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2 have sex with men who inject drugs during sex (Slamsex): Data from the U-SEX  
3 GESIDA 9416 Study.

4 **Short title:** Slamsex and psychopathological symptoms.

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38 **ABSTRACT**

39 **Objectives:** Intravenous sexualized drug use also known as slamsex seems to be  
40 increasing among HIV-positive men who have sex with men (MSM). This practice may  
41 entail severe consequences for physical and mental health in this population. Research  
42 on the subject is scarce. The aim of our study was to describe the psychopathological  
43 background of a sample of HIV positive MSM who practiced slamsex during the previous  
44 year and compare the physical and psychological symptoms between these participants  
45 and those who practiced sexualized drug use (SDU) or chemsex without slamsex.

46 **Design and Methods:** Participants (HIV-positive MSM) were recruited from the U-Sex  
47 study in 22 HIV clinics in Madrid during 2016-17. All participants completed an  
48 anonymous cross-sectional survey on sexual behaviour and recreational drug use. The  
49 present analysis is based on HIV-positive MSM who had practiced SDU.

50 **Results:** The survey sample comprised 742 participants. Of all the participants who  
51 completed the survey, 216 (29.1%) practiced chemsex, and of these, 34 (15.7%) had  
52 practiced slamsex. Participants who practiced slamsex were more likely to have current  
53 psychopathology (depression, anxiety and drug related disorders) than chemsex users.  
54 In addition, participants who practiced slamsex had more high-risk sexual behaviours,  
55 polydrug use and were more often diagnosed with sexually transmitted infections (STIs)  
56 and hepatitis C than those who did not inject drugs. Compared with patients who did not  
57 inject drugs, patients who engaged in slamsex showed more severe drug related  
58 symptoms (withdrawal and dependence), symptoms of severe intoxication (loss of  
59 consciousness), and severe psychopathological symptoms related to SDU, such as  
60 paranoid thoughts and suicidal behaviour.

61 **Conclusion:** Slamsex (intravenous SDU) is closely associated with current psychiatric  
62 disorders and severe drug-related and psychiatric symptoms.

## 63 **BACKGROUND**

64 Chemsex, or sexualized drug use (SDU), was first described in UK as the intentional use  
65 of recreational drugs in order to enhance sexual relations between gay, bisexual and  
66 other men who have sex with men (MSM), usually for long periods of time and often with  
67 multiple partners (1). The main drugs involved in this practice are mephedrone,  $\gamma$ -  
68 hydroxybutyrate/ $\gamma$ -butyrolactone (GHB/GBL), and crystal-methamphetamine (Crystal-  
69 Meth) (2), although other drugs have been also reported, like ketamine, other synthetic  
70 cathinones, 3,4-methylenedioxymethamphetamine (MDMA), cocaine, poppers and  
71 erectile-dysfunction drugs, (3). Other aspects of this phenomenon, such as the use of  
72 geosocial networking applications to locate or participate in sex parties, should be taken  
73 into consideration because of their relevance and implications (4). Intravenous use of  
74 psychoactive substances, especially stimulants such as mephedrone and Crystal-Meth  
75 in this context, is known as slamming or slamsex (2).

76 Some studies have suggested that the practice of injecting recreational drugs at sex  
77 parties might be increasing among MSM (2,5–7). Both chemsex and slamsex have been  
78 described as more prevalent in MSM living with human immunodeficiency virus (HIV-  
79 positive) when compared to HIV-negative MSM. A recent UK study of HIV-positive MSM  
80 reported that 3% of their sample had injected drugs related to sex in the previous 3  
81 months(8) Similarly, the U-Sex study performed in Madrid showed that 4.5% of the  
82 sample had practiced slamsex in the previous year (7).

83 Slamsex has been associated to sex in group, condomless sex with random partners or  
84 fisting practices, which increase the frequency of sexually transmitted infections (STIs)  
85 and the transmission of viral infections, such as those caused by HIV and hepatitis C  
86 virus (HCV) (9).

87 Both Mephedrone and Crystal-Meth are potent central nervous system stimulants that  
88 also act peripherally. The potency and half-life of mephedrone depends on the route of  
89 administration, which varies from an onset of action of half an hour if it is taken orally,

90 with a mild high that can last from 3 to 5 hours, intranasal, with a potent high after 15  
91 minutes and lasting 1-2 hours, and intravenously, with an almost immediate and very  
92 potent high with a short duration of 30 to 45 minutes. The rapid onset of action and fast  
93 dissipation of effects leads to a compulsive pattern of use and the need to re-dosify  
94 almost every hour. Thus, high doses of mephedrone are used in sexual settings, with  
95 the consequent risk of overdosing, with altered behaviors and delusive thoughts.

96 Crystal-Meth is different, as its potency is similar both inhaled or injected intravenously.  
97 Either route of administration produces an immediate action of the drug, from 0 to 2  
98 minutes, with a very potent high. If it is injected intravenously, its duration can be quite  
99 long, almost 8 hours. Crystal-Meth produces an intense state of excitement, with  
100 euphoria, self confidence and sociability. Its withdrawal syndrome is very unpleasant;  
101 thus, its addictive potential is very high (10).

102 Both substances have been related to induced psychotic symptoms in diverse  
103 populations (11,12). However, the emergence of psychiatric symptoms in relation to  
104 slamsex is scarce, although there is evidence suggesting that mephedrone related to  
105 slamsex can induce psychotic symptoms and suicidal conducts (13). Crystal-Meth also  
106 has been related to high levels of addiction, psychotic symptoms and other psychiatric  
107 disorders in the context of chemsex (14).

108 Mental health issues have been poorly studied among persons who engage in chemsex  
109 and few data are available on the severity of drug-induced symptoms in HIV-positive  
110 MSM who practice slamsex.

111 The aim of our study was to compare the physical and psychological patterns of HIV-  
112 positive MSM who practiced slamsex with that of those who practiced chemsex without  
113 intravenous injection of drugs. We also explored the presence of psychopathological  
114 symptoms and symptoms of substance use disorders induced by drugs in the entire  
115 sample, and their correlates. Patients were selected from the U-SEX GESIDA study (7).

