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Karolinska Institutet, Stockholm, Sweden

REACHING OUT

INTERNET-BASED SELF- ASSESSMENT OF PROBLEMATIC SUBSTANCE USE WITH PERSONALIZED FEEDBACK

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To:

The one who always believes that everything is possible.

ABSTRACT

Background: Effective treatment methods for reducing problematic substance use exist for delivery by professional treatment providers. However, they are highly underutilized since the vast majority of the substance users never seek professional help for their problematic use. In recent years, Internet-based interventions have been recognized as potentially effective tools for reaching individuals with problematic substance use and reducing such use. The aim of this thesis is to describe the development of eScreen.se, a Swedish Internet-based screening and brief intervention service for problematic alcohol and drug use, and to explore whether eScreen.se is an effective way of reaching problematic alcohol and drug users as well as an effective service for reducing their problematic substance use.

Method: In a naturalistic study, eScreen.se users were studied with regard to their individual characteristics and utilization patterns during the first 20 months of public availability for eScreen.se (Study I). Using the same electronic screening instruments that are part of eScreen.se, the prevalence of problematic alcohol and illicit drug use was explored among 1861 individuals in a random sample from the Swedish general population (Study II). The effects of eScreen.se on reducing problematic substance use were explored in two randomized controlled trials, one with 634 problematic alcohol users (Study III) and the second with 202 illicit drug users (Study IV). In both trials, the interventions were compared to Internet-based assessment only. In the alcohol trial, eScreen.se was also compared to an online self-help intervention based on the principles of Cognitive-Behavioral Therapy (CBT) and Motivational Interviewing (MI), Alkoholhjalpen.se. Participants in both trials were followed up for 6 months (drugs) and 12 months (alcohol) after recruitment to the study.

Results: Of the 2361 individuals that created an account at eScreen.se during the first 20 months of public availability, 51 percent were women, with a mean age of 23 years ($SD=10$) in the total sample. In total, 67 percent reported problematic alcohol use while 46 percent reported problematic use of illicit drugs. The highest prevalence of problematic use was found among 18-24 year olds (76 percent for problematic alcohol use and 64 percent for illicit drug use), with small gender differences. Corresponding prevalence figures for the sample from the Swedish general population were 21 percent for problematic alcohol use and 3 percent for illicit drug use. The psychometric properties of the electronic tests used in eScreen.se were very good, with Cronbach's α values well above 0.80. The two randomized controlled trials showed that eScreen.se was associated with a decrease in substance use occurring in the first three months and maintained for up to 12 months. However, among individuals with problematic alcohol use, eScreen.se was equally effective to Internet-based assessment only and partial indications were found showing that the use of the more intensive service Alkoholhjalpen.se was more effective in reducing problematic alcohol use than the use of eScreen.se or assessment only. Partial indications also showed that the use of eScreen.se among illicit drug users was more effective in reducing drug-related problems than Internet-based assessment only, up to three months after recruitment to the study, with effects maintained up to six months. Use of eScreen.se was also associated with decreasing alcohol consumption and alcohol-related problems among drug users, up to six months after recruitment to the study.

Conclusions: Through eScreen.se, an Internet-based screening and brief intervention service, professional instruments for identifying individuals with problematic substance use have been made available on a broad population basis. eScreen.se has been shown to be an important platform for reaching groups that are underrepresented in traditional treatment settings and the use of the service is associated with decreases in substance use including alcohol and illicit drugs.

LIST OF PUBLICATIONS

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LIST OF ABBREVIATIONS

AA	Alcoholics Anonymous
Alcohol-E	Problematic Alcohol Use Test-Extended
ANOVA	Analysis of Variance
APA	American Psychological Association
AUDIT	Alcohol Use Disorders Identification Test
AUDIT-C	Alcohol Use Disorders Identification Test-Consumption
AVI-R-2	Alkoholvaninventoriet - revised version – 2
BAC	Blood Alcohol Content
CAN	Centralförbundet för alkohol- och narkotikaupplysning [The Swedish Council for Information on Alcohol and Other Drugs]
CBT	Cognitive Behavior Therapy
CRA	Community Reinforcement Approach
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4 th edition
DUDIT	Drug Use Disorders Identification Test
DUDIT-C	Drug Use Disorders Identification Test-Consumption
DUDIT-E	Drug Use Disorders Identification Test-Extended
EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
FRAMES	Feedback, Responsibility, Advice, Menu, Empathy, Self-efficacy
ICD-10	International statistical Classification of Diseases, 10 th revision
ITT	Intention To Treat analysis model
IVR	Interactive Voice Response
KRIS	Kriminellas Revansch i Samhället [Criminals Return into Society]
MANCOVA	Multivariate Analysis of Covariance
MI	Motivational Interviewing
MITT	Modified Intention To Treat analysis model
MPA	Medical Product Agency
MPP	Modified Per Protocol analysis model
NIDA	National Institute on Drug Abuse
NGO	Non-Governmental Organization
PP	Per Protocol analysis model
SD	Standard deviation
SoRAD	The Centre for Social Research on Alcohol and Drugs
STD	Sexually Transmitted Diseases
WHO	World Health Organization

1 BACKGROUND

1.1 INTRODUCTION

Psychoactive substances have been used for thousands of years, all over the world and for various reasons. Such substances have been used for religious purposes; as entrance to artificial paradises or as a way of getting into contact with the spiritual world and even with Gods. They have been used for medical purposes, for the achievement of various healing effects, for relieving different medical problems and for surgical operations. Substances have been used by soldiers in war for reducing fear and increasing the bravery or ruthlessness (Petrovic, 2003). Today, alcohol and other psychoactive drugs are still used worldwide. Despite the short-term positive aspects of psychoactive substances experienced by the individuals using them, their use results in millions of deaths as well as individual and societal suffering all over the world (WHO, 2011).

But when does the use of psychoactive substances cross the line to become problematic use? That is not an easy question to answer. In reflecting on this question, several others arise, equally difficult but necessary to consider, namely what is problematic alcohol and drug use and what is a drug? There is no easy way of answering these questions since the answers differ from one context to another. Answering these questions is not the purpose of this thesis either but for a greater understanding of the context in which the empirical studies included in this thesis have been conducted, I will attempt to cast some light in the following sections on the difficulties associated with defining the problem and attempts made to resolve it.

1.2 LEGAL AND ILLEGAL DRUGS

In many countries worldwide, alcohol and tobacco are considered legal drugs. The term *illegal drugs* is, however, something that differs from country to country and from one legal system to another. It is also something that changes over time as the list of illegal drugs is updated. In Sweden, the term illegal drugs in Sweden includes the preparations included in the list of illegal drugs that is regulated by the Swedish Medical Product Agency (MPA). Common to these drugs is that they affect the central nervous system and have an addictive effect. The Swedish list of illegal drugs is divided into five sub-categories based on the risk for misuse and the addictive effect; 1) illegal drugs that are normally not used for any medical purpose, 2-4) illegal drugs that can be used for medical purpose and require a certificate for every import/export occasion and 5) drugs that are illegal in Sweden but are not covered by the international conventions and do not require a certificate for import/export (MPA, 2011). Throughout this thesis, my focus will be on the problematic use of the legal drug alcohol, and illegal drugs according to the definition above, also referred to as substance use. This requires, however, an answer to an additional question, namely what is *problematic* substance use?

1.3 PROBLEMATIC SUBSTANCE USE

Several terms are used all over the world to characterize problematic substance use. Alcoholism, alcohol or drug problems, misuse, abuse, addiction and dependence are just some of the well-known examples used in colloquial language. Looking deeper,

these different terms have different meanings and imply that the answer to the question of what problematic substance is, is not easy to find – not because we do not have enough knowledge about the phenomenon but rather because there are different perspectives from which the phenomenon can be viewed, focusing on, including and excluding different aspects of it. To illustrate this diversity, problematic substance use will be presented in following sections from four perspectives: medical, public health, legal and user-oriented.

1.3.1 The medical perspective

Even if the terms alcoholism, misuse, abuse, addiction and dependence are used in colloquial language to characterize problematic substance use, they are also professional terms used in the diagnosis of severe problematic substance use. The prevailing approach to such severe problematic substance use today is the medical approach, where addictive behaviors are viewed as the result of a brain disease. What starts as an intended, and many times controlled, drug use, turns over time into the compulsion to use drugs. This results from changes in the structure and function of the brain, following repetitive drug use over time. These structural changes lead to a distortion of an individual's natural motivational system, making drug use the only or at least one of the most important motivational priorities for the individual. These changes in the structure and the fundamental functioning of the brain remain for a long time even after the elimination of the drug use (NIDA, 2010). The focus on diagnosing such severe problematic substance use is on substance abuse or harmful substance use and on substance dependence. More about diagnostic tools and the criteria for being classified as problematic substance use can be found in section 1.4.2.

1.3.2 The public health perspective

The medical definition of problematic substance use, including substance abuse and substance dependence, focuses solely on the harm caused by the substance use to the user him- or herself. The medical definition is also to a high extent undifferentiated, dividing substance use into three categories: abuse or dependence, characterized by the criteria included in the DSM-IV and ICD-10, or non-problematic use, not fulfilling the diagnostic criteria. Rather than considering substance use as a dichotomized phenomenon consisting of non-problematic use or problematic use involving abuse or dependence, the public health perspective considers substance use a spectrum ranging from moderate use with positive effects to chronic dependence characterized by compulsive use despite negative effects. The spectrum includes everything from occasional use that leads to insignificant health and social effects, problematic use with beginning negative consequences for the using individual and other individuals in their surroundings as well as different levels of severity of use up to chronic dependence with severe consequences (Emerson, Haden, Kendall, Mathias, & Robert Parker, 2005). In that sense, problematic substance use viewed from the public health perspective is a very broad term that subsumes the most severe kinds of problematic substance use but also less severe use that can still be problematic for both the individual user and the society in whole.

1.3.3 The legal perspective

Alcohol use is legal in Sweden but Swedish legislation contains several regulations regarding manufacturing, selling and serving alcohol ("The Alcohol Act," 2010). In contrast, all non-medical use of illegal drugs is according to Swedish law classified as misuse ("Act on Penal Law on Narcotics," 1968). That means that, according to the Swedish law, the term problematic drug use includes everything from the occasional use of sleeping medication without a medical prescription to daily use of heroin. Thus, Swedish law provides an additional definition of problematic substance use (at least in relation to problematic drug use), classifying all drug use without a medical prescription as problematic use. However, despite the division of drugs into legal and illegal, the formulation of Swedish alcohol and drug policy indicates that the government is aware of the harm caused by both alcohol and drugs, and embodies a unified strategy for alcohol, drug, doping and tobacco policy permeated by a public health approach where increased health, social welfare and security are in focus. The grounding principle for the strategy is *"...a vision about a society where all people will have the chance to grow up and live without being at risk for harm because of their own or others' use of alcohol, illegal drugs, doping or tobacco"* (M. Larsson, 2010). The overriding goal for Swedish alcohol and drug policy is the elimination of illicit drugs and doping, decreased tobacco use as well as decreased medical and social harm caused by alcohol. The strategy for working towards these goals is built on several other long-term goals such as 1) reducing the availability of the substances, 2) protecting children from the harmful effects of using such substances, considering both their own use and the use of others, 3) reducing the recruitment of children and adolescents to substance use, 4) reducing the number of individuals that develop harmful use/misuse or dependence of such substances, 5) increasing the availability of high quality medical care and support for individuals already suffering the consequences of established misuse and/or dependence on such substances and 6) reducing the number of individuals dying or being injured due to their own or others' substance use (M. Larsson, 2010).

1.3.4 The user perspective

Research about recovery patterns following problematic substance use illustrates an additional perspective indicating that the process of becoming aware of one's own problematic substance use does not necessarily stem from being diagnosed as problematic substance user or legal problems due to substance use. From a user perspective, defining problematic substance use is very much about becoming aware of one's own problematic substance use. Qualitative interviews with problematic alcohol users in treatment have shown that the word "realize(d)" can be quite central in starting to see one's own alcohol use as problematic. "Realizing" was often associated with beginning to fear the possible negative consequences that alcohol use can lead to, physically and socially, as well as starting to think about, see and accept the negative aspects of alcohol use in one's own life. Such realization can lead to different thinking about one's own alcohol use which, among the interviewed problematic alcohol users in treatment, was a prerequisite to beginning to act differently (Orford et al., 2006). However, realizing that one's own substance use is problematic does not necessarily lead to behavior change and if it does, seeking professional treatment is not an obvious choice for everyone. Previous research has shown that the vast majority of those who

resolved their problematic substance use did so without professional help (Blomqvist, Cunningham, Wallander, & Collin, 2007; Sobell, Cunningham, & Sobell, 1996). This means that the definition of the term problematic substance use from a user perspective is very subjective and can differ from one individual to another, depending on which negative consequences are experienced by the individual user. However, becoming aware of the negative consequences associated with one's own alcohol use is a central part of the definition process.

In the same way as the term illegal drugs is something that differs from country to country, from one legal system to another, as well as changing over time, the answer to the question "what is problematic substance use" also varies widely. For a thorough description and discussion about the development of different theories and different views on problematic substance use as well as different approaches to how the problem should be handled, see Blomqvist (1998). However, irrespective of the definition of the problem and what is included or excluded from the concept of "problematic substance use" there is no doubt that the actual negative consequences of substance use are real.

1.3.5 Consumption and prevalence of problematic use in Sweden

1.3.5.1 Total alcohol consumption and prevalence of problematic alcohol use

In 2010 the total alcohol consumption per capita, among persons 15 years and older in Sweden, was estimated to 9.2 liters of pure alcohol. This number includes registered alcohol sales as well as unregistered legal and illegal alcohol consumption. Despite some decreases in recent years, alcohol consumption is estimated to be about 20 percent higher than it was in the middle of the 1990's (Engdahl, 2010). According to the Swedish National Institute of Public Health, 16 percent of the men in Sweden and 10 percent of the women reported problematic alcohol use in 2010. The highest prevalence of such use is to be found among young men, 16-29 years old, where 31 percent reported problematic use. In the contrary, the lowest prevalence of such use is to be found among women 65-84 years old, where only 2 percent reported problematic use. The same pattern is to be found for alcohol consumed with the purpose of getting drunk with the highest prevalence among young individuals 16-29 years, especially men, and the lowest prevalence among older individuals, 65-84 years, especially women (The Swedish National Institute of Public Health, 2012).

1.3.5.2 Total drug consumption and prevalence of problematic drug use

In contrast to the thorough study of alcohol use in Sweden, reports about the use of illicit drugs are not quite so detailed. Most of the information available concerns drug use among young individuals and cannabis use. The Swedish Council for Information on Alcohol and Other Drugs reports that in 2010, 9 percent of the men and 7 percent of the women in the 9th grade of compulsory school (grades 1-9) as well as 18 percent of the men and 15 percent of the women in the 2nd grade of high school (grades 1-3) had ever used any illicit drugs. Corresponding figures for those who used illicit drugs in the past 30 days are 3 and 1 percent respectively for those in the 9th grade as well as 5 and 2 percent for those in the 2nd grade (CAN, 2010). Cannabis use is most common among younger individuals in Sweden, 16 to 29 years old. In that age category, 23 percent of

men had ever used cannabis, in 2010. The corresponding figure among women in the same age category was 16 percent. The same pattern can be found among those who used cannabis in the past year and in the past 30 days (The Swedish National Institute of Public Health, 2011). Heavy drug use, defined as injecting drugs (irrespective of the frequency of such use) or using drugs daily in any other way was in 1998 most common in the age category of 30 to 39 years (Olsson, Adamsson Wahren, & Byqvist, 2001). Prevalence data about problematic drug use in the Swedish general population is also sparse. A population survey with the Drug Use Disorder Identification Test (DUDIT) from 2009 indicated that about 4.4 percent of Swedish women, 16-80 years, and 5.3 percent of Swedish men have used any illicit drugs in the past 12 months and 2.8 percent were estimated to have harmful drug consumption, 1.8 percent of men and 3.8 percent of women (Sinadinovic, Berman, & Wennberg, 2011). For more details see the second empirical study included in this thesis.

1.4 NEGATIVE CONSEQUENCES OF PROBLEMATIC SUBSTANCE USE

All over the world, problematic use of alcohol causes devastating suffering on many levels. A total of 3.8 percent of all deaths and 4.5 percent of Disability Adjusted Life Years (DALY), defined as the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability, are caused by alcohol use. The levels of harm vary by country income level: regarding deaths, 6.4 percent were caused by alcohol in middle-income countries and 1.6 percent in high-income countries, while DALYs due to alcohol was 2.1 percent in low-income countries, 7.6 percent in middle-income countries and 6.7 percent for high-income countries. In absolute values, this means millions of destroyed lives. In the same way, 0.4 percent of all deaths worldwide and 0.9 percent of DALYs can be attributable to illicit drug use (WHO, 2009).

Besides death, the ultimate negative consequence on the individual level, alcohol has been shown to have a negative impact on users' health and be a direct or indirect causal factor for several major cardiovascular- and gastrointestinal diseases, different types of cancer (Rehm et al., 2010) and neuropsychiatric disorders (WHO, 2011). Short-term consequences are often due to the situational risks that increase for the intoxicated individual, resulting in injuries and death from violent behavior and different types of accidents (WHO, 2004).

Social consequences for both the alcohol-using individuals themselves and people around them are also considerable. Previous research and reports have shown association between harmful alcohol use and individuals' inferior performance at work resulting in lower productivity (G. M. Ames, Grube, & Moore, 1997; Blum, Roman, & Martin, 1993; Trapenciere, 2000), work related accidents (Saxena, Sharma, & Maulik, 2003; Stallones & Xiang, 2003) and extensive sickness absence (Klingemann & Gmel, 2001; Saxena et al., 2003; Webb et al., 1994), with corresponding large costs to the workplaces (WHO, 2004). Previous research has also shown associations between heavy drinking and unemployment (Klingemann & Gmel, 2001; Mullahy & Sindelar, 1996; Mustonen, Paakkaned, & Simpura, 1994).

An individual's problematic alcohol use can also severely affect family members. Inferior work performance followed by unemployment or reduced income, the cost of alcohol consumed and increased medical expenditures due to bed health and injuries can result in reduced household income (Bonua, Rani, Jha, Peters, & Nguyene, 2004). A spouse or a partner is often forced to compensate for the reduced household income and economic possibilities for children decline. But this is not the only way in which family members can be negatively affected. Frequent drinking of at least one family member can result in extensive mental health problems among other family members (WHO, 2004), in families breaking apart (Collins, Ellickson, & Klein, 2007) and in increased home accidents and violence within the families (Maffli & Zumbrunn, 2003; Room, 1998; White & Chen, 2002). Previous research has shown that children run a higher risk of abuse in families where parents drink frequently, and that parental use of alcohol use negatively affects the situation for those children on various emotional, social and economic levels. (WHO, 2004). Also, unborn children can be affected by pregnant women's alcohol consumption, due to the increased risk for complications associated with premature birth and for fetal alcohol syndrome (Rehm et al., 2010).

Further, an intoxicated person can also harm persons outside the family, due to the risk of traffic and other accidents or violent behavior, with resulting physiological, psychological and social harm. However, the impact of harmful alcohol use reaches even deeper into society, generating a loss of economic productivity on a larger scale as well as costs in social institutions such as criminal justice or health care systems (WHO, 2004).

