

# **Assessing and Strengthening Motivation during Alcoholism Treatment to Prevent Relapse**

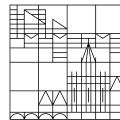
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## **Abstract**

This dissertation investigates the role of motivational factors during inpatient alcohol therapy. The focus lies on measuring (Research Paper I) and strengthening (Research Paper III) their motivation to abstain from alcohol. In this context, the risk of relapse during treatment (Research Paper II) is also examined in more detail.

Research Paper I examines the predictive power of motivation for alcohol abstinence during inpatient alcohol treatment. For this purpose, the transtheoretical model of behavior change served as the framework for assessing motivation. In addition, other substance-related and sociodemographic variables were examined to predict the dependent variable. The results of this observational study show that the risk of relapse decreased with higher treatment motivation and with occupational employment. The results of the Research Paper I therefore highlight that assessing treatment motivation is important for predicting treatment success, and the underlying mechanisms of motivation should be further researched.

Research Paper II investigates the risk of relapse during inpatient alcohol treatment, how the risk changes during treatment, and how a first relapse can affect the risk of subsequent relapses. The results of this observational study show that the risk of experiencing a first relapse during treatment decreased from one day to the next in abstinent patients. In the event of a first relapse, the risk of drinking alcohol again remained stable throughout treatment. The second important factor influencing relapse was the severity of the alcohol use disorder: the greater the severity, the higher the risk of experiencing one or more relapses. The results emphasize the importance of individually tailored treatment for abstinent patients on the one hand and patients who have experienced a relapse on the other. For abstinent patients, strengthening self-efficacy should reduce the risk of a first relapse. For those who have experienced a relapse and thus have an increased risk of further relapses, treatment should focus on relapse-prevention strategies.

Finally, Research Paper III examines the possibility of improving treatment outcomes in people with alcohol use disorder through mental contrasting with implementation intentions (MCII). As an effective and efficient self-regulation strategy, MCII should reduce craving and the risk of relapse during inpatient cessation treatment. The randomized controlled trial consisted of two groups: a group receiving

MCII as an intervention and an active control group receiving a module from a relapse prevention model. The results show that at the beginning of treatment, craving decreased more in the MCII group compared to the active control group. In further measurements during the course of treatment, there was not any difference between the groups and there also was not any difference in the number of relapses between the MCII group and the active control group. These results suggest that the disappearance of the initial difference in craving is probably due to the establishment of a normative context during the course of treatment. As a relapse prevention technique for alcohol use disorders, MCII should next be investigated in an outpatient context where there is no normative context.

In summary, the studies found that it is important to assess the motivation of patients with an alcohol use disorder during inpatient therapy in order to adapt the therapy accordingly and to improve the therapy results. The use of MCII as a self-regulation strategy also exhibited initial success with a positive influence on experiencing craving. Together, the present thesis points to the importance of motivational factors and provides specific suggestions for future research, for example, in the continued development of concepts for reducing relapses and improving treatment outcomes.

## Zusammenfassung

In dieser Dissertation wird die Rolle von motivationalen Faktoren während einer stationären Alkoholentwöhnungstherapie untersucht. Der Fokus liegt hierbei auf der Messung (Forschungsartikel I) und Stärkung (Forschungsartikel III) ihrer Motivation für die Alkoholabstinenz. In diesem Zusammenhang wird auch auf das Rückfallrisiko während der Behandlung (Forschungsartikel II) näher eingegangen.

Der Forschungsartikel I untersucht die Vorhersagekraft der Motivation zur Alkoholabstinenz während der stationären Alkoholentwöhnungsbehandlung. Zu diesem Zweck diente das Transtheoretische Modell der Verhaltensänderung als Rahmen zur Erfassung der Motivation. Zusätzlich wurden weitere substanzbezogene und soziodemografische Variablen zur Vorhersage der abhängigen Variable untersucht. Die Ergebnisse dieser Beobachtungsstudie zeigen, dass das Rückfallrisiko mit höherer Behandlungsmotivation und dem Vorhandensein einer Berufstätigkeit abnahm. Die Ergebnisse des Forschungsartikels I machen daher deutlich, dass die Erfassung der Behandlungsmotivation für die Vorhersage des Behandlungserfolgs wichtig ist und dass die zugrunde liegenden Mechanismen der Motivation weiter erforscht werden sollten.

Der Forschungsartikel II untersucht wie hoch das Rückfallrisiko während einer stationären Alkoholentwöhnungstherapie ist, wie sich das Risiko während der Behandlung verändert und wie sich ein erster Rückfall auf das Risiko weiterer Rückfälle auswirken kann. Die Resultate dieser Beobachtungsstudie zeigen, dass das Risiko während der Behandlung einen ersten Rückfall zu erleiden, bei abstinenten Patientinnen und Patienten von Tag zu Tag abnimmt. Im Falle eines ersten Rückfalls bleibt das Risiko, erneut Alkohol zu konsumieren, über die ganze Behandlung hinweg stabil. Der zweite wichtige Faktor, der sich auf den Rückfall auswirkt, ist der Schweregrad der Alkoholkonsumstörung: je höher der Schweregrad, desto höher das Risiko, einen oder mehrere Rückfälle zu erleiden. Die Ergebnisse unterstreichen einerseits die Wichtigkeit einer individuell zugeschnittenen Behandlung für abstinente Patientinnen und Patienten und andererseits für Patientinnen und Patienten, die einen Rückfall erlitten haben. Bei abstinenten Patientinnen und Patienten dürfte die Stärkung der Selbstwirksamkeit das Risiko eines ersten Rückfalls verringern. Bei denjenigen,

die einen Rückfall erlitten haben und somit ein erhöhtes Risiko für weitere Rückfälle haben, sollte sich die Behandlung auf Strategien zur Rückfallprävention konzentrieren.

Im Forschungsartikel III schliesslich, wird die Möglichkeit untersucht, die Behandlungsergebnisse bei Personen mit einer Alkoholkonsumstörung durch Mentales Kontrastieren mit Durchführungsintentionen (MCII) zu verbessern. Als wirksame und effiziente Selbstregulationsstrategie sollte MCII Craving und das Rückfallrisiko während einer stationären Alkoholentwöhnungstherapie reduzieren. Die randomisierte kontrollierte Studie bestand aus zwei Gruppen: einer Gruppe, welche MCII als Intervention erhielt und einer aktiven Kontrollgruppe, welche ein Modul aus einem Rückfallpräventionsmodell bekam. Die Ergebnisse zeigen, dass zu Beginn der Behandlung das Craving in der MCII-Gruppe stärker abnahm im Vergleich zur aktiven Kontrollgruppe. Bei weiteren Messungen im Verlauf der Behandlung gab es keinen Unterschied mehr zwischen den Gruppen und auch bezüglich Anzahl Rückfälle gab es keinen Unterschied zwischen der MCII-Gruppe und der aktiven Kontrollgruppe. Diese Ergebnisse deuten drauf hin, dass das Verschwinden des anfänglichen Unterschieds beim Craving wahrscheinlich auf die Etablierung eines normativen Kontextes im Verlauf der Behandlung zurückzuführen ist. Als Rückfallpräventionstechnik für Alkoholkonsumstörungen sollte MCII als Nächstes in einer ambulanten Umgebung untersucht werden, in dem es keinen normativen Kontext gibt.

Zusammenfassend wurde in den Studien festgestellt, dass es wichtig ist, die Motivation von Patientinnen und Patienten mit einer Alkoholkonsumstörung während der stationären Entwöhnungstherapie zu erfassen, um die Therapie entsprechend anzupassen und die Therapieergebnisse zu verbessern. Auch der Einsatz von MCII als Selbstregulationsstrategie zeigt erste Erfolge mit einem positiven Einfluss auf das Erleben von Craving. Insgesamt weist die vorliegende Arbeit auf die Bedeutung von motivationalen Faktoren hin und gibt konkrete Hinweise für die zukünftige Forschung, beispielsweise für die Weiterentwicklung von Konzepten zur Rückfallreduktion und zur Verbesserung der Behandlungsergebnisse.

