

## BRIEF REPORT

## Who uses digital drugs? An international survey of 'binaural beat' consumers

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## Abstract

**Introduction.** Digital drugs, or binaural beats claimed to elicit specific cognitive or emotional states, are a phenomenon about which little is known. In this brief report, we describe demographic and drug use correlates of binaural beat use, patterns of use, reasons for use and methods of access. **Methods.** The Global Drug Survey 2021 was translated into 11 languages; 30 896 responses were gathered from 22 countries. **Results.** The use of binaural beats to experience altered states was reported by 5.3% of the sample (median age 27; 60.5% male), with the highest rates from the United States, Mexico, Brazil, Poland, Romania and the United Kingdom. Controlling for all variables, age and non-male gender predicted binaural beat use, as did the recent use of cannabis, psychedelics and novel/new drugs. Respondents most commonly used binaural beats 'to relax or fall asleep' (72.2%) and 'to change my mood' (34.7%), while 11.7% reported trying 'to get a similar effect to that of other drugs'. This latter motivation was more commonly reported among those who used classic psychedelics (16.5% vs. 7.9%;  $P < 0.001$ ). The majority sought to connect with themselves (53.1%) or 'something bigger than themselves' (22.5%) through the experience. Binaural beats were accessed primarily through video streaming sites via mobile phones. **Discussion and Conclusions.** This paper establishes the existence of the phenomenon of listening to binaural beats to elicit changes in embodied and psychological states. Future research directions include the cultural context for consumption and proximate experiences, including co-use with ingestible drugs and other auditory phenomena. [Barratt MJ, Maddox A, Smith N, Davis JL, Goold L, Winstock AR, Ferris JA. Who uses digital drugs? An international survey of 'binaural beat' consumers. *Drug Alcohol Rev* 2022;41:1126–1130]

**Key words:** sound, music, hallucinogen, illicit drug, cross-sectional study.

## Introduction

The use of psychoactive drugs involves ingesting substances (e.g. plant matter, powder, pill, liquid) through a route of administration into the body (e.g. swallowing, smoking, snorting, injecting). This seemingly obvious statement is troubled by the

existence of *digital drugs*, which may or may not be consumed in concert with ingestible psychoactive substances. Here, the consumption of digital drugs involves listening to *binaural beats*, sound that is claimed to engender the embodied experience of psychoactive drugs or to elicit specific cognitive or emotional states [1–3]. (Note: The term 'digital drug' also

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has other emergent meanings. For example, some pharmaceutical drugs are equipped with ingestible sensors. These ‘digital drugs’ transmit a time-stamped signal to an app or other external monitor from inside the stomach, providing real-time medication adherence data [4,5].) These effects are made possible via a perceptual phenomenon that occurs when presenting two tones separately to each ear that slightly differ in their frequency [6,7]. The listener will then hear a modulating dyad [8] at a frequency equal to the difference in tone pitches, that is purported to ‘entrain’ brain waves and incite cognitive and mental effects [3,6]. A variety of internet and mobile applications can be used to purchase binaural beats, with different beats named after specific drugs [1–3] [e.g. ‘Budder Shatter glass’ (reference to cannabis concentrate), ‘Molly Rave Riot’ (reference to MDMA), ‘Roofie Enhanced calm’ (reference to Rohypnol); see Figure S1, Supporting Information]. The spread of binaural beats as a consumable experience is a function of interrelated affordances [9] at the intersection of digital sound production, personal listening devices and the physiology of listeners whose bodies mediate the auditory stimuli, potentially eliciting psychoactive effects.

Research investigating binaural beats has detected positive effects for pain alleviation [10,11], anxiety reduction [12] and memory [10,13]; however, there have been conflicting findings around its effects on concentration [10,14]. Aside from research exploring binaural beats as therapies or cognitive enhancements, there is scant literature concerning digital drugs as substitutes for, or in combination with, psychoactive substances. For example, binaural beats were mentioned in a paper investigating drug–drug combinations on a public internet forum. Participants ‘frequently described listening to binaural beats while using substances to enhance the experience’ [15, p. 3]. While some have expressed concern about binaural beats as a ‘gateway’ to ingestible substances [1,2,16,17], these concerns remain speculative and empirically untested. Neither is it clear whether binaural beats are similar in effect to the psychoactive drugs they are promoted to simulate.