Illicit drug use causes similar, if not even more severe negative consequences for individual users, their families and friends, societies and world as a whole. For reasons of space, no deeper account of the negative consequences for specific drugs is given here. However, the impact of illicit drug use on individuals' lives is great, jeopardizing the physical and mental health of the users and putting them at risk for different types of accidents and death. Health risks are specifically high for injecting drug users, whose behavior is associated with overdoses and transmission of infectious diseases such as HIV and hepatitis A, B, C and D, sexually transmitted and other diseases. The social consequences described above are also valid for illicit drug users, who experience higher levels of unemployment, homelessness and social exclusion (Degenhardt, Hall, Warner-Smith, & Lynskey, 2004; EMCDDA, 2011). Illicit drug use is also associated with crime, not only because the use and/or possession of such substances is forbidden by law (in Sweden), but also because individual drug users often need to commit other crimes to finance their own drug use. The production and export of illicit drugs is one of the world's largest industries that is based on internationally organized crime and has a great impact on the societies. It prolongs civil wars and conflicts, it devastates rainforests, pollutes water and nature and keeps countries in poverty. Corruption and violence follow in its way and profits from the illicit drug industry are used for sponsoring terrorism and trafficking (Kegö & Leijonmarck, 2010).

1.5 WHAT CAN BE DONE

According to the Swedish law, municipalities are responsible for meeting and financing the treatment needs of individuals registered as their residents. This means that the municipalities are obligated to help the individuals in need for treatment ("Social Services Act," 2001). Regarding individuals with problematic substance use at various levels of severity, the responsibility for planning treatment, ensuring that the treatment plan is followed and that the individual receives help to recover from problematic substance use, lies with municipal social services and is regulated in the Social Services Act ("Social Services Act," 2001). The act emphasizes respect for the individual's free will and integrity and stipulates that treatment plans should be made in consensus with the individual in need of treatment. In the cases where individuals are at risk of destroying their lives or harming themselves or others but are not willing to undergo treatment for their problematic substance use, compulsory treatment can be enforced ("Care of Abusers (Special Provisions) Act," 1988). Municipalities are also responsible for preventive work and early interventions with individuals at risk for developing problematic substance use. Although bearing primary responsibility for treatment of individuals with problematic substance use, the municipalities collaborate with county healthcare services, organized under the County Councils (Swedish *landstingen*), which are responsible for the medical and psychiatric care related to problematic substance use, including detoxification, emergency services, pharmacological treatment etc. ("The Health and Medical Service Act," 1982). However, according to a recent government study concerning the possible reorganization of addiction care in Sweden, great differences exist between the counties in how collaboration around addiction treatment is organized as well as how social and healthcare services interpret the law and their own responsibility. Some counties have established centers for dependency disorders and offer highly specialized addiction treatment while others do not offer any specialized treatment at all. Also the interventions available vary highly from county to county and from municipality to municipality (G. Larsson, 2011).

The type of treatment that should be offered to problematic substance users is regulated by The National Board of Health and Welfare, organized under the Ministry of Health and Social Affairs in Sweden, is the agency with responsibility for "supporting, influencing and inspecting" social services as well as the health and medical care services. In 2007, the Swedish National Board of Health and Welfare released national guidelines for substance misuse and dependence treatment, providing evidence-based information and recommendations to the medical care and social services about the treatment methods available for individuals with problematic substance use (The National Board of Health and Welfare, 2007).

In the following sections, an assessment and treatment model for helping individuals with problematic substance use is described from a caregiver perspective. This model includes identification of individuals with problematic substance use, assessing the severity of the problem and providing suitable treatment for reducing such use. This description is followed by a brief analysis of problematic issues with this perspective and the need for alternative approaches.

1.5.1 Screening for the problem

The first step of grasping the issue of problematic substance use is, from a resource-informed public health and treatment perspective, to identify individuals with or at risk for developing substance related problems. The Swedish National Board of Health and Welfare recommends two instruments for identifying individuals with problematic substance use; Alcohol Use Disorders Identification Test (AUDIT) (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993) and Drug Use Disorders Identification Test (DUDIT) (Berman, Bergman, Palmstierna, & Schlyter, 2005), in the national guidelines for the treatment of substance misuse and dependence (The National Board of Health and Welfare, 2007).

The 10-item AUDIT questionnaire, developed by the World Health Organization (WHO), assesses the alcohol consumption of the tested individuals with the first three questions, alcohol misuse with questions 4, 6 and 8 and alcohol dependence with questions 5, 7, 9 and 10 (see Appendix 1). The first eight questions can be answered by choosing one of the five response alternatives, each one generating scores from 0 to 4 and representing gradually increasing frequency of the behavior asked about. The last two questions can be answered by choosing one of the three response alternatives, each one generating scores 0, 2 or 4 representing no, life-time or past-year occurrence. The scores from each question are summarized, generating a possible maximum score of 40 points (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). Analyses of the internal consistency reliability of the Swedish version of the questionnaire have resulted in Cronbach's alpha values of over 0.90 on the Swedish version of the AUDIT. This can be considered excellent reliability of the instrument (Bergman & Källmén, 2002; Källmén, Wennberg, Berman, & Bergman, 2007). The total AUDIT score indicates the severity of problematic alcohol use, including the two domains of alcohol consumption and alcohol-related problems. The total score can be divided into categories defining different levels of problematic alcohol use. The Swedish AUDIT-manual takes into account physiological differences between the genders when establishing the threshold for problematic alcohol use. For this reason, scores between 0 and 7 for men or between 0 and 5 for women indicate no use or no problematic use of alcohol. Scores between 8 and 15 for men or between 6 and 15 for women indicate hazardous alcohol use. Total scores between 16 and 19 indicate harmful alcohol use for both genders while probable alcohol dependence is indicated by scores over 19 (Berman, Wennberg, & Källmén, 2012).

The DUDIT questionnaire, developed in Sweden, is to high extent comparable to the AUDIT. The questionnaire consists of 11 questions of which first four measure the consumption of the illicit drugs, 5, 7 and 9 measure drug misuse while questions 6, 8, 10 and 11 measure drug dependence (see Appendix 2). The first nine questions offer five response alternatives generating scores from 0 to 4 while last two questions can be answered by choosing one of three response options generating scores of 0, 2 or 4. The maximum possible score for the summarized responses is 44 points (Berman et al., 2005). Investigation of the internal consistency reliability for this questionnaire has also indicated very good Cronbach's alpha values of 0.93 in a general population sample and 0.80 in a sample of heavy drug users (Berman et al., 2005). Different levels of problematic illicit drug use are defined as follows: a total score of 0 indicates no drug

use, while a total score between 1 and 5 for men or score of just 1 for women indicates hazardous drug use. Scores between 6 and 24 for men or between 2 and 24 for women indicate harmful drug use while a total score of 25 or more indicates probable drug dependence for both genders (Berman et al., 2012). That all drug use, even just occasional, is categorized as problematic reflects the legal perspective on drug use in Sweden where use of all illicit drugs per se is a criminal act leading to legal consequences for the using individual ("Act on Penal Law on Narcotics," 1968).

1.5.2 Diagnosing the problem

The two diagnostic tools most used by medical professions worldwide for diagnosing problematic substance use in individuals are the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) published by the American Psychiatric Association (APA, 2000) and the International Statistical Classification of Diseases and Related Health Problems (ICD-10) published by the World Health Organization (WHO, 1992). Both classification systems divide problematic substance users into two categories; those with substance abuse (DSM-IV)/harmful substance use (ICD-10) and those with substance dependence. Criteria for substance abuse or harmful substance use are characterized by inability to fulfill commitments, repeated incidents of risky behavior, social and legal harm, damage to physical and mental health and persisting substance use despite physical or mental harm.

In contrast to the criteria for substance abuse/harmful use, characterized by behavior that is noticeable by others in the user's surrounding, criteria for substance dependence are characterized by feelings and behaviors that occur within the user him- or herself: desire or sense of compulsion to take substance, difficulties in controlling onset, level or termination of use, neglect of alternative pleasures/interests, increased amount of time devoted to substance use, evidence of tolerance, persisting substance use despite obvious harm, physiological withdrawal symptoms after reduction/termination of substance use and substance intake to reduce or eliminate abstinence symptoms.

According to both the DSM-IV and ICD-10 classification systems, substance abuse/harmful use and substance dependence are mutually exclusive.

1.5.3 Assessing the problem

After initial screening and identification of individuals with problematic alcohol or drug use the next step is to assess such use and explore more in depth the severity of the problem. An instrument recommended by the National Board of Health and Welfare in their national guidelines for substance misuse and dependence treatment (The National Board of Health and Welfare, 2007) for just this purpose is the in-depth self-report test Drug Use Disorders Identification Test-Extended (DUDIT-E) (Berman, Palmstierna, Källmén, & Bergman, 2007). The purpose of the test is to increase awareness about the role of drugs in the individual's own life. At first, assessed individuals are asked to provide information about how often they use different types of illegal substances. They are also asked to answer 17 questions about positive experiences of their drug use, 17 questions about negative experiences and 10 questions about their interest in treatment and readiness to change drug use (see Appendix 3). Answers about the frequency of drug use for each drug category generate scores from 0 to 5 where higher

score is associated with higher frequency of use. Responses about each positive and negative aspect of drug use generate scores ranging from 0 to 4 where higher scores indicate higher frequency of experienced positive or negative aspects of drug use. Answers on questions about treatment can produce scores of 0, 1 or 2. Scores from each response are summarized, using reverse scoring for responses on question 1 and 9. Scores from responses on questions 6, 7 and 10 are not included in the summarization. The meaning of the scores is described in section 1.6.2.3. The reliability of the instrument has previously been tested among heavy drug users and among prison inmates. In the Swedish sample of heavy drug users from inpatient detoxification the internal consistency was shown to be good with Cronbach's alpha values for positive and negative aspects of using drugs: 0.88 for each section and 0.72 for the treatment section. In a Swedish sample of heavy drug users from prison/probation the internal consistency was shown to be even better with Cronbach's alpha values of 0.92, 0.90 and 0.81 respectively (Berman et al., 2007). In a Norwegian sample of drug-involved prisoners the internal consistency was shown to be excellent with a Cronbach's alpha value of 0.95 for positive aspects of using drugs and 0.92 for negative aspects. For the treatment section, Cronbach's alpha indicated good internal consistency with a value of 0.84 (Lobmeier, Berman, Gossop, & Ravndal, 2012).

To explore the severity of alcohol use and gain more understanding about the problem AVI-R-2 (Alkoholvaneinventoriet - revised version – 2) is currently recommended in national guidelines as an evidence-based instrument. AVI-R-2 is a self-report questionnaire with 80 questions about drinking habits, reasons for drinking alcohol, different alcohol related problems and about motivation to change the problematic behavior (Bergman, Wennberg, Hammarberg, Hubicka, & Berglund, 2005). The results of the AVI-R-2 questionnaire can be provided as individual feedback, and treatment providers can use it to structure the meeting with the client/patient in order to initiate a change of behavior of the problematic alcohol user. Creating a profile for alcohol habits of the user with the AVI-R-2 also creates an opportunity to make individual treatment programs for each specific user, taking into account the specific characteristics, conditions and needs of the client (Berman & Brisendal, 2011).

An alternative to AVI-R-2 is the Alcohol-E (Berman, Palmstierna, Bergman, & Sundberg, 2004). Alcohol-E is a parallel instrument to the DUDIT-E and is identical in construction to it (see Appendix 4). The difference between the tests is that DUDIT-E assesses the problematic use of illegal drugs while Alcohol-E assesses the problematic alcohol use. Another difference is that Alcohol-E has been psychometrically tested only through the studies conducted within the framework of this thesis.

1.5.4 Treatment alternatives for problematic substance use

After identifying individuals with problematic alcohol or drug use, assessing the severity of their problem and after assessing the individual conditions, circumstances, possibilities and assets of the problematic user the next step is to provide an intervention for reducing the problematic substance use.

There are a range of effective interventions for reducing such use (Raistrick, Heather, & Godfrey, 2006; The National Board of Health and Welfare, 2007) that can be

categorized into brief interventions and specialist treatments such as psychosocial and pharmacological treatment (Raistrick et al., 2006). In addition, self-help in different forms has also been shown to be effective for reducing problematic substance use (Galanter & Castañeda, 1999; Kassel, Wagner, & Unrod, 1999).

1.5.4.1 Brief interventions

In the national guidelines, the Swedish National Board of Health and Welfare recommend brief intervention as an evidence-based and cost effective method for preventing hazardous alcohol or drug use from progressing into more severe problematic use (The National Board of Health and Welfare, 2007). However, brief intervention is not one specific intervention but a term that include several types of interventions (Raistrick et al., 2006). According to the World Health Organization's lexicon of alcohol and drug terms, brief intervention is "*a treatment strategy in which structured therapy of short duration (typically 5-30 minutes) is offered with the aim of assisting an individual to cease or reduce the use of psychoactive substance*" (WHO, 1994). Brief intervention often includes screening for problematic substance use and can also be seen as an early intervention aiming to identify individuals with problematic substance use and encourage them to make an effort to change such use before it escalates to more severe use. Such interventions are introduced pro-actively by non-specialist professionals before an individual at risk express any will of their own to do something to change the problematic substance use. In many cases an individual with less severe problematic substance use is not even aware that his or her consumption of a substance is of such a nature that it can have a negative influence on one's health or other aspects of life (Raistrick et al., 2006; WHO, 1994).

Similar interventions, delivered to a help-seeking population, have been classified as less intensive interventions and are often spread out over 1 – 4 sessions. Such less intensive but still brief interventions are provided by specialist alcohol workers (Raistrick et al., 2006).

A large body of evidence confirms that different types of in-person brief motivational interventions are effective in reducing problematic alcohol use, primarily for those with less severe alcohol consumption (W. R. Miller, Wilbourne, & Hetta, 2003; A. Moyer, Finney, Swearingen, & Vergun, 2002a; Raistrick et al., 2006). However, the evidence shows a short-term effect of up to two years and it is suggested that a delivery of booster sessions could be a way of prolonging the effect (Raistrick et al., 2006). In its national guidelines from 2007, the Swedish National Board of Health and Welfare divides brief intervention into two methods: FRAMES, a counseling method that is based on a health worker providing advice about healthier substance consumption; and Motivational Interviewing (MI), which is a conversation where the counselor in a respectful way helps the client to reflect over her own substance use and find her own way to resolve the problem (The National Board of Health and Welfare, 2007). More about MI is found in section 1.6.2.4.

1.5.4.2 Psychosocial treatment

For those with more severe alcohol or drug consumption, the Swedish national guidelines recommend the following treatments as effective, based on existing

evidence: brief intervention, in particular motivational enhancement treatment for those with alcohol consumption and motivational interviewing for those with illicit drug consumption; cognitive behavior therapy with focus on substance misuse, psychodynamic therapy, community reinforcement approach (CRA) and family therapy with a focus on substance misuse and dependence. In addition, 12-step programs and interactional therapy are recommended as effective treatment methods for those with problematic alcohol use (Raistrick et al., 2006; The Swedish Council on Technology Assessment in Health Care, 2001a, 2001b). However, guidelines emphasize that the intensity of the treatment should be accommodated to the degree of severity of substance use (The National Board of Health and Welfare, 2007).

1.5.4.3 Pharmacotherapy

The National Board of Health and Welfare also recommends some pharmacological treatments as effective for reducing substance use in individuals with substance misuse or dependence. For reducing alcohol use naltrexone (Revia®) is recommended as well as disulfiram (Antabus®) which should only be given to the patient under supervision. Disulfiram (Antabus®) is also recommended as an effective treatment for reducing cocaine use in individuals with cocaine misuse or dependence. For individuals with longstanding opioid misuse or dependence, Metadon® (methadone) and Subutex® (buprenorphine) are recommended in the guidelines as effective medicines but should be given in combination with psychosocial treatment methods (The National Board of Health and Welfare, 2007).

1.5.4.4 Self-help groups

One of the largest and most well-known self-help groups for individuals with problematic alcohol use all over the world is Alcohol Anonymous (AA). The concept of this organization is that people in large groups help and support each other to abstain from alcohol by sharing their personal experiences of the same problem. The fundamental model of the organization is based on the credo that there are twelve steps that are to be followed to achieve spiritual development and increase maturity of character. The twelve-step method has proven to be effective for reducing and abstaining from substance use (Galanter & Castañeda, 1999; Kassel et al., 1999). Similar organizations such as Narcotics Anonymous, Cocaine Anonymous and others have been developed over time, adopting the same fundamental model to help individuals abstain from substances other than alcohol.

In summary, reliable instruments exist for identifying individuals with problematic substance use and there is a range of evidence-based treatment methods to help individuals reducing their problematic substance use. However, these instruments and methods are restricted to individuals who have access to professionals who work with problematic substance users, or work in other health or social work settings where it is possible to identify such individuals. Being able to benefit from state-of-the-art assessment and treatment presupposes therefore that an individual is aware of his problematic substance use and seek help for reducing it. But, today, it is well-known that the vast majority of individuals with problematic substance use never come in contact with professional treatment providers with the purpose of resolving their problems. In other words, these evidently effective methods for reducing problematic

substance use, that are mainly restricted to delivery by professional treatment providers, only reach a small proportion of problematic substance users. Previous research has also shown that treatment systems in different countries in reality serve mainly those with the most severe and long lasting problematic substance use as well as those with severe social and psychiatric complications and consequences (Blomqvist et al., 2007; Humphreys & Tucker, 2002; Öjesjö et al., 2002).

Several studies have found that the motives for not contacting the professional treatment providers include the will to change problematic use without professional help, and shame and fear of being judged and stigmatized (Cunningham, Sobell, Sobell, Agrawal, & Toneatto, 1993; Fortney et al., 2004; Grant, 1997). Blomqvist (1999; 2002) however, presented, a somewhat more differentiated picture showing that shame and fear of stigmatization were the more common reasons for women not to seek professional help, while mistrust of traditional treatment for problematic substance use and belief in one's own ability to resolve such problems were reasons more common for men. The most important reason for young women with problematic drug use not to seek professional help was the fear that their children would be taken away from them if they admitted their drug use to the authorities (Blomqvist, 1999, 2002). Theoretically, it would be possible within primary care to identify a large number of individuals with problematic alcohol use and offer screening, medical advice or brief intervention, but not even in this context are this type of interventions successfully implemented (Denny, Serdula, Holtzman, & Nelson, 2003; Seppa, Aalto, Raevaara, & Perakyla, 2004). This indicates that there is a large discrepancy between the number of problematic substance users who could be helped by professional interventions and the number of those who access them. This also indicates that traditional treatment for problematic substance use is for various reasons not suitable for the vast majority of problematic substance users and should be extended with alternatives that put the individual substance user in charge of their own recovery. One such alternative was found to be self-help (Cunningham, Wild, & Walsh, 1999; Koski-Jännes & Cunningham, 2001) and early research has shown that a sample of problematic alcohol users would rather use Internet-based self-help tools than being contacted via the telephone by a live therapist or using a self-help book (Koski-Jännes & Cunningham, 2001). Lieberman (2003) has shown that problematic alcohol users who received personalized feedback via an Internet-based self-help intervention considered information comparing their individual level of alcohol consumption to levels for similar age groups in the general population as surprising to them and thus highly useful (Lieberman, 2003).

1.6 DELIVERING INTERVENTIONS VIA THE INTERNET

Delivering self-help and other interventions for reducing the problematic substance use via the Internet is today thought to have a potential for fulfilling unmet needs for professional interventions among problematic substance users and to reach a population of problematic users hitherto hidden to professional treatment providers (Kypri, 2009).