## 116 **Materials and Methods**

117 The present analysis is nested in the U-SEX GESIDA 9416 study, which was conducted  
118 in 22 HIV clinics in the Madrid area from June 2016 to March 2017. This study aimed to  
119 calculate the prevalence of chemsex and its associated factors in a sample of HIV-  
120 positive MSM in Spain. The inclusion criteria were; age  $\geq 18$  years, documented HIV  
121 infection and being an MSM. All the participants confirmed to be gay or bisexual.  
122 Infectious diseases physicians offered all the participants who met the inclusion criteria  
123 the opportunity to participate and gave them a card with a unique code and a link with  
124 access to an online survey. The survey was self-completed outside the hospital to ensure  
125 anonymity and confidentiality

126 The online survey was designed “ad hoc” by the research team to evaluate various  
127 domains: general sociodemographic data (age, occupational status, income, etc.), HIV  
128 infection status (year of diagnosis, treatment, adherence, etc.), sexual behaviours  
129 (condom use, receptive anal sex, fisting, etc.), diagnosis of STIs (including HCV),  
130 diagnosed psychiatric disorders and history of drug use. If the participant reported any  
131 kind of drug use, they were asked if these drugs were used before or during sexual  
132 encounters. Chemsex was defined as the intentional use of mephedrone or other  
133 cathinones, 3,4-methylenedioxy-N- methylamphetamine (MDMA), methamphetamine,  
134 amphetamines GHB/GBL, ketamine, or cocaine during sex. This analysis included  
135 participants who reported they had engaged in the practice of chemsex in the last 12  
136 months. The survey evaluated the type of drugs used, the context in which they were  
137 used, frequency, route of administration and other aspects referring to the practice of  
138 chemsex.

139 In order to collect psychiatric disorders data, the survey asked general questions  
140 regarding previously diagnosed psychiatric disorders and specific questions about “past”  
141 or “current” psychiatric disorders diagnosed by a mental health specialist. To conduct the

142 present analysis, we only considered self-reported current psychiatric disorders  
143 (diagnosed in the previous year), namely, depression, anxiety, personality, psychosis,  
144 and drug-related disorders. Because the survey was self-completed, we used the term  
145 “self-reported current psychiatric disorder”.

146 All participants were asked about dependence, withdrawal, and psychopathological  
147 symptoms related to the drugs used in chemsex sessions. To determine drug  
148 dependence symptoms, the survey asked about the following items: drugs used more  
149 often or in a higher quantity than planned, severe craving, not fulfilling obligations  
150 because of drug use, continuing drug use (even when this lead to physical or  
151 psychological discomfort), need to increase doses to obtain the same effect and less  
152 positive effects with same doses. The presence of 3 or more symptoms of drug  
153 dependence during the previous year were considered in the analysis.

154 In order to collect data on symptoms of withdrawal we asked about the following: severe  
155 craving, need to take medications/other drugs to compensate for discomfort, sleep  
156 disturbances (insomnia, hypersomnia), agitation, depressive thoughts/feelings, paranoid  
157 ideation, suicidal thoughts, suicide attempts, and the need to see a doctor for treatment  
158 of discomfort. The presence of 3 or more symptoms of withdrawal/abstinence during the  
159 last year were included in the analysis.

160 Finally, intoxication-related symptoms were assessed based on the following: sleep  
161 disturbances, “things done to me that I would not have consented to without being on  
162 drugs”, “more sexual risk practices that I don’t do when not on drugs”, unpleasant  
163 physical feelings under the effects of drugs, anxiety/panic attacks, irritability, and  
164 aggressiveness. Psychotic symptoms (mainly paranoid ideation), loss of consciousness,  
165 suicidal thoughts and suicide attempts were considered severe intoxication symptoms.

166 Details of the study procedures have been previously published (7). In the present study,  
167 to clarify the terminology applied when comparing participants, we used the following

168 terms: participants who engaged in slamsex when the SDU was intravenous and  
169 participants who engaged in chemsex when the drugs were not consumed intravenously.

170 The study protocol was approved by the Ethics Committee of Hospital Universitario  
171 Gregorio Marañón (HUIL 1606 96/16) and fulfilled the principles of the Declaration of  
172 Helsinki (2008).

173 Study data were collected and managed using the data capture tool Research Electronic  
174 Data Capture (REDCap) (15) hosted at “Asociación Ideas for Health”.

### 175 **Statistical Analysis**

176 Categorical variables were expressed as absolute and relative frequencies; continuous  
177 variables were expressed as median (IQR). Baseline characteristics were compared  
178 between participants who had engaged in slamsex and participants who had engage in  
179 chemsex during the previous year, using the chi-square test for categorical variables and  
180 the *t* test for continuous variables. Variables included in the comparisons were  
181 sociodemographic variables, self-reported current psychiatric disorders, physical and  
182 severe psychopathological symptoms related to drug use/abuse, sexual behaviors, and  
183 medical variables such as, time since HIV diagnosis, self-reported adherence to  
184 antiretroviral therapy or STDs diagnosis.

185 We conducted a logistic regression analysis to explore the association between slamsex  
186 and both symptoms of drug use disorders and severe psychopathological symptoms.  
187 We separately tested the association of slamsex with the presence of withdrawal (three  
188 or more withdrawal symptoms), dependence (three or more dependence-related  
189 symptoms), craving (strong need for consumption), paranoid ideation (during or after  
190 drug use), suicidal behaviors (suicidal ideation and suicide attempts during or after drug  
191 use) and loss of consciousness (during or after drug use).

192 The univariate analysis was conducted separately to evaluate the association between  
193 symptoms of drug-related disorders or severe psychopathological symptoms in the  
194 context of chemsex and, other drug-related variables or self-referred psychiatric current  
195 disorders. The dependent variables included withdrawal symptoms, severe craving,  
196 psychotic paranoid ideation, suicidal behaviours, and loss of consciousness.  
197 Independent variables were categorized as the presence/absence of self-referred active  
198 depression, self-referred active anxiety, polydrug use (three or more drugs used each  
199 time), cathinone use during the previous year, ketamine use during the previous year,  
200 GHB use during the previous year and inhaled Crystal-Meth use during the previous  
201 year. Thereafter, bivariate logistic regressions were conducted to explore associations  
202 regardless of the presence of slamsex. The presence/absence of slamsex was included  
203 in the bivariate regression as an independent variable. Independent variables were  
204 included in the bivariate analysis only if their p value was  $\leq .10$  in the univariate analysis.



