When people who inject drugs speak: Qualitative thematic analysis of the perception of a mobile app for needle exchange programs

Cuando las personas que consumen drogas inyectadas tienen la palabra: Análisis cualitativo de contenido temático sobre la percepción de uso de una aplicación móvil para los programas de intercambio de jeringas

Fran Calvo*,**, Xavier Carbonell***, Mercè Rived****, Cristina Giralt*.

* Grupo de Investigación en Salud Mental y Adicciones, [IdIBGi], Institut d'Assistència Sanitària, Girona.
** Departament de Pedagogia, Universitat de Girona.
*** FPCEE Blanquerna, Universitat Ramon Llull, Barcelona.
**** Escola Universitària d'Infermeria i Teràpia Ocupacional, EUIT, Universitat Autònoma de Barcelona.

Abstract

Spain is the Western European country with the highest prevalence of Human Immunodeficiency Virus among people who inject drugs. The Hepatitis-C Virus affects over fifty per cent of this population. At the same time, the World Health Organization considers that the average coverage of injection material for drug user per year is low. Harm reduction programs and services have been deployed for over thirty years, and these could now incorporate the advantages of eHealth and mHealth to improve harm reduction. The aim of this qualitative and descriptive study is to analyze how people who inject drugs perceive an application for mobile devices. Fifty-one such drug users participated actively in five focus groups. The main results of the thematic content analysis indicated that the application was welcomed as easy and useful. Participants reported that the application contributed to improving access to injection material, reducing the stigma of drug-dependence and optimizing the organization of the ritual of injection. Excessive preventive information and problems downloading the web app were identified as aspects for improvement. In conclusion, the application was seen as a useful eHealth tool that complements the normal intervention of needle exchange programs.

Keywords: Harm reduction; needle exchange programs; drug consumption; eHealth; mHealth; illicit drugs; cocaine; heroin; focus group.

Resumen

España es el país de Europa Occidental con más prevalencia del Virus de la Inmunodeficiencia Humana entre personas que se inyectan drogas. La presencia de Virus de la Hepatitis-C supera el cincuenta por ciento en esta población. Al mismo tiempo, la Organización Mundial de la Salud considera que la cobertura media de material de inyección por usuario y año es baja. Con más de treinta años de experiencia en el despliegue de los servicios y programas de reducción de daños, las ventajas que posibilita la eSalud y la mSalud como la accesibilidad y asequibilidad, pueden incorporarse también a la reducción de daños. El objetivo de este estudio fue analizar la percepción que las personas que consumen drogas inyectadas tienen sobre una aplicación móvil para mejorar el acceso a material de inyección. Partiendo de un enfoque cualitativo se recogió información a través de cinco grupos focales en los que participaron 51 personas consumidoras de drogas inyectadas en activo. Se llevó a cabo un análisis de contenido temático cuyos principales resultados indicaron que la aplicación tuvo una buena aceptación y se consideró sencilla y útil. Los participantes refirieron que la aplicación contribuía a mejorar el acceso a material de inyección, a reducir el estigma de los drogodependientes, y a optimizar la planificación del usuario para adquirir la jeringa en el proceso ritual del consumo. Como puntos a mejorar, destacaron reducir el exceso de información preventiva y simplificar la ruta de descarga de la webapp. En conclusión, la aplicación se posiciona como una herramienta útil para complementar la intervención ordinaria de los programas de intercambio de jeringas.

Palabras clave: Reducción de daños; programa de intercambio de jeringas; consumo de drogas; eSalud; mSalud; drogas ilícitas; cocaína; heroína; grupo focal.

Received: April 2019; Accepted: October 2019.

Send correspondence to:
Fran Calvo. CAS Gironès, Institut d'Assistència Sanitària. c/ Baldiri Reixac 50, bajos. 17003 Girona. Phone +34 617238344
E-mail: fran.calvo@ias.cat; fran.calvo@udg.edu

Introduction

The main harm associated with injected drug use is lethal overdose and infection with diseases such as the Human Immunodeficiency Virus (HIV) and the Hepatitis-C Virus (HCV) (Folch et al., 2016). One of the harm reduction (HR) interventions which has demonstrated the greatest efficacy and effectiveness in reducing HIV and HCV infections is the needle exchange program (NEP) (Platt et al., 2018). Although the name makes reference to the needle itself, NEPs provide people who inject drugs (PWID) with all the material needed to inject safely (filters, containers, sterile water, alcohol swabs). This material, called injection paraphernalia, has proven particularly effective in reducing such infections (Page, Morris, Hahn, Maher & Prins, 2013).

In the European Union, the rate of HIV infection is 6.3 cases per 100,000 inhabitants while in Spain it is 9.4 cases per 100,000 inhabitants, and 2.8% of the total cases of infection are due to intravenous drug use (Elattabi, Ruiz-Algueró, Hernando & Díaz, 2017). Regarding HCV, With a percentage of 1.7% of all adults, Spain is among the European countries with the highest estimated prevalence of people with antibodies (Buti et al., 2017). Twenty-three percent of new cases of HCV infection are related to injected drug use (World Health Organization, 2017).

The prevalence of HIV among all Spanish PWID is the highest in Western Europe (31.5%) followed by Italy (28.8%). The United Kingdom, Malta, Finland, and Norway present percentages below 2% (Stone, 2018). Regarding HCV, Spain is the country with the fourth-highest prevalence of infection in Western Europe (53.3%) after Portugal (65.8%), Sweden (61.3%) and Luxembourg (61%) (Grebely et al., 2019).

At the beginning of the 1990s, Spain reached the highest prevalence of HIV infection and mortality associated with Acquired Immune Deficiency Syndrome among PWID, mainly due to the use of injected heroin (Fuente et al., 2006). Motivated in part by this situation, the drug addiction network was founded and HR services and programs were set up, such as NEPs, which have managed to reduce new infections year on year (Bosque-Prous & Brugal, 2016).

The effectiveness of an NEP depends on good distribution of injection paraphernalia among PWID. The World Health Organization considers that plentiful provision of injection kits per PWID/year is a key strategy in infection prevention (World Health Organization, 2016). According to this report, the provision of sterile needles is currently low, with health services covering 5% of injection drug users' annual needs. Its strategy against infection with viral diseases includes multiplying this by 10, reaching 50% coverage in the year 2020 and increasing it a further 40 points to achieve 90% coverage in the year 2030. The information available to PWID regarding the resources available in their community and, in this case, of the services participating in the NEP is essential for improving the coverage of injection paraphernalia.

Recent years have seen advances in information and communication technologies (ICTs) and their applicability in the form of eHealth or mHealth applications for fixed or mobile devices for the treatment of addictions (Riper et al., 2018). EHealth is understood as the incorporation of ICTs into health care, both in terms of patient care as well as health promotion and disease prevention (Eysenbach, 2001), while MHealth (mHealth –Mobile Health) covers the same aims but on mobile devices and their corresponding applications (apps) (Kay, Santos & Takane, 2011).

In the absence of specific applications for NEPs, an app for smartphones was created in 2017 with the purpose of making injection parapheralia more accessible to PWID. The main objective of this study is to analyze and describe the subjective experience of a group of people who use injected drugs with regard to the use of this application. To this end, a qualitative methodology design with a descriptive approach was used. The specific purposes of this research are i) to analyze the experience of using the application in the autonomous community of Catalonia in Spain; ii) to understand which design elements and aspects of usability of the app prove to be facilitators or barriers to taking up use of the app; iii) to explore the perception of PWID as to how the app affected or could affect their behavior in terms of access to injection material; and iv) to identify future implications for the app in NEPs.

Method

General research design

A qualitative descriptive study was carried out by implementing and analyzing focus groups. The focus group is a research technique consisting of a form of group interview in which interaction between researchers and participants is created to generate a safe space to express points of view and opinions, in order to obtain information about how individuals understand, feel about, experience and perceive a topic (Flick, 2004). Since the aim of the study was to discover and describe the perceptions of PWID regarding the use of mobile technology applied to the reduction of harm associated with drug use, focus groups were considered a more appropriate strategy than individualized approaches (Quintana & Montgomey, 2006). This type of design has been used successfully in analyzing mobile applications with people in situations of extreme social exclusion (Sheoran et al., 2016) and is recommended in the study of communication media, including ICTs (Morgan & Krueger, 1989).

