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**+Title**

Technology-based interventions for substance use disorders: knowledge and utilization among health professionals in the European Union

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**Abstract**

*Background:*

*Methods:*

*Results:*

*Conclusions:*

**Keywords**

Communications technologies, European Union, addiction.

**Running title**

ICT for substance use disorders

## **TECHNOLOGY-BASED INTERVENTIONS FOR SUBSTANCE USE DISORDERS: KNOWLEDGE AND UTILISATION AMONG HEALTH PROFESSIONALS IN THE EUROPEAN UNION**

### **1 Introduction**

In the last two decades, we have witnessed extraordinary growth in the range of computer and mobile technologies available to the general public in the European Union (EU). In the EU, a majority of households (55%) had internet access in 2007: this proportion reached 81% in 2014. The EU's population that had never used the internet was 18% in 2014, down from 30% in 2009 [Eurostat, 2016]. The use of mobile phones to access the internet has increased greatly within the EU: 52% of the EU population accessed the internet from a mobile phone in 2015 [Eurostat, 2016a].

In the recent years clients are playing a more active role in managing their health [EC, 2012a]. A survey on digital health literacy carried out in the 28 EU Member States, assessed the extent to which Europeans use the internet to manage their own health. Sixty percent of respondents had used the internet for searching for health-related information in the last 12 months and over half did so at least once a month [EC, 2014].

Substance use disorders (SUDs) from licit and illicit drugs affect millions of people in the EU. It is estimated that 23 million people were affected by alcohol-related disorders in 2010 [Shield, 2013; Rehm, 2015]. The number of smokers in the EU is still high: 24% of the population smoke [Eurostat, 2016b; EC, 2017]. Cannabis is the illicit drug most used in the EU. An estimated 16.6 million young Europeans (aged 15–34), had used cannabis in the last year [EMCDDA, 2016]. It is estimated that there are of 1.3 million high-risk heroin users in Europe in 2014; no to mention that about 2.4 million young European adults (aged 15 to 34) used cocaine in the last year [EMCDDA, 2016]. In addition there is a growing concern in view of non-chemical, i.e. behavioural addictions such as gambling disorder and internet gaming [Tammi, 2015].

The importance of behavioral issues in many aspects of healthcare is increasingly being recognized [Michie, 2004]. In addition, the rapidly escalating cost of healthcare contributes to creating a strong need for innovative interventions to promote health control and disease prevention. European public health systems have difficulties addressing these needs because, among other factors, of resource constraints [Quaglio, 2013] and lack of health personnel [EP, 2015].

Given all these trends, it is not surprising that there has been significant interest in Europe devoted to the development of behavioral interventions delivered through computer and mobile technologies to people with SUDs [EMCDDA, 2009; Wood, 2014; Marsch, 2014]. Technology-based interventions (TBIs) now offer the potential to combine the efficacy of intensive treatments with the advantages of wide-reaching interventions through interactive responses and incorporating some of the features of face-to-face contact [Shahab, 2009]. TBIs can reach certain populations not reached by traditional treatment facilities [Lieberman, 2008]. They can be particularly useful in reaching people living in settings where access to treatment may be limited by stigma [Young, 2012], or for those with physical limitations [Portnoy, 2008]. They can also provide information with a high

degree of standardization, which can allow the examination of different clinical aspects, making it easier data collection in research [Litvin, 2013].

Despite growing evidence for TBIs to addiction care in the EU, there has been no comprehensive estimate of familiarity with, and access to, TBIs for health personnel involved in SUDs treatment, a factor that could significantly impact the feasibility of these efforts. In addition, barriers to using such approaches among health workers are not well understood. A lack of confidence in e-Health or a low level of digital literacy among healthcare professionals may impose a barrier on delivery of TBIs (Ramsey, 2016). The extent to which health workers in the field of drug addiction use TBIs is also largely unknown in the EU. A better knowledge would serve to improve clinical treatment interventions provided through technological means, but also can help the decision-makers to better understand the potentiality of interventions implemented by these technologies. Therefore, we conducted a study across six EU Member States, with the purposes of highlight the current state and future trends of the implementation of TBIs in the treatment of SUDs across Europe. In particular, we aimed to identify the extent to which these technologies are used, their clinical effectiveness, factors hampering their implementation and possible strategies to promote their use in the future.

