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Commentary

Digital chemsex support and care: The potential of just-in-time adaptive interventions

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ABSTRACT

Chemsex among gay, bisexual and other men who have sex with men (GBMSM) has received increasing attention as a public health concern in recent years. Chemsex can affect a variety of aspects of the lives of GBMSM and contribute to physical, social and emotional health burden. Starting from a continuum perspective of chemsex, rather than a binary view of problematic vs. non-problematic use, we argue that men engaging in chemsex at different points in their chemsex journey may benefit from tailored and personalized support to cope with the various and evolving challenges and concerns that may be related to their chemsex behavior. To date, interactive digital communication technologies are not much used to provide support and care for GBMSM engaging in chemsex, neither for community-based support and care nor by health services. This suggests potential for missed opportunities, as GBMSM are generally avid users of these technologies for social connections and hookups, including in relation to chemsex. Recent research has provided emerging evidence of the potential effects of so-called just in time adaptive interventions (JITAI) to provide effective support and care for a variety of health issues. JITAI hold much promise for the provision of appropriate, tailored support and care for GBMSM at different points in the chemsex journey. Co-designing JITAI with potential users and other stakeholders (co-design) is key to success. At the Institute for Tropical Medicine, in Antwerp (Belgium), we initiated the Chemified project to develop an innovative digital chemsex support and care tool for GBMSM. This project illustrates how current understanding of chemsex as a journey can be integrated with a JITAI approach and make use of co-design principles to advance the available support and care for GBMSM engaging in chemsex.

Background

Chemsex, 'the use of drugs before or during planned sexual activity to sustain, enhance, disinhibit or facilitate the experience' (HM Government, 2017) has been described as a public health issue in recent years (Kirby & Thornber-Dunwell, 2013; Stuart, 2013). The term chemsex is often associated with the use of methamphetamines, gamma-hydroxybutyrate (GHB) / gamma-butyrolactone (GBL) and mephedrone (Bourne et al., 2015), even though differences between regions (Schmidt et al., 2016) and user samples (Edmundson et al., 2018) have been observed. Stuart (2016) differentiates chemsex from traditional 'sex and drug issues', not only in the specificity of the used drugs (i.e., methamphetamine, mephedrone, GHB/GBL), but also in its context (e.g. chemsex events that may last for several days), and its association with previously unseen harm among a specific group of gay, bisexual and other men who have sex with men (GBMSM) using (digital) technologies (Stuart, 2016).

Despite the long recorded history of sex and drug use among GBMSM, including crystal methamphetamine (Leonard et al., 2008), the negative health impact of chemsex increased dramatically, suggesting mutually reinforcing factors (Stuart, 2016). Indeed, along with drug related health harms, chemsex has a strong association with high-risk sexual behavior, such as the ability to have prolonged sexual sessions, having multiple sex partners over a short period of time, condomless anal intercourse and higher risk sexual practices (e.g. fisting) (Glynn et al., 2018; Maxwell, Shahmanesh & Gafos, 2019). This results in an increased risk of STI and HIV transmission (Kenyon et al., 2018; Kohli et al., 2019; Pufall et al., 2018) as well as other bloodborne viruses such as hepatitis C (Maxwell et al., 2019).

Drugs associated with chemsex can also impact psychological aspects of users' lives, such as anxiety and depression (Prestage et al., 2018). Several studies report substantial proportions of GBMSM who

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engage in chemsex (Drückler, van Rooijen & de Vries, 2018; Hegazi et al., 2017; Maxwell et al., 2019; Sewell et al., 2017), yet little is known about potential underlying issues, such as the role of mental health problems and related coping strategies (Bourne & Weatherburn, 2017), or broader social issues and patterns related to stigmatization, marginalization, (sexual) subcultures and loneliness.