Previous research has shown that problematic alcohol users interested in Internet-based interventions are, in several ways, different from those seeking traditional professional help for their problems. Individuals interested in Internet-based interventions are more

often women, younger adults, highly educated, living in stable relationships, having children and employed. Regarding their alcohol use they tend to score high on AUDIT with the mean AUDIT scores corresponding to those of harmful alcohol use (Postel, de Haan, ter Huurne, Becker, & de Jong, 2011; Postel, De Jong, & De Haan, 2005; Riper et al., 2009; Riper et al., 2007; Sinadinovic, Berman, Hasson, & Wennberg, 2010; Swan & Tyssen, 2009). However, they have to a lesser extent utilized interventions for problematic substance use before accessing Internet-based treatment (VanDeMark et al., 2010). Interestingly, despite high AUDIT scores, the users of Internet-based intervention do not consider themselves as having a problem with the alcohol to the same extent as those seeking the traditional treatments (Lieberman & Massey, 2008; Vernon, 2010).

1.6.1 The prevalence of Internet use

Almost all individuals in Sweden have access to Internet today. However, it is important to emphasize that having access to Internet is not the same as being an Internet user. The highest proportion of those who use Internet daily in Sweden is to be found in the age category 16-34 years where over 90 percent use Internet daily and almost all, 98-99 percent, use it occasionally. Also, among younger individuals 9-15 years, 99 percent use Internet occasionally but to a lesser extent daily (46 percent of those 9-11 years old and 81 percent of those 12-15 years old). It has also been found that Internet use and frequency of use decrease with increased age. The prevalence of occasional Internet use is 97 percent in the age category 35-44 years, 91 percent in the age category 45-54 years, 80 percent in the age category 55-64 years, 60 percent in the age category 65-74 years and 25 percent among those 75 years old and older. The prevalence of daily Internet use follows the same trend but the figures are even lower. Among those 35-44 years of age 79 percent use Internet daily, 67 percent among 45-54 year olds, 57 percent among 55-64 year olds, 43 percent among 65-74 year olds and 16 percent among those 75 year olds and older (Findahl, 2011). In total, 85 percent of Swedish residents use Internet, which puts Sweden in a leading position in the world when it comes to Internet use, with the Netherlands right behind with 84 percent and Denmark with 81 percent. Corresponding figures for the USA, UK and Korea are 77 percent, for Japan 74 percent, for Hong Kong 68 percent, for Singapore 67 percent, for Portugal 46 percent and for China 23 percent (Findahl, 2011). The rate of Internet use is about 50 percent in several Southern European countries and some Eastern European countries (with wide variations) and under 10 percent in developing countries (Findahl, 2011).

A very popular category of data sought on the Internet is information related to health. In 2010, 55 percent of Swedes sought health-related information on the Internet. The corresponding figure for the USA is 61 percent (Findahl, 2011). These figures indicate that the Internet could be a relevant place to offer health-related interventions. In a survey conducted in 2009 by the Swedish National Institute of Public Health, 78 percent of Swedish respondents stated that they would use Internet to obtain information about alcohol and illicit drugs (The Swedish National Institute of Public Health, 2009) and results from focus group interviews with individuals with hazardous alcohol use showed that those individuals are interested in getting help in form of Internet-based screeners (Andréasson, 2010).

1.6.2 Advantages of Internet-based interventions

One of the advantages of Internet-based interventions in general is the possibility of delivering an intervention to many people irrespective of where they are and what time of the day it is. In other words an individual can with the help of the Internet receive an intervention whenever needed (Hester & Miller, 2006; Matano et al., 2007). This is a very important issue since the level of motivation to change a problematic behavior such as problematic substance use varies over time. This means that whenever an individual feels ready to change the problematic behavior the intervention should immediately be available if the window of opportunity is to be utilized (Cloud & Peacock, 2001).

An additional advantage with Internet-based interventions is avoidance of the stigma and embarrassment attached to meetings with a live treatment provider, two reasons for individuals in need not seeking professional help identified in previous research (Cunningham et al., 1993; Fortney et al., 2004; Grant, 1997). Research over the past 40 years has shown that people tend to report embarrassing or sensitive information to a higher extent when reporting to a computer than in a face-to-face communication (Des Jarlais et al., 1999; Greist, 1977; Joinson; Kissinger et al., 1999; Link & Mokdad, 2005; Turner et al., 1998; Wang et al., 2005). Servan-Schreiber (1986) showed that the same pattern was found for individuals with substance misuse when reporting about substance consumption (Servan-Schreiber, 1986) while Kobak and colleagues (1997) reported that computer-based screening detected alcohol abuse at twice the rate of face-to-face screening (Kobak et al., 1997). Several studies have investigated the reliability of data about alcohol consumption and alcohol-related problems collected via the Internet and found it to be reliable (Bason, 2000; McCabe, Boyd, Couper, Crawford, & d'Arcy, 2002; McCabe, Diez, Boyd, Nelson, & Weitzman, 2006; E. T. Miller et al., 2002).

At the same time as the chances for identifying individuals with problematic substance use increase with Internet-based interventions, the potential for cost-efficiency is great. After developing an Internet-based intervention, the cost for technical improvement and maintenance is quite low and the cost for delivering an Internet-based intervention does not increase with increased numbers of individuals receiving it (Hester & Miller, 2006; Matano et al., 2007). Budman (2000) showed that a computerized version of the Addiction Severity Index (ASI) led to an 80 percent decrease in cost compared to when a counselor conducted the interview (Budman, 2000). Smit and colleagues also provided evidence indicating the cost-effectiveness of an Internet-based interactive intervention for reducing problematic alcohol use (Smit et al., 2011; Smit, Riper, Kramer, Schippers, & Cuijpers, 2008). When delivering Internet-based self-help interventions without therapist support, the cost for education, training and supervision of the clinicians is also avoided (Copeland, 2011).

Further advantages with this type of interventions is consistent delivery of the intervention, which cannot be modified by individual therapists as with manual-based live therapies (Fotheringham, Owies, Leslie, & Owen, 2000). Also, if any modification

of the intervention is needed, the changes are carried out just once and instantly implemented (Copeland, 2011).

The advantage of Internet-based interventions as self-help tools over multimedia material such as CDs, DVDs or videotapes and over books and other written materials, always delivered in the same way to every user, is the possibility of adapting the information, feedback and the intervention itself to each user according to a variety of variables such as age, gender, risk factors and several other dimensions. Previous research has shown that the effects of an intervention are greater when they are accommodated to different individuals than when exactly the same intervention is provided to every user (Kreuter & Strecher, 1996; Kreuter, Strecher, & Glassman, 1999). Internet-based interventions allow the tailoring and accommodation of the intervention components at the same time as they are always delivered in the same way to individuals with the same or similar characteristics.

1.6.3 Defining Internet-based interventions

In comparison to a general website providing information about problematic substance use and its consequences, an Internet-based intervention for problematic substance use offers structured self-monitoring and other types of interactive counseling with pre-determined content, with or without human support via e-mail, chat or messages (Ritterband & Thorndike, 2006). An Internet-based intervention for problematic alcohol or illicit drug use can be seen as treatment with the goal of supporting the user in cutting down on such use and possibly eliminating it (Cunningham, Kypri, & McCambridge, 2011).

One way of categorizing Internet-based interventions for problematic alcohol and drug use is by the functions they contain, by the structure of the content and by length (brief or longer interventions). Cunningham and colleagues (2011) use the term “*screeners*” to describe interventions that take approximately 10 minutes and usually offer an assessment questionnaire which upon completion generates feedback that is personalized for the user. The term “*Cognitive–Behavioral Treatment Programs*” is used to describe interventions usually offering the same tools that are used in face-to-face treatments and designed for use on several occasions. However, Cunningham and colleagues acknowledge that this distinction is not very easy to make and state that the interventions should be placed on a continuum rather than categorized in this way since some interventions offering screening and personalized feedback can be very extensive and take some time to complete while interventions offering structured multi-session cognitive-behavioral treatment do not necessarily need to be long, depending on how the users of the interventions chose to use them (Cunningham et al., 2011).

Another way of categorizing Internet-based interventions for problematic alcohol and drug use is by the extent to which the user of the intervention has contact with a therapist: 1) An intervention can be pure self-help, where the intervention does not offer any contact with a therapist; 2) An intervention can be guided self-help which either means that a therapist conducts the initial assessment and teaches the patient how to use the Internet-based intervention or, that a user of the intervention does have the contact with the therapist during the whole time he or she is using the intervention but

to a lesser extent than in a face-to-face treatment and via electronic communication; 3) Self-help in combination with face-to-face therapy, which is characterized by the individual using self-help material while regularly meeting the therapist face-to-face (Andersson, Bergstrom, Carlbring, & Lindefors, 2005).

1.6.4 Overview of the research field

The research field regarding the Internet-based interventions for problematic substance use is still quite new, with many unanswered questions and insufficient evidence about the effectiveness of such interventions (Copeland, 2011; Cunningham et al., 2011). In 2004, Copeland and Martin identified four descriptive studies on Internet-based interventions for problematic alcohol use. One additional intervention was described, offering assessment of the problem online but making the intervention for reducing the problem accessible via a CD-ROM. None of these studies explored the efficacy or the effectiveness of the interventions described. Further, no study looking at Internet-based interventions for illicit drug use was included in that review article (Copeland & Martin, 2004). In 2008, Bewick and colleagues identified ten studies about Internet-based interventions for problematic alcohol use of which only five presented any measurement of effectiveness. Only one of the five studies that provided effectiveness measurements was addressing the general population, and only one was a randomized controlled trial. Bewick and colleagues were not able to draw any certain conclusions about the effectiveness of such interventions, based on the identified studies, because of inconsistent results (Bewick, Trusler, Mulhern, Barkham, & Hill, 2008).

In 2010, Khadjesari and colleagues identified 14 studies on Internet-based interventions designed to reduce problematic alcohol consumption. These studies, together with five other studies looking at the computer-based interventions for the same purpose were included in a systematic review in an attempt to explore the effects of such interventions. The authors presented results indicating that Internet-based interventions may be more effective for reducing alcohol consumption than only assessment of the problem. However, only three of the Internet-based interventions were addressing a non-student population and the authors also identified methodological problems in the included studies, weakening the evidence for effectiveness (Khadjesari, Murray, Hewitt, Hartley, & Godfrey, 2010). Newman and colleagues published a review article in 2011, trying to determine the efficacy of technology-assisted self-help and minimal contact therapies for problematic substance use. In total, six studies on Internet-based interventions for problematic alcohol use providing some kind of efficacy measurement were included in the review. Regarding interventions for problematic drug use, six studies were identified and included, of which all six looked at computer-based interventions and none were Internet-based. For this reason there is no evidence about the efficacy of Internet-based self-help interventions for problematic drug use. Since the authors did not investigate the efficacy of specific modes (computer-based versus Internet-based) through which interventions were delivered it is furthermore not possible to draw any conclusions about the efficacy of Internet-based interventions for problematic alcohol use (Newman, Szkodny, Llera, & Przeworski, 2011).

The lack of sufficient evidence about the efficacy and the effectiveness of Internet-based interventions for problematic alcohol use and the absence of evidence about such

interventions for problematic illicit drug use confirm the need for more research in this field. In October, 2011, a literature search in PsychINFO with the following search terms: (alcohol OR drink* OR substance OR drug* OR cannabis OR amphetamine OR cocaine OR opiates OR hallucinogens OR thinner OR GHB OR pills) AND (internet OR web OR online) AND (screening OR assessment OR feedback OR service OR intervention OR treatment OR program) generated 1493 articles. A manual screening of those articles, excluding irrelevant ones as well as interventions and prevention programs for adolescents and student populations, resulted in 48 original articles about Internet-based interventions for problematic alcohol use and 12 for problematic illicit drug use, with few overlaps. The results of the literature search are outlined below.

1.6.4.1 Screeners

Most of the published articles about Internet-based interventions for problematic alcohol use that address the general population are descriptive studies about online services that can be categorized as “screeners”, offering online assessment instruments and personalized, normative feedback often including short recommendations on what to do to change the problematic alcohol use. To the best of our knowledge there is no other Swedish example of such interventions, except for the eScreen.se website that is in focus for this thesis. eScreen.se is also one of the two interventions identified in the published literature that delivers screening and brief intervention for reducing both problematic alcohol and unspecified illicit drug use for general population. eScreen.se is described in more detail in section 1.6.

Alcohol

Other European examples of screeners for reducing problematic alcohol use are the Finnish www.paihdelinkki.fi/testaa/juomatapatesti (Koski-Jännes, Cunningham, & Tolonen, 2009; Koski-Jännes, Cunningham, Tolonen, & Bothas, 2007) and Spanish El Alcohol y Tú (Rodríguez-Martos & Castellano, 2009). There is also a Canadian service, <http://notes.camh.net/efeed.nsf/newform> (Cunningham, Humphreys, & Koski-Jännes, 2000; Cunningham, Humphreys, Koski-Jännes, & Cordingley, 2005) and a Canadian service that is open for all English, French, Portuguese and Spanish speaking individuals, www.CheckYourDrinking.net (Cunningham, Humphreys, & Kypri, 2006; Cunningham, Selby, & van Mierlo, 2006; Cunningham, Wild, Cordingley, van Mierlo, & Humphreys, 2010; Cunningham, Wild, Cordingley, van Mierlo, & Humphreys, 2009). The latter has also been tested with young adults 18-24 years at a workplace in USA (Doumas & Hannah, 2008). Otherwise, most of these services are from USA. The services www.carebetter.com (Cloud & Peacock, 2001), www.drinkerscheckup.com (Hester & Squires, 2008), www.alcoholcheckup.com (Lieberman, 2003, 2005, 2006), <http://creativecommons.org/licenses/bync-sa/3.0/> (Lieberman & Massey, 2008), www.AlcoholScreening.org (Saitz et al., 2004) are all for the general population and are freely available via the Internet (except for www.alcoholcheckup.com that is no longer available).

Screeners for specific groups

As mentioned earlier, screeners that are directed to specific groups are mostly addressed to college students. For the effects of Internet-based interventions addressing students see (Moreira, Smith, & Foxcroft, 2009). Regarding other screeners directed to

particular groups, Simon-Arndt and colleagues (2006) describe one such service for the USA military in active duty (Simon-Arndt, Hurtado, & Patriarca-Troyk, 2006), Cucciare and colleagues (2011) describe one screener targeting war veterans in the USA (Cucciare, Darrow, & Weingardt, 2011) while Zeiler and colleagues (2002) describe a screener that is freely available via the Internet but targets adult primary care patients (Zeiler, Nemes, Holtz, Landis, & Hoffman, 2002). Another service described in the literature is designed for adults that have been victims of significant traumatic events. In addition to screening and brief intervention modules for alcohol, cannabis and other illicit drug use, this service also contains modules for cigarette use, for depression, anxiety and posttraumatic stress and panic (Ruggiero et al., 2006). Patient Assessment System (PAS) is yet another service designed for use by mental health patients before meeting with a psychiatrist. Through an online questionnaire, the patient's substance abuse as well as depression, interpersonal problems, psychosis, self-harm, medication compliance and side-effects are assessed, generating a printed summary report. The report is intended to be brought to the meeting with psychiatrist and constitute the basis for the face-to-face session (Chinman et al., 2007).

Illicit drugs

A cannabis screener, www.CheckYourCannabis.net, is described in one study where authors also investigated whether there are any differences in use of the tool or user characteristics when the screener is used as standalone tool and when it is used as a part of a “well-established harm reduction website for young cannabis users”. Results from the study showed that ten times more people used the screener when it was attached to the well-established website than when it was used as a standalone tool. Otherwise, no differences in frequency and severity of cannabis use were found between the users of the two versions of the screener (Cunningham & van Mierlo, 2009).

All the services, described above contain an intervention without any human-to-human contact. However, www.CheckYourDrinking.net does offer the possibility of e-mailing the feedback generated on the web page to a therapist if the user already has contact with one and PAS offers the possibility of printing the summary report for bringing in to a face-to-face visit with a psychiatrist.

Outcomes of screener trials

The Finnish screener, www.paihdelinkki.fi/testaa/juomatapatesti, has been evaluated in an uncontrolled pre-post testing design with 3, 6 and 12 months follow-ups, showing a significant reduction in alcohol use, which occurred during the first 3 months. After that no further changes in alcohol use were found (Koski-Jännes et al., 2009; Koski-Jännes et al., 2007). Also, <http://creativecommons.org/licenses/bync-sa/3.0/> was evaluated in an uncontrolled pre-post testing design. At the 4-month follow-up study participants showed a significant increase regarding interest in treatment (Lieberman & Massey, 2008).

The effects of www.CheckYourDrinking.net were evaluated in a randomized controlled trial with 3-, 6- and 12-months follow-ups, showing a significantly larger decrease in alcohol consumption for the users of the service compared to an untreated control group. However, the effects of the service that were found at the 3- and 6-months follow-up were no longer noticeable at the 12-month follow-up (Cunningham,

Humphreys, et al., 2006; Cunningham, Selby, et al., 2006; Cunningham, Wild, et al., 2010; Cunningham et al., 2009). The effects of the same service were also evaluated in a group of young adults 18-24 years at a workplace in USA. In a randomized controlled trial, a group using the intervention was compared to a second group who, in addition to using the service, also received a 15-minute face-to-face Motivational Interviewing session, as well as to a third, untreated control group. At a 30-day follow-up, a significantly larger decrease in alcohol use was found for the two groups that used the intervention compared to the untreated control group. Further, no differences in decrease of alcohol use was found between the group using the intervention and the group that additionally received the face-to-face Motivational Interviewing session (Doumas & Hannah, 2008).

The effects of the screeners for drug use have not been evaluated in any way.

1.6.4.2 Cognitive-behavioral treatment without therapist contact

Alcohol

Three European examples of Internet-based interventions for reducing problematic alcohol use, that could be classified as cognitive-behavioral treatment without any therapist contact, were in the published literature. One is the Dutch “Self-help alcohol online” available for the patients of a specific treatment clinic (Blankers, Koeter, & Schippers, 2011), the Dutch www.minderdrinken.nl (Riper et al., 2009; Riper et al., 2007) and the British www.downyourdrink.org.uk (Linke, Brown, & Wallace, 2004; Linke, Harrison, & Wallace, 2005; Linke, McCambridge, Khadjesari, Wallace, & Murray, 2008; Linke, Murray, Butler, & Wallace, 2007; Murray et al., 2007; Wallace et al., 2011); the latter two are both freely available via the Internet.

In a randomized controlled trial, the effects of “Self-help alcohol online” (SAO) were compared to the effects of “Therapy alcohol online” (TAO), an extended version of SAO that also included 40-minute synchronous chat sessions with a therapist. The effects of the two interventions were also compared to a waiting-list control group. At the 3-month follow-up, participants in SAO and TAO had reduced their alcohol use significantly more than those in the waiting-list control group but no differences in decrease were found between the SAO and TAO. However, at the 6-month follow-up, TAO was shown to be more effective than SAO (Blankers et al., 2011). The effects of the self-help site www.minderdrinken.nl were explored in a randomized controlled trial, where users of the Minderdrinken service were compared to a control group that had access to an Internet site with psychoeducational information on the effects of using alcohol. At the 6-month follow-up, a larger proportion of the Minderdrinken users (17.2%) no longer had any problematic alcohol use compared to the control group (5.4%) and the decrease in alcohol consumption was significantly larger for the intervention group than the control group (Riper et al., 2009; Riper et al., 2007). The effects of the British www.downyourdrink.org.uk (Linke et al., 2004; Linke et al., 2005; Linke et al., 2008; Linke et al., 2007; Murray et al., 2007) site were tested in a large randomized controlled trial, where individuals with access to the service were compared to a control group directed to a website with factual information on the damage that can be caused by overconsumption of alcohol. Despite a decrease in

alcohol consumption at 1-, 3- and 12-months follow-up in both groups, no differences in alcohol use were found between the groups (Wallace et al., 2011).