## **2. Methods**

An online survey was designed to collect feedback from experts in the field of drug addiction and mental health. The survey's questions were first drafted and then validated through a pilot test. The English master version of the survey was translated into 4 European languages: Italian, French, Polish and German. A survey for each language was created and made available online on the platform SurveyMonkey [SurveyMonkey, 2016].

The survey included 13 questions about TBIs and SUDs treatment covering the following domains: (1) level of knowledge of TBIs (poor, fair, good); (2) frequency of use of TBIs (rarely, sometimes, often); (3) willingness to attend training courses on TBIs (slightly willing, moderately willing, willing); (4) integration of TBIs in their setting for SUDs treatment (poor, fair, well); (5) degree of use of TBIs for SUDs in the country where they work (poorly widespread, moderately widespread, widespread); (6) usefulness of TBIs in SUDs treatment (slightly useful, moderately useful, useful); (7) trend foreseen in the future (low increase, modest increase, significant increase, no opinion); (8) importance of TBIs for improving different aspects of SUDs treatment; (9) assess effectiveness of different TBIs tools, (10) assess effectiveness of TBIs with different populations of users; (11) assess effectiveness of TBIs with different psychiatric disorders; (12) perceived factors that hinder TBIs and (13) effective actions in promoting TBIs for SUDs.

The survey mainly comprised of closed-ended questions. For the majority of questions, participants were asked to evaluate between 3 and 7 proposed answers using the same set of ordered scale options. For each proposed answer, the choice was limited to only one option in the ordered scale. The survey ended with open-ended question, asking respondents to leave any general comments they had. Content analysis of open ended questions were screened and selected on the basis of their "added value" of the information they contained.

The target respondents of the survey were European experts in the field of SUDs. Respondents were selected using the approaches of convenience sampling and respondent-driven sampling. In particular, the following strategies were used: i) circulate the survey among members of relevant professional organizations in the area of addictions within the network of the European Brain Council (EBC) [EBC, 2017]; ii) contacts collected from public lists and online databases; iii) contacts provided directly by respondents; iv) formal requests sent to other relevant organizations and associations. The target respondents were searched for both at European and at national level, among experts operating in France, Germany, Italy, the Netherlands, Poland and the UK. A special effort was made to maintain a homogenous country coverage of about 50 respondents per country.

For all of the questions, the proportion of respondents who selected each option in the ordered scale was calculated for each proposed answer. This measure synthesizes the participant's opinion on selected proposed answers. To explore further the relationship between survey responses and several demographic characteristic of participants we performed logistic regression analyses using the Excel 2013 Real Statistics Resource Pack. All survey responses were coded in binary categorical variables and all demographic predictors were categorical. Logistic regression analyses were exploratory and -since groups did not show consistent distributions across technology outcomes, power was occasionally low for some models.

### **3. Results**

Overall, the invitation to participate to the survey was sent to around 1200 experts. Three hundred and fifty answers have been collected. Thirty-nine respondents (11%) left the survey after having providing only personal information, and they have been excluded from the analysis. Three hundred and eleven answers were considered for the analysis.

#### ***3.1 Respondents' characteristics***

Respondents' characteristics are described in Table 1. The mean (SD) age of the sample was 48.7 years (11.93), 59% were males. The sample was characterized by the overarching presence of experts working in public organizations (67%). The majority of participants included medical doctors (67%), the great majority specialists in psychiatry (54%). The mean (SD) duration of work in the field of SUDs was 16.9 years (10.81). Thirty-seven per cent reported more than 20 years of clinical experience on SUDs.

#### ***3.2 Knowledge, use and role of TBIs in the treatment of SUDs***

Knowledge, use and role of TBIs are shown in Table 2. As a whole, 23% stated that their level of knowledge on TBIs was good, though 48% reported that their level of knowledge as poor. This percentage was higher among people in the public sector (56%) as compared with those in the private sector and academia (30% and 20%, respectively).