### Aim

Digital drugs, or binaural beats that purport to elicit a drug-like state, are a phenomenon about which little is known. In this paper, we describe demographic and drug use correlates of binaural beat use, patterns of use, reasons for use and ways of access. We limit the current investigation to an initial characterisation of the use of binaural beats as a social practice: it is

beyond the scope of our paper to review the efficacy and safety of this practice.

## Methods

### Design and procedure

The Global Drug Survey (GDS) is an independent research organisation that collects data on drug use patterns and trends worldwide. GDS2021 launched on 1 December 2020 and ran until 16 March 2021. It was presented in 11 languages (German, English, French, Dutch, Hungarian, Spanish, Finnish, Portuguese, Danish, Romanian and Italian). Respondents were recruited opportunistically via media partners and collaborating institutions worldwide, such as Vice, Mixmag, *The Guardian* and Fairfax Media, and via social media platforms, such as Facebook and Twitter. There were no financial incentives for taking part. The survey was completely anonymous with no IP addresses or other potentially identifying information collected. It took 20–50 minutes to complete, depending on an individual participant’s recent experiences with substance types. While web surveys, such as GDS, are not necessarily representative of the general population, they offer timely signals on new emerging trends [18,19]. Further detail on GDS methodology is available elsewhere [19]. The GDS received ethics approval from University College London (11671/001), which was registered at RMIT University (2020-23913-11758) and The University of Queensland (2017001452).

### Measures

See Appendix S1 (Supporting Information) for full information on the question wording for all variables used.

**Binaural beats.** ‘Binaural beats (e.g. iDoser)’ was a response option for the following question: ‘In the last 12 months, have you used any of the following media to experience altered states (e.g. to relax, to fall asleep, to experience pleasure)?’. This question was part of a question set that surveyed respondents about a range of digital pleasures, including ASMR [20], cam models (i.e. OnlyFans) and apps facilitating meditation and sleep. Respondents indicating use of binaural beats were then asked about their use in the last 12 months: frequency, hours per day, reasons for use, and the platforms and devices used to access binaural beats.

**Demographics.** Country of residence, age, gender and level of education were measured.

**Drug use.** Use and number of days used in the last 12 months were measured for the list of drugs provided in Appendix S2.

### Analysis

In addition to descriptive statistics, a multivariable logistic regression determined which demographic and drug use characteristics were associated with use of binaural beats. Given that non-linear relationships between age and drug use are common [e.g. 21], polynomial age terms were included, and the regressions were clustered by country ( $n > 100$ ). These analyses were not pre-registered; therefore, this study can be considered exploratory only. Missing data were  $<5\%$ ; therefore, complete case analysis was used (see Appendix S2, Supporting Information).

### Results

The use of binaural beats to experience altered states in the last 12 months was reported by 5.3% of the sample (1635/30896). In the initial descriptive analysis, people who reported use of binaural beats were younger and