From the outset, in the early 1990's, GBMSM have used online forums, social networking sites, dating websites, and hookup apps in their search for sexual partners. According to an early meta-analysis, by the mid-2000s already 35%−45% of GBMSM used the Internet to search for sexual partners (Liau, Millett & Marks, 2006), and this figure rose to 85% in 2011 (Rosser et al., 2011). More recently, mobile applications, that make use of real-time geolocation, enable instantaneous hookups even more efficiently (European Centre for Disease Prevention & Control, 2015; Grov et al., 2014). Indeed, interactive online communication tools, such as dating websites and hookup-apps, are often used by GBMSM, especially those with less strong offline social connections, in search for sexual relations (Bien et al., 2015; European Centre for Disease Prevention & Control, 2015; Grosskopf, LeVasseur & Glaser, 2014; Lehmiller & Ioerger, 2014). In the context of chemsex, hookup applications, as well as their web-based pendants, contribute to the facilitation and promotion of sexualized drug use, by enabling their users to stay informed about gatherings (chemsex parties), to communicate their drug- and sex-related preferences, and share information about where to buy drugs (Bourne et al., 2014; European Monitoring Centre for Drugs & Drug Addiction, 2016; Knoops et al., 2015).

Support tools to prevent and mitigate problematic chemsex are much needed, but their availability remains limited. We argue that digital approaches to support GBMSM engaging in chemsex offer promising but as yet underexplored approaches, and therefore call for digital interventions to support people engaging in chemsex. GBMSM engaging in chemsex make extensive use of online resources, and digital interventions likely offer an appropriate approach to reach these men. Moreover, digital interventions allow leveraging the use of online resources, often seen as part of the chemsex problem, as part of the solution to enable access to chemsex support and care. Digital interventions are most likely to be effective if they benefit in particular current insights in effective intervention strategies, and below we present the development of such a digital intervention. Intervention success will also critically benefit from the involvement of people who engage in chemsex throughout the intervention development and implementation process, that is, from a co-design approach (Greenhalgh et al., 2019; O'Brien et al., 2016).

Chemsex and potential problems

In parallel with the diversity of chemsex definitions, views and understandings of chemsex engagement tend to be polarized, as either problematic or non-problematic/recreational (Troya et al., 2019). The limitation of this binary perspective is that it implies that (only) problematic use requires support (and possibly care), while non-problematic or recreational use is normalized. This binary perspective hence obscures the potential for adequate and tailored support for people in the (earlier) stages of what has been described as the journey toward problematic chemsex (Platteau et al., 2019). The continuum perspective of chemsex, as presented in the chemsex journey model, defines problematic chemsex as subjectively experiencing one or more unwanted outcomes of a dynamic, contextualized process that consists of multiple stages. This journey approach suggests opportunities to support people to prevent or reduce their perceived problems at earlier stages of drug use associated with chemsex, rather than wait until people's use may evolve and become problematic from their individual perspective.

The journey toward problematic chemsex-model is considered a starting point to build evidence, and generate research questions. The authors call for scientific evidence and debate to increase understanding of mechanisms underlying the chemsex journey, in order to further develop the model to guide for effective care and support for people who engage in chemsex and want to adapt their behavior (Platteau et al., 2019).

The chemsex journey model suggests that, prior to the initiating drug use associated with chemsex, some GBMSM may experience a disposition of vulnerability, arising from the accumulation of intersecting adverse experiences that are a reflection of an unsupportive, marginalized psychosocial environment. These include synergistic epidemics (syndemics; Singer & Clair, 2003) of HIV risk, childhood (sexual) abuse (Felitti et al., 1998), stigmatization as a member of a sexual minority population (Pollard, Nadarzynski & Llewellyn, 2018), and mental health problems (Halkitis & Singer, 2018; Tomkins, George & Kliner, 2019). This psychosocial vulnerability is a likely precursor of the initiation of chemsex, at least for some GBMSM, and may shape drug users' chemsex journey (Platteau et al., 2019). More specifically, according to the first stage of the chemsex journey model, psychosocial vulnerability may induce or compound feelings of loneliness and emptiness (Platteau et al., 2019).