## 205 RESULTS

### 206 1.1. Baseline characteristics and comparison between slamsex and chemsex

207 Of a total of 742 HIV-positive MSM who completed valid surveys in the U-Sex Study, the  
208 present analysis included all the participants who had engaged in chemsex during the  
209 previous year (N=216). Participants in our sample were mainly Spanish born (71.3%),  
210 middle aged (median=38; IQR: 33-44), and with a university education (63.9%). In  
211 addition, 70.8% had a salary of more than 1000 euros per month, and 42% were in a  
212 stable relationship. The median years with HIV diagnosis was 5 years (IQR: 2-11). More  
213 than 90% were receiving antiretroviral therapy and of these, 3% reported having taken  
214 less than 90% of doses (poor adherence). In our sample, thirty-four participants (15.7%)  
215 had practiced slamsex during the previous year. A comparison with HIV-positive MSM  
216 who did not engage in chemsex in our sample has been reported elsewhere (7).

217 When participants who had engaged in slamsex during the previous year were compared  
218 with those who engaged in chemsex, no differences were found regarding  
219 sociodemographic or medical variables. Compared with people who engaged in  
220 chemsex, people who had engaged in slamsex were less likely to have a stable partner  
221 (26.5 vs. 45.6%,  $P=.039$ ) and tended to have more frequently poor adherence to  
222 antiretroviral therapy (9.1 vs. 1.9%,  $P=.061$ ).

223 Comparisons based on the type of drug used in both groups of participants are shown  
224 in table 1. Participants who engaged in slamsex had higher rates of polydrug use (3 or  
225 more drugs per session), use of mephedrone and other cathinones, Crystal-Meth,  
226 ketamine, and intrarectal use of drugs. They also had higher rates of high-risk drug use  
227 behaviours, such as sharing needles or other drug paraphernalia. Symptoms related to  
228 drug abuse/dependence and severe psychopathological symptoms associated with the  
229 practice of slamsex and chemsex are shown in table 2. Regarding the kind of drugs

230 injected intravenously, the most frequent were mephedrone or other cathinones (94.1%),  
231 then ketamine (17.6%), Crystal-Meth (5.9%) and cocaine (5.9%).

232 Participants who engaged in slamsex showed a significantly higher percentage of sexual  
233 risk behaviours than those who practiced chemsex, as follows: fisting (73.5 vs. 38.5%,  
234  $P=.001$ ), fisting without a glove (67.7 vs. 28%,  $P=.001$ ), condom use in less than half of  
235 sexual relations (93.1 vs. 48.3%,  $P=.001$ ) and more than 20 sexual partners in the  
236 previous 6 months (70 vs. 39.6%,  $P=.002$ ). As for STDs, people who had engage in  
237 slamsex more often had gonorrhoea (43.4 vs. 61.8%,  $P=.049$ ), syphilis (62.6 vs. 88.2%,  
238  $P=.004$ ) and hepatitis C (18.1 vs. 61.8%,  $P=.000$ ) than people who engage in chemsex.

239 A self-reported current psychiatric disorder was more common among participants who  
240 engaged in slamsex than in those who engaged in chemsex, with the conditions reported  
241 as follows: depressive disorder (61.8 vs. 28%,  $P=.0001$ ), anxiety disorder (47.1 vs.  
242 23.1%,  $P=.004$ ), and drug use disorders (drug-dependence) (38.2 vs. 15.4%,  $P=.002$ ).

## 243 **1.2. Correlates of severe physical and psychopathological symptoms related to** 244 **drug use**

245 The simple logistic regression conducted to explore the association between slamsex  
246 and the presence of symptoms of drug use disorders or severe psychopathological  
247 symptoms related to drug use revealed a significant association. Compared with  
248 participants who had engaged in chemsex, those who engaged in slamsex were five  
249 times more likely to had experienced withdrawal symptoms (OR: 4.97 [2.13-11.57],  
250  $P=.0001$ ) and seven times more likely to had experienced intense craving (OR: 7.03  
251 [3.21-15.43],  $P=.0001$ ). Moreover, during or after drug use they were three times more  
252 likely to experience suicidal ideation (OR: 3.48 [1.48-8.10],  $P=.004$ ), psychotic paranoid  
253 ideation (OR: 3.38 [1.41-8.07],  $P=.006$ ) and loss of consciousness (OR: 2.88 [1.22-6.79],  
254  $P=.016$ ).

255 Figure 1 shows the associations between other drug-related variables or current self-  
256 reported psychiatric diagnosis and, the presence of symptoms of drug related disorders  
257 and severe physical and psychopathological symptoms related to drug use (suicidal  
258 ideation, paranoid ideation and loss of consciousness), regardless of the presence of  
259 slamsex. Patients who self-reported current depressive disorders more frequently had  
260 withdrawal symptoms. Active anxiety, cathinone use and GHB use were also associated  
261 with the presence of withdrawal symptoms. Moreover, participants who inhaled Crystal  
262 Meth more frequently experienced severe craving, and, those who inhaled Crystal -Meth  
263 or used multiple drugs were significantly more likely to present symptoms of drug-  
264 dependence. Suicidal ideation was only associated with self-reported depression and  
265 anxiety disorders; paranoid ideation was associated with anxiety disorders, polydrug  
266 use, and inhaled Crystal-Meth. Finally, loss of consciousness was related to polydrug  
267 use, GHB use, ketamine use, and inhaled Crystal-Meth (Fig 1).

268 **DISCUSSION**

269 The present study provides novel findings regarding the slamsex phenomenon in a  
270 sample of HIV-infected MSM who engage in SDU. In our sample, 216 subjects engaged  
271 in chemsex. From this sub-sample, 34 subjects (15.7%) engaged in slamsex during the  
272 previous year. Compared with those who did not inject drugs, people who had engaged  
273 in slamsex more frequently reported high risk sexual behaviours, had more frequently  
274 been diagnosed with an STD, and had more frequently reported a current diagnosis of a  
275 psychiatric disorder. In addition, compared with participants who engaged in chemsex,  
276 participants who had engaged in slamsex in the previous year had more drug-related  
277 adverse effects such as symptoms of withdrawal and dependence or severe physical  
278 and psychopathological symptoms such as psychotic paranoid ideation, suicidal  
279 behaviours and loss of consciousness.