USA-based services

All remaining publications on Internet-based services in this category concern US-based services. Hester and colleagues tested the effects of www.moderatedrinking.com, an Internet-based service offering training in a “Moderate Drinking protocol,” and www.moderation.org, an online site run by a US national support group network for individuals concerned about their drinking, Moderation Management, both targeting the general population and available via the Internet. A difference between these services and those described above is that there is a cost associated with the use of these services. Study participants using www.moderatedrinking.com in combination with www.moderation.org were compared to those using only www.moderation.org. Results showed a significant decrease in alcohol consumption and alcohol-related problems at 3-, 6- and 12-month follow-up for both groups but participants using both www.moderatedrinking.com and www.moderation.org had increased the percent of days abstinent to a larger extent than participants using only www.moderation.org. Results also showed a larger decrease in the log mean blood alcohol content (BAC) per drinking day for those using both interventions in comparison to those using only the www.moderation.org intervention. However, this difference was found only for the less heavy drinkers (Hester, Delaney, & Campbell, 2011; Hester, Delaney, William Campbell, & Handmaker, 2009).

Another US Internet-based service is “Stress and Mood Management”. Problematic alcohol users are not a primary target for this intervention. It is designed to help employed adults to “cope with stress, prevent mood problems and recognize early signs of depression and anxiety.” Alcohol use is regarded here as a strategy for coping with stress, and a specific module about alcohol use is included. Service users start working with the stress module and are thereafter free to work with whichever module they choose. Less stress, better knowledge about depression and anxiety, improved attitudes toward treatment and a more healthy view of alcohol consumption was found in the intervention group compared to a waiting-list control group (Billings, Cook, Hendrickson, & Dove, 2008).

Another Internet-based intervention for adult employees is CopingMatters, <http://copingmatters.stanford.edu>, (Matano, Futa, Wanat, Mussman, & Leung, 2000; Matano et al., 2007; Westrup et al., 2003). In a randomized controlled trial, all study participants had access to the intervention, which offered links to coping-related Internet sites, brief e-workshops, a self-monitoring journal for alcohol, recommendations and feedback about their stress level and coping strategies. Individuals allocated to the intervention group also received feedback about the risk of developing alcohol-related problems; this feedback was not given to those in the control group. Moderate-risk participants receiving the feedback about the risk for developing alcohol-related problems decreased binge drinking of beer by 48%. In contrary, moderate-risk participants not receiving such feedback *increased* their frequency of binge drinking of beer by 13%. Low-risk participants allocated to full feedback decreased their binge drinking of both beer and hard liquor to a higher extent than those allocated to the limited feedback. These results provide some evidence that

providing feedback about individuals' risk for alcohol problems via Internet can be an effective method for reducing alcohol consumption (Matano et al., 2007).

Finally, Williams and colleagues (2009) describe two freely available online services addressing the USA military: Alcohol Savvy and a version of the Drinker's Check-Up adapted for use by military (Williams, Herman-Stahl, Calvin, Pemberton, & Bradshaw, 2009). Pemberton and colleagues (2011) tested the effects of both these sites on individuals' alcohol consumption. In a three-armed randomized control trial, the effects of Drinker's Check-Up were compared to those of Alcohol Savvy and to an untreated waiting-list control group. Individuals that used the Drinker's Check-Up intervention had reduced their alcohol consumption significantly more than individuals from the control group at the one-month follow-up. This effect was also maintained at the 6-month follow-up. For participants who completed Alcohol Savvy, no statistically significant changes in alcohol use were found (Pemberton et al., 2011).

Illicit drug use

Regarding Internet-based interventions for reducing illicit drug use, two such services that can be categorized as cognitive-behavior treatment without therapist contact were identified, both from the USA. One of the two services is the Therapeutic Education System (TES), consisting of 48 modules covering relapse prevention, HIV/STD prevention, and psychosocial functioning. At the end of each module, tasks were provided to test how much the participants had learned. The service is an Internet-based version of the Community Reinforcement Approach (CRA) and is supposed to be used over eight weeks. The effects of TES were tested among patients from a drug and alcohol clinic, primarily cocaine users, in a randomized controlled trial. Participants using the service received a cash incentive after each completed module and were compared to a group receiving same incentives and treatment as usual but who did not use the service. Two weeks after completing the treatment program the 14 clients in the TES group showed greater knowledge and greater use of CRA style coping strategies when compared to the 14 individuals that received treatment-as-usual. However, no significant differences regarding cocaine use were found between the groups (Brooks, Ryder, Carise, & Kirby, 2010).

The second service, The SmartRx, is an Internet-based program for prevention of prescription drug misuse including analgesics, sedative-hypnotics, stimulants, antidepressants and tranquilizers. The program provides factual information about the pharmaceutical effects of such medications, information about how to use them safely, and a description of strategies for self-management. The effects of the program were tested in a randomized controlled trial where working women who had been prescribed drugs in the categories noted above were randomized either to program access for four weeks or to a waiting-list control group. The groups were compared directly after 4 weeks of program use. Participants from the intervention group knew more about the drugs and to a greater extent believed that they would continue the medication and be able to handle possible problems with it, compared to the participants from the control group. Participants from the intervention group also decreased the number of symptoms of problematic drug use (Deitz, Cook, & Hendrickson, 2011).

1.6.4.3 Cognitive-behavioral treatment with therapist contact

Three European examples of Internet-based cognitive-behavior treatments with therapist contact, two for the general population and one for adolescents, were found in the published literature. The effects of one of the interventions, the Dutch "Therapy alcohol online," are described in the previous section (Blankers et al., 2011). Another Dutch service, www.alcoholdebaas.nl, is also an online cognitive-behavior treatment program that includes e-mail contact with a therapist 1-2 times a week. This service is available for anyone via the Internet but there is a cost for its use. The treatment can be financed by the user him- or herself, the user's employer or by a medical service. The effects of the treatment were tested partly in an uncontrolled pre-post testing design which described decreases in alcohol consumption and alcohol-related problems among service users. This study also showed that users were very satisfied with the treatment (Postel, De Haan, & De Jong, 2010). The effects of the Alcoholdebaas.nl were also tested in a randomized controlled trial, where the users of the service were compared to a waiting-list control group. Study participants allocated to the intervention group were offered access to the treatment for three months, while control group participants received motivational e-mails containing psycho-educational information, in an attempt to reduce the attrition rate. Results from the study showed that individuals allocated to treatment decreased their alcohol consumption to much greater extent than those allocated to the control group (Postel, de Haan, ter Huurne, Becker, & de Jong, 2010).

Illicit drugs

One European site with therapist support, the German "Quit the shit" program, targeted young cannabis users. "Quit the Shit" is a solution-focused Internet-based treatment that consists of 50 days of electronic diary-writing. The treatment is freely available via the Internet for anyone who wants to reduce or quit cannabis use. Intervention users have contact with a counselor first at admission to the program via a 50-minute synchronous chat, and later once a week when service users receive detailed feedback on their diary writings and other entries. The intervention was tested in a randomized controlled trial showing that reductions in frequency and quantity of cannabis use as well as in anxiety and depression levels were significantly larger among individuals receiving the intervention than among those from the wait-list control group at the 3-month follow-up. Individuals receiving the intervention also significantly increased their self-efficacy for desisting from cannabis use and they increased their life satisfaction compared to the control group (Tossmann, Jonas, Tensil, Lang, & Strüber, 2011).

Three other examples of Internet-based program with therapist support, one for problematic alcohol use and two for illicit drug use, all from the USA, were found in the published literature. One of the services targets rural women and consists of eight reference modules with psycho-educational material and 15 modules about making decisions. Via an online bulletin, study participants could communicate asynchronously with the research team as well as with other users of the service. This Internet-based intervention was compared to the same intervention delivered via paper-based written material in a randomized controlled trial. Results from the study showed a significant decrease in alcohol use at the 90-days follow-up but no differences between the groups (Finfgeld-Connett & Madsen, 2008). Another intervention is described by Haack and

colleagues (2005) as targeting parents prosecuted for “child abuse and neglect related to substance misuse.” The service includes daily e-mail contact with a therapist, weekly computerized inspection of the environment, participation in an electronic support group when needed, regular urine-sample and physical visits to a treatment office when needed. A protocol for evaluation of the service is presented in the article but no results have been found (Haack, Alemi, & Nemes, 2005). The third study looked at an intervention consisting of a one-hour group therapy session delivered by a counselor twice a week via e-Getgoing, an Internet-based videoconferencing platform, to drug abusers in need of more intensive treatment. The participants had also received one individual face-to-face counseling session. In a randomized controlled trial, group therapy delivered via e-Getgoing was compared to the same group therapy delivered face-to-face. After six weeks in therapy, good satisfaction with the treatment was achieved in both conditions and a majority of the participants from both settings were able to manage with less intensive ordinary treatment. Participants attended all therapy sessions and abstained from drugs for at least 14 consecutive days. No significant differences between the groups were found. Individuals receiving therapy via the Internet reported that they preferred that alternative because they experienced greater privacy and found that treatment format more convenient (King et al., 2009).

1.6.4.4 One-to-one online therapy without an Internet-based intervention

Aside from the different forms of online therapy mentioned above, with or without contact with a therapist, there is yet another format found in the published literature. In this form of online therapy there is no pre-programmed intervention at all. The intervention is totally based on one-to-one contact between patient and therapist just as in traditional face-to-face therapy. The difference here is that all communication between patient and therapist occurs online via e-mail or synchronized chat and patient and therapist never meet in person. Alemi and colleagues (2007) and Zelvin (2006) describe such one-to-one therapy for substance abuse using e-mail (Alemi et al., 2007; Zelvin, 2006) while Swan and Tyssen (2009) describe such therapy occurring via synchronized chat, that is available via the Internet to anyone in Australia (Swan & Tyssen, 2009). Alemi and colleagues (2010) conducted a pilot study to test the effect of one-to-one online MI-therapy conducted via e-mail on clients’ drug use. They did not find any differences in drug use between those who had access to an online counselor and those who did not (Alemi, Haack, Nemes, Harge, & Baghi, 2010).

1.6.4.5 Other forms of Internet based interventions

In addition to the studies described above, two more studies were identified that were difficult to place in any of the above-described categories. One of these studies describes an Australian online game, Reach Out Central (ROC), that is available to anyone at www.reachoutcentral.com.au. The game targets young adults, 18-24 years, with the aim of teaching them skills for maintaining or achieving good mental health. The game provides a lot of information and the idea behind it is that individual playing it should use the new knowledge to progress in the game and later use that knowledge in real life situations. In an uncontrolled pre-post testing design female players of the game showed significant improvements in alcohol use, use of coping strategies, depression and anxiety, capacity to recover when something bad happened to them and

satisfaction with life at the 2-month follow-up. The same was not found for male players (Shandley, Austin, Klein, & Kyrios, 2010).

The second study describes E-TREAT, an intervention addressing clients at a specific treatment center in Denver. E-TREAT is a technological platform offering different computerized services to individuals to keep up their motivation while they are waiting for treatment or are transferring between one treatment service and another. Such clients meet first in person with a “recovery coach” who assesses the client’s situation. The coach then introduces the client to the E-TREAT platform and provides access to different computerized services available via the platform. Recovery coaches are, however, available for personal coaching and they play an important role in initiating, organizing as well as creating and distributing personalized feedback, messages, group discussions and “help-conferences” to the clients in order to keep them motivated for change. While doing so coaches use a variety of technologies, including telephone, text messages, e-mail and chat. Via E-TREAT, clients also design their own personal web page that expresses their interests in relation to recovery and health (VanDeMark et al., 2010).

In summary, published work in peer-review journals regarding Internet-based interventions for reducing problematic alcohol use includes mostly descriptive studies (n=28) describing the content or development of such interventions, or user characteristics. About one third of the studies are randomized controlled trials where a specific intervention is compared either to an untreated control group or to another intervention (n=14). The remaining studies (n=6) were conducted in uncontrolled pre-post-test designs targeting the users of the specific services. Published work regarding Internet-based interventions for reducing problematic illicit drug use is very sparse. Despite the fact that several web-sites offering different types of online interventions for other drugs than alcohol exist (EMCDDA, 2009) the scientific evaluation of these services is very limited.

1.7 ESCREEN.SE

The Internet-based intervention that is the focus of this thesis is eScreen.se, a Swedish Internet-based service that can be classified as a “screener”. eScreen.se provides repeated brief and in-depth self-screening for both alcohol- and drug-related problems using state-of-the-art instruments and giving personalized feedback with an electronic diary for long-term self-monitoring.

1.7.1 The eScreen.se design

The eScreen.se service (www.escreen.se) is a freely available for use via the Internet. There is no cost associated with the use of the service and total anonymity is guaranteed. The welcome page includes information about the content of the service and how to use it as well as the information that all data that users provide on the site will be registered and saved for research purposes. Individuals who choose to proceed and enter the service need to create a personal account in order to use the website. The registration page requires potential users to create a personal username and password and also to provide information about gender, year of birth and municipality where the

user is registered as resident. Anyone who wants to create an account and use the eScreen.se service is also required to give their informed consent regarding participation in ongoing research. It is optional for individuals to provide an e-mail address in connection with the registration. Those who choose to provide an e-mail address are able to receive a password reminder in case they forget their personal password, as well as discretionary reminders to log into the service at a frequency based on their own preferences.

Registered eScreen.se users are offered the use of an Internet-based version of the screening instruments AUDIT and DUDIT. As described earlier in section 1.4.1, both instruments are recommended by the National Board of Health and Welfare for identifying individuals with at least hazardous alcohol and drug use (The National Board of Health and Welfare, 2007). Directly after filling in either one of these instruments, eScreen.se users receive personalized feedback, generated based on the information that users have provided on the site. The feedback consists partly of a colored diagram showing individuals' consumption level and comparing it to the consumption levels of men and women from the Swedish general population, in different age categories. Another part of the feedback consists of written recommendations, individualized based on users' specific responses. Written recommendations suggest what individuals with problematic alcohol or drug use can do in order to change their problematic habit. The personalized recommendations are adapted for adults as well as for adolescents, 18 years or younger, reflecting both biological and legal differences between adolescents and adults when it comes to alcohol and drug use. eScreen.se is therefore one of the few Internet-based services that can be used both by adults and younger people.

In addition to the simple screeners AUDIT and DUDIT, users can also use the in-depth alcohol and drug self-report instruments Alcohol-E and DUDIT-E. The purpose of filling in these instruments is to help the user to explore what role alcohol or drugs play in his or her life. Answers that the users provide to these instruments also generate personalized feedback showing consumption levels for specific alcoholic beverages or drugs in a diagram, as well as written, personalized feedback about the individual's positive and negative experiences when drinking alcohol or using drugs. For every individual user, readiness to change problematic use of alcohol or drugs is also assessed and feedback is given on this.

The purpose of filling in the simple screening and the in-depth self-report instruments is to increase awareness in individuals' about their substance use, consumption levels and the role of the substances in individuals' lives, and to stimulate the users to start reflecting over their own consumption and its impact on their own life.

1.7.1.1 Recommendations

All recommendations to individuals for whom the screening instruments indicate hazardous or harmful substance use or probable dependence contain encouragement to seek professional help. Information about where to find professional treatment providers or other helpful organizations is provided on eScreen.se. Such information is available both on a national level and, in some cases, at the local level. Individuals with

problematic substance use are also encouraged to regularly revisit the service and retest themselves. As noted above, individuals who have provided an e-mail address can set up the system to regularly remind them to return to the site to be retested. All information that the users provide on the site over time is saved, making it possible for the users to see in a diagram how their own consumption of alcohol or drugs has changed or remained stable over time. Another tool for monitoring over time is the electronic diary in which the users can write about any and all important aspects of their lives. Previous research has shown that writing about things that are important for oneself increase physical and mental health (S. C. Ames et al., 2007; Esterling, L'Abate, Murray, & Pennebaker, 1999; Sloan & Marx, 2004).

A web questionnaire concerning frequency of eScreen.se use, preferred functions, and opinions on areas for improvement is also available on the site. The purpose of this questionnaire is to continue to improve user friendliness on the site.

1.7.2 Theoretical and empirical basis for eScreen.se

The service in its entirety, as well as the specific components of eScreen.se, were developed based on different theoretical approaches, previous research and current clinical practice.

1.7.2.1 Assessment instruments

The choice of assessment instruments for identifying individuals with problematic substance use used on eScreen.se (AUDIT, DUDIT and DUDIT-E) is based on Swedish national guidelines for misuse and dependence treatment where they were found to be scientifically valid and reliable instruments (The National Board of Health and Welfare, 2007). Alcohol-E is a parallel instrument to DUDIT-E that was previously untested and was intended for scientific testing in the studies included in this thesis.

1.7.2.2 Graphical feedback based on the social norm theory

Graphical feedback comparing the substance consumption level of a specific eScreen.se user to that of different gender and age groups from Swedish general population is based on the social norm theory. According to this theory, social norms are the behavior that we believe is normal for the individuals around us or for the individuals that are in several ways similar to us. Further, this belief is supposed to have a great impact on how we think and how we behave (Berkowitz, 2005; H. W. Perkins & Berkowitz, 1986). In the case of substance use, the amount of substance to be used is influenced by the belief of how much the individuals close to us consume. Research on college or university students has shown that students often believe that their peers are consuming more alcohol than they actually do. This in turn creates a discrepancy between how much alcohol individuals similar to us actually consume and how much we believe that they consume. It has also been shown in previous research on students that the larger this discrepancy is, the higher the level the specific individual's alcohol consumption is (McAlaney & McMahon, 2007; H. W. Perkins & Wechsler, 1996; W. Perkins, 2007). Providing eScreen.se users with information about the actual drinking or substance use norms in the general Swedish population, as a component of the individualized feedback, is an attempt to correct possible misperceptions of the substance use of individuals that in several aspects are like the eScreen.se user him- or

herself. Lieberman and colleagues (2003) showed that the users of an Internet-based intervention very much appreciated a comparison of their own alcohol consumption level to the national norms. This was also rated as for them the most surprising information, suggesting a misperception of the actual national norms by the users of that specific Internet-based intervention (Lieberman, 2003). In student populations, social norms interventions have been shown to have an effect on reducing alcohol use and alcohol-related problems, especially when such interventions were delivered via Internet or a computer. The effects were most evident for a period of up to three months with a few studies showing continuing effects even up to sixteen months (Moreira et al., 2009).

1.7.2.3 Written recommendations

The written recommendations that follow the graphical feedback are based on the Swedish AUDIT and DUDIT manual (Berman et al., 2012) as well as the Swedish Alcohol-E and DUDIT-E manual (Berman & Brisendal, 2011). The manuals describe the screening and scoring procedure in depth, and contain guidelines for feedback sessions and continued behavior change from a stepped care perspective. The guiding principles are those of Motivational Interviewing. Recommendations following assessment with the AUDIT or DUDIT differ based on the total AUDIT and DUDIT scores, categorizing substance use of the eScreen.se user as non-problematic, hazardous or harmful, or as a probable dependence on alcohol or illicit drugs, according to the cut-off scores described in the manual and defined in section 1.4.1 above.