Participants

Fifty-one PWID participated in five focus groups which took place between February and March 2019. Of the 51

participants, 84.6% were men with an average age of 36.7 years (SD = 7.5), with an age range from 28 to 51. People born in Spain made up 75% of the sample, with the rest being immigrants, of which 9 (17.3% of the total) were from the Maghreb. All participants knew how to read and write, but 65% said they had no higher or primary education. Those experiencing homelessness (living in designated shelters for the homeless, in squats or on the street, intermittently staying overnight in institutions) made up 41.4%. The main drugs injected were cocaine (44.2%), heroin (34.7%) and speedball (21.1%). The sociodemographic data of each focus group can be consulted in Table 1.

Participants were recruited between January and February 2019 in five places frequented by PWID to use drugs and which were known to the open environment intervention teams: a habitual drug use area on the outskirts of the city of Girona with an NEP in a primary health care center, two treatment centers, a mobile harm reduction service and a care center for the homeless. One focus group emerged from each context. The research team and a group of university students, all involved in the project of creating and developing the app, went to these places to ask participants whether they would be willing to participate in the focus groups.

Cumulative, sequential (to achieve discourse saturation) and discretionary sampling was performed among people whom we considered to be best able to explain the experience of using the application (Rodríguez, Gil & Garda, 1996), in other words, it was non-probabilistic convenience sampling. Participants were selected on the basis of the following inclusion criteria: i) having used the application during the pilot test; ii) being users of legal age, iii) being active drug users; iv) being in possession of a smartphone; and v) agreeing voluntarily to participate in the focus groups.

Two researchers with training in psychology and psychopedagogy, one specialist in qualitative research and implementing focus groups and another in addictions and harm reduction conducted the five focus groups and recorded the information. Two experts in qualitative methodology and one specialist in harm reduction and eHealth carried out the data analysis.

The three specialists in qualitative research were not connected to the specialized harm reduction intervention. Their main task was to ensure a solid structure and provide a guarantee of quality for the process of research design and the recording and analysis of data. The two specialists in harm and addiction reduction had a previous relationship with the participants as professionals in the reduction of harm associated with drug use, which made recruitment and retention of participants possible. The researchers co-supervised and inter-supervised the process in the dynamics of group development and the interpretation of results in a continuous way to generate a transparent and objective process in the coding, expression of topics and interpretation of results.

Procedure

Sequential description of the PixApp project development phases

The technical and community development of the application called *PixApp* is part of a project to improve harm reduction care at the *l'Institut d'Assistència Sanitària*, a public unit providing mental health and addiction services in the province of Girona. *PixApp* consists of a free and non-profit application in the form of a web app, available in three languages (Spanish, Catalan and English), which includes the NEP points in the area (community pharmacies, basic health centers, local clinics, hospitals, specific drug addiction centers and harm reduction centers). The user can choose the radius in kilometers within which the available NEPs will be shown as well as information relevant to each one, such as opening hours, addresses, telephone num-

Table 1. *Characteristics of the focus groups.*

Group code	Participants n (%)	Sex, n (%)		Origin, n (%)		Educational level n (%)			Own or family home	Residential exclusion	Age M (SD), Range	Main Injected Consumptionn (%)		
		Male	Female	Spanish	Immigrant	Primary or without schooling	Secondary or vocational training	Tertiary				Heroin	Cocaine	Speedball
FG1	8 (15.4)	7 (13.5)	1 (1.9)	7 (14.3)	1 (1.9)	6 (11.4)	1 (1.9)	1 (1.9)	6 (11.5)	2 (3.8)	39.9 (6.3), 30-47	3 (5.8)	4 (7.7)	1 (1.9)
FG2	12 (24.1)	10 (19.2)	2 (3.8)	8 (15.5)	4 (7.5)	8 (15.5)	4 (7.7)	0 (0)	9 (18.3)	3 (5.9)	33.2 (4.8), 28-40	6 (11.6)	4 (7.7)	2 (3.8)
FG3	11 (21.6)	8 (15.4)	3 (5.9)	9 (17.3)	2 (3.8)	7 (14.3)	4 (7.7)	0 (0)	6 (11.5)	5 (9.6)	37.1 (7.7), 25.51	3 (5.8)	6 (11.5)	2 (3.8)
FG4	9 (17.3)	9 (17.3)	0 (0)	6 (12.4)	3 (5.9)	5 (9.5)	3 (5.9)	1 (1.9)	0 (0)	9 (18.3)	40.6 (2.8), 36-45	2 (3.8)	4 (7.7)	3 (5.8)
FG5	11 (21.6)	10 (19.2)	2 (3.8)	8 (15.5)	3 (5.9)	7 (14.3)	3 (5.9)	1 (1.9)	9 (17.3)	2 (3.8)	37.4 (7.4), 26-45	4 (7.7)	5 (9.6)	3 (5.8)
Total	52 (100)	44 (84.6)	8 (15.4)	39 (75)	13 (25)	33 (65)	15 (29.1)	3 (5.9)	31 (58.6)	21 (41.4)	36.7 (7.5), 28-51	18 (34.7)	23 (44.2)	11 (21.1)

bers and a map linked to Google Maps®. After the initial download, the application does not require Internet access (works off-line). In addition, users can leave comments on their experience of using the application and the NEP. Figure 1 shows the application interface.

The first phase of the project was to review the scientific literature on the use of ICTs (Calvo, Carbonell & Johnsen, 2019) and online social networks (Calvo & Carbonell, 2019) by people at risk of or experiencing social exclusion, including PWID. These reviews indicate the great potential and low risk involved in the implementation of eHealth and mHealth instruments in socially vulnerable groups with mental health problems and/or addictions. In a second phase and as a feasibility study during 2016, we surveyed the use of ICTs, Internet and smartphones by PWID on the ground and found that the prevalence, frequency and motivations of use of people in situations or at risk of extreme social exclusion and PWID was similar to those of the general population (Calvo, Carbonell, Turró & Giralt, 2018). During the months of March to October 2017, the application was designed in the web app format, downloadable to the smartphone's desktop from any browser. The web app format was chosen precisely because of its technical versatility and ease of updating. Its first version was subjected to four usability tests, carried out by 45 professionals specialized in addictions, mental health and other community health services and 16 users between January and March 2018. During the usability tests, the participants

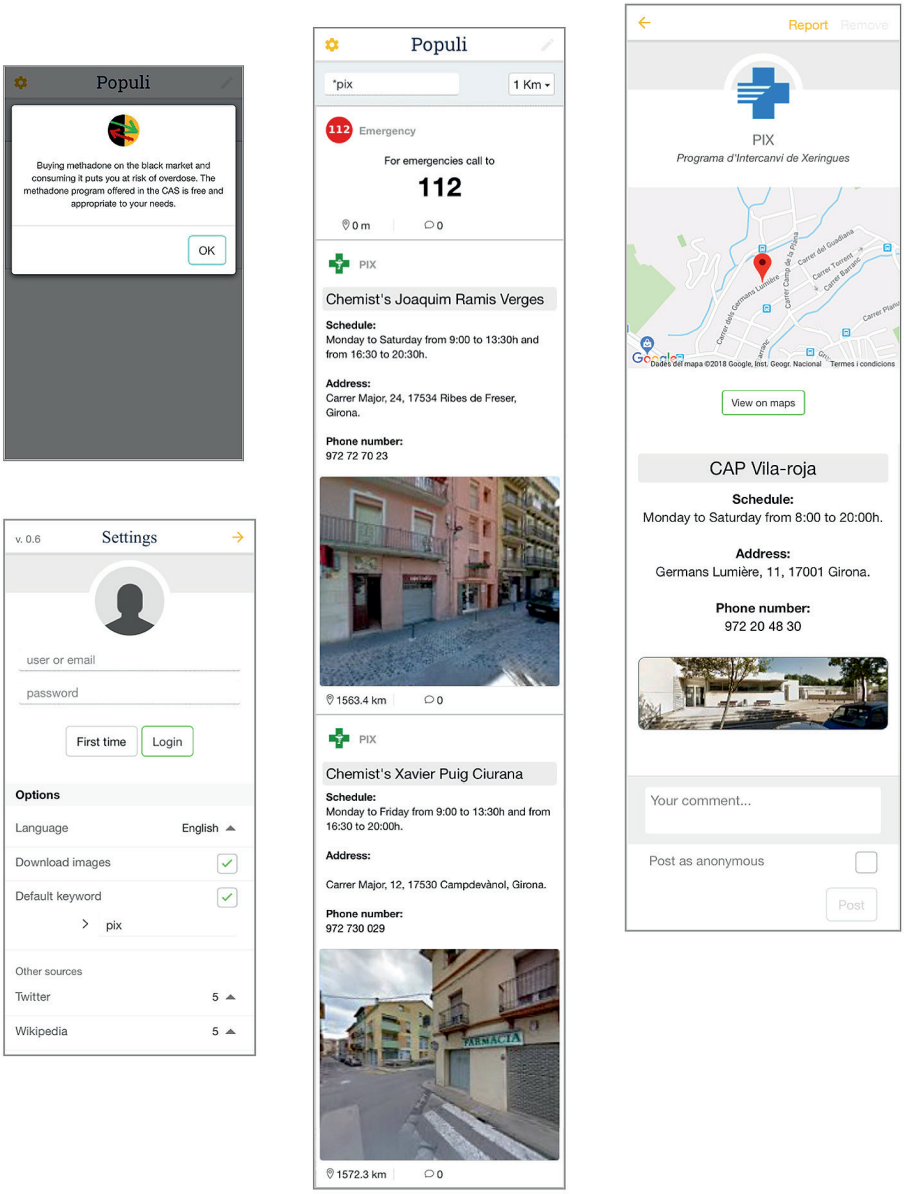

Figure 1. Final interface of the application in its English version. From left to right: First column: Example of health tips and settings screen. Second column: Main interface. Third column: Information regarding a needle exchange point.