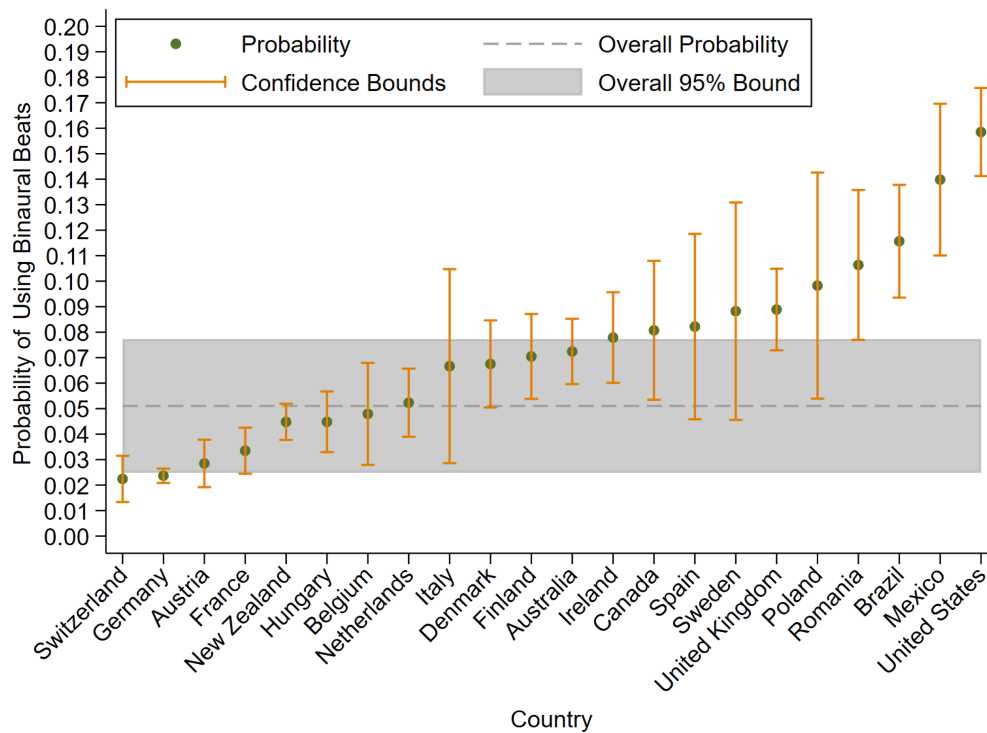
more likely to report recent use of all prohibited drugs (including cannabis), compared with the rest of the sample (see Table 1). Wide variation in prevalence across countries was observed, with the highest rates reported by (in order) the United States, Mexico, Brazil, Poland, Romania and the United Kingdom (see Figure 1). In the multivariable logistic regression controlling for all variables, age and non-male gender predicted binaural beat use, as did the recent use of cannabis, psychedelic drugs and novel/new drugs (and non-use of cocaine). Binaural beat use peaked among 16- to 20-year-olds (7.6%) and again among 45- to 49-year-olds (5.6%) (see Figure S2, Supporting Information).

Among respondents who reported binaural beat use, the median number of days in the last 12 months that they did so was 10, that is, close to once per month (interquartile range 3–30; range 1–365). On a day that they listened to binaural beats, 49.3% reported listening for less than 1 h, 26.9% for 1 h, 11.7% for 2 h and the remaining 12.1% for more than 2 h. When asked what altered states or effects they were using binaural beats to achieve, the most common responses were ‘to relax or fall asleep’ (72.2%) and ‘to change my mood’ (34.7%), while 11.7% reported that they were trying ‘to get a similar effect to that of other drugs’. This latter motivation

**Table 1.** Demographic and drug use characteristics associated with recent use of binaural beats

Variables	Descriptives (%)		Univariable OR (95% CI)	P-value	Multivariable aOR (95% CI)	P-value
	Binaural beats (n = 1635)	No binaural beats (n = 29 261)				
Age (median, IQR) <sup>a</sup>	27 (21–37)	31 (24–41)	0.16 (0.07–0.33)	<0.001	0.26 (0.14–0.46)	<0.001
Age squared <sup>a</sup>			1.26 (1.15–1.38)	<0.001	1.21 (1.12–1.30)	<0.001
Age cubed <sup>a</sup>			0.99 (0.99–0.99)	<0.001	0.99 (0.99–1.00)	<0.001
Gender						
Cis man <sup>b</sup>	60.5	62.3				
Cis woman	32.5	34.5	0.97 (0.87–1.08)	0.572	1.23 (1.14–1.34)	<0.001
Trans, non-binary, intersex	7.0	3.2	2.24 (1.80–2.79)	<0.001	1.76 (1.49–2.07)	<0.001
Highest qualification						
University degree	38.8	48.0	0.69 (0.55–0.85)	0.001	0.92 (0.82–1.03)	0.146
Drug type used last 12 months						
Cannabis (THC)	72.4	55.9	2.07 (1.71–2.51)	<0.001	1.37 (1.20–1.56)	<0.001
MDMA	35.5	25.5	1.61 (1.24–2.07)	<0.001	0.90 (0.78–1.05)	0.177
Cocaine	25.5	23.2	1.14 (0.91–1.41)	0.251	0.74 (0.65–0.84)	<0.001
Amphetamine	27.1	19.4	1.54 (1.26–1.89)	<0.001	0.98 (0.79–1.21)	0.842
Methamphetamine	6.1	3.2	1.97 (1.46–2.65)	<0.001	1.34 (1.12–1.59)	0.001
Ketamine	19.8	13.2	1.61 (1.22–2.13)	0.001	0.85 (0.72–1.00)	0.050
LSD	34.7	15.1	2.98 (2.31–3.84)	<0.001	1.71 (1.41–2.06)	<0.001
Mushrooms	34.5	14.5	3.11 (2.37–4.07)	<0.001	1.90 (1.59–2.27)	<0.001
DMT	12.2	3.9	3.48 (2.55–4.75)	<0.001	1.55 (1.25–1.92)	<0.001
Other novel/new drugs	33.6	17.2	2.44 (2.09–2.84)	<0.001	1.48 (1.25–1.75)	<0.001