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## Synopsis

Patients with alcohol use disorder (AUD) often report being motivated to remain abstinent during treatment and beyond. Although the motivation seems to be given, the maintenance of abstinence is not always successful. In three research papers, I examined the background of this issue and possible ways to overcome it.

In this synopsis, the three research papers are discussed in a common framework to address the above-mentioned issues and to show how they contributed to the present thesis. In the first section, I will introduce a widely used model of treatment motivation from alcohol research and discuss its explanatory value regarding relapse. Second, I will present the temporal pattern of single and multiple relapses, as well as the different therapeutic consequences derived from them. The third section discusses a motivation psychology intervention applied during inpatient alcohol treatment and addresses the question of whether it reduces relapse. Lastly, I will conclude with a general discussion and outlook for future research. Now I will begin with a theoretical introduction to alcohol use disorder.

### Alcohol Use Disorder

As the well-known American actor and comedian Robin Williams said: “As an alcoholic, you will violate your standards quicker than you can lower them.” Or put more scientifically in the definition of AUD according to the National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2020): “Alcohol use disorder (AUD) is a chronic relapsing brain disorder characterized by an impaired ability to stop or control use despite adverse social, occupational, or health hazards.”

The Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5; American Psychiatric Association, 2013) sets the following criteria for diagnosing AUD: “A maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by 2 or more of the following, occurring at any time in the same 12-month period:

- Alcohol is often taken in larger amounts or over a longer period than was intended.

- There is a persistent desire or unsuccessful efforts to cut down or control alcohol use.
- A great deal of time is spent in activities necessary to obtain alcohol, use alcohol, or recover from its effects.
- Craving, or a strong desire or urge to use alcohol.
- Recurrent alcohol use resulting in a failure to fulfill major role obligations at work, school, or home.
- Continued alcohol use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of alcohol.
- Important social, occupational, or recreational activities are given up or reduced because of alcohol use.
- Recurrent alcohol use in situations in which it is physically hazardous.
- Alcohol use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by alcohol.
- Tolerance, as defined by either of the following: a need for markedly increased amounts of alcohol to achieve intoxication or desired effect, or a markedly diminished effect with continued use of the same amount of alcohol.
- Withdrawal, as manifested by either of the following: the characteristic withdrawal syndrome for alcohol, or alcohol (or a closely related substance, such as a benzodiazepine) is taken to relieve or avoid withdrawal symptoms.”

What all these three definitions have in common is that, in addition to the excessive consumption of alcohol, the negative consequences for the individual and their social environment primarily characterize alcohol use disorder.

This is also reflected in the *Global Status Report on Alcohol and Health* by the World Health Organization (WHO 2018). The report states that worldwide, 3 million deaths are attributable to harmful alcohol use, corresponding to 5.3% of all deaths. In addition, 5.1% of the global burden of disease and injury is caused by alcohol misuse.

Data from Switzerland show that harmful alcohol use causes social costs in the amount of 4.2 billion Swiss francs per year (Fischer et al., 2014) and that in the year 2002, 29,000 years of life were lost due to premature mortality because of immoderate use of alcohol, which equals 8.2% of all the years of life lost in Switzerland



(Rehm et al., 2006). In the European Union, results are similar: Anderson et al. (2012) report that 13.9% of all deaths among men and 7.7% of all deaths among women from the ages of 15 to 64 were caused by alcohol, and countries in central and eastern Europe have the highest rate of alcohol-attributable deaths.

In addition to these public-health facts and statistics, alcohol use disorder also has a large negative impact on individuals. For example, the harmful use of alcohol is linked to an increased risk of committing or experiencing violence in partnerships (Lipsky et al., 2014). Heavy episodic drinking is also associated with a higher risk of suicidal behavior and sexual victimization, especially among young women (Wilsnack et al., 2018). Moreover, alcohol use disorders are associated with the development of various diseases, like liver disease, heart disease, and cancer (Carvalho et al., 2019). Besides the negative physical consequences, it also has a high comorbidity with mental disorders: Castillo-Carniglia et al. (2019) found that personality disorders, depression, anxiety disorders, attention-deficit hyperactivity disorder (ADHD), and other substance use disorders are more prevalent in individuals with AUD. In the work environment, heavy drinking has been shown to increase the risk of absenteeism, a loss of productivity, disciplinary problems, and unemployment (Anderson et al., 2012). In short, it can be concluded that alcohol use disorder has a major negative impact on individuals' quality of life and their social context (Carvalho et al., 2019).

The next chapter after this introduction to the topic of alcohol use disorder and its social and individual effects provides an overview of the treatment of alcohol use disorder.

## **Alcohol Use Disorder and Treatment**

Based on the severe consequences of alcohol use disorder, it is important to address the treatment options for individuals with an alcohol use disorder, as well as their chances of success. Unfortunately, there is scarce epidemiological data on whether people with AUD take advantage of access to appropriate treatment. It has been estimated that in Western countries, 10% or less of all people with an alcohol use disorder receive appropriate treatment (Probst et al., 2015). Data from a European multicenter study show that although the prevalence of AUD was quite high in patients seeing general practitioners, only about a quarter of them subsequently sought specialized treatment (Rehm et al., 2015). Another study, which was conducted in six

European countries (Probst et al., 2015), examined the reasons for not seeking treatment. The most common reason given was that patients with alcohol use disorder lacked awareness of the problem, followed by concerns about being stigmatized by society when seeking treatment, finding barriers to treatment, and preferring to deal with the problem on their own.

Once individuals with AUD find their way into treatment, there are several therapy options available. In German-speaking regions, the S3-Leitlinie provides expert recommendations for treating mental disorders. This guideline is used as a basis for deciding what is effective for which mental disorder and what should be offered to patients. The S3-Leitlinie for alcohol-related disorders (Mann et al., 2017) distinguishes between three different forms of intervention options: brief intervention, detoxification, and postacute inpatient treatment. Brief interventions are recommended primarily for individuals with heavy alcohol use. In the case of alcohol addicts, brief interventions can be offered in primary care, although the effectiveness has not been clearly proven. Detoxification accompanied by medical professionals is recommended for individuals with AUD. And lastly, inpatient treatment probably plays the most important role. In the case of AUD, subsequent treatment after detoxification is recommended. In addition, abstinence should be the treatment goal. If abstinence is not achievable, reducing consumption can be the goal in order to minimize harm. During inpatient treatment, motivational interventions, cognitive behavioral therapy, behavioral therapy, and contingency management should be offered, as the scientific evidence for these approaches is strongest (Mann et al., 2017).

In Switzerland, the Forel Clinic is the largest and leading center for the treatment of alcohol use disorder. The clinic includes outpatient, partial-inpatient, and inpatient areas for alcohol, pharmaceutical, and tobacco addiction. Approximately 400 patients are treated every year in the clinic. With their evidence-based therapy and their own research division, they can be viewed as a reference point for patients, relatives, and physicians.