tried the app and made suggestions for improvement. Changes were made as a result of these proposals: i) the two columns of the main interface were removed because users considered it to be too dense; ii) the app's random health tips appeared on the main interface in the first version and in a pop-up window in the second version; and iii) the visual map information was prioritized to geolocate position with respect to the NEP point and the relevant written information (schedules, telephone, address). The usability testing process can be consulted in its entirety in the earlier study by Calvo, Carbonell and Mundet (2020).

The application was piloted from September 2018 to February 2019. During these six months, the PWID were able to test it on the ground and then finally participate in the focus groups, where their experiences were assessed. To carry out this test, a team of voluntary social education undergraduates who took part in a training course for this purpose were present in person at the local NEPs. The selection of NEP points was based on the level of demand for injection materials. The eight NEP points selected included the Vila-Roja Primary Care Center in the city of Girona, the point which distributed the most injection materials in Catalonia in 2017 (Calvo et al., 2020), and a specific center for care of the homeless. The volunteers informed the PWID about the existence of the app, advised on how to download and use it, and invited them to use it. During the pilot test, the application was downloaded to 97 mobile devices, producing 297 hits. The estimated total number of PWID in this territory is 300 people.

The researchers asked potential candidates about participating in the focus groups for analysis of the app's trial period. The PWID who used these services and tried the app were offered participation in the groups. Once a number was reached which was considered sufficient to run the group, taking into account the drop-out risk, groups of 15 people from five different centers were offered the opportunity to participate. Of the 75 PWID thus approached, 51 (68%) finally took part.

The 23 PWID who did not want to participate in the focus groups argued that they were not in a position to do so at the time set for the group, or did not agree or had other commitments. It was agreed that there was no profile which could provide information on the type of PWID who did not participate in the groups or their reasons for not doing so, their relationship with the proposal or the project, nor with respect to the type of center. Figure 2 shows the sequence of creation, development and assessment study of the *PixApp* application.

Data Collection

The focus groups were created using a convenience criterion. Participants were asked at the beginning to provide in writing and anonymously their age, sex and the main drug they injected. The rest of the sociodemographic data (level of education, housing situation, origin) was drawn from the databases of the centers.

During the process, there were no circumstances leading us to believe that the data collection strategies needed to be modified, given that we considered the information available was of sufficient quality to answer the research questions.

Participants were informed at the start of each focus group of the approximate duration and that their collaboration would be very useful for the application, the area and the program and, in general terms, for the medical and scientific community. All participants expressed their willingness to collaborate with the team of researchers.

The focus group sessions lasted between 45 and 70 minutes, at an average of 58 minutes. The intention was to let conversation and information flow naturally among the participants. The following opening statement was used: *All of you have voluntarily participated in the pilot test of the needle exchange program application. In this group, we would like to find out what you think about this app in everyday use; what you liked most about what the app provides; what you liked least and doesn't contribute anything in your opinion, or what should be improved. You can speak freely and say whatever you think. It's important that you speak honestly so that our team can evaluate the work they have done and improve it if necessary. I would like to thank you once again for your efforts here and remind you that your opinion is very valuable for the improvement of the app and the NEP program in general.*

After this introduction, the researchers remained silent in an attempt to prompt participants to start talking. If this did not happen, two open-ended questions were asked: i) What positive things would you highlight about the application and its everyday use? and ii) What negative things would you highlight about the application which could be improved to meet your everyday needs? In order to refocus conversations which were not going anywhere, a brief synthesis was made of what had been said so far, and participants were then invited to talk about a subject that had been left open or asked if they wanted to expand on any question that had been dealt with superficially. The sessions closed with a prompt/closing to thank the participants for their attendance and collaboration.

Since the start of usability testing with PWID, researchers have reflected on all phases of the project (De la Cuesta-Benjumea, 2011), especially regarding data collection, the formulation of introductions and closings, and the questions that were being asked during its execution. For example, the information extracted from the first focus group was examined by the members of the research team, who concluded that the protocol was suitable, did not need to be modified, and ensured that the study could be implemented without the need for contributions beyond those already described to motivate the participants to talk.

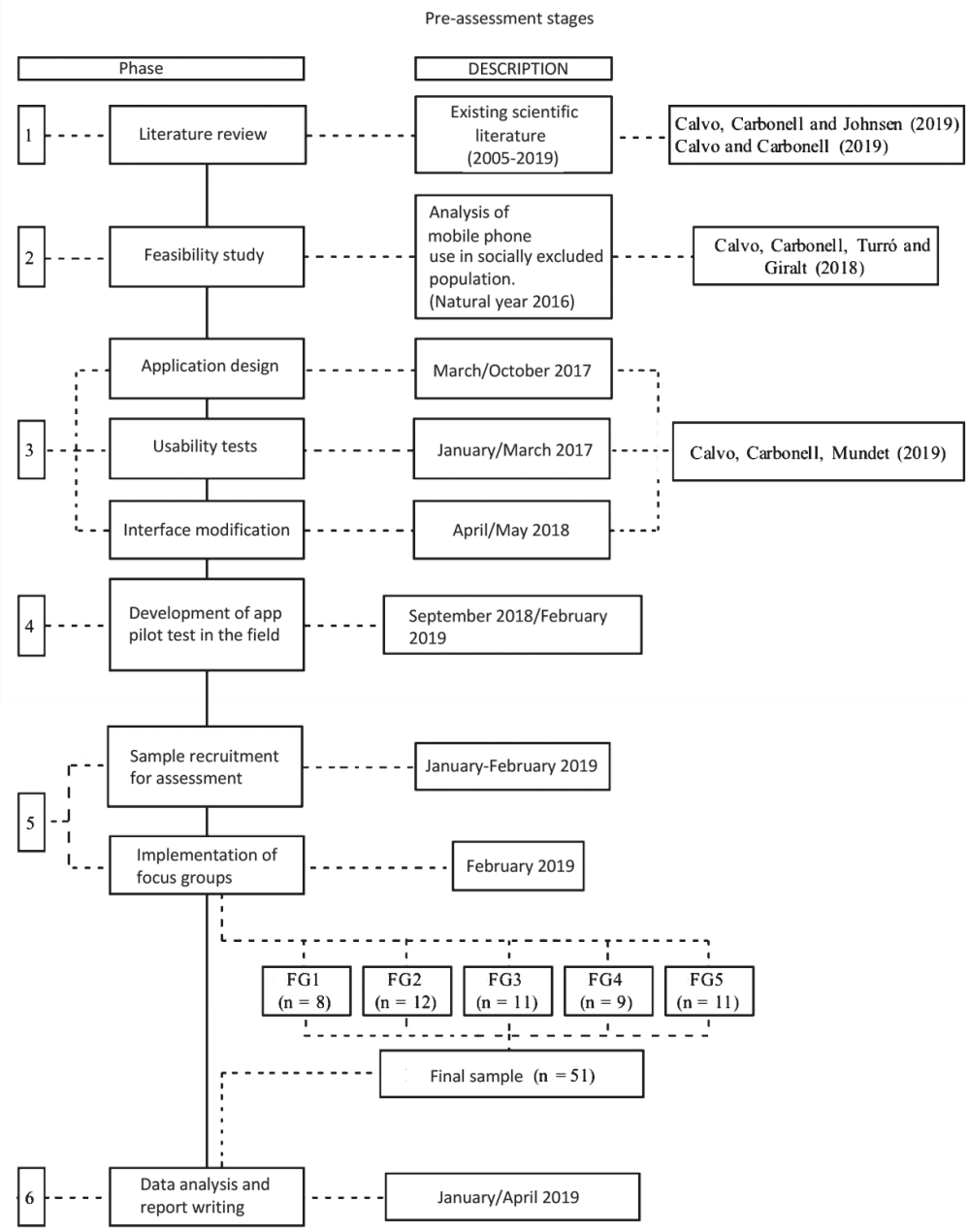

Figure 2. Flowchart of the study phases.