Regressions were clustered by country ( $n > 100$ ).  $N = 30\ 896$ . <sup>a</sup>Odds ratio (OR) and adjusted odds ratio (aOR) for age are calculated for 5-year age groups. <sup>b</sup>Reference group. CI, confidence interval; IQR, interquartile range.



**Figure 1.** Probability of using binaural beats by country.

was more commonly reported among those who used classic psychedelics (16.5% vs. 7.9%;  $\chi^2(1) = 18.54$ ,  $P < 0.001$ ). In ‘Other’ text responses, respondents noted that they were using binaural beats to increase concentration, focus or productivity, for meditation or spiritual practices, to ease headaches or pain, and to facilitate lucid dreaming, astral projection and other ‘out of body’ experiences. Others reported use of binaural beats to enhance experiences with psychoactive drugs, for example ‘to help relax when using drugs like psilocybin which can create meditative states’ and ‘while smoking DMT’. When asked whether they used binaural beats to feel connected to themselves or others, 59.5% reported using them to feel connected with someone or something – including 53.1% with ‘myself’ and 22.5% with ‘something bigger than myself’, with only small numbers reporting connecting with ‘other people like me’ (2.5%) or ‘the content producer’ (1.6%). Binaural beat content was accessed primarily through video streaming sites (e.g. YouTube, Vimeo) (68.3%), followed by the audio streaming service Spotify (34.4%) and other app-based services (19.4%). The content was primarily accessed through mobile devices (80.7%), but also via laptop (30.6%), desktop (13.8%) and tablet (9.6%).

## Discussion

Binaural beats are being used with the aim of experiencing altered embodied and psychological states. Our

survey provides scoping information about this practice, which occurs across multiple countries worldwide, with the recent use of cannabis, psychedelics and new/novel substances predicting binaural beat use. Our data add to Chary *et al.*'s [15] study by demonstrating that some binaural beat consumers aim to connect with a higher consciousness (‘something bigger than myself’), some report listening to binaural beats to obtain similar effects to psychoactive substances, and others report listening to them while also taking substances, in particular psychedelics.

## Limitations

The GDS is a non-representative sample and should not be used to indicate the prevalence of behaviours in the general population [19]. Given the non-representative sampling strategy, country estimates require confirmation through more robust sampling in future work in this area. Due to the significant length of the survey, drop out is more common among younger and male respondents, meaning that focused modules may be biased more towards older and non-male gender groups than core modules presented earlier in the survey (see Appendix S2). The GDS is also reliant on self-report. Anonymous web surveys with no material incentives (like GDS) at least provide a suitable setting for people to self-report behaviours that carry any embarrassment or stigma [22]. Although there is some dispute in the academic literature about the



reported efficacy of binaural beats in lab-based contexts, this study describes only the *reported* desired effects in a natural setting.

## Conclusions

This paper has established the existence of the phenomenon of listening to binaural beats to elicit/changes in embodied and psychological state (i.e. ‘digital drugs’). The mere existence of this phenomenon challenges broadly held assumptions about what drugs actually are (e.g. What constitutes a psychoactive effect? What constitutes a psychoactive substance? [23]). It has led us to ask whether mediated digital experiences could also be considered ‘drugs’, or whether they are better placed as complementary practices alongside drug use. Future research directions into these mediated sensory experiences include the cultural context for consumption, the technologies that afford them and proximate experiences, including co-use with ingestible drugs and similar auditory phenomena like autonomous sensory meridian response.

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## Conflict of Interest

ARW is the founder and director of the company Global Drug Survey. There are no other interests to declare.

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## Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher’s website:

**Figure S1.** Examples of digital drugs available through the iDoser Premium app.

**Appendix S1.** Global Drug Survey items used in binaural beats paper.

**Appendix S2.** Missing data and drop-out analyses.

**Figure S2.** The relationship between age and binaural beat use.