280 There is some research regarding the prevalence of slamsex and associated high risk  
281 behaviours among MSM. The Unlinked and Anonymous Monitoring (UAM) survey of  
282 people who inject drugs reported that since 2000, the proportion of MSM who inject drugs  
283 has increased significantly (4.4% in 2000/2001 to 8.1% in 2014/2015,  $P<0.001$ ). They  
284 also reported the presence of higher-risk behaviours associated with injecting such as  
285 needle/syringe sharing (15% vs 11%,  $P=0.07$ ) and having more than 10 sexual partners  
286 among MSM who injected drugs than among MSM who did not inject drugs (25% vs.  
287 4.0%,  $P<0.001$ ) (6). A recent study from an Australian cohort of MSM reported a high life  
288 prevalence of injecting drugs (10.3%); the prevalence of injection in the previous six  
289 months was 4.7% in this population. The authors reported that injecting drugs was  
290 associated with high-risk sexual practices such as having multiple sex partners, group  
291 sex with casual partners and condomless anal intercourse with casual partners (16). In  
292 the case of HIV-positive MSM, the ASTRA study (17) reported that of 2248 HIV-positive  
293 sexually active MSM recruited in 2011-2012, 1138 (51%) had used recreational drugs in  
294 the previous three months and the prevalence of injection drug use was 3% ( $n=68$ ). The

295 Positive Voices Study reported that 105 of 392 sexually active HIV-positive MSM (29%)  
296 had engaged in chemsex during the previous year. Among these, the prevalence of  
297 slamsex was 33.3% (18). The prevalence of slamsex in our study could be directly  
298 compared with the findings of the Positive Voice study only because of methodological  
299 and sample similarities. While the rate of chemsex reported is similar to the rate we report  
300 previously (29%) in the U-Sex Study (7), the authors found higher rates of slamsex  
301 among their participants (33.3 vs. 15.6%). Therefore, we think that regional differences  
302 in slamsex frequencies should be explored in future studies. Otherwise, the most  
303 dangerous profiles of drug use and sexual practices found in the above mentioned  
304 studies in samples of MSM who injected drugs are congruent with the higher rates of  
305 polydrug use, rectal use of drugs, sharing drug paraphernalia, sexual risk behaviours  
306 and STDs found among those who engaged in slamsex in the present study.

307 We found that the most common intravenous drugs used during slamsex were  
308 mephedrone or other synthetic cathinones (94.1%), followed by ketamine (17.6%),  
309 Crystal-Meth (5.9%) and cocaine (5.9%). To our knowledge, only a few reports discuss  
310 the type of drug used by HIV-positive MSM during slamsex. The UAM Survey found high  
311 frequencies of injected mephedrone and ketamine among MSM who injected drugs (12%  
312 and 9.3%, respectively) (6). Furthermore, data from Antidote, a specialist drug clinic  
313 aimed at the gay community in London, UK, showed that 75% of patients used  
314 mephedrone in the chemsex context and of these, 80% injected the drug. Of this 80%,  
315 75% were HIV-positive and 70% reported sharing needles (19). The recently published  
316 FLUX study, a survey performed in Australian gay and bisexual men, found that of the  
317 1995 respondents, 206 (10.3%) reported having injected drugs and 93 (4.7%) had  
318 injected recently, most commonly Crystal-Meth (91.4%) and speed (9.7%), as well as  
319 cocaine and ketamine, albeit in low percentages (16). Together with the data reported  
320 above, our results suggest that the type of drugs injected in the chemsex context are  
321 similar but that there may be regional differences. Drug use in the context of chemsex

322 and slamsex may be changing continuously, as a result of travel by MSM to different  
323 countries for leisure, socialization and clubbing and to expand sexual experiences.

324 The participants in our sample who engaged in slamsex presented higher rates of drug  
325 use related adverse symptoms than those who engaged in chemsex . Severe craving  
326 and other withdrawal symptoms were more frequent, as was loss of consciousness. The  
327 participants also showed higher rates of severe psychopathological symptoms such as  
328 paranoid ideation and suicidal ideation or attempts.

329 Mephedrone and other synthetic cathinones were the main drugs “slammed” in our  
330 sample, both as stimulants and as sexual enhancers. The intravenous use of  
331 mephedrone has been related to compulsive use, intense craving, bingeing behaviours  
332 and withdrawal symptoms (20). Diverse psychotic symptoms, mainly paranoid ideation,  
333 have also been reported for mephedrone, especially if it is consumed intravenously  
334 (21,22). In the context of slamming, one case in Spain has been reported in a young  
335 HIV-positive man, who experienced persistent mephedrone-induced paranoid delusions,  
336 intense anxiety and visual and kinaesthetic hallucinations (13).

337 Ketamine, cocaine and Crystal-Meth were also consumed in slamsex in our sample,  
338 albeit at a lower frequency than cathinones. Injected Crystal-Meth has the potential to  
339 induce psychotic symptoms and has been related to drug-related disorders such as  
340 abuse or dependence. In slamsex, its potent stimulant effect has been related to high-  
341 risk sexual behaviors, with an increased risk of infection by HIV or other STDs (10).

342 Traditionally, more frequent drug dependence and psychiatric symptoms have been  
343 described during intoxication by or abstinence from some drugs if they are used  
344 intravenously. Our novel data together with the few previously published findings support  
345 the addictive potential and severe psychopathological consequences of drugs injected  
346 in the chemsex context.

347 Other variables related to drug use might modulate the severity of physical and  
348 psychopathological symptoms induced by drugs in the context of SDU. Regardless of  
349 the presence of slamsex, use of inhaled Crystal-Meth, GHB use (oral), ketamine use,  
350 polydrug use, and self-reported depression and anxiety disorders were associated with  
351 more severe physical and psychopathological symptoms related to drug use in our sample  
352 of HIV-infected MSM who engaged in chemsex. In particular, inhaled Crystal-Meth was  
353 associated with higher rates of drug dependence and withdrawal symptoms. Moreover,  
354 participants who used inhaled Crystal-Meth more frequently had psychotic paranoid  
355 ideation and loss of consciousness experienced during or after drug use.