The focus group sessions were recorded in audio format. Once completed, they were transcribed in full. Subsequently, the transcripts were imported into the Atlas Ti program (version 7) for analysis, after ensuring that the computer program was suitable for the chosen design (Hwang, 2007).

Analysis

Analysis Strategies

The qualitative study with a descriptive focus was carried out based on thematic content analysis. The thematic analysis made it possible to identify, organize and analyze patterns (themes) in a detailed manner thanks to the reading and rereading of the information by the research team (Braun & Clarke, 2006). This method led to some cross references being identified between subjects, making it possible to compare them with the rest of the units of analysis; thus, the list of codes and subjects was established gradually until researchers reached a final agreement (Alhojailan, 2012). Open, axial and selective coding techniques were used on the data (Strauss & Corbin, 1990), which was categorized by identifying text fragments and assigning a code (abbreviation of a thematic idea) to each one (Gibbs, 2007).

Two of the five themes were previously chosen by the researchers and were introduced with questions regarding the app's benefits and aspects for improvement. Once the

data was analyzed and after the data reduction process, three further codes (fifteen subcodes in total) were agreed regarding usability, user experience, benefits and aspects for improvement and perception of the NEP; each of these codes corresponded to a theme and thus the results of the study were organized. See Table 2.

Four researchers worked autonomously to establish codes and subcodes, sharing their decisions at different stages and reaching a final consensus. Subsequently, the codes were also analyzed independently and then in teams in order to optimize the reliability of the process (Saldaña, 2013). In this way, any researcher-bias effect was limited. In addition, seven meetings, both face-to-face and virtual, were held to homogenize the analysis and contribute to the quality and thoroughness of the entire process. A fifth person supervised the investigation externally, carrying out a cross-sectional audit of the process to guarantee transparency, objectivity and to encourage consensus on the units of analysis.

The transcribed fragments included in the results section use square brackets and italics for clarification given the widespread use of slang by the participants. No significant contradictions or discrepancies were found that could not be resolved in the analysis process.

This research was approved by the Research Ethics Committee CEI-Girona, code XSO_2017, on June 7, 2017. Participants were informed verbally and in writing about the objectives of the study and its voluntary nature, and they received an information sheet and signed informed consent. At the end of their participation, they were remunerated with 15 Euros. This manuscript took into account American Psychological Association criteria for the preparation of qualitative research (Levitt et al., 2018). The article was written following the research report model of Fernández, Dema and Fontani (2019).

Results

Part one: How did the participants use the application?

Most participants came into contact with the application in the usability tests before or during the pilot test, aided by project volunteers who provided information and helped them download it to their devices. The sequence below with a group of men and women aged between 30 and 47 shows how they found out about the application and started using it.

> Researcher: How did you start using the application?
>
> User 1, 33 years of age: When those girls [*volunteers*] showed it to me. I went to look for [*injection*] material at outpatients and met them at the door. They gave me the information.
>
> User 2, 38: They showed me how to download and use it. I was a bit surprised at first. I showed it to my girlfriend as soon as I got home.
>
> User 1, 33: I also showed it to my partner. She has a problem with this [*mimics injecting herself in the arm*], too.
>
> User 1, 35: I didn't pay much attention at first, but one day I was bored and started to play with it. I was pretty amazed because I'd never seen an app like that before and immediately showed it to my buddies.
>
> (FG1, Men and women aged 30 to 47).

As described in the Procedure section, a group of volunteers at street level in the most active NEP points of the area showed how to download the application. User 2 and

Table 2. *Code Classification.*

Codes	Subcodes
Type of app use[1]	Priority use Reasons for use Frequency
Benefits of the app regarding the NEP [2]	Stigma reduction Improves knowledge of NEP points Facilitates anonymity Improves planning
Aspects of the app that could be improved	Downloading Excessive pop-ups
Usability and user experience	Clear interface Easy and intuitive Health tips Participation
General perceptions of the needle exchange program	Normalization Belief in professionals' change of perception

Note. [1]Application. [2]Needle Exchange Program.

user 3 became interested by what these volunteers were doing, and this curiosity motivated them to start using it. As we have seen, these participants informed family and friends about their first contacts with the app, generating peer-to-peer information transfer, which is greatly used in harm reduction. Beyond the initial surprise generated by an application informing users about NEP points, the following fragment illustrates how the use of the app changes from satisfying mere curiosity to responding to a need.

User 1, 37: The app was just there ... on the screen ... The truth is that I didn't use it after looking at it the first day. I always go to the same place for needles.

User 2, 41: Same with me. I always go to the same place.

User 3, 39: Yes, but one day I got there and it was closed. It had just closed and I remembered the app. I got online and there was a pharmacy right nearby. Really opened my eyes a bit. I thought: "- so easy -".

User 4, 40: The same happened to me. I looked at the app to see if there were any [*NEP points*] in my town and there were. This way I don't have to be going here and there [*to another municipality*] to get needles.

Researcher: Do I understand correctly that the main use has been when you couldn't find needles at the main point?

User 3, 39: Yes.

User 4, 40: Yes. That's been very important. It broadens your horizons.

User 3, 39: Yes, another time I would've used a needle that I had at home. But there was a pharmacy very close by, and I didn't know about it, and in the end I went down. I think it was new in this ... in this exchange business.

(FG4, men aged 36 to 45)

This fragment shows how the researcher focused the users to clarify if they were referring to an informative use of the application when the NEP point they normally used did not meet their needs. User 3's final comment is especially relevant since it indicates that on finding his usual NEP point closed, he used the app and discovered NEP points he had not known about.

Below is a fragment about the informative use of the application and its frequency of use.

User 1, 40: Having the opening hours [*of the NEP points*] right there is great.

User 2, 32: I go up [*to use*] once a week and I'm not sure when they [*the usual NEP point*] close. I checked on the app and it's very easy. It takes me longer on Google.

User 1, 40: Thing is, I never bother to ask at outpatients when they close.

User 3, 35: I forget.

User 4, 28: I don't like it. All the waiting.

User 5, 39: Sometimes there are loads of people queuing up and there's no way you're going to wait there just to ask for opening hours cold turkey [*with withdrawal syndrome*] or high [*intoxicated*].

User 1, 40: Also, the schedules change all the time.

User 2, 32: I was home one night, already quiet, I opened the app and saw that they closed at three [*15h*] and I thought that gives me time.

(FG2, men and women from 28 to 40 years old).

From this fragment we can extract different elements. First, it shows to the need for users to have the schedules of the NEP centers at hand and regularly updated. They also commented on the difficulties of finding this information with an ordinary search engine, and how the application had facilitated this task. Moreover, they expressed their problems with asking for opening times at the primary care center NEP because they had to wait a long time to ask (from the comment we can surmise that this is due to the sheer numbers attending the center) and because of suffering withdrawal symptoms or intoxication.

Part two: Benefits of the application under the Needle Exchange Program

The narratives of the PWID described their perception of the benefits provided by the application. First, the participants emphasized that they saw the application as part of the normalization of health services towards them in terms of using ICTs. The following fragments describe how they perceived the benefits related to the normalization associated with the use of the mobile phone:

Researcher: What benefits does the application have? (...) What is positive?

User 1, 51: The fact that someone actually invented it. That they had the idea [*All laugh*].

User 1, 33: It's true, nobody had thought of us before.

User 2, 38: Because they must think we don't use mobiles because we do drugs.

User 1, 33: That's ... how do you say? ... prejudice. We are normal people with a very big problem.

User 3, 26: They see you lying there, surviving and probably think: They don't use mobiles.

User 2, 25: They probably think we don't even know what the Internet is [*All laugh*].

User 4, 36: Right, of course, the fact that I shoot drugs and have this problem doesn't mean I can't have a mobile like everyone else.

