use than those who did not use a test kit. Those who had used a reagent test kit were also more likely to report past six-month use of LSD and ketamine, consistent with previous findings that people who use NPS consume a broad range of other illegal drugs (10). Use of colorimetric reagent test kits by this group indicates an interest in the contents of illegal drugs, and an awareness of the potential risks associated with NPS given their diverse, or unknown, effects (3).

Consistent with our previous findings (5), we also found that age, gender, and self-reported drug dealing (weekly or more frequently in the past month) were associated with use of a test kit. These results further reinforce the potential role of people who supply drugs in harm reduction efforts. That is, these individuals can contribute to 'quality control' of the illegal drug market through drug checking and could play an important role in sharing information about the advantages, as well as informational limits, of drug checking. This opportunity for knowledge sharing is particularly important in the context of our findings regarding participant beliefs regarding the accuracy and scope of reagent test kits.

Specifically, in 2021, we asked participants who reported testing their drugs in the last 12 months four items to assess consumer understanding of the scope and functionality of colorimetric reagent test kits. Notably, more than half of these participants either agreed or strongly agreed that purity testing kits can provide reliable information about the strength or dose of a tested drug, while one quarter did not know. This is consistent with our previous finding that one quarter of participants who had used a colorimetric reagent test in 2019 reported undertaking a test to quantify dose of the tested substance (5). However, while participants may have purchased tests which claim to quantify a tested substance, the functionality of such tests is variable and generally reported to be limited (4). Further, three quarters of participants believed that expertise was not needed to interpret personal reagent test kit results. While such tests are categorised as basic-intermediate in terms of ease of use (4), previous research has determined that less than half of people who have used a colorimetric reagent test kit can cite limitations of the technology (11).

Conclusion

Consistent with our previous findings, we found that in each year from 2019-2021 between a quarter and a third of our sample reported past 12-month use of colorimetric reagent test kits. This continued engagement with drug checking practices, even throughout the COVID-19 pandemic and related restrictions, reinforces the risk awareness of people who regularly use MDMA/ecstasy or other/stimulants, and their ongoing desire and willingness to seek objective information about the contents of their drugs.

However, we also found that most participants did not believe that expertise was needed to use colorimetric reagent test kits and that purity testing kits can provide reliable information about the strength or dose of a tested drug. Reagent test kits are a suboptimal technology, and these findings highlight the need for more education about their scope and limitations, as well as expanded access to more reliable information regarding the contents and/or dose of illegal substances.

Combined, our findings suggest that there is a missed opportunity to reduce drug-related harm, which could be addressed through the provision of a full drug checking service with laboratory grade equipment, coupled with healthcare interventions and harm-reduction education.

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