Despite the evidence-based recommendations, many years of practical experience, and countless research results, the therapy results are unfortunately rather unsatisfactory. Alcohol use disorder is a chronic disorder with a relapsing course. Despite the recommended treatment options, a considerable portion of patients with AUD drop out of treatment or return to drinking during treatment or in the long-term,

even if they entered treatment voluntarily. For example, data from Switzerland indicate that up to 40% of inpatients in abstinence-oriented inpatient treatment returned to drinking during treatment (Klingemann et al., 2013), and at a one-year follow-up, only 40–48% of former inpatients reported abstinence (Moggi et al., 2007; Müller et al., 2019). In addition, alcohol consumption during therapy is a good indicator of persistent excessive alcohol use in the long-term (Ludwig et al., 2013; Maisto, Roos, et al., 2016). To date, research has focused on predictors of relapse and the measurability of treatment success in terms of relapse and early treatment completion. However, patterns of relapse and the chronological classification of relapses have rarely been studied. One exception is a study by Charney et al. (2010): they showed that relapses at the beginning of treatment led to a worse long-term prognosis. Other study results in this area are still pending. It is thus still unclear if and when there is a specific period of time in which the risk of relapse during treatment is especially high or even low. Such insights would be important to better understanding AUD and also to adjusting treatment procedures accordingly.

In summary, it can be said that much has been done to improve treatment access and outcomes for AUD, but clinicians and researchers should be aware of the limitations. There is still a need for further improvement in the treatment of patients with alcohol use disorder.

### **Alcohol Use Disorder and Motivation**

There have been diverse approaches to address the problem of unsatisfactory treatment outcomes described above. Various predictors, mechanisms, concepts, and theories of dropout and treatment outcomes have been studied. Motivational approaches have not yet been well studied, but they have shown promising results in other health-related areas. For example, motivational interviewing, a technique for encouraging motivation (Miller & Rollnick, 1991, 2012), has exhibited positive results in promoting physical activity, body weight reduction, and willingness for behavioral change (for an overview, see Bischof et al., 2021). And research on self-determination theory, a process- and content-oriented theory of motivation (Ryan & Deci, 2017), has also found that promoting motivation leads to increased physically and psychologically healthy behavior (see the meta-analysis by Ntoumanis et al., 2021). The possibility of transferring these promising results from the field of motivation psychology and health

promotion to the field of alcohol use disorder should be studied. The focus of this dissertation was therefore on assessing and strengthening motivation as a way to prevent relapse during treatment for alcoholism. It included approaches from motivation psychology as a suitable and promising theoretical basis.

In a meta-analysis by Adamson (2009), several concepts of motivation psychology were identified as predictors of alcohol treatment. Among various other variables (e.g., baseline alcohol consumption, employment, psychopathology, treatment history), motivation to change, alcohol-related self-efficacy, and treatment goal were the most consistent univariate predictors of drinking-related outcomes in AUD treatment. A second meta-analysis by Sliedrecht et al. (2019) also showed that self-efficacy is very protective against relapse. They also stated that motivational factors such as drinking goals and overall motivation have been less widely studied but are nevertheless predictors of positive treatment outcome.

These results show the importance of constructs from motivation psychology for predicting treatment outcomes. However, they have been insufficiently incorporated into research on alcohol use disorder. As described above, single concepts or variables have been examined, but without a solid theoretical basis. Such a basis is important for comprehensively assessing and strengthening motivation so as to prevent relapses during the treatment of alcoholism. In particular, the assumption that abstinence can be achieved with pure intention seems to be prevalent in many research studies. The concept of volition, which is described in various forms in many theories of motivation psychology, has often been neglected in alcohol research. Volition (synonyms: self-regulation, self-control, willpower, self-discipline, etc.) is particularly important when problems arise in the pursuit of goals and when it takes more effort to achieve the goal (Gollwitzer, 1990; Heckhausen, 1987; Heckhausen & Gollwitzer, 1986, 1987). In relation to alcohol use disorder, volition becomes particularly important when abstinence becomes increasingly difficult: in order to remain abstinent, a certain amount of volition is needed to deal with difficult situations, such as individual risk situations. However, whether a relapse is a sign of dysfunctional motivation or volition cannot be concluded due to a lack of research results. A better understanding of the process of relapse from a motivational and volitional perspective could also help improve the treatment options.

To examine volition and the corresponding research gap, two appropriate theoretical models were selected for this thesis: first, the Rubicon model of action phases (Gollwitzer, 1990; Heckhausen, 1987; Heckhausen & Gollwitzer, 1986, 1987), which is a purely motivation psychology model that directly refers to the concept of volition and considers its temporal sequence in the pursuit of goals; and second, the transtheoretical model of behavior change (TTM, Prochaska & DiClemente, 1983), which is a motivation psychology model that was developed and applied in the context of alcohol research. These two models were chosen because they include volition as a concept, divide the pursuit of goals into phases, are well applicable to the field of alcohol research, and are well recognized. In addition, both models are important for the present thesis. On the one hand, the Rubicon model is a classic motivation psychology model that explains human behavior and explicitly focuses on the goal-striving phase, in which volition is particularly important. On the other hand, TTM comes directly from alcohol research and refers to the establishment and maintenance of abstinent behavior, which also requires volition. The inclusion of both models is intended to promote a common understanding of the role of motivation in individuals with an alcohol use disorder in order to find important starting points for intervention and to prevent relapses by strengthening motivation. The description of the two models is given in the following sections.

The very well-known and established model in motivation psychology is the Rubicon model of action phases (Gollwitzer, 1990; Heckhausen, 1987; Heckhausen & Gollwitzer, 1986, 1987). It helps to better understand and predict human behavior by differentiating motivational and volitional processes in the control of action. Motivational processes operate in intention formation and deactivation, whereas volitional processes guide the initiation and implementation of intentions. The Rubicon model of action phases is based on four phases. In the first and last phase of the Rubicon model, the focus is on motivation, which is why these are also called motivational phases. In the second and third phases, self-control is required, so they are considered volitional phases. The first phase, the predecisional action phase, involves the determination of goals. The chances and risks of different wishes are weighed, and then the goals are chosen that can be realized with the available resources. This is followed by the process of intention formation and the crossing of the Rubicon that follows into the preactional phase. In this volitional phase, the focus

is on planning and implementing the goals that have been set. When, where, and how action will be taken are defined in order to achieve the goal. Distractions or interruptions with regard to pursuing the goal are avoided as far as possible. The third phase is the action phase, which is also a volitional phase. This is where the previously defined strategies for achieving the goal are implemented and the specific behavior is realized. For example, studying for an exam is done in order to pass the exam. Here, discipline and self-regulation—or, in summary, volition—are needed to pursue the goal constantly. The last phase, the postactional phase, is again a motivational phase. In this final phase, an evaluation is made based on comparing the defined goal and the status of goal achievement. What action steps were successful and what improvements can be made are examined with regard to the future.

The Rubicon model has been further elaborated over the years and has led to the development of the mindset theory of action phases (Gollwitzer, 1990, 2012; Gollwitzer & Keller, 2016). The mindset theory of action phases assumes that depending on the current motivational or volitional phase, a certain mindset predominates. Specifically, a distinction is made between the deliberative and the implemental mindset. The deliberative mindset characterizes the predecisional action phase in which the individual is still uncertain about how they will decide. The individual is therefore open to all possible information in order to attain the goal. In contrast, in the implemental mindset, the individual is in the pre-actional phase, in which the decision for a goal has already been made. This is where a focused and selective approach becomes apparent and where a closed-mindedness is required. These two different mindsets lead to adjustments in the individual's attention and cognition and thus also explain the different behavior in the pursuit of goals. Since it incorporates not only motivational and volitional phases but also the accompanying cognitive processes, the mindset theory of action phases is a good addition to the assumptions of the Rubicon model.