Likewise, 12% of respondents often use TBIs in their clinical practice but 64% rarely used these tools. This percentage increase among people in the public sector (70%) but decrease in the private sector and academia (45% and 50% respectively).

The majority (66%) of participants were willing to attend training courses on the use of these technologies in the treatment of SUDs, with a minority (18%), not ready to do so.

Sixty-nine percent of respondents reported that TBIs are poorly integrated in the health care setting where they work. Again, this percentage was higher for the public sector (75%) rather than in the private one (43%).

The large majority of experts (73%) reported that the use of TBIs for SUDs treatment was poorly widespread also in the country they work in. This situation did not significantly vary across countries, with only the exception of The Netherlands where this percentage is reduced to 34%.

Despite the low knowledge and utilization levels, about 46% of respondents consider TBIs potentially useful in the treatment of SUDs. This percentage increased to 58% in the TBIs-competent subgroup (defined as participants who have fair/good level of knowledge of TBIs).

In addition, 44% of the survey's participants foresee a significant increase in the use of TBIs for SUDs in the future, with only 15% expecting a low increase.

### **3.3 Effectiveness of TBIs, factors hindering the use of TBIs and future policy**

Survey participants considered TBIs important to aid populations with significant barriers in accessing treatment (63%) and to allow for on-demand access to therapeutic support outside of formal care settings (60%).

In general, online counselling and therapy (43%) are the TBIs considered most effective in the treatment of SUDs. TBIs appear to be particularly effective in the treatment of tobacco (44%) and alcohol users (40%), and gamblers (37%), though less effective in the treatment of opioid users (20%).

TBIs would be particularly effective in the treatment of users with anxiety disorders (42%) and dysthymia or depression (36%), while they would be only slightly effective for patients with psychotic disorders (10%).

Concerning the underlying obstacles facing the diffusion of TBIs for SUDs, the survey's participants identified lack of technical support (48%), poor infrastructure and equipment (42%), and the lack of digital literacy of health workers (38%) among main relevant elements.

Focusing on policy that can contribute to fostering TBIs interventions usage, the need for increased awareness among health workers (66%), and for more dedicated funding (64%) are described as major issues, similarly to improved sustainability of TBIs initiatives (61%) and increased awareness among drug users (60%) (Table 2).

The most relevant relationships found with logistic regression analyses are the following: experts from both academia and private sector have higher level of knowledge on TBIs ( $p=0.0003$  and  $p=0.0075$ , respectively) and they also use this more in their daily practice ( $p=0.0072$  and  $p=0.0015$  respectively) than those from public sector; German experts have higher level of knowledge of TBIs ( $p=0.033$ ); experts from Netherlands have also higher level of knowledge of TBIs ( $\exp(b)=2.05$ ) although not statistically significant ( $p=0.082$ ).

## **4. Discussion**

This study aimed to explore the diffusion, perceived clinical efficacy and barriers to the implementation of TBIs for SUDs among health professionals in six EU Member States. The complexity of the topic and the diverse development and organization of different health system in Europe, makes it hard to come up with generalizations. However, several key findings emerged that will help guide further research, practice, and policy.

**Met opmerkingen [GC1]:** In general discussion needs robust improvement. For example the literature used is too old and this is not appropriate in particular for a topic such as ICT and eHealth, which had an impressive development in the last few years. Addiction has compiled a virtual issue of 34 of these papers

(<http://onlinelibrary.wiley.com/doi/10.1111/add.13243/pdf>).

Also there is some European literature which possibly deserves some consideration. E.g. Hoch on cannabis and ehealth <https://www.karger.com/Article/FullText/445716> and also a couple of papers I co-authored

<https://www.ncbi.nlm.nih.gov/pubmed/25203226>

<https://www.ncbi.nlm.nih.gov/pubmed/27107907>

**Met opmerkingen [QG2R1]:** I read the abstract of the 34 articles of the virtual issue. The great majority are RCTs. I am not able to find any one suitable for citation, but please, feel free to suggest one, if appropriate.