(FG3, men and women aged 25 to 51)

As can be seen in the response of user 1, the first benefit mentioned by the participants was that the design of the application saw PWID as normal users of technology. This element modifies a fairly generalized discourse by health professionals regarding the supposed under-use of technology by people in situations or at risk of social exclusion and PWID, a form of discrimination PWID said they felt. Below, we see an example of a homeless person:

User 1, 42: I live in the street and more than once somebody has looked at me disapprovingly for using a mobile. It seems that by their look they're saying you have no right to have a phone just because you're on the street (...) But the thing is, it [*the phone*] solves many problems: you can contact the family, for free, with WhatsApp over WiFi in some place; you can read the news ... books ... you pass the time ... and the day goes by better (...) It's easier if anybody needs to find me (...) It's always the last thing I sell when I have more problems and it's the first thing I buy back as soon I've got money. This application suits my reality and is useful.

(FG1, men and women aged 30 to 47)

Another improvement perceived by the participants was that the app extended their knowledge of the NEP points in the area. Most participants reported that they got the injection material from one or two usual points, close to where they buy substances or their home. They described how they often traveled specific routes depending on where they could obtain a needle and in relation to the opening times of each NEP point. Having more information also changed the planning of the using process:

User 1, 32: The other day we were (...) and I together [*refers to the person sitting beside him/her*] and I said, why don't you look at the app to see if there's anywhere to grab some needles round here?

User 2, 26: It's true, really. We'd already had some ... but we needed more [*refers to the injection paraphernalia*].

User 1, 32: So we think hey, we do not need to go up [*to the usual NEP point*], they've also got some here. And we went to ask at the pharmacy, and they gave us some and that was it.

(…)

User 1, 33: I freaked out at the number of places that hand out needles.

User 3, 42: I also freaked out that there were so many sites that did exchanges. I didn't know that many.

(FG5, men and women aged 26 to 45).

User 1, 27: The best thing is it helps me to know where else I can get needles. Nobody had told me about this.

User 2, 42: Yes, me neither.

User 3, 39: There's usually no information about that at the PTC [*Public Treatment Center*].

User 1, 25: Actually, there *is* information. There was a paper with the needle exchange points ... I was given it by (...) [*refers to a reference professional*], but I lost it right away.

User 1, 27: I had a paper with the exchange points, but I remember once I went to a pharmacy and they told me that they no longer had any. They didn't do needle exchange there.

User 2, 33: Sure, with the application this doesn't happen: you open it up and there they are [*the NEP points*].

User 2, 42: And it also tells you if it's open at that time or not.

User 4, 33: And it tells you the ones closest to you, so you don't have to worry yourself stupid or walk miles.

User 5, 51: That's also important ... you save yourself a long walk.

(FG3, men and women aged 25 to 51).

As we can see in the comment by user 5, he or she thought the treatment centers did not provide information about NEP points. Participants 1 and 2 indicated that this perception was not correct because they were provided with the leaflets that the organization updates and prints periodically. The final comment by user 1 indicates that on one occasion, he was able to consult this information on paper, and that when he went to the place in question, it was no longer an NEP point. Therefore, the participants perceived it to be positive to have a tool with updated information on the NEP points. The comment of user 6 and the final comment of user 3 reinforce the importance of the geolocation of these services since, if the PWID does not find injection material in a particular place, the experience will make them unlikely to return.

Third part: Aspects of the application which could be improved

Participants were urged to mention the elements of the application which needed improving. In practically all groups, and in general, there was a feeling that application was not easy to download. As described above, this application is not native but rather a web app. After accessing it the first time through a browser, it must be anchored to the smartphone desktop using a shortcut. Once this is

done, the application works like a native application, but the download process is very different from that of native applications for IOS or Android devices. In addition, for optimal functioning of the application, the phone's GPS must be permitted to geolocate the points of the NEP, otherwise the application does not work.

Researcher: What aspects of the app do you think are improvable?

User 1, 40: What things don't we like?

Researcher: Yes. And what things can make it difficult to use, do you think they can be changed to make it better, and so on.

User 1, 40: Downloading it.

User 2, 42: Downloading it.

User 1, 40: That's it.

User 3, 45: It's difficult to follow all the instructions.

User 4, 41: It messes you around a lot. It's one thing after another.

User 2, 42: Wouldn't it be easier if you could download it like any other app?

User 5, 26: Now that I know how to download it, you want to go and change the system [*All laugh*].

User 4, 41: It could be easier, really.

User 1, 40: I tried to teach someone ... to download it ... and the truth is I wasn't able to follow the steps.

User 2, 42: I ended up looking for it in the app store ... but it wasn't there ...

User 1, 40: That's right. That's something that must be changed because if it is difficult to download and in the end the gang [*people*] can't be bothered and in the end they don't use it.

(FG5, men and women aged 26 to 45).

The first response of user 1 comes across with noticeable force, which, added to the final comment of user 2 explaining how he or she had tried to find the application in a virtual application platform for mobiles, indicates the confusion around the download process of the web app format. Participants agreed that the application had to be simplified.

A second aspect for improvement was the excess information appearing in pop-up windows with health tips. The application offers a health tip every time the user opens the app. This advice is random from among more than 25 tips, such as "*Always use clean needles when you use*". Each time the app users do a search, the pop-up window appears with another tip. The participants considered this information to be excessive, as reflected in the following fragment of FG2:

User 1, 35: What bothers me a lot is the automatic screen.

Professional: The health tip?

User 1, 35: Well, it's not that it always bothers me. It's annoying how often it pops up.

User 1, 40: The one that advises you ... stuff.

User 2, 32: The idea is good, but once you've opened it twice you're already fed up with it.

User 2, 37: It should be dialed down a bit.

User 3, 39: One tip each time would be enough.

User 1, 40: Thing is, if not, in the end it's ... how do you say? ... it doesn't have the effect ... the effect it should.

(FG2, men and women aged from 28 to 40).

User 1's final comment emphasizes that too much information can have a dissuasive effect, and that too many health tips in the form of pop-up windows are counterproductive. There were no notable opinions against this, and the participants considered that a single tip when opening the application would be sufficient.

Fourth part: Concrete aspects of usability and user experience

The participants considered that the usability of the application in its real development context was simple and adequate. With the exception of the aspects previously mentioned, they did not consider that there was any difficulty in using the interface, and it was considered to be very intuitive to use. In some cases, participants mentioned how they had to familiarize themselves with the application to make the search for NEP points easier when they needed injection material, but felt this to be no different to the effort required to familiarize themselves with other mobile applications aimed at the general population.

User 1, 39: It's easy.

User 2, 42: Super easy.

User 3: Man, it took me a while to figure out how it worked, really.

User 1, 39: But that's normal, dude! You can't enter and directly be a pro ... you have to study it a little! [*Laughs*]

User 3, 47: It's just, I thought you were pretty handy with all this.

User 2, 42: No, no ... thing is that it is easy once you spend a minute to see what's going on and how it's used. Then it's done in a flash [*quick*].

(FG1, Men and women aged from 30 to 47).

Furthermore, the participants felt that the application could be a tool to communicate with the health services. The application allows the user to leave text comments about their experiences in obtaining injection paraphernalia. Participants considered that this feature of the applica-

tion offered the potential to promote asynchronous communication with the health services, especially in terms of their needs as active drug users.

> User 1, 42: Sometimes, you just don't want to talk to anyone.
>
> User 1, 38: That's true.
>
> User 1, 42: [*In the centers*] They stop you to talk, really, (...) many times they stop you but you just don't want to talk. You say – oh no, not now! - but the possibility of having a way to contact them other than the usual appointment would go down well. Sometimes you just feel wrecked [*depressed*] as you're coming down [*fragile*] and the mobile is the only thing you have. Sometimes the person next to you is worse than you ... I don't know ... it's two o'clock in the morning ... you're all high [*intoxicated*] ... who are you going to talk to ... this thing about having another way [*to contact*] is interesting. Sometimes you try it with the family ... but they're fed up with you.
>
> (…)
>
> User 2, 32: Come on. Let's be honest. We are not exactly innocent lambs [*All laugh*] (...). Sometimes we also go too far. This way maybe they [*the professionals*] can also use the app to tell us a thing or two.
>
> (FG5, men and women aged from 26 to 45).

As we saw in the previous excerpt, user 1 (female) identifies and describes the need to be able to access an alternative communication channel. This could increase the range of availability of health services beyond the formal arrangement of face-to-face appointments. This is particularly relevant at the times when the user feels a greater need to communicate, in this case because he or she is suffering the negative effects of active substance use at a time when the normal treatment service is closed.

Moreover, user 3 proposes that the application could be used as a contact tool by the services themselves, something very important given the difficulty in contacting PWID who are less motivated to communicate with the services.