The transtheoretical model of behavior change (TTM; Prochaska & DiClemente, 1983) was chosen as the second model for this thesis because it is a widely used and well-known model in research on alcohol addiction that also includes motivational processes. In addition, the TTM addresses a phase that is neglected by other models: the time after reaching the goal and the maintenance of a new behavior. The TTM measures individual motivation for behavior change in the form of a phase model. In its initial form, the model assumed that behavior change proceeds in five stages,

beginning with the precontemplation stage, where individuals have no awareness of the problem and may be unaware of the need for change. In the next stage of contemplation, people are more aware of the problem and tend to start behavior change within the next six months. During the preparation stage, individuals prepare to take action within the next 30 days, whereas in the next stage, action, they then actually change and try to keep moving ahead. In the last stage, maintenance, people try to sustain their newly developed healthy behavior. The TTM has been widely implemented in alcohol addiction research. In some cases, the TTM was able to predict treatment outcomes based on the staging (e.g., Bauer et al., 2014; Small et al., 2012). But study results have not verified the predictive validity of the TTM regarding relapse or therapy outcome (e.g., Dale et al., 2011; Field et al., 2009). The reasons underlying these inconsistencies are still unclear and require further clarification.

As described in this chapter, motivational processes are an important component in maintaining or overcoming alcohol use disorder. In addition, volitional processes have so far been neglected in the research on alcohol use disorder, although the two models presented here both outline the importance of volitional processes in pursuing a goal. This research gap is investigated in more detail in this thesis.

In the next chapter, volition—or self-regulation, which is used synonymously—will first be discussed in general and then in relation to alcohol use disorder. In addition, the self-regulation strategy of mental contrasting with implementation intentions is introduced.

### **Self-Regulation by Mental Contrasting with Implementation Intentions (MCII)**

Based on the theory of the Rubicon model of action phases (Gollwitzer, 1990; Heckhausen, 1987; Heckhausen & Gollwitzer, 1986, 1987), every human behavior can be divided into motivational and volitional processes. The importance of this distinction was particularly evident in the area of behavior change. Previous studies have consistently shown that even if people declare strong intentions to change and maintain a behavior, this does not always lead to behavior change. For example, this has been demonstrated by the fact that people fail to eat healthier or to exercise more, despite having the intention to do so (e.g., reviews by Adriaanse et al., 2011; Bélanger-Gravel et al., 2013). This phenomenon has been subsumed under the term *intention–behavior gap* (e.g., Sheeran & Webb, 2016; Wieber et al., 2015). In other words: in

addition to a formed intention and motivation, volition is also important to changing one's behavior. In order to advance the translation of intentions into action, the use of implementation intentions (Gollwitzer, 1999, 2014) has been suggested (e.g., Gollwitzer & Oettingen, 2016; Sheeran & Webb, 2016).

Implementation intentions are if-then plans (Gollwitzer, 2014), which specify when, where, and how to strive for a goal. They are expressed in the following format: "If the critical situation X is encountered, then I will perform the goal-directed response Y!" (e.g., "If I feel hungry, then I will eat an apple"). Implementation intentions and their effect on behavior change have been widely studied. In their meta-analysis, Gollwitzer and Sheeran (2006) summarized the results of 94 studies, showing that implementation intentions had a medium to large positive effect ( $d = .65$ ) on goal attainment in various life domains (e.g., health, exercise, social relationships, academic achievements). Another meta-analysis by Bélanger-Gravel et al. (2013) reported, based on 26 studies, a small to medium effect size ( $d = .31$ ) of implementation intentions on promoting physical activity, finding that student and clinical samples benefited in particular. A recent meta-analysis has again shown the effectiveness of if-then plans (Sheeran et al., 2024): Based on 294 articles, it identified a medium effect size ( $.27 \leq d \leq .66$ ) for various outcomes (e.g., cognitive, affective, and behavioral). Higher effect sizes were found when implementation intentions were formulated in an if-then format, when the plans were repeatedly practiced, and when the participants were highly motivated to pursue the goal.

Another approach to promoting the translation of intentions into action is mental contrasting. Mental contrasting consists in imagining a desired future and contrasting it with the obstacles of the present reality in order to increase goal commitment (Oettingen, 2000; Oettingen et al., 2001). By using mental contrasting, people detect obstacles more often and faster (Kappes et al., 2013), overcome obstacles better (Kappes et al., 2012), and are thus more likely to achieve their goals in different areas of life, such as wellbeing, health, education, and work (summaries by Oettingen, 2012; Oettingen et al., 2018). When combining these two approaches into one strategy, we speak of mental contrasting with implementation intentions (Oettingen, 2012; MCII, Oettingen & Gollwitzer, 2010, 2018). MCII consists of four steps: wish/goal, outcome, obstacle, and if-then plan. MCII starts with specifying a personal wish (e.g., being abstinent). The next step is to imagine the positive outcomes of attaining the goal



(being a good father, being healthier, being able to retain a job, etc.). The best positive outcome (e.g., being a good father) is chosen, and one vividly imagines how it would feel to attain this wish. Then potentially critical inner obstacles to pursuing the wish are identified (e.g., feeling sad, peer pressure, arguing with one's spouse, being annoyed because of work).

The most significant personal inner obstacle (e.g., feeling sad) is chosen, and one vividly imagines how it would feel to experience this obstacle. In the next step, one mentally contrasts the best positive outcome with the most significant personal inner obstacle (mental contrasting). Then the steps of implementation intention follow. Possible means for overcoming the obstacle are imagined (calling a close friend, explaining to those present that one wants to remain abstinent, leaving the situation, etc.) and then the best option is selected (e.g., calling a close friend). Finally, the obstacle, as defined in the process of mental contrasting (e.g., feeling sad), is included in the if part of the plan. The best option for overcoming the obstacle (e.g., calling a close friend) is included in the then part of the plan (e.g., "If I feel sad, then I will call a close friend!").

Combining mental contrasting and if-then plans takes advantage of the positive effects of both approaches: mental contrasting strengthens goal commitment and goal striving (Oettingen, 2000; Oettingen et al., 2001), while implementation intentions foster the instrumental action for behavior change (Gollwitzer, 2014). The effectiveness of MCII has been shown in a lot of studies (for a review, see: Oettingen, 2012; Oettingen & Gollwitzer, 2018). In particular, MCII has been shown to be effective in the area of health behavior: For example, when using MCII, participants have been shown to be more physically active (Stadler et al., 2009), to practice a healthier diet (Stadler et al., 2010), to be more likely to reduce their weight (Marquardt et al., 2017), to be better able to reduce smoking (Mutter et al., 2020). A recent meta-analysis (Wang et al., 2021) of 21 studies showed that MCII has a small to medium effect size ( $g = 0.336$ ) on goal attainment. Previous research has shown that MCII works especially through nonconscious motivational and cognitive processes (e.g., Achtziger et al., 2011; Bieleke et al., 2021; Wieber & Sassenberg, 2006). This nonconscious mechanism is particularly intended to help people who suffer from impaired self-regulation—as is often the case with alcohol addicts or people who suffer from a mental illness—to pursue their goals. This assumption was confirmed in a study by Sailer et al (2015),

who found that inpatients with schizophrenia participated more often in a jogging group through the use of MCII compared to a control group.

Implementation intentions and MCII have been applied in non-clinical samples in order to reduce alcohol consumption with promising results. For example, undergraduate students were able to reduce their alcohol consumption using implementation intentions (Hagger et al., 2012). Armitage (2009) showed that forming an if-then plan led to a decrease in drinking in an intervention group compared to a control group in a general population. Furthermore, a study by Wittleder et al. (2019) showed that MCII can help people at risk for hazardous drinking reduce their drinking. Malaguti et al. (2020) summarized the results from multiple studies in a recent meta-analysis and found a small significant effect of implementation intentions on reducing alcohol use in students and in the general population ( $g = 0.31$ ).

Overall, this chapter has shown that MCII is an effective tool for changing behavior in various areas of life and thus for achieving personal goals. There are initial promising results for its application in reducing alcohol consumption. However, research on applying MCII during inpatient treatment for alcohol use disorder is still pending and will be part of this thesis.