Alternatively, GBMSM may start using drugs for more hedonistic reasons, and may be less likely to evolve towards the later stages of 'problematic chemsex', that is severe (mental) health impact, or even death (Platteau et al., 2019). Previous research has found that GBMSM report various motivations why they start combining sex and drugs. Weatherburn and Weatherburn (2017) interviewed 30 gay men, and found eight distinct motivations that could be clustered into two groups of reasons: drug use as providing the capability for the sex that is wanted, and drug use as enhancing the qualities valued in sex. Other reasons, such as pleasure, a sense of belonging and coping with everyday problems, may also facilitate substance use (Bourne & Weatherburn, 2017; Milhet et al., 2019). Hedonistic motivations and values to start drug use are currently under-emphasized in the journey model, mostly because their implications for problematic chemsex, and care and support, are not clear.

In the second stage, a search for connection arises, which may include the use of social media to connect to others, in particular potential sex partners, as is highly prevalent among GBMSM (European Centre for Disease Prevention & Control, 2015; Holloway et al., 2014). The use of hookup apps and other digital social media typically enables men to swiftly establish sexual connections (Choi, Wong & Fong, 2017; Holloway et al., 2014), reflecting the third stage of the chemsex journey. Alcohol and other substances are commonly used among many GBMSM (Parry, Curtis & Chadwick, 2019), and through hookups some men rapidly establish a chemsex connection; that is, they become connected to a network of other GBMSM who use drugs to enhance their sexual experiences, constituting the fourth stage of the chemsex journey. Some men may subsequently come to experience challenges in self-managing their engagement in chemsex and its potential impacts, and may increasingly experience problematic chemsex use. In this fifth stage of the chemsex journey, chemsex may adversely affect mens' health and personal, professional, and relational functioning. This may ultimately result in the sixth stage of the chemsex journey, where chemsex has a severe impact on peoples' health and wellbeing (Platteau et al., 2019).

The chemsex journey model is distinct from typical conceptualizations of chemsex as either (always) problematic or (generally) unproblematic, in that it conceptualizes chemsex engagement as a dynamic process, with potential but not inevitable problematic outcomes for some but not all people engaging in chemsex. Also, the journey is not a deterministic depiction, but "represents a common pattern of events, rather than an inevitable progression"(Platteau et al., 2019, p. 51). To date little is however known about factors and mechanisms that protect people from transitioning to the later ('problematic') stages of chemsex, or regarding when and how to provide what intervention strategies to prevent or mitigate problematic engagement in chemsex.

Digital support for GBMSM engaging in chemsex

Examples of peer-based approaches to support people experiencing problematic substance use have been documented (Bakker & Knoops, 2018; Moncrieff, 2018; Stardust et al., 2018; Stuart, 2016). In healthcare settings, support and care for people engaging in chemsex is however scarce (Platteau et al., 2019; Stevens & Forrest, 2018). People engaging in chemsex seem to fall between the cracks of 'traditional' drug services on the one hand and sexual health care on the other (McCall et al., 2015), with none of these disciplines providing proven support programs (Graf et al., 2018). Furthermore, the absence of theory- and evidence based support and care programs, either offered in community or healthcare settings, is particularly concerning. In addition, people who engage in chemsex do not always recognize or acknowledge the consequences of their use or may find it difficult to (imagine to) change, reduce or stop their use of drugs associated with chemsex. This touches on the question of how 'problematic' chemsex is defined. The authors consider the use of drugs associated with chemsex problematic when the person experiences negative impact or consequences of his behavior. The 'problematic' character is a hence subjective interpretation of one's own behavior. Yet a lack of consensus regarding what constitutes problematic chemsex, a sometimes limited acknowledgement of the negative consequences of one's own use, and a subsequently limited motivation to change are critical challenges for the provision of easily accessible, appropriate and timely support for people engaging in chemsex. At the same time, there is an untapped potential for support of people in earlier stages of engaging in chemsex who may assess their use as (potentially) problematic, and can be highly motivated to change their behavior.