Recommendations following assessment with Alcohol-E or DUDIT-E reflect users own positive and negative experiences of alcohol or drug use. A motivational index is calculated in accordance with DUDIT-E manual, taking into account the personal positive and negative experiences of substance use as well as readiness to change the problematic behavior. The motivation to change is categorized as high if an individual user scores 10 points or more on the motivation index. Individuals scoring between 4 and 9.99 will be categorized as being moderately motivated while those scoring 3.99 points or less are considered as low motivated (Berman & Brisendal, 2011; Berman et al., 2007).

1.7.2.4 The eScreen.se service in general

The Internet-based intervention eScreen.se is in general shaped by principals of Motivational Interviewing (MI) and is based on the assumption that each individual possesses the power to change an undesired behavior (W. R. Miller & Rollnick, 2002). In MI, five strategies are used to stimulate such a change, each one related to a specific theoretical approach:

- 1) *Expressing empathy* involves listening without being judgmental, reflecting on what has been said and making the client feel heard and respected for who he or she is and for the choices he or she has made (W. R. Miller & Rollnick, 2002). This strategy can be related to Carl Roger's client-centered counseling. Within this approach, clients are seen and treated as conscious individuals able to resolve their own problems. Clients do not need a counselor to analyze their unconscious but rather to be a non-judgmental listener who does not provide their own solution to someone else's

problem. The role of a counselor is to be someone who can assist the client in understanding his or her own feelings as well as finding a feeling of acceptance and the solution for their own problems (Rogers, 1959).

2) *Developing discrepancy* involves helping the clients explore where they are now and where they want to be in the future. Discrepancy can also refer to an individual's values and actual behavior (W. R. Miller & Rollnick, 2002). This strategy can be related to Leon Festinger's Cognitive Dissonance Theory. According to that theory, cognitive dissonance occurs when an individual experiences discomfort because of contradictory attitudes or values and behavior. This dissonance creates an unpleasant psychological tension that produces a driving urge for changing the behavior and harmonizing it with attitudes and thoughts (Festinger, 1957).

3-4) *Avoiding arguments* and *rolling with the resistance* involves avoiding arguments in cases where the counselor's opinion differs from the opinion of the client and helping the client to find out their own reasons for changing the undesirable behavior. Rolling with the resistance involves assisting the client in adjusting their perception and in finding their own way of resolving their problems (W. R. Miller & Rollnick, 2002). This strategy can be related to J. W Brehm's theory of reactance. The thought behind avoiding argument and rolling with the resistance is that experiencing a threat to or loss of freedom to perform a particular act leads to reactance, an unpleasant feeling that actually motivates a continuous performance of that act in order to regain or maintain the freedom (Brehm, 1966).

5) *Supporting self-efficacy* involves increasing awareness in individuals about their own power and resources for change (W. R. Miller & Rollnick, 2002). This strategy is directly based on the self-efficacy component of Bandura's social cognitive theory. Self-efficacy is the individual's belief about his or her own ability to make a change. Self-efficacy can be strengthened when the individual succeeds with something and gives him- or herself credit for that, by social comparison where the individual is compared to someone else who has succeeded and is in several aspects like the individual him- or herself, and by support from other people (Bandura, 1986, 1997).

MI is also closely associated with Carlo C. DiClemente's & James O. Prochaska's trans-theoretical model of behavior change, where influencing motivation to change a behavior is seen as a process going from an individual being in a pre-contemplation stage, where individual is not aware of or bothered by a specific behavior, moving to a contemplation stage, where individual is becoming aware that a specific behavior is problematic, moving further to a preparation stage, where the individual actually make plans on how to change the problematic behavior, and further to the action stage, where individual actually carries on with the plans to change the behavior in question. After the action stage, the individual moves on to the maintenance stage where he or she needs to continue performing the new, changed, behavior in order not to slip back to the old problematic behavior. If the individual is not able to maintain the new behavior, he or she will relapse and may thereafter need to start all over again (J. O. Prochaska & DiClemente, 1984; J. O. Prochaska, DiClemente, & Norcross, 1992). MI recognizes the different stages of change and the basic concept of the method is that different techniques need to be applied depending on where in the motivational process the

individual is and to meet the individual there he or she is (W. R. Miller & Rollnick, 2002). However, it is important to emphasize that MI differs significantly from Prochaska's & DiClemente's Trans-Theoretical Model of change (TTM). TTM is a model for understanding behavior change, whereas MI is way of communicating about behavior change. It is important to recognize that the different stages of change may not be so clearly separated in reality, as in the TTM. In reality, it is not unusual that individuals float between the various phases of such a change process, which may well be facilitated by MI-based conversations (Berman & Brisendal, 2011).

MI can also be said to be closely associated with Edward Deci's and Richard Ryan's self-determination theory, which states that the long-standing character and the quality of a behavior depends on the type of motivation that lies within the individual. The motivation can be external, the reason for doing something is that someone told the individual to do so or to experience something positive or avoid something negative. Motivation can also be introjected, meaning that an individual does something to avoid internally provoked feelings of guilt, remorse or anxiety (which could be externally triggered). Identified motivation is when an individual does something because he or she recognizes the value attached to doing that. Integrated motivation is when an individual does something that agrees with his or her own values about what is important in life. Lastly, intrinsic motivation is when an individual does something that he or she enjoys and that is stimulating in and of itself. According to Self-determination theory, long-lasting desirable behavior can be initiated and maintained when an individual's motivation to perform is intrinsic. In other words, when an individual feels pleasure associated with the performance of the new behavior, the joy she feels is per se the source of the motivation to maintain the new behavior. Achieving more intrinsically motivated behavior is facilitated by social environments that support the realization of three basic human needs: *autonomy*, the possibility of deciding on one's own and influencing one's own behavior; *competence*, challenges, development and increased skills; and *relatedness* with the drive to belong to some kind of social context, where it is possible to experience confirmation of feelings, thoughts and values (Deci & Ryan, 1985; Deci & Ryan, 2000; Ryan & Deci, 2000).

1.7.2.5 *Conceptualization of eScreen.se*

The concept of eScreen.se relies mostly on making users more aware of their problematic substance use and helping them move from one motivational stage to another. To a large extent, eScreen.se can be said to target users at the pre-contemplation stage or the contemplation stage, which often precede initiating a change of a problematic behavior. Further, the concept of eScreen.se relies on supporting autonomy and individual's own decision to change the problematic behavior and how to change it as well as on strengthening individual's self-efficacy, the belief that they are capable of making that change. Great effort has been put on making all the recommendations on eScreen.se non-judgmental and non-confrontational, in harmony with the principles of MI. The concept of eScreen.se is also based on the harm reduction principles (Marlatt, 1998), regarding every improvement in substance use as a positive achievement. Expressions of affirmation for small, positive changes are viewed as strengthening individuals' self-efficacy.

To use eScreen.se an individual needs to create an account and is encouraged to use the service repeatedly rather than just once. The reason for that is that effects of brief intervention have been found to decline after some time (Raistrick et al., 2006). Cunningham and Koski-Jännes (2007) also found that the effects of the Internet-based intervention they evaluated declined after six months and that alcohol use started to increase again after that point (Koski-Jännes et al., 2007). Repeated use of eScreen.se is an attempt to prolong the eventual effects that eScreen.se can have on users' substance use. Such use makes it also possible for the individuals to follow their own progress over time where actually seeing their own decreases can strengthen users' self-efficacy and stimulate further decrease, while increases can indicate warning flags that require action in the form of self-regulation or seeking external help.

1.7.3 Development and dissemination of eScreen.se

The development of eScreen.se has resulted from a collaboration between researchers from Karolinska Institutet, the Departments of Clinical Neuroscience, Public health and Physiology and Pharmacology; Stockholm University, the Centre for Social Research on Alcohol and Drugs (SoRAD) and the Stress Research Institute; the Stockholm Center for Dependency Disorders, Interactive Health Group AB, and the non-governmental organization UngaKRIS. The service became public on February 7, 2007 allowing everyone who wants to use it to do so without any cost whatsoever. Since no evaluation of the service was available at that time, and it was unknown whether the service could be helpful or even harmful to users, its dissemination was very restricted. The only active disseminators of the service were young "ambassadors" from UngaKRIS, themselves former substance users. UngaKRIS targets adolescents 13 to 25 years old who are at risk for developing problems with problematic substance use and/or criminality, or who have developed such problems. The organization works actively to establish contact with adolescents who are at risk of entering the criminal justice system as clients; UngaKRIS also helps individuals who are also already subject to criminal justice measures. They therefore meet with young people in schools, youth centers and other places where adolescents usually meet as well as in institutions such as police custodies, jails and prisons. Information about the service was thus mainly spread among adolescents with whom ambassadors came into contact through their daily work.

Young "ambassadors" from Unga KRIS were not only actively involved in the dissemination of the service but also in the development of it. They contributed many valuable points of view on the service from a user perspective and helped create a service permeated with a non-judgmental and a non-threatening tone. When the project began, 12 ambassadors from six Swedish cities were involved in the developmental work and dissemination of the eScreen.se service. A total of 15 regular meetings were held, where ambassadors discussed their experiences and offered their views on what could be done to improve eScreen.se and its dissemination. In addition, telephone conferences were held once a week for the same purpose. At this writing, all representatives of local Unga KRIS associations as well as the adult KRIS associations in the whole of Sweden participate in the dissemination of eScreen.se.

2 AIMS OF THE THESIS

2 AIMS OF THE THESIS

The general aim of this thesis is to describe the development of the Swedish Internet-based screening and brief intervention service for problematic alcohol and drug use, eScreen.se, and to explore whether eScreen.se is an effective way of reaching problematic alcohol and drug users as well as an effective service for reducing their problematic substance use. In order to do so four different scientific studies, positively reviewed by the Stockholm Regional Ethical Board (no. 2008/308-31/5) have been conducted and carried out according to the Act on vetting the ethics of research involving humans ("Act on vetting the ethics of research involving humans," 2003). All data collection was carried out in accordance with the Personal Data Act ("Personal Data Act," 1998).

2.1 STUDY I

The specific aim of the first study was to study the use of eScreen.se during the first 20 months when it was publicly available to users, and to describe: 1) eScreen.se as a service; 2) the characteristics of those who used eScreen.se, including demographic data and levels of alcohol and drug consumption; 3) the way in which eScreen.se has been used and 4) the psychometric properties for the Internet-based instruments used in eScreen.se.

2.2 STUDY II

The specific aim of the second study was to investigate whether it would be possible to conduct a survey of good quality on problematic alcohol and drug use in the general population, with exclusive use of computerized data collection methods such as the Internet and Interactive Voice Response (IVR). We investigated response rates, the prevalence of three categories of problematic alcohol and drug use among men and women in different age categories, and psychometric properties of the web based AUDIT and DUDIT questionnaires. We also examined whether the results differed when data were collected via Internet or via IVR.

Furthermore, information about alcohol and drug consumption levels in the Swedish general population collected with exactly the same Internet-based version of the instruments used in the first study enabled a comparison with consumption levels among eScreen.se users. We were hoping that such a comparison would clarify the picture about whether eScreen.se actually was reaching problematic alcohol and drug users.

2.3 STUDY III

The specific aim of the third study was to explore the effectiveness of eScreen.se in sample of problematic alcohol users, recruited via the Internet. Changes in alcohol use over a period of twelve months were measured and compared between three groups: 1) eScreen.se, the above-described intervention offering Internet-based screening with

personalized feedback, 2) Alkoholhjalpen.se, an intervention offering Cognitive Behavioral Therapy-based self-help and 3) Internet-based assessment only.

2.4 STUDY IV

The specific aim of the fourth study was to explore the effectiveness of eScreen.se in sample of drug users, with or without concurrent problematic alcohol use. Changes in drug and alcohol use over a period of six months were measured and compared between study participants allocated to use eScreen.se and study participants allocated to receive only Internet-based assessment of their substance use.

3 THE EMPIRICAL STUDIES

3.1 STUDY I

3.1.1 Context and aims

The brief Internet-based intervention eScreen.se consists of short screening instruments for identifying individuals with problematic alcohol or drug use, in-depth self-reporting instruments for the assessment of the severity of the problematic use, personalized feedback with recommendations on what to do in order to change the problematic use and an electronic diary. The service was developed in an attempt to offer individuals unaware of their problematic use a possibility of testing their substance use with professional instruments, previously restricted for use only by professional treatment providers. The service was also an attempt to offer a self-help tool to those who for different reasons do not want help from professional treatment providers. eScreen.se is freely available via Internet for anyone who wants to use the service, irrespective of whether they are adults or adolescents.

The general aim for the first study included in this thesis was to study the use of eScreen.se in a naturalistic setting. The specific aims were to study the use of eScreen.se during the first 20 months of public availability and to describe: 1) eScreen.se as a service, 2) the characteristics of those who used eScreen.se, including demographic data and levels of alcohol and drug consumption, 3) the way in which eScreen.se has been used and 4) psychometric properties for the Internet-based instruments used on eScreen.se.

3.1.2 Methods

3.1.2.1 *Study design*

To study the use of eScreen.se in a naturalistic setting, a naturalistic study was conducted, meaning that use of eScreen.se was observed and studied by the research team without any interference or contact with the users. eScreen.se users were free to use the service in whichever way they wanted and it was possible for them to contact the research team if needed since the contact information was provided on eScreen.se.

3.1.2.2 *Recruitment and the participants*

Anyone 15 years old or older, who used eScreen.se during the first 20 months that the service was available, was included in the study. In order to use the service individuals had to create an account where they registered basic information such as gender, year of birth and municipality of residence. The final step in creating the account involved providing informed consent that all the information users provide on the service could be used for research purposes. Individuals younger than 15 years could use the service but they were excluded from all data analyses and from the presentation of the results. The information required for using eScreen.se did not make it possible to identify any specific user. Information about the existence of eScreen.se was mainly spread by ambassadors from the NGO Unga KRIS among young individuals with whom they came in contact with through their daily work. For more details about the dissemination of eScreen.se, see section 1.6.3. In total, at least 76 percent of the eScreen.se users included in this study came in contact with the service via Unga KRIS.

3.1.2.3 Measures and statistical analysis

Descriptive statistics such as frequencies, means and standard deviations were used to describe the number of created accounts on eScreen.se and the data collected. These data included the extent to which different components of the service were used, gender, age and prevalence of different levels of problematic substance use among the service users, substance use in terms of what types of alcoholic beverages as well as illicit drugs they mostly used, their personal positive and negative experiences of substance use and their level of motivation to change the problematic use. Differences in proportions were statistically compared with χ^2 -tests while independent *t*-tests were used to compare differences in means. The level of motivation to change problematic substance use was calculated according to the standard formula where the sum of negative aspects of using alcohol or drugs was divided by the sum of positive aspects and multiplied by the formula expressing treatment readiness. Reliability of the Internet-based versions of the instruments used on eScreen.se (AUDIT, DUDIT, and each section of the Alcohol-E and DUDIT-E) was explored by measuring internal consistency of the tests with Cronbach's α . Test-retest reliability of the data collected for this study was explored among those who used the same instruments more than once within a period of one week by correlating the individual scores from different test occasions with each other using the Pearson Product Moment Correlation. It was assumed that it was not likely that alcohol or drug use would change within one week and that high correlations between the first and second use of the instruments would indicate high reliability of the data provided by eScreen.se users.

3.1.3 Results

During the first 20 months of the public availability of eScreen.se, 2361 accounts were created, excluding 549 test accounts and 179 accounts created by individuals younger than 15 years. In total, 51 percent of the included accounts were created by women. The vast majority of the study participants were between 15 and 24 years old with a mean age of 23 years ($SD=10$) for both men and women.

3.1.3.1 Alcohol use

For 67.4 percent of the 1846 individuals who used the AUDIT, the test indicated problematic alcohol use with the highest prevalence among women 18-24 years old. Looking at the more severe levels of problematic alcohol use such as harmful use or probable dependence, the prevalence was 10.7 percent and 20.4 percent respectively in the total sample, with the highest rates in the age category of 18-24 years and with very small differences between the genders. The most popular alcoholic beverages consumed by the 717 individuals that used Alcohol-E were strong beer, spirits, strong cider, medium-strong beer and fortified wine. The five positive aspects of alcohol use most frequently experienced were: becoming happy, reducing tension, becoming relaxed and more self-confident, improving contact with others and feeling that with alcohol the person can function socially. The five negative aspects most frequently experienced were: destroying finances, worse health, getting headaches and nausea, feeling anxiety and having trouble concentrating. The vast majority (90.9%) had a low level of motivation to change their alcohol use when they first came into contact with eScreen.se.

3.1.3.2 Drug use

For 46 percent of the 1211 individuals who used the DUDIT, the test indicated either harmful use of drugs (38.4%) or probable dependence (15.2%), with the highest rate (54.5%) among individuals in the age category of 18-24 years with women showing a larger proportion of harmful use and men showing a larger proportion of probable dependence. Among the 361 eScreen.se users who completed the DUDIT-E test, the most frequently used drugs were: cannabis, pain-relieving pills, tranquillizers, amphetamine and cocaine. The most frequently experienced positive aspects of drug use were: reducing tension and becoming relaxed, becoming happy, getting a feeling that everything will work out, sleeping better and becoming creative (getting many ideas, doing artistic things). The five most common negative aspects of drug use were destroyed finances, worse health, destroyed family life, having trouble at work, in school or at home because of drugs and feeling anxiety. Here, too, the majority of the users had low motivation to change their problematic drug use (73.1%).

Cronbach's α values measuring the internal consistency of the Internet-based versions of the tests in use within eScreen.se were well above 0.90 for the AUDIT, DUDIT and the sections about positive and negative aspect of substance use in the Alcohol-E and DUDIT-E. Cronbach's α values for the treatment section in Alcohol-E and DUDIT-E were well above 0.80.

Test-retest correlations for those using the same instrument more than once within a period of one week showed a very low correlation or none at all for the AUDIT (n=186), DUDIT (n=74) and Alcohol-E (n=25) tests, with r ranging from 0.05 to 0.40 but in most cases not statistically significant. For the DUDIT-E (n=21) the correlations for the different sections of the instrument were statistically significant and relatively high (r ranging from 0.77 to 0.91).

3.1.4 Discussion

To the best of our knowledge, eScreen.se is the only Internet-based service studied that offers brief intervention for both problematic alcohol and drug use. Regarding demographic data on the study participants, the high proportion of young individuals using the eScreen.se was not surprising since the majority of the user accounts were created via Unga KRIS, an NGO targeting individuals 13-25 years old. Also, the high prevalence of problematic substance use could reflect the dissemination work of Unga KRIS. However, it is important not to ignore the fact that these individuals with problematic substance use did choose to use the eScreen.se once they received the information about the existence of the service. The proportion of women who used the service was high but consistent with previous research (Cunningham et al., 2005; Koski-Jännes et al., 2007; Kypri, Langley, Saunders, Cashell-Smith, & Herbison, 2008; Linke et al., 2004; Matano et al., 2007; Saitz et al., 2004). The large proportions of women and young individuals with high prevalence of problematic substance use indicate that Internet-based platforms like eScreen.se could be an important and effective way of reaching individuals with problematic substance use that otherwise are difficult to reach via traditional treatment settings. The results from this study also showed that Internet-based versions of the test used on eScreen.se have very good

psychometric properties, even better than Swedish paper versions (Bergman & Källmén, 2002; Berman et al., 2005; Berman et al., 2007; Källmén et al., 2007). Low test-retest reliability may have been caused by different individuals using the same account when testing themselves, or the same individuals testing the service by providing different information at separate testing occasions. However, these results raise the question of how users of Internet-based services actually use them, a question that might be best answered with qualitative research methods.