## **Present Research**

To summarize the key findings discussed above, in the general population, excessive alcohol consumption leads to extremely negative consequences, including an increased burden of disease, economic and social costs, high comorbidity with mental disorders and physical illness—in sum, an impaired quality of life among both the people affected and in society. Despite recommendations from research and guidelines on treating alcohol use disorder, therapy results remain unsatisfactory. Relapse is standard, but little is known about the patterns of relapse or the chronological classification of relapses. In addition, it is well known that using concepts from motivation psychology in AUD research has been justified (e.g., motivation to change as a predictor of therapy outcome), but they are still applied too little. In particular, too little attention has been paid to the concept of volition and the relationship between volition and relapse. Lastly, mental contrasting with implementation intentions is an effective self-regulatory strategy that has been

shown to be effective at reducing alcohol consumption in the normal population, but the use of MCII in inpatients with alcohol use disorder is still pending.

This work aims to contribute to resolving some of these issues by carrying out a series of studies that build on each other. The first research paper measures treatment motivation based on assumptions of the transtheoretical model of behavior change (TTM; Prochaska & DiClemente, 1983) to predict relapse and to introduce and review concepts from motivation psychology in AUD research. The second paper examines patterns of relapse to gain a better understanding of the underlying mechanisms of relapse. In the third research paper, mental contrasting with implementation intentions is used for the first time during inpatient alcohol treatment to reduce relapse. Each research paper is briefly discussed below.

### **Research Paper I: Therapeutic Success in Relapse Prevention in Alcohol Use Disorder: The Role of Treatment Motivation and Drinking-Related Treatment Goals**

The first study aims to better understand the role of motivation in relapse behavior by investigating whether motivation can be predictive of relapse during treatment in inpatients with an alcohol use disorder (AUD).

The transtheoretical model of behavior change (TTM; Prochaska & DiClemente, 1983) serves as the theoretical basis for the first research paper. The TTM consists of different stages that represent the progress of an individual's readiness to change attitudes and behavior (precontemplation, contemplation, preparation, action, maintenance). Individuals who reach higher stages are more likely to manage behavior change. In terms of AUD, this means that individuals in higher stages should be more likely to achieve abstinence. To date, this assumption has only been partially confirmed, as there are inconsistent results in the research (e.g., Field et al., 2009; Migneault et al., 2005; Zhang et al., 2006). To strengthen the predictive value of the TTM, we added an abstinence-oriented treatment goal as an additional predictor in our study, as this variable also appears to predict relapse (Berger et al., 2016; Meyer et al., 2014)

In this study, we aimed to determine whether the TTM, along with the abstinence-oriented treatment goal, could predict drinking during treatment in inpatients with AUD. To test the distinct predictive value, we additionally controlled for well-known

sociodemographic and substance-related variables with predictive power, such as age, gender, employment status, baseline alcohol consumption, and the severity of AUD (Adamson et al., 2009; Sliedrecht et al., 2019).

In order to test our hypotheses, we conducted an observational study in an inpatient treatment center for alcohol use disorder in Switzerland. To assess treatment motivation in accordance with the concept of the TTM, participants filled out the University of Rhode Island Change Assessment Scale (McConaughy et al., 1983). The assigned psychotherapists recorded the drinking-related treatment goal. The remaining variables and the dependent variable (return to any drinking vs. status of abstinence) were gathered from the clinic's information system.

Our analyses refer to 99 study participants with alcohol use disorder. The study sample was characterized by a balanced mix in sociodemographic data. In addition, mainly patients with a more severe alcohol use disorder (long-term heavy alcohol use, heavy use before entering treatment) were part of the sample. Our data analysis, based on a stepwise logistic regression, showed that employment status and treatment motivation measured in accordance with the TTM were significant predictors of drinking during treatment, even when controlling for sociodemographic and substance-related variables. A high score on the action stage was thus a significant predictor of abstinence. This indicates that patients who are actually changing and who are trying to make further progress in abstinence are most likely to remain abstinent. Together, being in this more advanced motivational stage and also being employed increased the likelihood of remaining abstinent. An abstinence-oriented treatment goal was associated with staying abstinent, but this effect did not reach statistical significance.

**Conclusion.** Our study confirms the validity of the TTM in predicting drinking during treatment in individuals with AUD. Compared to the earlier inconsistent findings, however, our results also show that it may be worthwhile to be open to other variables in addition to motivation psychological processes in order to obtain the most comprehensive picture possible. This is especially important because our results show the relevance of employment. This means that in addition to strengthening motivation, reintegration in the work environment is also of high importance during inpatient treatment. Work integration can foster financial security, future perspectives, and social inclusion (see also Henkel, 2011) and should therefore be addressed even to a greater degree during treatment. The unique significance of treatment motivation in relation to

drinking during treatment emphasizes its importance. This verifies the importance of enhancing treatment motivation to prevent drinking during treatment and thus also to foster long-term abstinence. In particular, examining the result more closely makes clear that the action stage is the best predictor of abstinence. In this phase, people are still in the process of change, are motivated to continue changing, but also need more resources to achieve their goal. This phase can be assigned to the action phase according to the Rubicon model (Gollwitzer, 1990; Heckhausen, 1987; Heckhausen & Gollwitzer, 1986, 1987), which is a volitional phase in the pursuit of a goal. This reaffirms the importance of volition in achieving abstinence in people with an alcohol use disorder. Motivational approaches such as motivational interviewing (Miller & Rollnick, 1991, 2012) or mental contrasting with implementation intentions (Oettingen & Gollwitzer, 2010) thus qualify as promising interventions for improving therapy outcomes by strengthening volition.

Overall, the study shows that the TTM, as well as concepts from motivation psychology in general, have an important role in alcohol research and should be further considered. To find out how motivation is related to relapse, it is important to have a differentiated understanding of relapse and relapse patterns. The question of how motivation changes before or after relapse has remained unanswered, which is why additional knowledge about the exact effects of motivational interventions is important. The next part therefore focuses on patterns of relapse.

## **Research Paper II: What is the Relapse Risk during Treatment? Survivor Analysis of Single and Multiple Relapse Events in Inpatients with Alcohol Use Disorder as Part of an Observational Study**

The second article looked at the risk of relapsing in the course of inpatient treatment for alcohol use disorder to better understand the temporal patterns of drinking and to improve the treatment options.

Results from inpatient alcohol research show that more than one-third of patients return to drinking during inpatient alcohol treatment (Klingemann et al., 2013; Rösner et al., 2016). Drinking during treatment is considered one of the strongest predictors of the long-term course of alcohol use disorder (e.g., Ludwig et al., 2013). That is why it is important to reduce drinking during treatment as much as possible. Previous research has focused on predictors of relapse, but little is known about possible patterns of

drinking or if and how the risk of drinking changes in the course of inpatient treatment. Also, the possibility of critical periods during treatment and the consequences of an initial relapse (return to abstinence vs. further relapses) remain unclear.

The aim of Research Paper II was to identify temporal patterns of drinking in the course of inpatient treatment for alcohol use disorder. We divided the dependent variable into abstinent (no relapse event), first relapse, and multiple relapses to understand better the patterns and reasons of drinking. In addition, we wanted to include several covariates known to be predictors of relapse (age, gender, years since the onset of addiction, and the number of DSM-5 criteria of AUD) to control for their influence. Overall, the findings were meant to provide guidance for enhancing treatment options to reduce the risk of relapse.