In the current information technology era, professional support is increasingly offered at a distance using interactive communication tools (Weisel et al., 2019), and computerized through the use of expert systems. Similarly, the advent of interactive digital communication tools can enable the delivery of peer group support in other ways than face-to-face gatherings. Offering support through digitizing established interventions as well as developing novel e-support approaches can facilitate user participation by not requiring any travel to a service location, thereby reducing cost and time (Weisel et al., 2019). Digital interventions also meet demand for a safe space that allows participants in substance user support services to safeguard their anonymity (Weisel et al., 2019). Shame and the fear of being recognized and judged are recognized barriers to accessing substance use support (McCall et al., 2015; Tan et al., 2018; Tomkins et al., 2018).

The use of interactive technology holds much potential to better reach and engage GBMSM engaging in chemsex to prevent or mitigate health and social problems. Importantly, many GBMSM who engage in chemsex already use digital technology to connect to others, in particular potential sex partners and their broader sociosexual networks (Bourne et al., 2014; European Centre for Disease Prevention & Control, 2015; European Monitoring Centre for Drugs & Drug Addiction, 2016; Knoops et al., 2015). Yet, to the best of our knowledge, the use of interactive communication technology is not currently an established part of the portfolio of chemsex support services, neither from a community nor healthcare perspective. Nevertheless, information about and referral to sexual and drug health services can be integrated in informative or prevention websites. The use of smartphone applications makes navigating this information and referral even easier, as geolocation technology can be used. Smartphones are already used for the delivery of sexual health promotion messages (Jenkins Hall et al., 2017), as well as in relation to sexualized drug use, such as information about drug testing, in a recently developed mobile app ('TripApp', www.tripapp.org). Smartphone applications may increase the use of digital interventions, relative to the use of websites, as GBMSM today more often rely on smartphones than on computers for access to online services (European Centre for Disease Prevention & Control, 2015), and for many people smartphones constitute a communication device that is permanently 'on'. Smartphone applications also facilitate collection of user data that enable the delivery of tailored and timely interventions (Nahum-Shani et al., 2018).

Just-in-time adaptive interventions

Ideally, chemsex support (and care) should be delivered when people need and want it, and only then. People engaging in chemsex should not be confronted with sexual or drug health-related support when this is not needed, or when the person is not receptive of such support. This implies that intervention delivery should be dynamic and adapted to the different and varying needs. The purpose of so called just-in-time adaptive interventions (JITAI) is precisely to provide the right support at the right time (Nahum-Shani et al., 2018). JITAI have to date been used to support people experiencing a variety of health issues and/or to promote healthier lifestyles, such as support overweight and obese individuals in following a weight control diet (Goldstein et al., 2017), provide evidence-based sleep interventions to active military service personnel and veterans who experience service-related sleep disturbances (Pulantara, Parmanto & Germain, 2018), and promote physical activity and reduce sedentary behavior (Hardeman et al., 2019; Miller, 2019; Müller, Blandford & Yardley, 2017).

In a series of theoretical and conceptualizing articles on the development of JITAIs, Nahum-Shani and colleagues (Nahum-Shani et al., 2014, 2018; Nahum-Shani, Hekler & Spruijt-Metz, 2015) address elements that need to be considered in JITAI design. The *distal outcome* is the ultimate goal of the JITAI (e.g., to decrease chemsex engagement and/or to reduce problems associated with chemsex), and thus provides the purpose for developing an intervention. More specific *proximal outcomes* need to be distinguished that contribute to achieving the distal outcome. These short-term goals (e.g., to broaden people's social network, to plan activities other than chemsex during the weekends) can be achieved through matching *intervention options*. Intervention options are a set of possible actions, encompassing aspects of intervention content and type of delivery. A comprehensive description (taxonomy) of intervention options is derived from the Intervention Mapping Protocol (Kok et al., 2016). This authoritative protocol describes steps and tasks in intervention development based on theoretical, empirical and practical considerations.