I have inserted the Eva Hoch reference

I do not find the place to properly mentioned the 2 papers you co-authored, but please feel free to insert the two citations in the appropriate place if they are pertinent

### ***Diffusion and knowledge***

Given the proliferation of data supporting the efficacy of new technologies, it is surprising that few therapists use them in their clinical settings. Sixty-four per cent reported that they rarely/never use these tools in their clinical practice. A quite similar proportion reported that TBIs are not at all/poorly integrated in their health care setting. This is apparently also the general situation in the country where they work. Similarly low percentages were reported from other surveys. For instance, a study carried out among psychotherapies in the UK, found that only 2.4% were using computerized self-help with their clients and only 1% were using computerized self-help as an alternative to face-to-face contact [Whitfield, 2004]. Similarly, other studies found that most practicing psychologists had positive attitudes toward the use of computers in their activity; however, few used computers for anything other than clerical functions [Farrell, 1989; McMinn, 1999].

The survey also shows that the level of knowledge of TBIs is very low: only half of respondents reported a level of knowledge from fair to very good. Similar results were found in a more recent study carried out among a group of decision makers on use of TBIs for behavioral health care [Ramsey, 2016].

Furthermore, most of respondents from our survey agreed that a combination of face-to-face and TBIs (blended interventions) are the most effective ones. The extent to which TBIs should be included in a therapeutic program should always be carefully considered. The right balance in each therapeutic program between the face-to-face and TBIs components depends heavily on the patient characteristics. This appear to be in line with the results of Whitfield *et al.*, where 90% of the sample said that they would use TBIs as an adjunct to face-to-face therapy, not as an alternative to face-to-face therapy [Whitfield, 2004].

### ***Efficacy and advantages of TBIs***

Notwithstanding the low level of knowledge and use, the majority of the respondents believe that TBIs could be important for improving access to treatments (60% of respondents), providing service to more people and to people with limitations that prevent them from fully participating in the healthcare services as they are currently structured.

In Europe, the demand for SUDs treatment in publicly funded systems far exceeds the available capacity [EMCDDA, 2016]. As a result, a substantial number of patients cannot receive the needed treatment. For example, 10% or less of the people fulfilling the diagnostic criteria of alcohol use disorders receive treatment in Europe [Rehm, 2012; Rehm, 2013]. The majority of European smokers have tried to quit (59%) [EC, 2015], but only a minimal proportion of smokers receive adequate care and treatment in Europe. Existing cannabis treatment programs reach only a very limited proportion of problematic cannabis users in Europe [EMCDDA, 2015a; Hoch, 2016]. Possible reasons of this include the feeling among users that treatment is not necessary, a lack of treatment option awareness and stigma, that has been shown to reduce the probability of using healthcare services for treatment [Gates, 2012; Wallhed Finn, 2014]. TBIs appear to be recognized as useful instruments in order to reduce this gap.

TBIs on SUDs may not be appropriate for all clients; for example participants with a substantial chronic abuse disorder (e.g. opioids users) and heavy psychiatric problems may not benefit from TBIs [EMCDDA, 2009]. Respondents are in line with these concerns. They believe that TBIs are particularly effective in the treatment of tobacco, alcohol, but not for

**Met opmerkingen [GC3]:** Again this seems really outdated literature, not appropriate in order to make comparisons with our results

**Met opmerkingen [QG4R3]:** Please provide more recent survey articles useful for comparison. The surveys cited for comparison (Farrell, McMinn, Whitfield and Ramsey 2016) are the only 4 surveys that we were able to find in the literature

opioids users. Although some evidence involving illicit drugs is already available [Saladin, 2006; Christensen, 2014], they remain scarce. It is important to gain additional data about the efficacy of new technologies also for illicit drugs [Danielsson, 2014].

Respondents believe that TBIs are more effective with patients with anxiety disorders and dysthymia or depression and inappropriate with severe psychiatric disorders like psychoses. Although further investigation is warranted to establish effectiveness and benefit in these populations, there is growing evidence that online treatment can be useful also for subjects with severe psychiatric conditions [Naslund, 2015; Blankers, 2016].