To answer our research questions, we analyzed inpatients from the same Swiss treatment center for alcohol use disorder. In total, 103 inpatients participated in our study and were observed a total of 42 days after the start of treatment. Relapses were recorded by breath and urine alcohol tests, as well as by self-report. In total, 951 alcohol tests were performed; 594 at a previously announced time, and 357 were performed unannounced. Survival analyses for the event relapse were based on Kaplan–Meier estimates and the Cox proportional-hazards model in order to estimate survivor functions (unadjusted and adjusted). Covariates were controlled for using generalized estimating equations (GEEs).

The study population was diverse with regard to the sociodemographic variables, and the study participants were more likely to be inpatients with a more severe alcohol use disorder.

Concerning the dependent variable relapse, about one-third of the participants had a first relapse during the observation period. The proportion of continuously abstinent patients decreased steadily during the course of treatment from 100% at the beginning, to 92.2% at day 7 of treatment, to 65.3% at the end of the observation period (day 42 of treatment). The unadjusted and adjusted hazards of experiencing a first relapse also declined over time. In terms of covariates, only the number of DSM-5 AUD criteria showed a positive association with first relapse: When one more alcohol use disorder criterion was fulfilled, the hazard of a first relapse increased by 44%.

The variable multiple relapse was met by 10 participants, nine participants (8.74% of the total sample) having two relapses and one participant (0.97% of the total

sample) having three relapses. In contrast to the first relapse variable, the multiple relapse cases showed that the unadjusted and adjusted hazards of experiencing any relapse did not decline over time. The covariate number of DSM-5 AUD criteria was again the only covariate with a significant positive relationship with relapse: when one more alcohol use disorder criterion was fulfilled, the hazard of a first relapse increased by 34%.

**Conclusion:** The study identified two different trajectories: the risk to relapse once during inpatient treatment for alcohol use disorder declined over time, whereas the risk to relapse multiple times remained stable during the course of treatment. If we look more closely at these results concerning a single relapse, the risk of relapse decreased day by day. This means that the probability of remaining abstinent increased from day to day. This finding should be used in therapy to motivate patients and to help them feel self-efficacious. However, it is evident that more needs to be done regarding relapse prevention for patients in danger of multiple relapses. Once a patient has relapsed, the results of this study indicate that relapse prevention should be started immediately. The study results also indicate that individuals with more severe alcohol use disorder were more likely to relapse. This means that they represent a risk group that also requires increased support in relapse prevention.

Overall, the study indicates that abstinent inpatients should be strengthened in their motivation and inpatients with more severe alcohol use disorder, as well as those who have already experienced relapse, should be empowered with relapse prevention strategies. The focus of these strategies should be on strengthening volition, as this is effective in the pursuit of goals, especially when difficulties arise. These two different approaches should contribute to the stabilization of abstinence during inpatient treatment for alcohol use disorder and thus be considered as protective factors for a medium- and long-term positive course of alcohol use disorder. A possible technique for strengthening motivation and ensuring better abstinent rates will be discussed in the next section on Research Paper III.

### **Research Paper III: Improving Relapse Prevention in Inpatients with Alcohol Use Disorder Using Mental Contrasting with Implementation Intentions (MCII): A Single-Blind Randomized-Controlled Trial**

The third study aimed to apply a self-regulation strategy effective in many areas of life to inpatients with an alcohol use disorder during treatment in order to reduce relapse by investigating the role of craving.

There are immense social and economic costs of AUD (e.g., WHO, 2018). As mentioned above, despite the use of treatment recommendations and relapse prevention programs (e.g., Marlatt & Gordon, 1985), relapses during inpatient treatment are still frequent, as more than one-third of patients relapse during inpatient alcohol treatment (Klingemann et al., 2013). Studies have found that the variable craving seems to have a high predictive value for clinical outcomes in substance use disorders and relapse (e.g., Sayette, 2016). A close relationship between craving and another interesting variable, self-regulation, is found in the literature, for example, in cognitive neuroscience (Heatherton & Wagner, 2011; Volkow et al., 2019), which describes how self-regulation is weakened due to strong impulses or impaired functioning of the prefrontal cortex (Heatherton & Wagner, 2011). Alternatively, the incentive-sensitization theory of addiction by Robinson and Berridge (1993) assumes that a pathologically increased incentive salience of alcohol in individuals with AUD leads to strong impulses, which in turn weakens self-regulation and can therefore lead to relapses. The importance of self-regulation is also described in various therapy approaches (e.g., cognitive behavioral therapy, mindfulness- and acceptance-based therapy). An important self-regulation strategy that originated from motivation psychology is mental contrasting with implementation intentions (MCII; Oettingen & Gollwitzer, 2010). The first step of MCII involves mentally imagining a desired future and contrasting it with the critical obstacle of the present reality (mental contrasting; Oettingen, 2000; Oettingen et al., 2001). The second step is to create an adequate if-then plan that specifies how to react to the critical obstacle (implementation intentions; Gollwitzer, 2014). In relation to alcohol use disorder, the wish could be to stay abstinent, and the obstacles can be conceptualized in terms of risk situations. A risk situation could be that an individual with an AUD drinks alcohol when they feel sad. As a possible solution to this risk situation, someone might decide to call a friend. These considerations are then summarized in the form of an implementation intention:



“If I feel sad, then I will call a friend.” The efficacy of MCII has been demonstrated in a wide variety of studies and meta-analyses for a broad range of life domains (e.g., Christiansen et al., 2010; Marquardt et al., 2017; Mutter et al., 2020; Sailer et al., 2015). Previous studies have found that implementation intentions or MCII were successful at reducing risky alcohol use in general non-clinical populations (Hagger et al., 2012; Malaguti et al., 2020; Wittleder et al., 2019).

Given the effectiveness in a non-clinical population, the question arises whether MCII is effective for individuals with alcohol use disorder. However, preliminary evidence from the literature suggests that MCII functions primarily in modern cultures with few norm-oriented rules, as these require more self-regulation (Kizilcec & Cohen, 2017; Oettingen, 1997, 2012). In environments where there are clear structures, little autonomy, and high demands for norm-oriented behavior, MCII seems to function less well. Inpatient treatment of alcohol use disorder is more of a highly structured setting. It is therefore an open question whether MCII is effective in reducing relapse in individuals with alcohol use disorder during inpatient treatment and what role craving has in this context. These questions were investigated in the third research paper, in which we conducted a single-blind randomized control study at the same Swiss treatment center for alcohol use disorder. Participants were randomly assigned to either the experimental or the active control group. The experimental group received individual training in MCII. The active control group received a control training based on the relapse-prevention model by Marlatt and Gordon (1985) consisting of a 2 × 2 contingency table in which participants had to list advantages and disadvantages of being abstinent and of drinking. Each participant was given their training (MCII vs. control training) three times. As a dependent variable, the frequency of drinking during treatment was assessed and adjusted for the influence of the varying length of treatment (ratio drinking during treatment = frequency of drinking during treatment / number of days in treatment). Lastly, we assessed individuals' subjective craving before and after conducting the training. To control for the entry level of craving, we computed the variable difference craving, which was calculated from the difference between craving after the intervention and craving before the intervention.

In order to answer the research questions, 122 participants, 61 per group, participated in the study. The baseline sociodemographic and alcohol-related variables were similar to those in the two previously reported studies: predominantly men, middle aged, and

several years of history of alcohol use disorder, as well as a chronic course of the disease to date.

Analyses on the effect of MCII on craving showed that at the first point of measurement at the beginning of treatment, craving decreased from preintervention to postintervention in the MCII group. In contrast, in the control group, craving increased from preintervention to postintervention. For the other three points of measurement, no more differences were found between the two groups and craving decreased from preintervention to postintervention, but it did not change significantly within the points of measurements. The results on the effect of MCII on the ratio drinking during treatment showed that there were equal numbers of relapses in the control group and in the MCII group: 38.5% of the study participants had at least one alcohol relapse during treatment.