To provide support when needed, appropriate points in time need to be identified at which intervention strategies can be deployed. Such so-called *decision points* can occur at (1) pre-specified time-intervals (e.g. check location every minute to monitor if an individual is approaching a high-risk location), at (2) specific, pre-defined time points during the day/week/month (e.g. Friday nights), as (3) a dynamic response to user self-report data indicating a support need (e.g. when user scores low on daily mental health monitoring), or (4) on-demand, in response to a user's request for support. At any given decision point there are multiple potential interventions that could be delivered. To decide at which decision point to offer which type of support (i.e., which intervention strategy), a JITAI needs to be guided by information about the user. In other words, it needs to be tailored to the user. Smartphone-based JITAIs can collect tailoring information ('*tailored variables*') through the active (e.g., self-reports of substance use, mental health, wellbeing) and passive (e.g., monitoring of daily screen time, location tracking) collection of user data (Nahum-Shani et al., 2015). Lastly, decision rules tie, which need to be specific for different decisions point, systematically connected intervention strategies with tailoring information (e.g., when user scores low on mental health, a mindfulness exercise might be provided).

A recent meta-analysis has documented the (short-term) effectiveness of JITAIs in a variety of health domains, such as mental health, healthy diet, weight loss, diabetes self-management, physical activity and addiction (Wang & Miller, 2019). Yet, to the best of our knowledge, no evaluations have been published of JITAI for sexual health

promotion or chemsex support. Importantly, in addition to efficacy, acceptability is also an important prerequisite for the successful use of JITAI. It is especially important to ensure that potential users find the intervention personally relevant, consider the intervention tools attractive and usable, use the intervention as intended, and maintain use over time. Use and effectiveness of a JITAI can be optimized by involving potential users throughout the development process (Buxton, 2007; Greenhalgh et al., 2019; Nahum-Shani et al., 2014, 2015; O'Brien et al., 2016).

Digital chemsex support for GBMSM in Antwerp

The combination of problematic drug use and sexual behavior that entails a risk of transmission of HIV or other sexually transmitted infections poses a serious public health problem that received much attention in recent years (Glynn et al., 2018; Maxwell et al., 2019; Stuart, 2013). Providing adequate support is challenging due to the lack of effective, evidence-based intervention strategies for people engaging in (potentially) problematic chemsex, and limited by the binary perspective where the primary focus lies on support and care for people engaging in later stages of the journey toward problematic chemsex, rather than people who find themselves in the earlier stages (Platteau et al., 2019). To address the current gap in evidence-based support tools to prevent or mitigate (potentially) problematic chemsex, we initiated the Chemified project to develop a digital intervention approach for GBMSM engaging in chemsex in Flanders.

Drawing on promising developments in web- and smartphone-based health interventions, including in healthcare settings (Fiordelli, Diviani & Schulz, 2013; Steinhubl, Muse & Topol, 2015), the Chemified project aims to leverage the added value of interactive communication technologies as part of an innovative approach to support GBMSM to control or adapt their chemsex engagement. More specifically, we are currently developing a smartphone application to respond to the diverse and varying support needs. This application will make use of JITAI-principles, as this allows tailoring and adaptation to differing, varying and evolving user needs (Goldstein et al., 2017; Nahum-Shani et al., 2018). The app will consist of two main intervention components: static information and dynamic support. The app user has access to the information component at all times, including information regarding safer drug use practices, sexual health advice and referral, and an overview of existing (drug and sexual) healthcare (and peer support) in Flanders. In addition, users can also make use of the dynamic support option and receive tailored advice before, during and after a chemsex party. This dynamic support encompasses advice on a set of harm reduction measures, and an option to turn these harm reduction tips into personal action plans (e.g., what drugs (not) to take, what and when to eat, what type of sex to (not) engage in, adherence to PrEP, when to leave from the party), reminders to improve achievement of the action plans (e.g., reminders of the importance to eat during a party, especially if this lasts multiple days, the option to set an alarm indicating when the user intends to leave the party or needs to take PrEP), tips to tackle the afterparty dip, tools to enable self-reflection after a chemsex party, a brief assessment of whether the app user succeeded in achieve the goals that were set, and other options that respond to user needs and preferences. This dynamic support requires sharing personal information such as monitoring frequency of use of the app, and assessing emotional and social wellbeing.