### **Obstacles and Policy**

#### *Obstacles*

Several studies described the existing barriers of e-Health in Europe. They focus on the interoperability of e-Health services (semantic, legal and organizational) and e-Health deployment and uptake (funding, awareness, evidence, digital health literacy etc.) [EC, 2012; Moen, 2012]. Some of these barriers emerged also as factors hindering the use of TBIs in the addiction field: lack of technical support, poor infrastructure equipment and lack of digital literacy of health workers.

It has been observed that a clinician skilled in treating subjects with SUDs and with good knowledge of online technologies will not necessarily make an expert online therapist [Lovejoy, 2009]. Contrary to what is generally thought, especially for those who use the internet in a non-professional way, internet/technology-mediated therapy in drug abuse treatment is not an easy task. Although training courses on online counselling on drug abuse treatment have started to appear in the EU, they remain few in number. In addition, few standards exist that elucidate the technical skills required to practice online therapy with these clinical populations. In this context, TBIs could be included in the training programs for addiction professionals. With increasing access and demand for TBIs, health workers will need to embrace this evolution and evolve along it [Marsch, 2013]. Training for health personnel is becoming not only necessary but also multidisciplinary. Clinicians should develop expertise in different types of media, developing collaboration with experts of other fields, such as cognitive psychology, statistics, ICTs and communications [Marsch, 2013; Ramsey, 2016]. Finally, it is worth to mention that a minority of respondents reported cultural bias towards TBIs as a major barrier to the implementation of these technologies. A cultural bias lies in the belief of some professionals who consider TBIs lacks the essential element of direct human-to-human communication [McLean, 2011].

#### *Policy*

Optimism regarding the promise of TBIs should not be mitigated by the limited access and knowledge on new technologies by health professionals that emerged from this study. On the contrary, the results should support decision makers to address concerns raised. This finding suggests a strong need for broad dissemination of information about available evidence-based on TBIs in drug addiction prevention and treatment, alongside with the improvement of education, training and technical assistance [Ramsey, 2016]. Increased awareness about the benefits of TBIs and fostering digital literacy among healthcare professionals and patients are widely recognized as important. In this context, promoting the integration of training programs on TBIs in existing programs for addiction health

professionals, and establishing incentives promoting the development and the use of TBIs in clinical practice should be considered potential solutions. The vast majority of respondents declared to be ready to attend training courses on the use of TBIs, and a relevant percentage (44%) foresee a significant/high increase in the use of TBIs in the future.

A transformation of the regulatory and funding environment to support the integration of TBIs in the current health care services is also required. For example, including TBIs in the formal reimbursement system would also stimulate the usage of these technologies in clinical practice and investments in this area.

A suggested option was to provide more funding for initiatives and projects promoting TBIs. However, austerity led Europe to reduce in spending in those categories that encompass most drug-related initiatives (health, social protection and public safety). Nonetheless, policymakers are aware of the need for more cost-effective policy measures and in some EU countries, radical redesigning of drug services has been attempted [EMCDDA, 2014]. As a whole, EC encourages methods to reduce health care costs and enhance treatment-related efficiencies that include TBIs approaches to foster efficiencies in care delivery [EC, 2012].

#### ***Limitations and Conclusions***

To the best of our knowledge, this is the first survey of a large network of drug and mental health professionals on the impact of TBIs on addiction care in Europe. The study has some limitations common to those of other online surveys (e.g. bias of predefined questions, small samples involved, etc.). That said, all questions in the survey were reviewed by a panel of researchers in the pilot study, and thus, the questionnaire was less likely to include items that could mislead respondents' judgment.

A limited number of those experts invited to participate responded to the survey. It is possible that there were some selection bias and other conclusions would have been reached with a different group of respondents. However, despite the limited response rate, the majority of participants are health workers with many years of experience in the field of addiction, confirming that most of the collected opinions are underpinned by a significant professional experience in the field. This helped to ensure that the answers received were valid as based on a deep knowledge of the topic.

TBIs represent an exciting and promising development in the treatment of SUDs but technological and non-technological factors should be addressed effectively in order to adopt these technologies widely. This first comprehensive data set on the use of TBIs among health professionals working in substance abuse treatment represents a 'first state of the art', useful to monitor the development of TBIs in SUDs in the EU in the future.

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