**Conclusion:** The randomized controlled trial was able to show that MCII reduced craving compared to a strong control group at the beginning of inpatient treatment. In terms of relapse, the MCII and control group did not differ. In summary, this means that MCII was comparable to an established therapy method and even outperformed it at the beginning of inpatient treatment. The initial difference at baseline indicates that at this point MCII was working differently than the control training. This difference can be interpreted in the context of the difficulties of the highly structured environment of inpatient alcohol treatment discussed above. While at the first appointment of the study, patients are just arriving at the clinic and do not yet know the normative context, the normative context becomes increasingly established in the course of treatment such that the initial effect disappears. This moderation effect of the normative context should be tested by future research that applies MCII in an outpatient setting.

### **General Discussion**

The three papers reported in the present thesis show the importance of including motivation in the treatment of alcohol use disorder. Moreover, it became apparent that there are different patterns of risk for relapse and that MCII deserves an equal place in the treatment of alcohol use disorder as established therapy methods. Since some points have already been discussed in detail in the manuscripts, possible further implications to my initial research questions will be addressed first. Afterward, I will expand the discussion and consider it in the context of future research.

### **Implications for Research on Alcohol Use Disorder and Motivation**

Research Paper I was able to confirm the importance of constructs from motivation psychology in alcohol research. Previous research has already been able to show how motivation influences the outcome of treatment and that is a stable predictor. The transtheoretical model of behavior change (TTM; Prochaska & DiClemente, 1983) has also been studied many times, with partially inconsistent findings. The first research paper demonstrated that categorization in the TTM, including employment status, could predict drinking behavior during an inpatient treatment for alcohol use disorder. Including other variables like employment status that do not have their direct origin in psychological concepts could thus help improve the prediction of relapse. It may therefore be worthwhile for future research to open up even more and investigate variables that have so far been investigated little or not at all as possible predictors or moderators in addition to motivational variables. In terms of patients' motivation, inpatients who were in a more advanced motivational stage were more likely to remain abstinent in the first study. This finding underscores the importance of considering patients' motivation in the further study of alcohol use disorder and the application of the TTM. This also raises the question of how the TTM and its potential can be further utilized in research and in the treatment of individuals with AUD. For example, do different therapies need to be offered depending on the motivational state? Do we need interventions that more strongly promote the readiness to change in cases of low motivation and a stronger focus on relapse prevention for highly motivated patients? Pursuing these implications of using the TTM would make it possible to explore new tailored intervention approaches.

### **Implications for Research on Alcohol Use Disorder and Relapse**

The results of Research Paper II showed that relapse is a common phenomenon during inpatient alcohol treatment. It is therefore important to have a closer look at the variable relapse in addition to its possible predictors. Research Paper II demonstrated that there are two different patterns of relapse: single relapse and multiple relapses. While the risk of relapse decreased over the duration of treatment for inpatients who were abstinent, the risk of relapse remained stable for inpatients who had relapsed before. These two different outcomes imply that the two groups should be treated

differently: abstinent inpatients should be supported in developing a strong motivation and high self-efficacy expectations, and relapsing inpatients should be supported in relapse prevention in the form of interventions that strengthen volition. Another relevant insight from this study refers to the severity of the alcohol use disorder: the more severe, the more likely it was that one or more relapse would occur. This implies that there should be an increased focus on relapse prevention for inpatients with a more severe AUD, as they are a high-risk group.

From Research Paper II, it can be concluded that it is highly important to assess the severity of the AUD and to monitor drinking patterns. Based on these observations, the right type of therapy can be selected and tailored to the individual. In addition to drinking patterns (one relapse or multiple relapses), the question also arises whether there are other indicators related to the relapse that should be incorporated into treatment, like triggers, risk situations, or emotions before, during, or after the process of relapsing. This would allow treatment to be even more individualized and may also contribute to improving the treatment results.

### **Implications for Research on Alcohol Use Disorder and MCII**

The single-blind randomized controlled trial of Research Paper III was the first to examine the use of the self-regulation strategy mental contrasting with implementation intentions for reducing the risk of relapse in patients with AUD during inpatient treatment in contrast to an active control group. In addition, the association with craving was analyzed. Research Paper III found that at the beginning of treatment, craving significantly decreased after conducting MCII, whereas this was not the case in the control group. This effect was no longer detected in subsequent measurements. The number of relapses was also the same in the control and the MCII groups.

Research Paper III showed that the MCII group and the active control group exhibited the same risk of relapse. In addition, it showed that MCII had a positive effect on craving, at least at the beginning of treatment. We interpreted this effect to mean that at the beginning of treatment, the normative context was not yet established, so individual self-regulation processes still played an important role. We assume that the normative context becomes more established in the course of treatment, with the result that the normative influence on patients increases and individual self-regulation decreases. In the transition from the clinic to everyday life, the opposite process

occurs: patients find themselves back in an autonomous environment in which they are once again on their own, no longer share the common environment with other patients, and have to take responsibility for their lives, so the normative influence decreases and the demands on individual self-regulation increase. Due to these changes in normative influence and individual self-regulation, MCII should be tested either at the end of inpatient treatment as a preparation for the time after treatment or in an outpatient setting. Toward the end of treatment, MCII could be applied in such a way that the content would refer to the time after treatment. This would mean that the obstacles and if-then plans would refer to the outpatient setting. This would allow inpatients to take responsibility for their return to their home environment, to prepare optimally, and to strengthen their self-regulation in advance before discharging from treatment.

The results also identified a positive effect of MCII on craving. In this regard, it would make sense to include the variable craving even more in the method of MCII. For example, for certain individuals with AUD, it may be productive to explore craving as an obstacle in more detail and to formulate if-then plans for it. Using MCII to improve how to cope with craving could thus reduce the risk of relapse. Initial evidence for this assumption can be found in the recent meta-analysis by Sheraan et al. (2024). Among other things, the authors examined how effective implementation intentions are based on cues (the if part of the plan). It was found that negative emotions (e.g., disgust and threat) had high effect sizes for the effectiveness of implementation intentions. Tempting stimuli and feeling tempted also showed medium effect sizes. These results suggest that in the context of AUD, it will be beneficial to treat craving as an obstacle when applying MCII. However, it is still unclear how craving and MCII interact. Investigating the relationship between MCII and craving on a process level would therefore be an interesting next step. How does MCII affect craving? What is the process behind it? Can the inclusion of craving as an obstacle improve the efficacy of MCII (Sheeran et al., 2024)? Should patients have to deal with craving when conducting MCII in order to better recognize craving as an obstacle (Kappes et al., 2013)? Can the finding that MCII particularly works through nonconscious motivational and cognitive processes (e.g., Achtziger et al., 2011; Bieleke et al., 2021; Wieber & Sassenberg, 2006) make a further contribution to our understanding of the relationship

between craving and the effectiveness of MCII? These would be interesting research questions.

### **Future Research**

This chapter will contextualize the results and provide an outlook on future research on motivational processes in AUD. This thesis showed that it is important to assess the motivation of individuals with alcohol use disorder during inpatient treatment in order to adjust the therapy accordingly and to improve therapy outcomes. At the beginning of treatment, MCII as a self-regulation strategy made a positive difference in the experience of craving. The question now is how these results can be further advanced to avoid relapses and to improve treatment outcomes. In this regard, I see three main areas of focus: improving the measurement of motivation, further developing MCII in the field of alcohol use disorder, and opening up research to new ideas and concepts.