To ensure the mobile app will be acceptable, useable and effective, the development of the intervention strategies and application platform is guided by principles of co-design (Greenhalgh et al., 2019; O'Brien et al., 2016). Throughout the intervention development process, GBMSM engaging in chemsex, other stakeholders (e.g., health promotion workers drug support professionals, sexual health clinicians, researchers), and information and communication technology (ICT) experts collaborate with intervention developers to ensure intervention acceptability and alignment with users' needs. At the start of our project, we undertook a brainstorming session with 30 stakeholders to compile a list of potential components of the intervention, additionally informed by the findings of a systematic literature review. In a subsequent phase this initial, long list of components was validated and complemented through in-depth interviews with a different sample of 20 GBMSM engaging in chemsex and intended users of the app, whose views and experiences are obtained regarding the acceptability and relevance of the identified potential intervention components. According to the respondents, a prerequisite for the use of the app is its value-neutral character and its focus on harm-reduction, rather than decrease in chemsex engagement. Current harm-reduction strategies and needs were also questioned in order to match users' context and experiences (via achievable goals), meet existing needs and complement or reinforce current harm-reduction strategies.

The intervention components that the respondents found most relevant and useful were: (a) receiving harm reduction tips before and after participation in chemsex, (b) easily accessible and reliable information about drugs and sexual health, (c) monitoring the frequency of participation in chemsex in order to raise awareness and reflect afterwards, (d) the possibility to receive harm reduction messages during the chemsex party and to access reliable information (such as: what to do in case of an emergency?), and (e) an overview of existing (drug and sexual) healthcare in Flanders. Respondents especially emphasize that the intervention can serve as a tool to create awareness about their participation in chemsex. Support in managing chemsex engagement and prevent development of more problematic chemsex may be offered by providing reliable information, harm reduction tips when needed, tracking participation in chemsex, and knowing where to go for help.

Possible barriers that would prevent respondents from using the intervention are: not wanting an intervention to be pedantic, receiving too many notifications (intrusive), privacy concerns, not being able to set up the intervention according to their own wishes and the intervention not keeping up to date with current developments (e.g. new drugs). The evidence resulting from the interviews feeds into the further development of the app and were discussed with the app designers in a collaborative workshop, allowing the opportunity to explore and co-design concrete intervention options. Upon completion of app development, an evaluation of the intervention development process and effectiveness will be undertaken.

Conclusions

Through use of a smartphone app, GBMSM who engage in chemsex can receive support when needed, where-ever they are, and as much as needed. The intervention development process undertaken in the Chemified project for GBMSM engaging in chemsex in Antwerp enables the bundling of proven intervention approaches and good practices to support GBMSM to effectively cope with any challenges of their chemsex engagement in an easy-to-use, attractive and relevant mobile phone application. To further enhance relevance of the app, the intervention strategies are embedded in a just-in-time adaptive intervention approach, and to maximize acceptability and usability, we engaged potential users in a co-design approach. We believe that this intervention approach provides a novel way to offer better support to prevent or mitigate the risks of problematic chemsex at an early stage, rather than waiting until people's chemsex may evolve and become problematic. People engaging in a problematic type of chemsex could also benefit from the intervention, and it is important to evaluate whether a digital intervention is sufficiently powerful to support GBMSM in early stages as well in later stages of the chemsex journey reducing problems resulting from their engagement in chemsex. It is important to note that we see a mobile-phone based tool to support people engaging in chemsex as complementary to and not as a substitute for open, non-judgmental support by peers and healthcare providers. A combination of (virtual and in-person support) approaches will likely strengthen

each other and could be used simultaneously. The availability of various support options also provide GBSM engaging in chemsex with the possibility to choose an approach that best meets their needs which likely differ and evolve.

Declaration of Competing Interest

The authors state no conflict of interest.

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