Part Five: General perceptions of the participants regarding the needle exchange program

Finally, we asked participants how they felt about the use of the application within the framework of the NEP and how the use of technology could influence the development of a program which had been running for several decades. Participants stressed that the use of the application could contribute to reducing social stigma as people on the margins of society or to other aspects not related to drug use or its environment. Users described situations in which they felt they were being judged because they had mobile phone devices and how this is seen as a problem for the development of specific eHealth interventions, as the following extract illustrates:

> User 1, 45: Well, I want to thank you for your initiative.
>
> User 2, 36: It's great that you called us in to give our opinion ... I don't want to look like a toady [*flatterer*] [*Laughs*].
>
> User 1, 45: (...) But seriously, nobody remembers us ... that we also have a phone and a computer.
>
> User 2, 36: People think that because I'm a junkie, I don't use the Internet, but I bet I have more followers than them on Insta [*Instagram*].
>
> User 3, 41: I remember (...) [*refers to a professional*] who was very surprised that I had an IPhone. It was old but he looked at me ... like judging me ... I felt judged ... hey, I didn't steal it! ... I wanted to tell him. In the end I left the place feeling really down.
>
> User 4, 40: Of course, if many people think like that, that we are all criminals, how are they going to create apps for us ...
>
> User 5, 41: For me, it makes me feel more normal. This [*mimics injecting*] is a disease, right? We also have the right to use this [*pick up the mobile phone*].
>
> (FG4, men aged from 36 to 45)

In his second comment, user 2 highlights the use of the Internet and social networks by PWID. This comment asserts their active use of social networks and argues that despite the stigma weighing on them as injection drug users, they may be much more active on social networks than people who do not have this problem; it also shows how important the use of these social networks is for them and, in a way, the need to accept this normalized use of ICTs despite their addiction. In his last comment, user 3 recounts a situation in which he felt judged for using the mobile and the implied accusation of criminal activity merely by possessing this device. In both cases, the participants considered that the application helped to normalize their situation through the use of technology, to reduce the associated stigma and to see them as actively participating in technological development as eHealth users.

At another level, other users considered that the way the professionals felt about how PWID were using the technology helped to reduce barriers and contributed to generating empathy. That is, the fact that the professionals might be interested in the use of specific health applications such as this was an indicator of how their perceptions were changing regarding people who injected, and the interest in technology of the professionals was a new common in-

terest with the potential to generate empathy. Take the following example:

> User 1, 40: Well, I was in a pharmacy once and [*the clerk*] was very interested in the application ... he already knew it and we talked ... he behaved fine ... I don't know ... he was interested. It seemed more like talking to someone on equal terms (...). He stood there with me ... you know ... side by side ... really ... he stood next to me and it seemed that he was more interested than me ... he was a bit of a *freak* [*Laughs*] ... no ... I mean ... but *geeky* like with the technology, you know ... he liked the idea, you know.
>
> (…)
>
> User 2, 41: Well, I think this will make looking for a needle more normal. It's like when you're looking for a restaurant. You don't have to give so many explanations.
>
> User 1: We should let our opinions be heard more. This would make our voice ... well, we're sick ... to be more widely heard ... not as junkies ... first as people.
>
> User 3, 45: Giving our opinion is fucking great [*all laugh*]. Well it's true ... let's be honest, that's how it is.
>
> User 4, 37: That's it, if anyone looks at me disapprovingly, this is what I do [*the participant makes the thumbs-down sign, the typical "don't like" sign on social networks*], and fuck you very much [*all laugh*].
>
> User 3, 45: That would help to get them to notice us more, right? We are also customers of a service. It's like going to a restaurant and the waiter treats you well so that you don't put bad feedback on the Internet. At least he treats you well for that reason.
>
> (FG4, men aged from 36 to 45)

It can be seen that in the conversation the participants saw themselves as customers of health services and credited the application with the potential to be used as a communication channel through which they could give their opinion as users of these services, as active participants in their own health with the power to give feedback on the service received. Their discourse also highlighted that technology and the application can contribute to this normalization.

Discussion

This is the first study of which we are aware to pilot a mobile application for a needle exchange program. A qualitative descriptive thematic content analysis was employed, involving five focus groups with 51 people who inject drugs, had a mobile phone and had access to the application during the six months of field testing. The main findings indicated widespread acceptance of the *PixApp* application, which was considered simple and useful, especially when the normal injection material exchange points were closed or needles were not available. Participants considered that the application contributed to reducing the stigma of people who inject, increased knowledge of the area's NEPs, ensured anonymity, improved planning to obtain injection paraphernalia and could contribute to the normalization of people who inject drugs as users of eHealth technology. Among the aspects to be improved, the participants highlighted the excessive appearance of health tips in pop-up windows and difficulties in downloading. Participants reported that the application had potential as an alternative channel for communication with health services, especially at those times when users felt the greatest need to communicate and when the services could not meet their needs for structural reasons.

In Spain, the scientific evidence regarding the use of ICTs by people who inject drugs and the possibilities of implementing eHealth or mHealth interventions in this population and context is scarce but promising (Calvo & Carbonell, 2018, 2019). At the international level, educational eHealth interventions have proven effective in preventing HIV infection and Hepatitis-C by increasing knowledge about transmission channels, modifying erroneous beliefs about infection mechanisms and reducing risky sexual behaviors (Noar & Willoughby, 2012). Specific applications for harm reduction have demonstrated the potential for reducing the harmful effects of alcohol consumption (Milward, Deluca, Drummond & Kimergård, 2018) and to prevent the risk of overdosing (Baldacchino et al., 2016).

Involving the users for whom an eHealth or mHealth tool is designed to meet their needs is strongly recommended because it provides insights into the functionality of the tool in a real context, with direct user experience (Law & van Schaik, 2010) and offers the possibility of modifying and adapting it in a bidirectional process of analysis and continuous improvement. In fact, the acceptance by the vulnerable population at risk or in a situation of social exclusion (Byrnes, 2016) depends largely on this since the penetration of ICTs in these populations requires a follow-up which goes beyond providing the technology and Internet access and must try to adjust to the socio-economic needs of those people to whom it is addressed, working with them prospectively and regularly to try to keep them connected (Kaba, 2018).

As they continued to use the web app, participants reported that the application contributed to improvements in their planning and played a part in the process/ritual of obtaining needles. Changing the patterns/rituals of

harmful consumption is, to a large extent, the focus of socio-educational interventions in harm reduction, the success of which depends on their acceptance by and usefulness for the recipients (Calvo, Ribugent & Pontsa, 2015). The anxiety associated with the craving to use a substance and withdrawal symptoms generates situations which those affected describe as desperate and which increase serious high-risk practices such as the shared use of injection material (Castaño-Pérez & Calderón-Vallejo, 2010). It seems clear that the more difficulties PWID have to access the injection material, the greater this risk becomes, since planning drug use (and the material needed to realize it) is potentially influenced by ritual, which in many cases can detract from protective behavior (Roth et al., 2015). An example of this, a frequent occurrence in daily clinical harm reduction practice, is when a person who injects drugs obtains the substance before the needle, arguing that the opposite "brings bad luck" or "awakens" the withdrawal syndrome (Calvo-García, Turró-Garriga & Giralt-Vázquez, 2014). If after obtaining the dose, the injection drug user cannot access a nearby NEP point, the risk of reusing a needle increases. PWID described how they would go to the usual NEP points, but if they were closed or had run out of material, access to updated information through the mobile phone was a potentially effective tool in modifying the process of acquiring material at the usual point and generated the feeling that it was possible to plan their access to needles better.

Thus, complete and up-to-date information regarding the area's NEPs and a suitable channel to make this information accessible to PWID are the basis for improving the coverage of injection material, something that the World Health Organization considers insufficient (OMS, 2016). The use of information leaflets is common but its effectiveness can be increased. Users said they were unaware of the existence of such information and mentioned the risk of losing forgetting it. NEP participating centers can drop out of and rejoin the program for various reasons, which means directories and databases have to be constantly updated. A delay in the transmission of updated information to the user is a risk factor whose impact could be reduced by virtual tools, through a channel with which the user is familiar, i.e., smartphone and internet. Participants considered that the application contributed to reducing the information gap between the health provider and the end user, in addition to including supplementary information considered appropriate by PWID, such as photographs, opening times, address and telephone, which facilitated contact with the service.