3.2 STUDY II

3.2.1 Context and aims

The AUDIT and DUDIT are the two brief screening instruments that are recommended by the National Board of Health and Welfare for identifying individuals with problematic alcohol or drug use in clinical settings (The National Board of Health and Welfare, 2007). These instruments can, however, also be used for investigation of the prevalence of problematic substance use in the general population. All such studies in Sweden, investigating both prevalence of problematic substance use in the population as well as the psychometric properties of the tests, have until recently been conducted with paper versions of the AUDIT (Bergman & Källmén, 2002; Bergman & Källmén, 2003; Källmén et al., 2007) and the DUDIT (Berman et al., 2005). Today's technology offers the possibility of conducting such studies in a more cost-effective way, computerizing large parts of the data collection. Previous research does not answer the question of whether data collected when computerizing the questionnaires are with certainty equivalent to data collected with the paper questionnaires. The results from different studies are simply inconsistent, with most studies investigating the question in the student population and some studies providing indications that higher levels of substance use are reported in computerized questionnaires than in paper ones (Källmén, Sinadinovic, Berman, & Wennberg, 2011; Link & Mokdad, 2005; Wang et al., 2005) while others show that insignificant or no such differences are to be found (Bason, 2000; Collins, Kashdan, & Gollnisch, 2003; McCabe et al., 2002; McCabe et al., 2006; E. T. Miller et al., 2002; Mundt, Bohn, King, & Hartley, 2002; Rubin et al., 2006). The one study investigating the question among the Swedish general population provided evidence supporting higher levels of substance use in computerized questionnaires (Källmén et al., 2011). In the present study, two computerized versions of the AUDIT and DUDIT (Internet and IVR) were compared with each other and used for investigation of the prevalence of problematic alcohol and drug use in the Swedish general population.

The specific aim of the study was to investigate whether a good quality survey about problematic alcohol and drug use in the general population could be conducted solely via computerized data collection methods such as Internet and Interactive Voice Response (IVR). We investigated whether differences occurred between Internet and IVR versions in terms of response rates, prevalence of three levels of problematic alcohol and drug use among men and women in different age categories, and reliability figures.

3.2.2 Methods

3.2.2.1 Study design

The prevalence of problematic alcohol and drug use in the Swedish general population was investigated by administering Internet and IVR versions of the AUDIT and DUDIT questionnaires to a randomly selected sample from the Swedish general population.

3.2.2.2 *Recruitment and the participants*

Postal invitations for participation in the study, containing unique individual 5-digit log-in identification codes, were sent to 5000 randomly selected individuals registered as Swedish residents. In total, 2000 randomly selected individuals were invited to fill in the AUDIT and DUDIT questionnaires via an Internet site, 2000 were invited to fill in the same questionnaires via IVR telephony and 1000 had the possibility of choosing the administration mode, where in 500 letters Internet was listed as the first option of choice and in another 500 IVR telephony was listed first. All information about gaining access to the questionnaires was provided in the letter. Two reminder letters were sent, to non-responders, 3 and 12 weeks after the initial invitation.

Out of 5000 invited individuals, 1861 (37.8%) chose to fill in the questionnaires, 1089 via the Internet and 772 via IVR. With a somewhat higher proportion of women participating in the study (53.3%), 2.8 percent of the sample were classified as 16–17 years old, 12.6 percent were 18–24 years old, 16.3 percent were 25–34 years, 51.5 percent were 35–64 years and 16.8 percent were 64–80 years old.

3.2.2.3 *Measures and statistical analysis*

Frequencies, means and standard deviations were used to describe gender and age of the study participants and of the non-responders, as well as participants' levels of problematic alcohol and drug use. Differences in proportions were tested using the χ^2 -test while means from two groups were compared using independent *t*-tests and means from more than two groups were compared using one-way ANOVAs, followed by Bonferroni post hoc comparisons. Reliability for the Internet and IVR versions of the AUDIT and the DUDIT was measured with Cronbach's α .

3.2.3 Results

The response rate for the group invited to participate in the study via Internet was 38.1 percent and for the group invited to participate via IVR the rate was 33.9 percent. In the group with the possibility of choosing the administration mode, the response rate was 46.6 percent when Internet was listed as the first alternative and 43.2 percent when IVR was listed first. When a choice was offered, irrespective of which mode was listed first, over 70 percent of the respondents chose to participate via Internet.

Regarding the prevalence of problematic substance use, no significant differences were found between those who participated in the study via Internet and those who participated via IVR. For this reason, the following prevalence figures are presented for the entire sample for both administration modes together. In total, 21.1 percent of the respondents reported problematic alcohol use (18.5 percent reported hazardous alcohol use, 2.4 percent reported harmful use and 1.3 percent reported probable alcohol dependence). Harmful drug use was reported by 2.8 percent of the respondents. Gender differences in the prevalence of problematic substance use were found in the age category 35–64 years, where men showed higher proportions of harmful alcohol use (2.4%) and probable alcohol dependency (1.3%) compared to women (0.7% and 0.8%; $\chi^2 = 10.24$; $df = 3$; $p < 0.05$). The opposite was found for drug use, where 1.8 percent of

the men and 3.8 percent of the women in the total sample reported harmful use of illicit drugs.

Good internal consistency was achieved for both Internet and IVR versions of the AUDIT and DUDIT. Measured with Cronbach's α , the coefficient for the Internet version of the AUDIT was 0.80 and for the IVR version it was 0.77. The Internet version of the DUDIT yielded a Cronbach's α coefficient of 0.86 while the IVR version yielded a coefficient of 0.85.

3.2.4 Discussion

In comparison with previous population screenings with the paper version of the AUDIT and DUDIT, where response rates up to 80 percent were achieved, the response rate for this study is quite low (Bergman & Källmén, 2002; Bergman & Källmén, 2003; Berman et al., 2005; Källmén et al., 2007). However, in comparison with the most recent AUDIT study (Källmén et al., 2011) the response rate was higher in this study. Declining response rates in epidemiological research have in the last decade been acknowledged as an increasing problem. Significantly higher response rates among those offered a choice of administration method indicate that a mixed mode study could be an effective way of increasing the response rates in studies like this one. Mixed mode study design was also found in previous research to be the most cost-effective survey design (Werner, 2005). The fact that the majority of the participants from the group, when offered a choice, chose the Internet as a way of participating in the study, indicates that the Internet as an administration mode should be a given complement to the paper version of the AUDIT and DUDIT for increasing the response rates. Since a fourth of all participants also choose the IVR option, it is probably important to also offer IVR in order to reach individuals who prefer not to use the Internet or who lack Internet access.

The lack of statistically significant differences between those participating in the study via Internet and those participating via IVR suggests that both versions of the screening instruments have the same capacity to capture the prevalence of problematic substance use in the general population. Good reliability of the instruments also suggests that the quality of the data do not decline when computerizing the paper versions of the instruments. With this in mind, future computerized prevalence studies should also offer a choice of responding via the paper versions of the AUDIT and DUDIT in order to increase response rates. This would also facilitate more research clarifying the issue about the differing inclination to report problematic substance use in paper and computerized versions of the instruments, respectively.

3.3 STUDY III

3.3.1 Context and aims

Alcohol use causes problems in all aspects of the life for many individuals all over the world and results in enormous negative consequences (WHO, 2004, 2009, 2011). Despite the existence of effective methods for reducing alcohol use via delivery by professional health workers (A. Moyer, Finney, Swearingen, & Vergun, 2002b; Raistrick et al., 2006; The National Board of Health and Welfare, 2007), few problematic alcohol users actually seek professional help for their problems (Blomqvist, 1996, 1998, 1999; Blomqvist et al., 2007; Cunningham, 2005; Cunningham & Breslina, 2004). However, previous research has shown that Internet-based self-help can be of interest for problematic alcohol users (Cunningham et al., 1999; Koski-Jännes & Cunningham, 2001). For this reason, the potential of the Internet for meeting the treatment needs of many untreated problematic alcohol users has been recognized in the last decade. Keeping in mind that the research field of Internet-based interventions for reducing alcohol use is still quite new, there is no clear answer to the question of whether such interventions are effective when targeting the general population. This study aimed to bring more light on this question by comparing the effects of three interventions with three different levels of intensity.

The specific aim of the third study was to explore the effectiveness of eScreen.se in a sample of problematic alcohol users. Changes in alcohol use over a period of twelve months were measured and compared between three groups: 1) eScreen.se, the intervention offering Internet-based screening with personalized feedback, 2) Alkoholhjalpen.se, the intervention offering Cognitive Behavioral Therapy-based self-help and 3) Internet-based assessment only.

3.3.2 Methods

3.3.2.1 Study design

This randomized controlled trial compared the effects of eScreen.se on individuals' problematic alcohol use, with the effects of another, more intensive Internet-based intervention, Alkoholhjalpen.se, and with the effects of less intensive Internet-based assessment of problematic alcohol use. Changes in alcohol use were measured 3, 6 and 12 months after study recruitment and comparisons were made between the individuals allocated to those three different interventions. The total trial was conducted online.

3.3.2.2 Recruitment and the participants

During a period of 13.5 months, 633 individuals searching for information about Alcohol or drugs via Internet were recruited to the study via a Google ad. Interested individuals were screened with the AUDIT and DUDIT, and individuals older than 14 years with exclusively problematic alcohol use (AUDIT >5 for women and >7 for men) who gave their informed consent online were randomized to use eScreen.se (n=211), Alkoholhjalpen.se (n=212) or to receive only assessment (n=210). At the 3-, 6- and 12-month follow-ups individuals from all three groups filled in the AUDIT, the same

screening instrument as at baseline, in order to measure changes in alcohol use over time.

The mean age for the recruited individuals in the sample was 44 years, with about 55 percent women. Alcohol use was quite problematic, with a mean AUDIT score of 22.1, indicating probable alcohol dependence for over one half of the sample. When looking at the baseline characteristics for those who actually accessed the interventions, it became clear that individuals who accessed Alkoholhjalpen.se had somewhat less severe problematic alcohol use than those accessing eScreen.se and those receiving only assessment.

3.3.2.3 Interventions

The effects of three interventions, with different levels of intensity, were tested in this trial. A brief description of the interventions follows.

3.3.2.3.1 eScreen.se

eScreen.se is described in detail in section 1.6.1.

3.3.2.3.2 Alkoholhjalpen.se

Alkoholhjalpen.se is an intervention for problematic alcohol users, based on Cognitive Behavior Treatment (CBT) and Motivational Interviewing (MI), freely available via the Internet. This intervention offers psycho-education with a solution-oriented focus in following modules: “Risk situations, Diary, Consequences, Progress rating scale, Decisional balance, Paths to change drinking, Formulating goals, Problem solving, New solutions, Things that already work, Miracle question, Friends and family, Other support/treatment, Alcohol refusal skills, Coping with cravings, Coping with thoughts, Related problems and Relapse prevention.” Although users of Alkoholhjalpen.se receive recommendations on which module to work with, based on their answers on electronic questionnaires, they are free to make the decision regarding what to work with on their own. The service also offers the possibility of writing in an electronic diary and interaction with other service users in an open chat forum.

3.3.2.3.3 Assessment only

Individuals allocated to the assessment only group were screened with the AUDIT at baseline and at the three follow-ups without receiving any feedback regarding the results from the screening.

3.3.2.4 Outcome measures

The primary outcome measure was the total AUDIT-C score (alcohol consumption) (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). Secondary outcome measures were the total AUDIT score (alcohol consumption and alcohol-related problems), the percentage of participants who had reduced their alcohol use to a non-problematic level and the percentage of participants who reduced their alcohol use to a clinically lower level of use (irrespective of whether the reduction led to a non-problematic level or not).

3.3.2.5 *Statistical analyses*

Repeated measures analysis of variance (ANOVA) was used to analyze changes in total AUDIT-C and AUDIT scores over time, while post-hoc comparisons were made with paired *t*-tests. Since the level of alcohol use differed between those who used different interventions due to selective attrition, there was a need to control for baseline scores when conducting analyses. For this reason, differences between the groups in changes of alcohol use over time were also analyzed with MANCOVA using the AUDIT-C and total AUDIT scores from 3, 6 and 12 month follow-ups as dependent variables and the baseline score as a covariate. Differences between the groups in categories of clinical significance were measured using χ^2 -tests.

Statistical analyses were conducted in four different models in order to control for different types of attrition. The first model (ITT) included all study participants. The second model (MITT) included all participants who responded to at least one follow-up. The third model (PP) included all participants who actually accessed the allocated intervention while the fourth model (MPP) included the participants who actually accessed the allocated intervention and participated in at least one follow-up.

3.3.3 Results

Results from the trial showed a significant decrease in alcohol consumption in all three groups at the 3-month follow-up with no further decrease at 6- and 12-month follow-ups. MANCOVA analyses, based only on those individuals actually accessing the intervention, showed that the mean AUDIT-C score for the group that used Alkoholhjalpen.se was 0.7-1.1 points lower at the follow-ups compared to those using eScreen.se or receiving a screening, when correcting for the differences in the baseline scores. In contrast, repeated measures ANOVAs showed no such differences between the groups.

Based on the same models, a significantly higher proportion of Alkoholhjalpen.se users decreased their alcohol use to a clinically lower level of use compared to the two other groups.

Further analyses showed that at least half of the 234 individuals that participated in the 12-month follow-up (from all three groups) talked to someone about their problematic alcohol use but the proportion of those who did so was substantially higher (70%) among those allocated to eScreen.se compared to those allocated to Alkoholhjalpen.se or assessment only. Considerably fewer individuals (under 10%) from all three groups used pharmacological treatment, other Internet- or telephone-based interventions and written self-help material in order to reduce their problematic alcohol use. Analyses also showed that a relatively high proportion of those allocated to eScreen.se or only assessment (15.6% and 20.7% respectively) also used Alkoholhjalpen.se during their participation in the study.

3.3.4 Discussion

The results from this study provide some indication that using Alkoholhjalpen.se is a more effective way of reducing alcohol consumption than using eScreen.se or receiving

only assessment of problematic alcohol use. This results are consistent with another study testing the effects of a service similar to Alkoholhjalpen.se (Blankers et al., 2011). However, these results were not confirmed in all four analysis models, and this weakens support for the greater effectiveness of Alkoholhjalpen.se. A different statistical method (repeated measures ANOVA) showed no such differences, indicating that all three interventions were to the same extent associated with the decrease in alcohol consumption. In this case, it is important to consider screening as the effective ingredient of all three interventions since that is the component that individuals from all three groups received, a component shown in previous research to be effective for reducing alcohol use (Kypri, Langley, Saunders, & Cashell-Smith, 2006; McCambridge & Day, 2007).

Some methodological issues make it even more difficult to draw any final conclusions. One such issue is the different criteria used for classifying study participants as intervention users. For individuals allocated to eScreen.se, the criteria to be fulfilled was logging in at the service at least once. The same was valid for those allocated to Alkoholhjalpen.se with the difference that a large part of that intervention can be accessed without logging in. That means that individuals who may have done so would not have been classified as service users, although they actually were. Another issue was the large attrition rate, which is more often a rule than an exception in studies with Internet-based interventions (Cunningham et al., 2011), but makes the conclusions uncertain. Yet another methodological issue is the fact that a relatively large proportion of individuals not allocated to Alkoholhjalpen.se used the service during the studied period, a finding that may have led to an underestimation of the effect for Alkoholhjalpen.se. Notwithstanding these limitations, it is important to note that professional interventions with different levels of intensity were made available for the general population through the tested services, and the study seems to establish that they do not cause any harm to the users. With this in mind, a very important result from this study is that all three tested interventions were associated with a decrease in problematic alcohol use.

3.4 STUDY IV

3.4.1 Context and aims

Research about Internet-based interventions for problematic substance use is quite new and there are many questions left to be answered. The evidence base in this research field has indeed been growing in the last decade but most studies have been focused on interventions for problematic alcohol use. Further, many studies were conducted in student populations with only a few investigating the efficacy or effectiveness of such interventions for the general population (Khadjesari et al., 2010; Moreira et al., 2009; Newman et al., 2011). Internet-based interventions for reducing problematic illicit drug use do exist (EMCDDA, 2009) but published research describing their design and user characteristics and, even more important, investigating their effects on users' illicit drug use is very sparse. In section 1.5.4 above, a description of the published literature in the field was outlined. To the best of our knowledge, eScreen.se is the only Internet-based intervention for both alcohol and illicit drug use that has been scientifically evaluated, in this study.

The specific aim of the fourth study was to explore the effectiveness of eScreen.se in a sample of drug users, with or without concurrent problematic alcohol use. Changes in drug and alcohol use over a period of six months, among study participants allocated to use eScreen.se and study participants allocated to receive only Internet-based assessment of their substance use, were measured and compared.

3.4.2 Methods

3.4.2.1 Study design

In this randomized controlled trial the effects of eScreen.se on individuals' problematic alcohol and illicit drug use were explored and compared to effects of Internet-based assessment without any feedback. At 3 and 6 months after the initial recruitment of the participants to the trial, a follow-up assessment was conducted in order to investigate the changes in alcohol and drug use among the participants. The trial as a whole was carried out online.

3.4.2.2 Recruitment and the participants

For slightly over 19 months, a Google ad appeared to individuals searching for information about alcohol or drugs via the Internet. The ad asked about their interest in participating in a study about these substances. Interested individuals were screened for problematic alcohol and drug use with the AUDIT and the DUDIT. Eligible individuals (at least 15 years old with drug use, DUDIT>0), were asked for informed consent and randomized into either an intervention group given personal access to eScreen.se (n=101) or a control group assessed with AUDIT and DUDIT, who received no further intervention (n=101). All participants were reassessed with the AUDIT and DUDIT after 3 and 6 months following recruitment to the study.

Women constituted about 45 percent of the total sample, and their mean age was 32.5 years. Drug use and drug-related problems were quite extensive in the sample, with a

mean DUDIT score of 14.3 and a mean DUDIT-C score of 5.7. In total, 55 percent of the total sample had a harmful drug use and 24 percent probable drug dependence. Also problematic alcohol use was quite common in the sample, where the mean AUDIT score was 21.1 and the mean AUDIT-C score was 7.5. For 13.9 percent of the total sample, screening with AUDIT indicated hazardous alcohol use, harmful alcohol use for 10.9 percent and probable alcohol dependence for 63.9 percent. The proportion of more severe drug users (harmful use and probable dependence) was significantly higher in the intervention group (86.1%) than in the control group (71.3%).

3.4.2.3 Interventions

The effects of eScreen.se, primarily on individuals' use of illicit drugs and secondarily on problematic use of alcohol, was compared to the effects of brief assessment of problematic drug and alcohol use.

3.4.2.3.1 eScreen.se

For a detailed description of the eScreen.se intervention see section 1.6.1.

3.4.2.3.2 Control group

Individuals in the control group were assessed for problematic drug and alcohol use with the AUDIT and the DUDIT at three occasions; at baseline as well as at 3 and 6 months after the study recruitment. They received no further intervention.

3.4.2.4 Outcome measures

The primary outcome measure was the total DUDIT-C score (drug consumption), and secondary outcome measures included the total DUDIT score (drug consumption and drug-related problems), the percentage of participants who stopped using drugs, the percentage of participants who reduced their drug use to a clinically lower level of use (irrespective of whether they stopped using drugs or not), the total AUDIT-C score (alcohol consumption), the total AUDIT score (alcohol consumption and alcohol-related problems), the percentage of participants who reduced their alcohol use to a non-problematic level and the percentage of participants who reduced their alcohol use to a clinically lower level (irrespective of whether the reduction led to a non-problematic level or not).