356 In addition to intravenous injection, inhaled Crystal-Meth has been used by MSM at sex  
357 parties for quite some time. The potent disinhibiting effect of this drug has been related  
358 to high-risk sexual behaviours and an increase in the frequency of STIs, particularly HIV  
359 infection(23). Furthermore, drug-dependence has been described in MSM who inject  
360 Crystal-Meth and who are also more prone to comorbid psychiatric disorders and suicidal  
361 behaviour (10). Induced psychotic symptoms have been reported in other populations  
362 (24), although other psychopathological symptoms induced by inhaled Crystal-Meth in  
363 chemsex are scarcely known.

364 Loss of consciousness was also associated with GHB and ketamine use in our sample.  
365 In addition, participants who used more than 3 drugs (polydrug use) had higher rates of  
366 loss of consciousness and paranoid ideation and tended to show more pronounced  
367 symptoms of drug dependence. This observation must be taken into account, because  
368 GHB is usually consumed in combination with other drugs. GHB is frequently related to  
369 loss of consciousness, owing to its depressive effect on the central nervous system and  
370 because it accumulates over time (2). In addition, the combination of GHB with  
371 mephedrone, Crystal-Meth and alcohol increases the risk of drug-drug interactions and  
372 overdose, with loss of consciousness and respiratory depression (2). Although ketamine  
373 is a dissociative anaesthetic that acts as a stimulant at low doses, with higher doses,

374 polydrug use and intravenous injection, it can increase the risk of loss of consciousness  
375 and cardiovascular toxicity in recreational settings (25) such as chemsex, as reported in  
376 the present study. Our results are congruent with the effects of these drugs (Crystal-  
377 Meth, GHB, mephedrone) previously known. In our opinion this results help to  
378 understand the role of each type of drug and route of administration in the severe  
379 consequences that may be experienced by some people engaged in chemsex.

380 Finally, self-reported current diagnosed psychiatric disorders may have played a  
381 significant role among the chemsex users in our sample. Regardless of the presence of  
382 slamsex, those participants who self-reported current depression more frequently  
383 experienced withdrawal symptoms and suicidal ideation during or after drug use.  
384 Participants with current anxiety disorders also reported higher rates of withdrawal  
385 symptoms, suicidal ideation and paranoid ideation in this context. Moreover, participants  
386 who engaged in slamsex were more likely to have anxiety and depression.

387 While there is evidence that HIV-positive MSM frequently present mental health  
388 problems such as depression, anxiety, suicidal behaviour and drug-related disorders,  
389 there is little research on the effect of these variables on the health consequences of  
390 chemsex practice in this population. The initial published data suggest that HIV-positive  
391 MSM who practice chemsex had a higher frequency of depression and anxiety disorders  
392 than HIV-positive MSM who did not (8) . Other studies on chemsex did not report  
393 psychopathological diagnoses, but rather analysed emotional distress and psychological  
394 discomfort associated with chemsex. It has been suggested that some vulnerability  
395 factors related to problematic chemsex may be the so-called “minority stressors” such  
396 as negative internalised homophobia, fear of disapproval, experience of discrimination  
397 and a negative self-concept (26).

398 Therefore, according to the syndemic approach, mental health disorders in HIV-infected  
399 MSM appear to increase vulnerability to develop drug abuse disorders and sexual risk



400 behaviours, acting in a syndemic framework by which disease outcomes and the social  
401 conditions that contribute to their proliferation sustain each other (26). Consequently, a  
402 multidisciplinary approach is necessary to address the situation appropriately. Although  
403 our data do not enable us to speculate on causality, in our opinion, the presence of  
404 depression and anxiety among HIV-positive MSM who engage in slamsex could indicate  
405 vulnerability to develop more severe physical and psychopathological consequences.  
406 Moreover, people with previous mental health problems may be more likely to start  
407 chemsex and become involved in high-risk practices such as slamsex. We also found  
408 that suicidal behaviour in slamsex users was associated with reported current depression  
409 and anxiety. These findings can be interpreted in two ways: first, intravenous use of  
410 particular drugs such as synthetic cathinones or other stimulants can trigger suicidal  
411 ideation in vulnerable subjects; second, subjects with current depression or anxiety may  
412 be more prone to use drugs intravenously. The presence of psychopathology along with  
413 intravenous drug use can lead to suicidal ideation and suicide attempts, as well as  
414 psychotic symptoms. More research is needed to know the causality and interaction  
415 between these variables in people who had engaged in chemsex and slamsex.

416 We think it is important to evaluate the mental health of HIV-positive MSM alongside  
417 other routine evaluations conducted in HIV clinics. The detection of psychiatric disorders  
418 and their appropriate treatment can prevent other mental and physical consequences of  
419 drug use in this population. In addition, approaches such as reducing the harm caused  
420 by drug-use can be more effective in people who are not willing to stop drug use in  
421 relation to sex. It is necessary to create multidisciplinary approaches in the prevention  
422 and treatment of the consequences of chemsex.

423 To our knowledge we provide for the first time a detailed analysis about drug-related and  
424 severe psychopathological symptoms experienced in people engaged in slamsex . We  
425 also report data that that increases knowledge about the role of different types of drugs,

426 routes of consumption and psychiatric disorders in drug addiction and psychopathological  
427 consequences of chemsex practices among HIV-positive MSM.