In addition, one of the application's functionalities is the possibility of giving health advice in the form of text messages such as pop-up windows every time the user navigates the interface. Health tips delivered on fixed or mobile devices have been proven to have great preventive potential (Mason, Ola, Zaharakis & Zhang, 2015). However, while it is true that the great accessibility of health services to recipients through ICTs is an advantage associated with the ubiquity of technology, an accompanying excess of indiscriminate preventive information which is not adapted to the cognitive capacity of the user can be counterproductive (Nation et al., 2003). Moreover, the web app cannot be installed as a native application, and this posed a considerable problem which was resolved thanks to the help of the volunteers. Providing guidance for users on the ground is important when the target population is in a situation or at risk of social exclusion (Byrnes, 2016). In fact, despite the many opportunities to reduce barriers to accessing health care through ICTs, continuous adaptation to the users' limits is required (McInnes, Li & Hogan, 2013). Given the lack of examples assessing applications for mobile devices aimed at PWID, the study by Sheoran et al. (2016), based on focus-groups, which assessed the development of a geolocation app for young homeless people, concluded that the application contributed to reducing barriers between users and health care providers by reducing the stigma associated with social exclusion and improving the perception of users regarding socio-health services.

Finally, the participants perceived the application as a technological tool which contributed to reducing their stigma. The main reason for this was that they felt the services could better understand their problem, thus normalizing them by appearing to the service providers as users of ICTs. Secondly, it allowed them to describe their experiences in the process of obtaining injection material. For PWID, seeking needles implies a relationship with various health agents who sometimes tend to be judgmental about the injector's behavior, contributing to their stigmatization and reducing the preventive capacity of needle exchange programs, with adverse results (Paquette, Syvertsen & Pollini, 2018). Participants said that the possibility of explaining this discrimination to those responsible for public health was protective and reduced the possibility of such stigmatization. This relationship which technologies enable for service users is no different in other areas where health care users are increasingly active in managing their own health and has the capacity to play a role in the processes of which they are active participants and, therefore, to contribute to optimizing resources and adapting to needs

(Armayones et al., 2015). Increasing PWID participation is important as well as necessary given the fact that it can contribute to social and community integration, which in turn presents proactive potential for reducing health care costs, detecting new needs more quickly, and improving care and research.

This study is not free of limitations. In the first place, limited sociodemographic and clinical information was obtained in a sample where participants and context were specific. For this reason and although it is not the aim of qualitative research to generalize results since it describes a particular context, situation and participants, this limitation must be taken into account and its results must not be generalized. Future lines of investigation are therefore recommended to continue researching the use of eHealth and mHealth by the population of drug injecting users, especially those in a situation or at risk of social exclusion. We also considered that this information was sufficient to describe the participating population, and prioritized the limited focus group time available to try to fulfill the objectives of the study in terms of describing the experience of the participants with the application. Secondly, the likelihood that participants would have responded with a certain degree of social desirability should be taken into account, although this effect was reduced by requesting their sincere opinions and generating a relaxed climate in the focus groups. Thirdly, the participants received financial compensation for their participation, which may have mediated their motivation to do so, although this type of reward is common in health studies with populations in situations of extreme social exclusion and injected drug use in order to facilitate sample recruitment and retention. Fourth, the impact of the application on the distribution of injection material has not been assessed. This fact points towards a future research path to analyze whether the use of the application has the capacity to produce quantitative changes in the number of injection kits distributed or in the geographical areas where NEP activity is concentrated. Moreover, it would have been useful to access other information sources, such as individual interviews, as a complement to the focus groups, but this was not possible due to problems of participant retention. In any case, we consider that the information obtained from the groups provided enough data to answer the research questions. A further limitation was the very limited number of women participating in the study; increasing this number is recommended so that gender can be included as a mediating variable. The gender perspective would have enabled the use of focus group dynamics to determine the possible relationships between different groups in the same way as with other differentiating characteristics, such as the comparison between people who did and did not use the application (e.g., there is no information available on people who did not use the application because, for example, they did not find it useful or did not like it), but the difficulties in accessing and retaining the sample made it impossible to access other subsamples. Finally, this study lacks the necessary information to assess the impact of the app on the coverage of NEPs in quantitative and qualitative terms, but it does guide us towards future research paths related to this question.

In conclusion, the application was considered to be a suitable mHealth tool for its purpose, which is to contribute to improving the access of people who inject drugs to injection material. Users perceived the application as an easy and accessible tool, with the capacity to contribute to more protective planning of drug use due to updated information regarding the exchange points. Excessive tips on prevention and the download process were considered aspects for improvement. Finally, the participants suggested that the application offers potential for reducing the stigma of users because it normalizes their use of technology like that of any other citizen and facilitates the possibility to interact with health care providers by giving feedback on their experiences in the process of obtaining injection paraphernalia.

Acknowledgments

To the users of the application who participated in this pilot study and gave us their valuable opinion. To the volunteers who collaborated by showing the application to users: Inma Tineo, Marta García, Laura Rovira, Júlia Presas, Ana Martínez, Gemma Alonso, Félix Romero, Núria Martín, Sara Ramos and Marta Pera. To the Subdirecció General de Drogodependències of the Department of Salut of the Generalitat de Catalunya for providing part of the funds for financial compensation for the participants in the study and supporting the project.

Conflict of interests

Fran Calvo is the creator and co-developer of the application referred to in the article, alongside the computer engineer José Núñez, with whom he is co-owner. The application arises from the needs detected in professional practice in a public service, the *Institut d'Assistència Sanitària* in Girona and is a non-profit program whose objective is to improve the access to injection material of people who

inject drugs. Xavier Carbonell, Mercè Rived and Cristina Giralt declare the absence of any conflict of interest.

References

Alhojailan, M.I. (2012). Thematic analysis: A critical review of its process and evaluation. *West East Journal of Social Sciences, 1*, 39-47.

Armayones, M., Boixadós, M., Gómez, B., Guillamón, N., Hernández, E., Nieto, R.,… Sara, B. (2015). Psicología 2.0: Oportunidades y retos para el profesional de la psicología en el ámbito de la salud. *Papeles del Psicólogo*, *36*, 153–160.

Baldacchino, A., Crocamo, C., Humphris, G., Neufeind, J., Frisher, M., Scherbaum, N. & Carrà, G. (2016). Decision support in addiction: The development of an e-health tool to assess and prevent risk of fatal overdose. The ORION Project. *Computer Methods and Programs in Biomedicine*, *133*, 207–216. doi:10.1016/j.cmpb.2016.05.018.

Bosque-Prous, M. & Brugal, M. T. (2016). Intervenciones de reducción de daños en usuarios de drogas: Situación actual y recomendaciones. *Gaceta Sanitaria*, *30*, 99–105. doi:10.1016/j.gaceta.2016.04.020.

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3,* 77–101. doi:10.1191/1478088706qp063oa.

Buti, M., Calleja, J. L., García-Samaniego, J., Serra, M. A., Crespo, J., Romero, M.,... Robbins, S. (2017). Eliminación de la hepatitis C en España: Adaptación de un modelo matemático de salud pública partiendo del plan estratégico para el abordaje de la hepatitis C en el Sistema Nacional de Salud. *Medicina Clinica*, *148*, 277-282.

Byrnes, M. (2016). Text4baby mHealth Program: Implementation and applicability within a homeless population of young mothers. *International Journal of Communitcation and Health*, *8*, 45.

Calvo-García, F., Turró-Garriga, O. & Giralt-Vázquez, C. (2014). El consumo activo de drogas de pacientes incluidos en un programa de tratamiento de mantenimiento con metadona. *Revista de Trabajo Social y Salud*, *79*, 57–68.

Calvo, F. & Carbonell, X. (2018). Using Facebook for improving the psychological well-being of individuals experiencing homelessness: Experimental and longitudinal study. *JMIR Mental Health*, *5*, e59. doi:10.2196/mental.9814.

Calvo, F. & Carbonell, X. (2019). Is Facebook use healthy for individuals experiencing homelessness? A scoping review on social networking and living in the streets. *Journal of Mental Health 28*, 505-519. doi:10.1080/09638237.2019.1608927.

Calvo, F., Carbonell, X. & Johnsen, S. (2019). Information and communication technologies, eHealth and homelessness: A bibliometric review. *Cogent Psychology, 6*, 1631583. doi:10.1080/23311908.2019.1631583.

Calvo, F., Carbonell, X. & Mundet, C. (2020). Developing and testing the populi needle exchange points finder: An app to reduce harm associated with intravenous drug consumption among homeless and non-homeless drug users. *Frontiers in Public Health, 8,* 493321. doi:10.3389/fpubh.2020.493321.