3.4.2.5 Statistical analysis

Changes in the total DUDIT-C, DUDIT, AUDIT-C and AUDIT scores were analyzed and compared between the groups in four repeated measures analyses of variance (ANOVA) with post-hoc comparisons tested using paired *t*-tests. Significantly higher DUDIT-C and DUDIT scores among individuals in the intervention group compared to the individuals from the control group, due to selective attrition, required a correction of the baseline scores when comparing the groups' mean scores at follow-ups. This was done with a MANCOVA for each outcome measure using the DUDIT-C, DUDIT, AUDIT-C and AUDIT scores from 3- and 6-month follow-ups as dependent variables and the baseline scores as a covariates. Differences between the groups regarding the remaining secondary outcome measures were tested with χ^2 -tests.

For a better understanding of the results, data were analyzed in four models, the first one (ITT) including all study participants, the second one (MITT) including all participants followed-up at least once during the study period, the third one (PP) including all participants that actually accessed the allocated intervention and the fourth one (MPP) including participants that actually accessed the allocated intervention and participated in at least one follow-up.

3.4.3 Results

The results from this trial showed a significant decrease in the DUDIT-C and DUDIT scores in both the intervention and the control group at the 3-month follow-up but no further decrease after that. Analyses from three out of four analysis models (MITT, PP and MPP) showed a larger decrease in total DUDIT score for the intervention group compared to the control group ($p=0.006$; $p=0.046$; $p=0.001$).

Further, the results from this trial also showed a significant decrease in the AUDIT-C and AUDIT scores at the 3-month follow-up in both groups but analyses from two out of four analysis models (ITT and MITT) showed that the decrease in AUDIT-C and AUDIT scores also continued at the 6-month follow-up among individuals from the intervention group, a phenomenon which did not occur for participants in the control group. No other statistically significant differences were found between the groups. Analyzing the data with MANCOVA resulted in no differences between the groups.

3.4.4 Discussion

The results from this study are not uniform but indicate to some extent that Internet-based screening services like eScreen.se providing personalized feedback could have some short-term effects on reducing the problematic substance use in drug-using individuals with or without simultaneous problematic alcohol use. Since most of the significance testing showed no differences between the groups it could simply be that the eScreen.se is not more effective for reducing substance use than Internet-based assessment only. In that case, some alternative explanations for the decrease in both groups would need to be considered. One such explanation could be the screening procedure that individuals from both groups participated in up to three times during the study period. As mentioned earlier, such screening has been shown to be effective for reducing alcohol use (Kypri et al., 2006; McCambridge & Day, 2007). Another explanation could be that study participants were all to some extent help seekers since we recruited them when they were searching for information about alcohol or drugs on the Internet. If that is the case, study participants could have continued to search for other help and maybe also found it. It could be possible that such use of other interventions could be the explanation for the decrease in both groups. The results from Study III also showed that individuals who were not expected to use one of the tested interventions did so anyway, a phenomenon that could lead to underestimating the effects of the tested intervention. For this reason it is important to explore what other interventions study participants may have received during the study period. This will be done in the 12-month follow-up for this study. However, given the finding that many nominal values show a larger decrease in the intervention group compared to the control group, a conclusion that the service does not have an effect in relation to the control group does not seem entirely warranted. High attrition rates in this study are an

additional issue that makes it even more difficult to draw any certain conclusions about the effectiveness of the tested interventions. But, since previous research in this area is lacking, it is difficult to relate the results from this study to other research. For this reason, it is highly important that future research further explore the partial indications found in this study that interventions like eScreen.se could be effective in reducing problematic drug use.

4 CONCLUDING DISCUSSION

4.1 PRIMARY FINDINGS

The aim of this thesis was to scientifically describe and evaluate the Internet-based screening and brief intervention service for problematic alcohol and drug use, eScreen.se. For this reason four studies have been conducted. The general aim of the first study was to describe the individuals who chose to use the eScreen.se service and to describe utilization patterns. The general aim of the second study was to collect data from Swedish general population with same Internet-based instruments that are used in eScreen.se, data that can be used to comparing service users with the general population and thus to obtain a clearer picture about which individuals are reached through the service. The general aim of the third and fourth studies was to evaluate the effects of eScreen.se on individuals' substance use, where Study III targeted individuals with problematic alcohol use only and Study IV targeted individuals with use of illicit drugs. In this section, primary results from all four studies will be related to each other and discussed as a whole.

4.1.1 Characteristics of eScreen.se users

The results from the first study showed that problematic substance use was quite common among individuals who used eScreen.se. Slightly over two thirds of the users reported problematic alcohol use and almost one half reported more severe problematic drug use (harmful use or probable dependence). Comparing these figures to corresponding figures from the general population, where 21.1 percent reported problematic alcohol use and 2.8 percent reported more severe problematic drug use, it is clear that Internet-based services like eScreen.se constitute a very important platform for reaching individuals with problematic substance use. In the fourth study, it could also be seen that the vast majority (90.9%) of the illicit drug users included in the study had a simultaneous problematic alcohol use. This clarifies the importance of offering interventions that also address the problematic alcohol use when targeting problematic drug users. The fact that almost all individuals completing the Alcohol-E or DUDIT-E had a low motivation for changing their problematic use when first coming in contact with the service may indicate that many problematic substance users are not aware of their problematic consumption. In this case, services like eScreen.se, offering personalized feedback, may play a very important role in increasing awareness about problematic substance use in the general population.

4.1.1.1 Gender

Slightly over 50 percent of the eScreen.se users in Study I were women. This figure corresponds quite well with the gender distribution in the Swedish general population. Problematic substance use was somewhat higher for the female eScreen.se users than for male users. In the general population (Study II), problematic alcohol use was somewhat higher for men in comparison with women while the opposite was found for problematic drug use. However, although the level of problematic substance use was much higher for eScreen.se users than for general population, the gender differences in each sample were not that large. Also, in Study III the proportion of women participants was slightly over 50 percent, with mean AUDIT scores somewhat lower than for men. In Study IV the proportion of women was a little under 50 percent with no statistically significant differences between the genders in mean AUDIT and

DUDIT scores. The high proportion of women using the Internet-based interventions for reducing alcohol use is also consistent with previous research (Cunningham et al., 2005; Koski-Jännes et al., 2007; Kypri et al., 2008; Linke et al., 2004; Matano et al., 2007; Saitz et al., 2004) and suggests that the need for interventions for reducing problematic alcohol and drug use is about the same for both men and women. However, looking at the gender distribution in the specialized addiction care in Stockholm county the proportion of female patients was only 33 percent in 2011 (Leifman, 2011). This figure seems in turn to suggest that the traditional treatment is for some reason not as attractive for women, or else it is more available for men. This could be due to the fact that women search for health-related information to a somewhat higher extent than men via the Internet (Fox, 2006). Another reason could be the fear of stigmatization, which in previous research has been shown to be a more common reason for women not to seek traditional face-to-face treatment for their problematic substance use, in addition to the fear that children will be taken away from them (Blomqvist, 1999, 2002). Further, the difference in proportions regarding women's use of interventions delivered via the Internet and by traditional treatment providers respectively could mean that women do not feel comfortable in traditional treatment groups, which tend to be male-dominated (Finfgeld, 2002; Humphreys & Klaw, 2001).

4.1.1.2 Age

The mean age of 23 years for users of eScreen.se in the first naturalistic study, was considerably lower than the mean age for the general population sample in the second study (46 years). It was also considerably lower in comparison to the mean age of the sample of alcohol and drug information seekers with problematic alcohol use recruited for Study III (44 years) and alcohol and drug information seekers with drug use recruited for Study IV (33 years). Since at least 76 percent of the accounts in the naturalistic study were created via Unga KRIS, the low mean age can be assumed to reflect the work of Unga KRIS in spreading information about eScreen.se among the young individuals, 13-25 years, whom they met in their daily work. While this is a methodological issue that will be discussed in the following section, it is quite an important finding. These young individuals belong to same age categories as those reporting the highest prevalence of problematic alcohol and drug use in the sample from the general population. Still, these individuals chose to use eScreen.se which in its turn indicates that services like that one could be a very effective way of reaching the individuals with problematic substance use. Similar to women as a group, young adults are a difficult group for traditional specialized addiction care to reach.

4.1.2 Utilization patterns for eScreen.se

The first naturalistic study provided information about the utilization patterns for the service. The most popular component of the service was screening for problematic alcohol use, used by almost 80 percent of those who created a user account, while about one half of the users self-screened for problematic drug use. About 30 percent of the users explored the role of alcohol in their lives using the in-depth test, while 15 percent did this for illicit drug use. These are relatively high figures in view of the recommendation that only those with problematic substance use use the in-depth tests. However, the interesting finding is that the vast majority of those who used different

components used them just once (89-94%, depending on which test). Similar findings were found in material from Studies III and IV. Analysis of unpublished data from Study III showed that 28 percent of the problematic alcohol users allocated to use eScreen.se did not log in to the service, 41 percent did so only once while 31 percent logged in more than once. While logged in, 21 percent did an additional screening for problematic alcohol use (on top of the ones constituting the baseline or follow-up screenings), mostly just once, while 56 percent used the in-depth Alcohol-E test and 23 percent wrote in the electronic diary. Data from Study IV showed that 31 percent of the illicit drug users allocated to use eScreen.se never logged in to the service, 50 percent did so only once while about 20 percent did so twice or more times. In total, 14 percent filled in additional screenings for problematic drug use, while 24 percent used the in-depth self-report test helping them explore the positive and negative aspects of their illicit drug use. Further, 15 percent of the participants in Study IV filled in additional alcohol screenings, 38 percent used the in-depth alcohol test while 18 percent wrote in the electronic diary. In this sample, too, the components were mostly used just once.

The thought behind the construction of eScreen.se is that it should be used multiple times in order to self-monitor the development of substance use over time, an activity which is supposed to stimulate the motivation for decreasing such use. The fact that the service was used just once by the vast majority of the service users suggests that considerable effort should be made to maximize the benefit of the service for the user when it is delivered as one-time intervention, something that should be kept in mind for future reconstruction, development or improvement of the service.

4.1.3 Effects of eScreen.se on problematic alcohol use

The results from Study III showed that the use of eScreen.se is associated with a decrease in alcohol consumption and alcohol-related problems in individuals with problematic alcohol use who have no reported concurrent use of illicit drugs. This decrease occurred in the first three months after the recruitment to the study and remained stable at that level for additional 9 months. Similar results to the short-term decrease have been found in several other studies (Cunningham et al., 2009; Hester et al., 2009; Koski-Jännes et al., 2009; Pemberton et al., 2011; Postel, De Haan, & De Jong, 2010; Riper et al., 2007). Several studies have also reported stabilization of the alcohol use level and the level of alcohol-related problems after the decrease, for up to six months (Cunningham et al., 2009; Koski-Jännes et al., 2009; Pemberton et al., 2011). Cunningham and colleagues (2009) have further shown that scores on such outcome measures tend to increase somewhat again after 6 months (Cunningham et al., 2009), a finding which was not confirmed in our study.

The effect of using the eScreen.se on individuals' alcohol consumption and alcohol-related problems was not larger than the effect of only completing the screening for problematic alcohol use via the AUDIT. A natural question, based on these results, is therefore whether the screening itself may be the effective component in both interventions. Previous research has provided results supporting that assumption. Kypri and colleagues (2006) found in a randomized controlled trial that an assessment with the AUDIT questionnaire alone reduced alcohol consumption and alcohol-related problems in comparison to individuals not receiving the assessment, suggesting that a

consequence of including baseline assessment with such instruments in randomized controlled trials could be the underestimation of treatment effects (Kypri et al., 2006). McCambridge and Day (2007), in a randomized controlled trial, also found a significant effect of completing the AUDIT questionnaire, expressed in a between-group effect size of 0.23, a result equivalent to that of brief interventions delivered for reducing problematic alcohol use (McCambridge & Day, 2007). Rooke and colleagues (2010) found in a meta-analysis that providing normative feedback in minimal-contact Internet-based interventions did not affect effect sizes in any direction, suggesting that such feedback in itself, without screening, is ineffective (Rooke, Thorsteinsson, Karpin, Copeland, & Allsop, 2010).

In comparison to the more intensive Internet service based on the principles of CBT and MI (Alkoholhjalpen.se) some analyses showed eScreen.se to be a less effective intervention for reducing alcohol consumption. However, these results should be interpreted with caution since they were not confirmed with other statistical analyses and not in the intention to treat models reported in Study III. But, the results are interesting, suggesting they should be explored in more detail in future research. Another interesting finding is that many more study participants chose to log in at eScreen.se than at Alkoholhjalpen.se. The discussion of this finding is deferred to the methodological limitations section.

One great advantage of the interventions tested in Study III is that they increase the availability of the assessment instruments showed in previous research to be effective, instruments that were previously only available to individuals in contact with professional treatment providers for their problematic substance use. Contact with a professional treatment provider presupposes that an individual is aware of his or her problematic substance use, that he or she is motivated to change their problematic behavior, that he or she may have actually made the decision to change the problematic use and, finally, has taken the next step and initiated contact with a professional treatment provider. The advantage with the interventions tested in Study III is that they can all be used by individuals who may not yet have come to an understanding about their problematic use. In such cases, a progression of problematic substance use might be prevented at an earlier stage than what would be the case when waiting for an individual to initiate a contact with a professional treatment provider. And even more important, the use of these interventions does not seem to cause any harm to the users.

4.1.4 Effects of eScreen.se on illicit drug use

The results from Study IV showed that the use of eScreen.se was associated with a decrease in both alcohol and illicit drug use as well as in substance-related problems in individuals with illicit drug use, with or without concurrent problematic alcohol use. As in Study III, the significant decrease in substance use occurred in the first three months. This is, as discussed in previous section, consistent with previous research about Internet-based interventions for reducing problematic alcohol consumption. The changes in illicit drug consumption over the study period of six months were found to be equal in both the group allocated to use eScreen.se and the group allocated to receive assessment only without any further intervention. The decrease in the total DUDIT score, measuring both drug consumption and drug-related problems, was found to be

larger in the group allocated to use eScreen.se than in the assessment only control group. This result was confirmed in three out of four analysis models. Regarding changes in alcohol consumption and alcohol-related problems the same short-term decrease was found as in Study III with no differences in decrease between the groups. However, in two out of four analysis models the decrease in alcohol consumption and alcohol-related problems continued also after the 3-month follow-up for individuals from the intervention group, a finding which did not hold for individuals from the control group. Also in this case it is important to interpret the results with caution since all differences between the groups disappeared when controlling for baseline substance use levels.

Published literature about Internet-based interventions for reducing problematic substance use among illicit drug users is sparse. This is especially true for studies evaluating their effects. For this reason, it is difficult to relate the findings from this study to other scientific findings. This also shows the importance of not discarding any findings for want of strong evidence but rather seeing them as indications worth exploring further in future studies. Otherwise, the discussion from the previous section about the assessment instruments and the advantages of interventions like eScreen.se is also applicable in this section.

4.2 METHODOLOGICAL LIMITATIONS

4.2.1 Study samples

One methodological limitation concerns the first study, where the primary aim was to study eScreen.se in a naturalistic setting and with that as a starting point, to describe utilization patterns and user characteristics. Having this aim in mind, it would be methodologically correct to study a sample of naturally self-selected service users. Since vast majority of the user accounts were created via Unga KRIS (at least 76 percent) we know that these individuals were informally referred to the service. Targeting individuals with specific characteristics such as adolescents and young adults, as Unga KRIS did when spreading the information about eScreen.se, does have consequences for our results. The results from the first study described the user characteristics and utilization patterns in a sample recruited via Unga KRIS rather than in a sample of naturally selected eScreen.se users. The results from the first study should therefore be interpreted accordingly.

Individuals constituting the samples from Studies III and IV were also referred to the tested services by the research team following their own display of interest in response to the Google ad. They did not, in that sense, constitute a sample of completely naturally self-selected service users. However, the results from these studies are still valuable, showing that services like eScreen.se can be useful for reaching problematic users.

4.2.2 Test-retest reliability

Another methodological concern is about the low test-retest reliability of the data from the first study. Such low reliability may indicate that data from that study were not

reliable. But, this may well not be the case. Firstly, good to excellent internal consistency reliability for all tests in use at eScreen.se indicated that users did not fill in the tests randomly. Secondly, there was a relatively small proportion of the users that had retested them twice within a week. A more detailed analysis of that sub-sample showed that almost all of those users retested themselves within a period of just a few minutes. This finding, together with the very good coefficients of internal consistency reliability, suggests that it could be so that different individuals have used the tests while logged in as the same user. It could also be so that one individual filled in the questionnaires differently out of curiosity, wanting to see the variation in feedback. However, such a scenario would probably have generated lower internal consistency reliability coefficients.

4.2.3 Attrition rates

Another methodological limitation is the large attrition rates in Studies II, III and IV. In study II, about 62 percent of the individuals invited to participate in the study did not respond to the invitation. A wave analysis indicated that more severe drug users were to higher extent to be found among non-respondents than among the respondents, meaning that the proportion of more severe drug users was underestimated in the results of this study. The fact that none of the respondents in Study II reported probable drug dependence and the fact that patients in professional addiction care in Sweden are frequently diagnosed with several drug dependence diagnoses (Berman et al., 2005) supports the conclusion that the proportion of more severe drug users in Study II may have been underestimated. In study III, 28 percent of the individuals allocated to use eScreen.se did not log in to the service, 66 percent of individuals allocated to use Alkoholhjalpen.se did not log, and only between 35 and 45 percent participated in each follow-up. In study IV, 30 percent did not access the eScreen.se intervention tested in the study and only about 32 percent participated in each follow-up. In recent years, large attrition rates have become quite common, both in epidemiological research (Caetano, 2001) and in research about Internet-based interventions (Cunningham et al., 2011). There is a possibility that we could have decreased the attrition rates somewhat by offering incentives for participation in the study or increasing the number of reminder letters in Studies III and IV, but in that case we would have reduced the similarities between the research setting and the real life situation in which these interventions exist.

In these studies an attempt was made to investigate to what extent non-respondents differed from respondents in the studies and to control for the selective attrition by analyzing the material in different analysis models. Still, it is not possible to know with any certainty the exact characteristics of non-respondents, and how the attrition impacted the results as well as their interpretation (Kypri, Stephenson, & Langley, 2004). This limitation constitutes a serious threat to the external validity of the results found in our studies. At the same time, however, it also provides a very important insight, namely that high attrition rates are part of the way that people use Internet-based interventions. This is very important finding that needs to be taken into account when considering Internet-based interventions as an alternative to traditional treatment. The fact that a relatively large proportion of the study participants did not use the services tested in the studies further suggests that a simple referral to an Internet-based

service may not be an effective way of motivating people to use such services. A more accurate way of investigating the effects of such services would therefore be to do so among self-selected service users since such recruitment would be more similar to the real life situation in which such services are supposed to be used.