428 Our study is subject to the limitations inherent to cross-sectional survey-based studies,  
429 especially response bias. Although we used limited time periods in questions that  
430 depended on memory, recall bias could distort the accuracy of the results. Furthermore,  
431 we were unable to confirm causality because of the cross-sectional nature of the study.  
432 Further longitudinal studies should be performed to compare our results in order to be  
433 able to confirm that slamsex can be related to previous psychopathology and may have  
434 drug-related and severe psychopathological symptoms in HIV-positive MSM. Another  
435 limitation is that the psychiatric diagnosis or drug-related symptoms were self-reported.  
436 Although the questionnaire specified previous or current diagnosed psychiatric disorders  
437 diagnosed by a psychiatrist or other mental health specialist, the survey did not have  
438 standardized diagnostic scales. The exploratory nature of this study led to the inclusion  
439 of a large number of variables and the “ad hoc” design of the survey, using sometimes  
440 particular slang of the phenomenon in Spain. However, questions about substance  
441 dependence and withdrawal were elaborated following DSM-IV-rev criteria. Future  
442 studies should include standardized screening scales for mental disorders, substance  
443 use disorders, presence of craving or specific psychopathological symptomatology to  
444 allow a detailed measurement of specific variables.

445 Our results suggest that slamsex is relatively common, although it does not appear to be  
446 generalized among HIV-positive MSM who practice chemsex in Spain. People who  
447 engage in slamsex appear to have high-risk practices associated with both drug use  
448 and sexual behaviour in comparison with people who engage in chemsex. Also, people  
449 who engage in slamsex, are more likely to experience drug-related induced  
450 psychopathological symptoms and symptoms of drug dependence. Moreover, the non-  
451 injected use of other substance such as Crystal-Meth, GHB/GBL or ketamine and the

452 presence of psychiatric disorders might also contribute to severe consequences for the  
453 physical and mental health of persons who engage in chemsex.

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**Table 1. Comparisons between Participants who practiced Chemsex and Participants who practiced Chemsex in terms of type of drug used in the previous year.**

	<b>Entire sample (N=216)</b>	<b>Chemsex (n=182)</b>	<b>Slamsex (n=34)</b>	<b>P value</b>
<b>Polydrug No. (%)</b>	98(45.4)	70(38.5)	28(82.4)	.000
<b>Poppers No. (%)</b>	170 (78.7)	140 (76.9)	30 (88.2)	.139
<b>Mephedrone or other cathinones No. (%)</b>	150 (69.4)	116 (63.7)	34 (100)	.000
<b>Cocaine No. (%)</b>	171 (79.1)	146 (80.2)	25 (73.5)	.378
<b>MDMA No. (%)</b>	105 (48.6)	87 (47.8)	18 (52.9)	.582
<b>GHB No. (%)</b>	155 (71.7)	128 (70.3)	27 (79.4)	.280
<b>Crystal methamphetamine No. (%)</b>	64 (29.6)	47 (25.8)	17 (50)	.005
<b>Ketamine No. (%)</b>	78 (36.1)	57 (31.3)	21 (61.8)	.001
<b>Rectal use of drugs No. (%)</b>	44(20.4)	24(13.2)	20(58.8)	.000
<b>High-risk drug use No. (%)</b>	168 (77.8)	135 (74.2)	33 (97.1)	.003

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**Table 2. Self-reported psychiatric symptoms during or after chemsex and slamsex.**

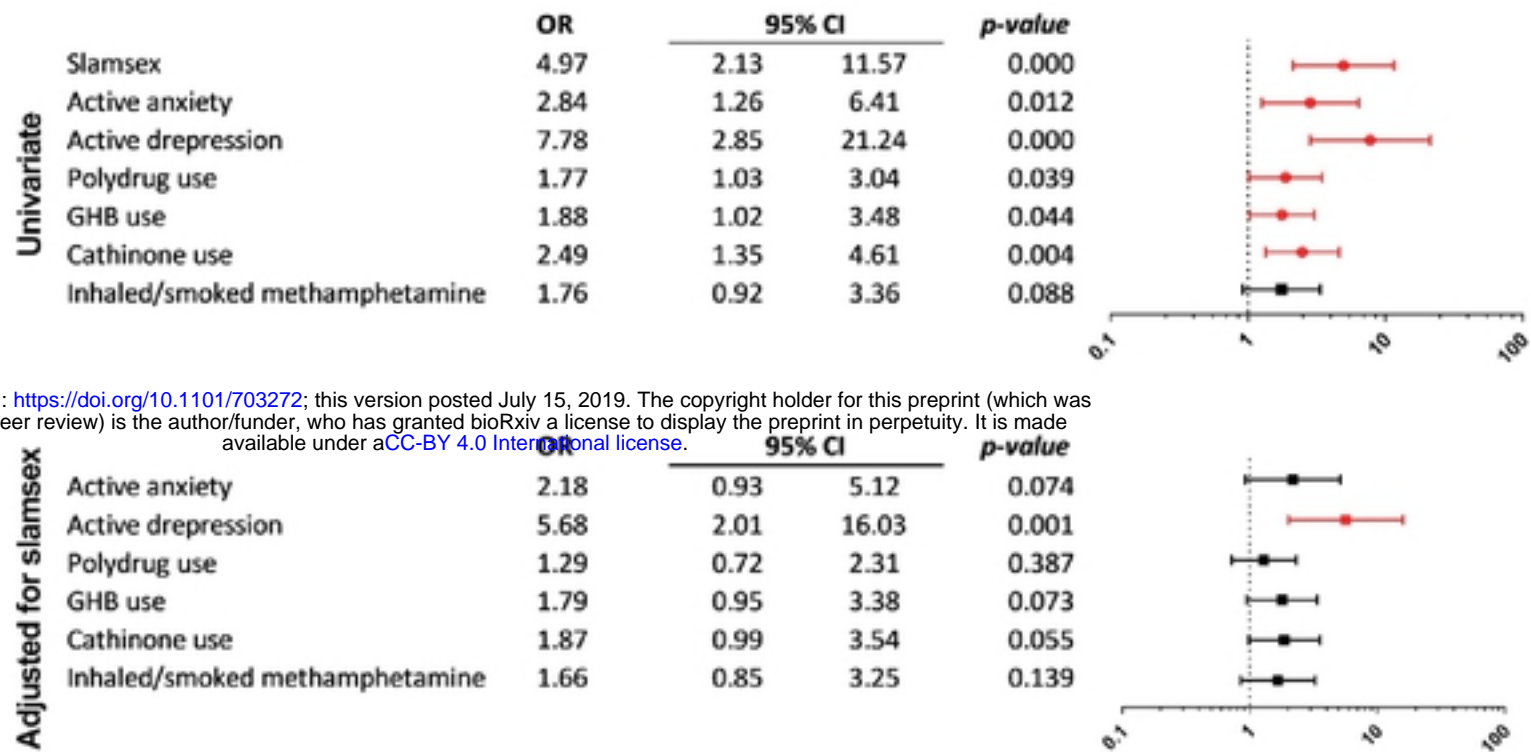
	<b>Entire sample (N=216)</b>	<b>Chemsex (n=182)</b>	<b>Slamsex (n=34)</b>	<b>P value</b>
<b>3 or more dependence symptoms No. (%)</b>	60(27.8)	40(22)	20(58.8)	.000
<b>3 or more withdrawal symptoms No. (%)</b>	98(45.8)	72 (39.6)	26 (76.5)	.000
<b>Intense craving. No. (%)</b>	55 (25.5)	34 (18.5)	21 (61.8)	.000
<b>Interference with work, social or family life No. (%)</b>	68 (31.5)	46 (25.3)	22 (64.7)	.000
<b>Paranoid ideation No. (%)</b>	30 (15.3)	20 (11)	10 (29.4)	.004
<b>Suicidal ideation No. (%)</b>	33 (15.3)	22 (12.1)	11 (32.4)	.003
<b>Suicide attempt No. (%)</b>	30 (13.8)	19 (10.4)	11 (32.4)	.001
<b>Loss of consciousness. No. (%)</b>	33 (15.3)	23 (12.6)	10 (29.4)	.013