Calvo, F., Carbonell, X., Turró, O. & Giralt, C. (2018). Connected in the street: The relation between online social networks, selfesteem and satisfaction with life among individuals experiencing homelessness. *Aloma*, *36*, 21–28.

Calvo, F., Mundet, C., Gonzalvo, B., Terrades, J., Cabarrocas, S., Giralt, C.,… Carbonell, X. (2019). Análisis del programa de intercambio de jeringuillas de la región sanitaria de Girona. *Revista Comunidad*, *21*, 5.

Calvo, F., Ribugent, I. & Pontsa, O. (2015). Valoración psiquiátrica involuntaria e ingreso no programado de usuarios sin-hogar: Estudio de casos desde la educación social y la psicología. *Revista de Educación Social*, *20*, 1–27.

Castaño-Pérez, G. & Calderón-Vallejo, G. A. (2010). Consumo de heroína en Colombia, prácticas relacionadas e incidencia en la salud pública. *Revista Cubana de Salud Pública*, *36*, 311–322.

De la Cuesta-Benjumea, C. (2011). La reflexividad: Un asunto crítico en la investigación cualitativa. *Enfermería Clínica*, *21*, 163-167.

Elattabi, M., Ruiz-Algueró, M., Hernando, V. & Díaz, A. (2017). Vigilancia epidemiológica del VIH/sida: Situación en Europa y en España, 2015. *Boletín Epidemiológico semanal*, *24*, 147-152.

Eysenbach, G. (2001). What is e-health? *Journal of Medical Internet Research, 3*, e20. doi:10.2196/ jmir.3.2.e20.

Fernández, M., Dema, S. & Fontanil, Y. (2019). La influencia de los roles de género en el consumo de alcohol: Estudio cualitativo en adolescentes y jóvenes en Asturias. *Adicciones*, *31*, 260-273. doi:10.20882/adicciones.1003.

Flick, U. (2004). *Introducción a la investigación cualitativa.* Madrid: Ediciones Morata.

Folch, C., Casabona, J., Espelt, A., Majó, X., Meroño, M., Gonzalez, V.,… Group, R. S. (2016). High prevalence and incidence of HIV and HCV among new injecting drug users with a large proportion of migrants. Is prevention failing? *Substance Use & Misuse*, *51*, 250–260. doi:10.3109/10826084.2015.1092991.

Fuente, L., Brugal, T., Domingo-Salvany, A., Bravo, M. J., Neira-León, M. & Barrio, G. (2006). Más de treinta años de drogas ilegales en España: Una amarga historia con

algunos consejos para el futuro. *Revista Española de Salud Pública*, *80*, 505–520.

Gibbs, G. R. (2007). *Analyzing qualitative data*. Thousand Oaks, CA: Sage Publications.

Grebely, J., Larney, S., Peacock, A., Colledge, S., Leung, J., Hickman, M.,... Lynskey, M. (2019). Global, regional, and country–level estimates of hepatitis C infection among people who have recently injected drugs. *Addiction*, *114*, 150-166. doi:10.1111/add.14393.

Hwang, S. (2007). Utilizing qualitative data analysis software: A review of ATLAS.ti. Social Science Computer Review, 26, 519–527. doi:10.1177/0894439307312485.

Kaba, B. (2018). Modeling information and communication technology use continuance behavior: Are there differences between users on basis of their status? *International Journal of Information Management*, *38*, 77–85. doi:10.1016/J.IJINFOMGT.2017.08.007.

Kay, M., Santos, J. & Takane, M. (2011). mHealth: New horizons from health though mobile technologies. *World Health Organization, 64*, 66-71. Retrieved at https://www.who.int/goe/publications/goe_mhealth_web.pdf.

Law, E. L.C. & van Schaik, P. (2010). Modelling user experience. An agenda for research and practice. *Interacting with Computers*, *22*, 313–322. doi:10.1016/j.intcom.2010.04.006.

Levitt, H. M., Bamberg, M., Creswell, J. W., Frost, D. M., Josselson, R. & Suárez-Orozco, C. (2018). Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA publications and communications board task force report. *American Psychologist*, *73*, 26. doi:10.1037/amp0000151.

Mason, M., Ola, B., Zaharakis, N. & Zhang, J. (2015). Text messaging interventions for adolescent and young adult substance use: A meta-analysis. *Prevention Science*, *16*, 181–188. doi:10.1007/s11121-014-0498-7.

Morgan, D. L. & Krueger, R. A. (eds.) (1989). *The focus group kit* (6 vols). Thuosand Oaks: CA: Sage.

McInnes, D. K., Li, A. E. & Hogan, T. P. (2013). Opportunities for enganging low-income, vulnerable populations in health care: A systematic review of homeless persons' access to and use of information technologies. *American Journal of Public Health*, *103*, 11–20.

Milward, J., Deluca, P., Drummond, C. & Kimergård, A. (2018). Developing typologies of user engagement with the BRANCH alcohol-harm reduction smartphone app: Qualitative study. *JMIR mHealth and uHealth*, *6*, e11692. doi:10.2196/11692.

Nation, M., Crusto, C., Wandersman, A., Kumpfer, K. L., Seybolt, D., Morrissey-Kane, E. & Davino, K. (2003). What works in prevention. Principles of effective prevention programs. *American Psychologist*, *58*, 449. doi:10.1037/0003-066X.58.6-7.449.

Noar, S. M. & Willoughby, J. F. (2012). eHealth interventions for HIV prevention. *AIDS Care*, *24*, 945–952. doi:10.1080/09540121.2012.668167.

Page, K., Morris, M. D., Hahn, J. A., Maher, L. & Prins, M. (2013). Injection drug use and hepatitis C virus infection in young adult injectors: Using evidence to inform comprehensive prevention. *Clinical Infectious Diseases*, *57*, 32–38. doi:10.1093/cid/cit300.

Paquette, C. E., Syvertsen, J. L. & Pollini, R. A. (2018). Stigma at every turn: Health services experiences among people who inject drugs. *International Journal of Drug Policy*, *57*, 104–110. doi:10.1016/J.DRUGPO.2018.04.004.

Platt, L., Minozzi, S., Reed, J., Vickerman, P., Hagan, H., French, C.,… Hickman, M. (2018). Needle and syringe programmes and opioid substitution therapy for preventing HCV transmission among people who inject drugs: Findings from a Cochrane review and meta-analysis. *Addiction*, *113*, 545–563. doi:10.1111/add.14012.

Quintana, A. & Montgomery, W. (Eds.) (2006). *Psicología: tópicos de actualidad*. Lima: UNMSM.

Riper, H., Hoogendoorn, A., Cuijpers, P., Karyotaki, E., Boumparis, N., Mira, A.,… Smit, J. H. (2018). Effectiveness and treatment moderators of internet interventions for adult problem drinking: An individual patient data meta-analysis of 19 randomised controlled trials. *PLOS Medicine*, *15*, e1002714. doi:10.1371/journal.pmed.1002714.

Rodriguez-Gómez, G., Gil-Flores, J. & Garda-Jiménez, E. (1996). *Metodología de la investigación cualitativa*. Granada: Aljibe.

Roth, A. M., Armenta, R. A., Wagner, K. D., Roesch, S. C., Bluthenthal, R. N., Cuevas-Mota, J. & Garfein, R. S. (2015). Patterns of drug use, risky behavior, and health status among persons who inject drugs living in San Diego, California: A latent class analysis. *Substance Use & Misuse, 50,* 205-214. doi:10.3109/10826084.2014.962661.

Saldaña, J. (2013). *The coding manual for qualitative researchers*. London: SAGE.

Sheoran, B., Silva, C. L., Lykens, J. E., Gamedze, L., Williams, S., Ford, J. V. & Habel, M. A. (2016). YTH StreetConnect: Development and usability of a mobile app for homeless and unstably housed youth. *JMIR mHealth and uHealth*, *4*, e82. doi:10.2196/mhealth.5168.

Stone, K. (2018). *The global state of harm reduction 2018*. London. Retieved at https://www.hri.global/global-state-harm-reduction-2018.

Strauss, A. L. & Corbin, J. M. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage Publications.

World Health Organization. (2016). *Estrategia mundial del sector de la salud contra las hepatitis víricas 2016-2021. Hacia el fin de las hepatitis víricas*. Geneva: OMS. Retrieved at http://apps.who.int/iris/bitstream/10665/250578/1/WHO-HIV-2016.06-spa.pdf?ua=1.

World Health Organization. (2017). *Global hepatitis report 2017*. Geneva: WHO. Retrieved at https://apps.who.int/iris/bitstream/handle/10665/255016/9789241565455-eng.pdf.