4.2.4 Accessing the services

Yet another methodological limitation in Study III is the differences in the way eScreen.se and Alkoholhjalpen.se are currently accessed in real life, implying different thresholds for being classified as a service user and being included in different analysis models. To be able to use any component of the eScreen.se service, a user has to log in to the service, meaning that service cannot be used at all without logging in and all data that a user provides on the service is saved and can be analyzed. In contrast, almost all material on Alkoholhjalpen.se can be accessed without any obligation to log in, meaning that the service can be used without logging in. It is, however, possible to create a personal user account at Alkoholhjalpen.se and data that users provide on the site as well as utilization patterns are only saved if the user has logged in to the service. To be categorized as a service user in Studies III and IV, study participants had to have logged in at least once. The difference in the ways the two services can be accessed and which data are saved means that individuals logging in at eScreen.se are classified as service users without the researcher's knowledge of whether they actually read the personalized feedback and written recommendations. A similar, contrasting limitation is that there could be large proportion of individuals who actually used Alkoholhjalpen.se and benefited from it without logging in and for that reason were not classified as service users. That could mean that the Per Protocol analysis models could to some extent be misleading, classifying only very active users of the Alkoholhjalpen.se as service users and leading to an overestimation of the effects of Alkoholhjalpen.se. To what extent this is true cannot be assessed without further research.

4.2.5 Similarities between intervention and control groups

Another problem is associated with the comparison of intervention groups with the assessment only control group, both in Studies III and IV. The control group is very much like the intervention groups. All groups received assessment with the AUDIT and/or DUDIT up to four times during the study periods. As discussed in section 4.1.3, the effective component of the interventions could actually be the assessment itself, meaning that the control group also received a very important part of the interventions and thus leading to an underestimation of the effects of the services evaluated in Studies III and IV.

Participants from all randomization groups were also very similar to each other in another way. They were all recruited to the study while searching for information about alcohol and drugs via the Internet, implying that they were all to some extent help-seekers. The thought behind including a control group in Studies III and IV was that these individuals should represent individuals not receiving an intervention (except for the assessment). However, the participants could have continued to search for help, found help and used it during the study period, meaning that we were actually not comparing our interventions group with an assessment only group but rather with some

other, unknown interventions. The results from the 12-month follow-up in Study III, exploring other interventions that participants had received during the study period, supported this speculation, suggesting that the effects of the evaluated interventions might be underestimated. For this reason, the Internet may not be an optimal arena for recruiting participants for studies evaluating Internet-based interventions. A better solution could be to recruit individuals identified as problematic users in general population screenings as in Study II, increasing the variation between study participants. Another solution might be to evaluate the effects of the interventions among naturally selected service users, as suggested earlier. Another issue could be, as found in previous research, that the changes in problematic substance use for the individuals that were in some way help-seekers began already before the participation in the studies (Blomqvist & Christophs, 2005) and that it is their own will to change that led to the decrease seen in the studies rather than the intervention tested or the screening itself.

Further, all individuals recruited for Study III were selected on the basis of their problematic alcohol use meaning that only individuals from one end of the AUDIT score scale were included. This creates space for the regression toward the mean phenomenon in the results. The decrease in alcohol use and alcohol-related problems associated with all three interventions evaluated in the study could conceivably be due to that phenomenon. An attempt was made to eliminate such effects by controlling for differences in baseline values of outcome measures but this was only possible within the group of problematic users. Since individuals with low AUDIT scores were not included in the study it is not possible to eliminate the possible effects of regression toward the mean phenomenon. However, such an effect could only play a role for the interpretation of the results regarding the decrease in alcohol use; the size of such an effect should be equal in all three groups and not have an impact on the comparison between the groups.

In Study IV, individuals with low total DUDIT score were included in the study, excluding only those with the total DUDIT score of 0. Regarding their AUDIT scores, individuals with low scores were not excluded, meaning that it has been possible to a high extent to eliminate the effects of the regression toward the mean phenomenon. Still, the patterns regarding the changes in substance use during the study period are very similar to those from Study III, suggesting the conclusion that the regression toward the mean phenomenon may not have been overly significant in both studies.

4.2.6 Sample size

Because of the relatively small sample sizes in Studies III and IV it was not optimal to control for gender, age and other baseline characteristics of the study participants. A thorough investigation of the effects of the evaluated interventions has thus not been conducted. It could be so that those interventions are more effective for individuals with some specific characteristics, an aspect which should be explored in more detail in future studies.

4.3 STRENGTHS OF THIS RESEARCH

The major strength of this research is that the studies conducted for this thesis scientifically evaluate the only service known to us, that offers screening and brief intervention for both problematic alcohol use and the use of illicit drugs, irrespective of drug type and including the misuse of prescription drugs. An additional strength is that the service can be accessed by both adults and adolescents from general population and that both groups are included in the research.

Further, the first study included in this thesis is to the best of our knowledge the first one that investigates the reliability of the data provided by users of a freely available Internet-based intervention. Internet versions of the instruments in use at eScreen.se were also psychometrically tested. Even though these instruments have previously been shown to be of good quality when delivered via pen-and-paper, it was important to make sure that the Internet versions offered to the users of eScreen.se were at least at the same level of quality. In association with such an investigation some research questions were answered and several more new questions arose.

Yet another strength of this research is that different types of selective attrition were taken into consideration when exploring the effectiveness of eScreen.se, both when analyzing the data and when presenting the results. With this kind of presentation of the results the transparency of the research is hopefully increased as is the understanding of the data presented.

4.4 CLINICAL IMPLICATIONS

Several advantages of Internet-based interventions for problematic substance use were discussed above, some tested empirically and some on a theoretical level, . But despite all the possibilities, such Internet-based interventions are still not implemented for use on any larger scale; neither in addiction care, nor in primary care, nor generally on the Internet for use by the general population. At present, this type of intervention has not yet been accepted or implemented as an obvious alternative to the interventions delivered in a traditional treatment settings such as face-to-face. One explanation for this could be that some aspects of treatment cannot be technically preprogrammed.

4.4.1 Providing feedback

Internet-based interventions, such as eScreen.se and Alkoholhjalpen.se are often individually tailored based on the answers that service users have provided on the assessment instruments. Scores are generated where different cut-off scores are used to provide an intervention adapted to a specific score range. In the specific case with eScreen.se the feedback provided and the recommendations are based on previously tested AUDIT and DUDIT manuals and current clinical practice. But without the possibility of exploring more about the individual's situation, as a therapist can do in a face-to-face setting, it can be quite difficult, if not impossible, to know what the concrete practical implication of such scores can be on individuals' lives. The situation and consequences of substance use can differ a great deal for individuals with exactly the same score. The level of motivation to do something about the problematic use can

also differ between the individuals with the same score. Still, individuals with the same basic characteristics will be served the same intervention on the Internet. This is against the principals of Motivational Interviewing, which advocates the importance of meeting individuals where they are in the motivational process in order to promote success in actually changing a problematic behavior (W. R. Miller & Rollnick, 2002). The lack of explaining of the practical meaning of screening scores increases the risk of interpreting the results based on such scores, incorrectly. When a live therapist is not able to make a thorough assessment of the problem for a specific individual, there may also be an increased risk of “categorizing” the individual incorrectly and providing a feedback that is not suitable for that individual. The risk is especially high for those being classified as hazardous drug users. This category is defined based on the legal view of zero-tolerance regarding the drug use in Sweden, where all drug use is categorized as problematic. Just one point on the DUDIT is therefore enough for a person to be classified as a problematic drug user. This means that hazardous drug use includes highly occasional use and it is not impossible to score 1 or even several points on the DUDIT without any current drug use at all. This is problematic since there is a great risk of delivering feedback for problematic drug use to individuals who will not recognize themselves in the feedback. This could decrease their confidence in the service.

4.4.2 Communication issues and therapeutic alliance

Another issue is the lack of non-verbal communication in Internet-based interventions which constitutes a great part of the communication in interventions delivered face-to-face (Segall, 2000). Internet-based interventions, especially those with minimal or no therapist contact, often imply a one-way communication, where the preprogrammed intervention is delivered to the service user. Many times, the service user is just a receiver of the intervention without the possibility of communicating back to the service or an online therapist. Even if a service user in some cases does have the possibility of communicating with the therapist via e-mail, chat or electronic bulletin boards, there is no possibility for the online therapist or a preprogrammed service to catch aspects that the user might communicate with his or her body language.

This suggests the importance of research showing that what makes an intervention successful is not necessarily which treatment method is used or different components of a specific method but rather the alliance between the therapist and the client. Such an alliance is characterized by “*agreements on the therapeutic goals; consensus on the tasks that make up therapy; and a bond between the client and the therapist*” (Horvath, Del Re, Flückiger, & Symonds, 2011). The question arises regarding to what extent it is possible to build up a working alliance with a computerized program, especially ones with minimal or no therapist involvement. In contrast to a real life therapist, a preprogrammed intervention usually does not have the possibility of recognizing if the user of the service does not agree on the therapeutic goals or the tasks that make up therapy, and then change goals or tasks to better fit the user. This could increase the risk for the user to interrupt participation in the preprogrammed intervention. In the research field dealing with the Internet-based interventions, these possible disadvantages with delivering interventions for problematic substance use via Internet are rarely discussed. A speculative suggestion is that this may be more applicable for

longer cognitive-behavioral therapies delivered via the Internet, rather than for screeners with brief interventions aiming to make people more aware of their problematic substance use and stimulate a change. However, these are some important questions that require a deeper exploration elsewhere.

Yet another issue concerns the fact that the most of Internet-based assessment instruments as well as the other components of the interventions are delivered as texts, making such interventions less suitable for use by individuals with difficulties in reading and writing. Since some cognitive-behavioral-therapy based interventions contain large text masses, they may also be unsuitable for use by the individuals with concentration difficulties, a problem not so unusual among individuals with problematic substance use (Wilens, 2006).

4.4.3 The value of eScreen.se and Internet-based interventions

Keeping in mind these clinical limitations, Internet-based interventions such as eScreen.se should not be seen primarily as an alternative that could replace traditional treatment methods but rather as a complement that could contribute to reach a wider range of problematic substance users, introducing them to traditional treatment methods and/or offering stand-alone tools for individuals not wanting contact with traditional treatment providers. Internet-based interventions are also a very important alternative to traditional treatment methods, assisting and perhaps enabling problematic substance users to be in charge of their recovery process. For this reason, the results from studies in this thesis carry great importance in the sense that they show that the use of interventions like those tested in the studies is actually associated with a decrease in substance use.

Even if the results from Studies III and IV indicate that the direct effects of eScreen.se on individuals' substance use may not be larger than for assessment only, the results from Study III suggest that service users do seem to take in the personalized feedback and recommendations. Talking to someone is the main recommendation delivered to all problematic substance users via eScreen.se, and the majority of the eScreen.se users in Study III talked to someone about their problematic alcohol use – significantly more than in the comparison groups. This indicates that they did reflect over their problematic use and made the decision to talk to someone about it. This could constitute another step in the right direction, in the process of changing a problematic behavior. Further, previous research has shown that about two thirds of the Swedish general population do have someone in their close environment with problematic substance use but only a minority of these ever intervenes actively to help resolve the problem (Blomqvist, 2009). Previous research has also shown that individuals seeking professional help for their problematic alcohol use had stronger social support than those not seeking such help (Blomqvist & Christophs, 2005). This could imply that people around the problematic user are a considerable but unused helping resource. Informing the general population about the important role they can play to help individuals with problematic substance use could therefore be an effective public health strategy for reducing problematic substance use. Thus, freely available services like eScreen.se that encourage problematic substance users to talk to somebody about their problems – with or without family members or friends ready to offer their support to

resolve the problem – could have a positive, wide impact on reducing problematic substance use.

4.4.4 Marketing and development of Internet-based services

In Sweden, with its approximately nine millions residents, far from all are problematic substance users. If Internet-based services such as eScreen.se are to be used as stand-alone tools, massive marketing, conducted continuously or in intermittently, is needed to optimize the potential of such services. Study I suggested that without marketing, eScreen.se would have been poorly utilized. When Unga KRIS spread information about eScreen.se, at least 76 percent of the accounts were created via the organization, indicating that relatively few individuals found the service on their own. Another solution is to integrate such services with other well established harm reduction web sites. Cunningham and van Mierlo (2009) showed that such a solution resulted in attracting ten times more users than when a screener was used as a stand-alone tool (Cunningham & van Mierlo, 2009). Recognizing the potentials of Internet-based interventions, the Stockholm Center for Dependency Disorders has begun to build up a virtual clinic for users in Stockholm County, offering Internet-based interventions ranging from simple screeners with personalized feedback to fully developed cognitive-behavior-therapy programs with or without therapist support. In a setting like that, supported by a well-established specialized treatment provider, services like eScreen.se could find a natural position as a bridge between individuals unaware of their problematic substance use and a highly specialized professional treatment provider.

4.5 FUTURE DIRECTIONS

Since this research has shown that the different components of eScreen.se and the service in its entirety was used just once by the majority of individuals accessing it, one important direction for future development is to put a lot of effort into maximizing benefits when the service is used as one-time intervention. When testing the efficacy or the effectiveness of eScreen.se or services similar to it, the possible sampling pool for recruiting participants could consist of individuals with problematic substance use identified in general population screenings such as the one conducted in Study II and in Cunningham, Wild, et al. (2010). Cunningham and colleagues (2010) suggested, however, that one risk of recruiting participants through screening studies in the general population is that individuals with the most severe substance use will not be included since they are often overrepresented in the attrition for such studies (Cunningham, Khadjesari, Bewick, & Riper, 2010). However, studying the effects of a screener of the eScreen.se type in a non-help-seeking population would enrich the research field by investigating the question of whether this type of interventions could be useful for individuals at risk of remaining unidentified by professional treatment providers. If the aim of the research is to investigate effects among seekers of Internet-based interventions, then it would be best to do so among naturally self-selected users of the specific Internet-based intervention evaluated. In other words, an intervention should be evaluated among the individuals that actually do use it. Yet another suggestion is to investigate the effects in both groups and compare effects in an attempt to identify the population for whom the benefits of such interventions are largest.

This research also indicates a need for greater understanding of how Internet-based services like eScreen.se are actually used. One way of increasing understanding could be by complementing research like that conducted for this thesis with qualitative studies on actual patterns of service use, for example with focus group interviews.

Studying the use of Internet-based interventions in their natural setting, entirely online, often implies loss of control over the trial for the researcher. At the very least, efforts should be made to increase control over the way users manage their accounts so that a researcher could gain a greater understanding of the meaning of the data provided by study participants. As suggested in Study I, one way of doing this could simply be to ask intervention users to indicate whether they are just curious and testing the service, or are answering questions about their own situation, as in (Saitz et al., 2004), a measure that has been implemented for eScreen.se. For individuals interested in participating in long-term efficacy studies an e-mail could be sent containing a log-in link, unique to each participant, through which they can log on to the study-site. The account, username and password that they later create on the site could then be tied to the specific e-mail log-in information, thus possibly increasing control over study participants' user patterns as research subjects.

To increase control over a study, other outcome measures than substance use should also be included. As discussed earlier, scores measuring the consumption of different substances and/or substance related problems could have very different practical implications in individuals' lives. Including outcome measures about the consequences of substance use on different aspects of individuals' lives would broaden the perspective about the efficacy or effectiveness of Internet-based services. Another very important outcome measure related to the effectiveness of Internet-based interventions, and which should be included in the efficacy studies, is the utilization of primary care or specialized addiction treatment. Even if an Internet-based intervention is not directly effective in decreasing substance consumption, but leads to individuals seeking traditional treatment for their problematic use, such a sequence of events should be considered a great accomplishment.

Evaluating the effects of Internet-based interventions by comparing them to the effects of the same intervention delivered in a face-to-face setting is something as yet unexplored in the published literature and should be an aim for future research. The effects of such interventions in different patient groups such as in student health care at various levels, primary care or psychiatry should also be tested and scientifically evaluated. In psychiatry, for example, where the prevalence of problematic substance use is relatively high (Cruce, Nordström, & Öjehagen, 2007; Eberhard, Nordström, Höglund, & Öjehagen, 2009; Grant et al., 2004; Regier et al., 1990) at the same time that psychiatric treatment often does not include the treatment for problematic substance use Internet-based interventions could be a valuable complement. Future research should also look at how Internet-based interventions could be integrated in different traditional treatment settings.

It would also be of interest to investigate possible differences in the effects of Internet-based interventions by age, gender, level of education and other characteristics. It might thus be possible to gain a deeper understanding of what type of problematic substance

users could benefit most from Internet-based interventions, if different types of Internet-based interventions are suitable for different types of problematic substance users and possibly identify types of problematic substance users for whom Internet-based interventions are directly unsuitable. Such an investigation would both broaden and deepen the understanding of the effects of Internet-based interventions and it would be interesting to further investigate the possibility of matching specific problematic substance user with a specific Internet-based intervention. Such possibilities would be of particularly great value for settings like virtual clinics offering a spectrum of Internet-based interventions based on the idea of the stepped care model (Levin & Lillis, 2011).

In many published studies the potential for cost-efficacy when delivering Intervention for problematic substance use (almost exclusively for problematic alcohol use) via the Internet is described as large. However, few studies have actually investigated that issue (Budman, 2000; Smit et al., 2011; Smit et al., 2008) and more evidence is needed. It is also desirable to explore the long-term effects of Internet-based interventions for problematic substance use. Few published studies exist with a follow-up time of 12-months and none with follow-up times longer than that.

Another interesting aspect requiring more research is exploration about which specific components of the Internet-based interventions for problematic substance use are effective and to what extent. It would also be interesting to investigate whether effective components would retain their effectiveness if delivered as stand-alone interventions, or whether they might be effective only when delivered together with other components.

Regarding Internet-based instruments used for surveys, more research is needed to clarify the answer whether they are just as good as paper versions for capturing the prevalence of sensitive issues, or better. Although quite a few studies explore this question, the results are still inconsistent. It would also be interesting to test mobile applications in surveys that could increase convenience for potential survey participants and might help to reverse declining response rates in epidemiological research.

4.6 CONCLUSIONS

The conclusions drawn from this research are that eScreen.se, an Internet-based screening and brief intervention service offering professional instruments for identifying individuals with problematic alcohol and drug use, makes these available on a broad population basis. Through this research it has been shown that the Internet versions of four such tests (AUDIT, DUDIT, Alcohol-E and DUDIT-E) show psychometric qualities at least as good as the paper versions of the tests.

eScreen.se is an important platform for reaching individuals with problematic substance use and is attractive to groups that are underrepresented in traditional treatment settings (e.g. women and young adults). This research has also shown that the proportions of different levels of problematic substance use among individuals who chose to use eScreen.se, were much higher than in the Swedish general population.

Further, the use of eScreen.se was shown to be associated with decrease in substance use, mostly in the first three months, but with effects maintained for up to twelve months. When testing the effects of eScreen.se among problematic alcohol users, the results indicated that effects on individuals' alcohol consumption and alcohol-related problems were not larger than when only assessing individuals' alcohol use. Some results indicated that the effects were somewhat smaller than for a cognitive-behavior-treatment based self-help Internet service, but inconsistencies in the results do not allow any certain conclusions in this regard.

When testing the effects of eScreen.se among illicit drug users, with or without problematic alcohol use, the results indicated that the effects of the use of eScreen.se on individuals' substance use were somewhat larger in comparison to the assessment only group, but here too the inconsistencies in the results provide no certain answers. However, since screening with professional instruments and brief intervention via eScreen.se has been brought out of the traditional face-to-face setting and made available for use by a much larger population of problematic substance users, one of the most important results is that this intervention does lead to a decrease in substance use, and even more important, is not harmful to the users of the service.

This research constitutes just the beginning of the exploration of the effects of eScreen.se and other similar services. There are still many more questions to be answered, many more unclear and inconsistent indications found in previous research that need to be explored further and many more aspects of Internet-based interventions to be investigated. More research is definitely needed in order to express any certain conclusions about the effectiveness of Internet-based interventions such as eScreen.se but the future does seem hopeful.

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