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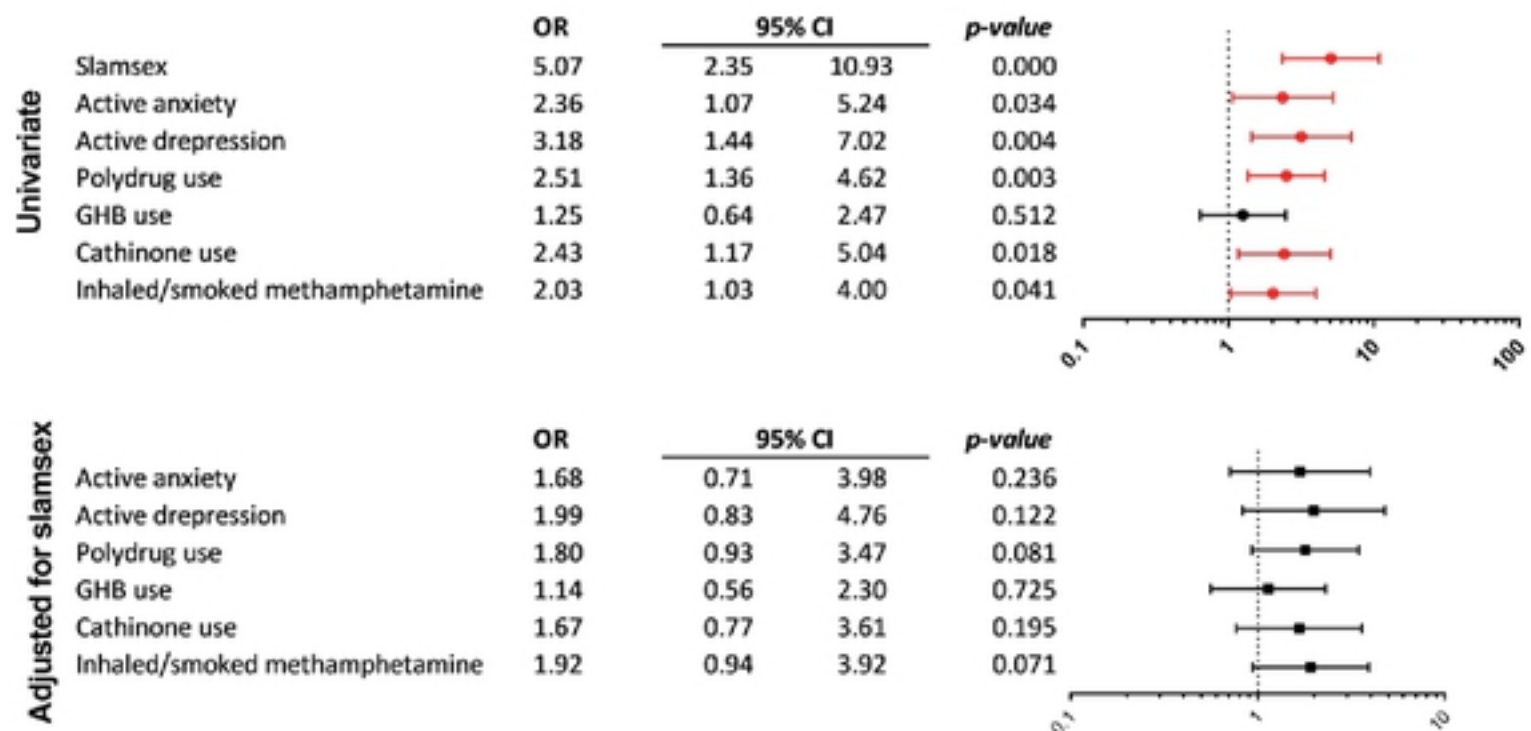
Figures

**3 or more withdrawal symptoms**

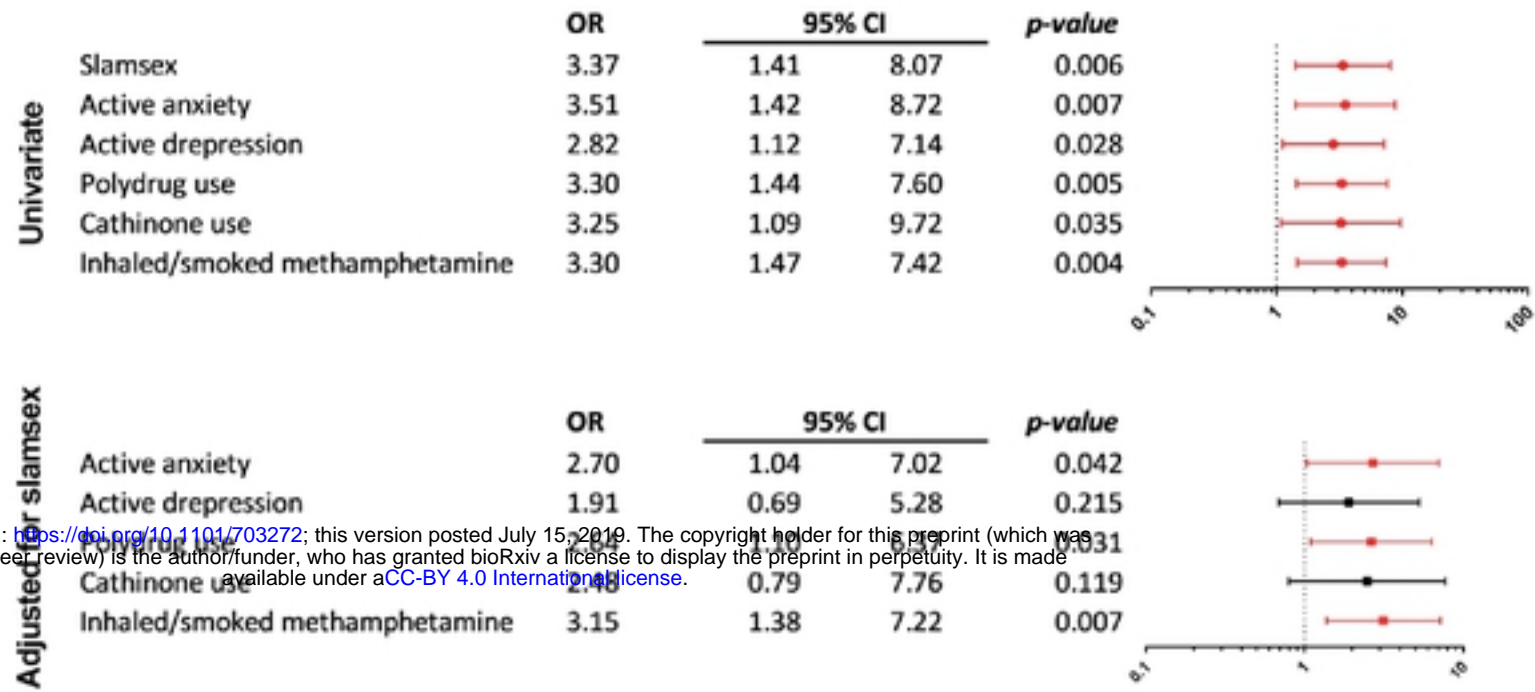


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**3 or more drug dependence symptoms**

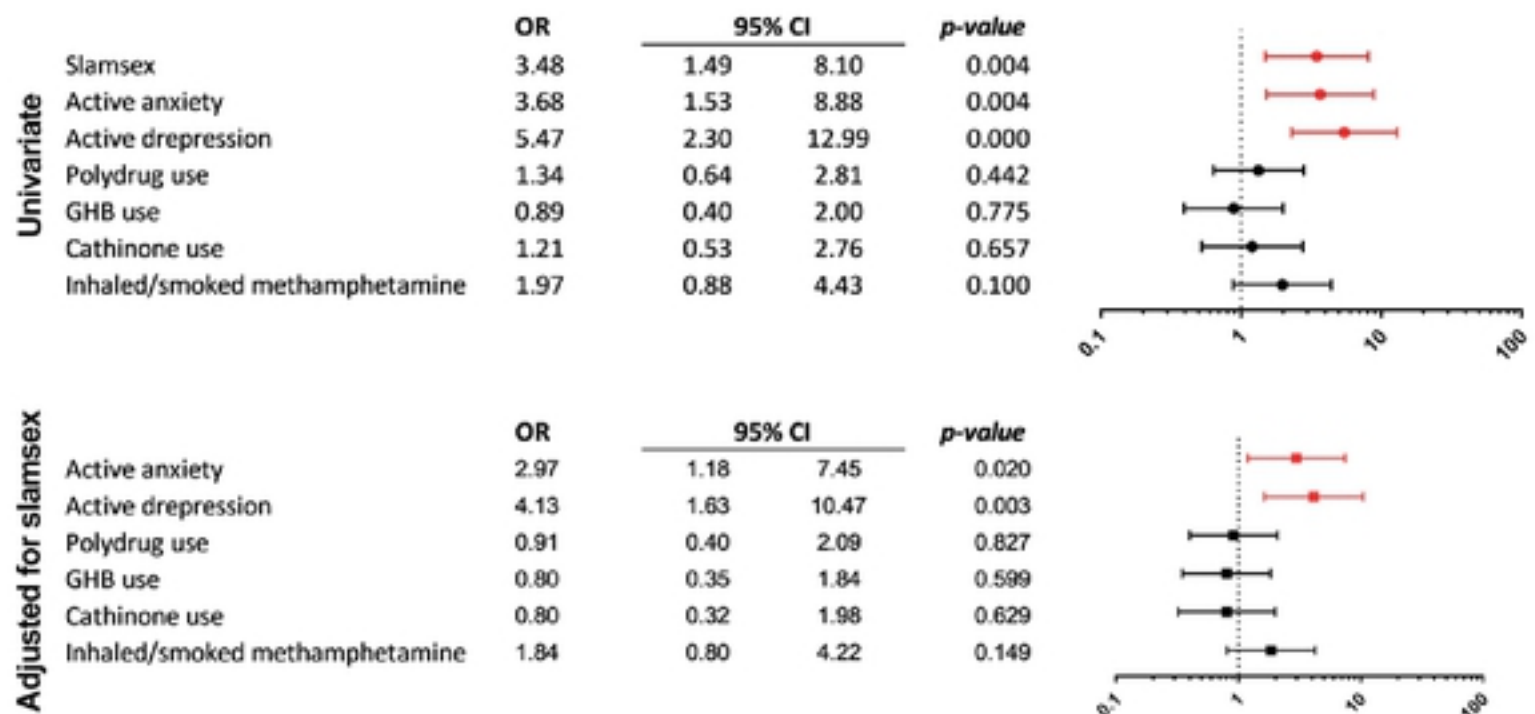


## Psychotic symptoms



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## Suicidal ideation or attempt



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