In order to better understand the motivation of people with AUD, it is worth taking a look at the psychology of decision-making. Kahneman (2011) famously distinguished between two systems of thought. System 1 functions instinctively, is characterized by fast, automatic processes, and can be assigned to unconscious patterns. System 2 functions logically and is characterized by slow, thought-out processes, which run consciously. This concept has attracted a great deal of attention in recent years and has been further developed (e.g., Gawronski & Payne, 2011; Greenwald & Lai, 2020). The findings have also been examined in the research field of AUD in order to improve the measurement of motivation. In particular, research in the field of cognitive neuroscience has recently advanced our empirical and theoretical knowledge (e.g., Berridge & Robinson, 2016; Heatherton & Wagner, 2011; Langner et al., 2018). New models have shown that there are neurobiological changes in the brains of individuals with an alcohol use disorder that particularly affect behavior on an unconscious and automatic level (system 1 as described above). It is very important to record these unconscious processes to obtain a complete picture of what happens in the brain with this disorder. In the past, the focus has normally been on conscious processes, which can be easily recorded using questionnaires or interviews. Lately, however, methods have also been developed to record unconscious processes (e.g., visual probes, flicker tests, dual-task tests, stroop tests; for an overview, see Cox et al., 2014) by

measuring reaction times to alcohol-related cues. Using these methods, unconscious processes have been shown to be related to the strength of alcohol consumption, the amount of craving, and drinking after treatment in individuals with AUD (Cox et al., 2014). In addition to measuring unconscious processes, other studies have investigated how they can be changed in order to change behavior, for example, through so-called cognitive bias modification. The results in the field of AUD have been encouraging but rather mixed (Batschelet et al., 2020). Since there are still inconsistent results, and since it remains unclear how the unconscious processes can be best recorded (Christiansen et al., 2015), further research work is needed to assess motivation more comprehensively and to strengthen predictive validity.

In terms of further developing MCII in the field of alcohol use disorder, two topics can be identified where research would be beneficial: first, on strengthening self-regulation in relation to a higher goal and, second, on improving the subjective evaluation of possible risk situations. To the first point: the focus of relapse prevention treatment is to prevent or reduce relapses. This was also the aim of Research Paper III: to reduce relapse by applying MCII. However, some authors describe the focus on relapse as limiting and stigmatizing and therefore demand that treatment must be opened up to higher goals (e.g., Roos et al., 2022). Individuals with AUD should be supported in self-regulation within relapse prevention treatment so that they can achieve goals such as well-being, meaningful relationships, community involvement, and occupational or personal growth through alcohol abstinence (Roos et al., 2022). In other words, alcohol abstinence is a means to the end of living a better life. In terms of MCII, this means that in the first step, instead of the wish for abstinence, a higher goal or wish could be chosen by the patient, such as finding and keeping a meaningful job. The next three steps (imagining the most positive outcome when attaining the wish, considering inner obstacles standing in the way of attaining the wish and choosing the main inner obstacle, finding a specific behavior to overcome the obstacle) would then relate to this higher wish. Testing whether this assumption improves the effectiveness of MCII in individuals with AUD could be a promising research avenue. A second avenue could be addressing the cold-to-hot empathy gap (Loewenstein, 1996), which means that people in an emotionally neutral cold state often underestimate their future behavior in an emotional, hot state. With regard to AUD, this means that abstinent individuals with an AUD underestimate the risk of relapsing in the

near future and overestimate their self-efficacy and strategies for action in emotionally difficult situations when they experience craving. This underestimation of risk can lead to their exposing themselves to risk situations that turn out to be more difficult than expected and that place (too) high of a demand on self-regulation, which can end in relapse (Sayette, 2016). Although MCII places a high value on the emotional, vivid processing of the four steps of MCII in addition to purely cognitive processing, there may be opportunities for improvement here. This could be achieved, for example, by supplementing MCII with mindfulness. Mindfulness promotes the perception of the present moment and inner experiences without judgment (Khanna & Greeson, 2013). In terms of AUD, mindfulness has the effect of better recognizing and tolerating internal and external triggers for addictive behavior (Khanna & Greeson, 2013). The combined application of MCII and mindfulness could lead to an improved recognition and evaluation of internal processes and external risk situations, allowing behavior to be adapted.

Lastly, it seems important that research should be open to new ideas and concepts, especially since motivation is an important aspect in the treatment of AUD, but just one of many. I will discuss two aspects here as examples.

In addition to psychological factors, psychotherapeutic methods, and medical support options, socioeconomic causes and influencing factors seem to be neglected in psychologically oriented addiction research. However, as Research Paper I has shown, employment is an important predictor of relapse. Research has shown that although people with a low socioeconomic status have a similar pattern of harmful alcohol use to people with a higher status, they are more exposed to negative alcohol-related consequences (Collins, 2016). Research has also found that individuals with an AUD and a low socioeconomic status have less access to treatment (Mulia et al., 2014), are more likely to drop out of treatment (Saloner & Lê Cook, 2013), and have poorer treatment outcomes (Peacock et al., 2018). The systematic review by Sliedrecht et al. (2019) also showed that social factors (e.g., socioeconomic status, education, employment) have an impact on relapse. All these results indicate how important it is to involve social factors in treating individuals with AUD, such as in the form of social counseling or as goals in psychotherapeutic treatment. Unfortunately, these promising research results contradict the conditions in the current healthcare system, which makes it difficult to implement them. In Switzerland, for example, there are limited



billing options for social counseling, which means that clinics tend to keep their services limited. Although there has been a focus on increased interdisciplinary and interprofessional collaboration in healthcare in recent years, there is also further potential for improvement in terms of accompanying patients within the framework of a fully developed case-management system. However, the costs of this approach are not currently covered in Switzerland. It is quite conceivable that this reduced or lack of support for patients has a negative impact on their motivation, as there are also breaks in support from the transition from the clinic to outpatient services, which can be associated with an increased risk of relapse.

As Research Paper II has demonstrated, more attention should be paid to the individualization of therapy in the future. Based on Research Paper II, we recommend strengthening self-efficacy for groups with a low risk of relapse and focusing on relapse-prevention strategies for groups with a high risk for relapse. Treatment could be individualized, for example, based on the motivation of the patient, whether or how often someone has relapsed in therapy, and how strongly someone experiences craving. Therapy could be further individualized by combining MCII with the measurement of unconscious processes, the inclusion of higher goals, and mindfulness.

To summarize, this thesis confirmed the importance of motivational factors as relevant variables in therapy for AUD. Measuring motivation and volition enhances the prediction of relapse and provides options for improving treatment. It can be beneficial to use self-regulation strategies to better prepare patients for challenging situations, thereby enabling them to remain abstinent. Nevertheless, it must be stated that the overall effectiveness of alcohol treatment and research faces further challenges. But this will also enable the further development of methods that combine advances in motivation science, digital health, and behavioral engineering with medical or pharmaceutical measures and improvements in health care systems.



## Research Paper I

# Therapeutic Success in Relapse Prevention in Alcohol Use Disorder: The Role of Treatment Motivation and Drinking-Related Treatment Goals

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## Abstract

Changing addictive behavior is a complex process with high demands on motivation. The Transtheoretical Model of Behavior Change provides a theoretical framework for explaining and predicting behavioral change, although its predictive value for addiction is somewhat inconsistent. The aim of the present study is to extend the Transtheoretical Model of Behavior Change by investigating not only treatment motivation but also the predictive value of the type of drinking-related treatment goal. Additional predictors, such as substance-related and sociodemographic variables, are also included in analyses seeking to predict return to drinking during relapse prevention treatment for alcohol use disorder. In this observational study, 99 inpatients from a treatment center for alcohol use disorder were recruited. Treatment motivation was assessed in accordance with the Transtheoretical Model of Behavior Change, drinking-related treatment goal through a self-report questionnaire, and substance-related and sociodemographic variables via the clinic information system. Associations between the potential predictors and covariates were explored using stepwise logistic regression. During treatment, 42.6% of participants had at least one relapse. Scoring higher on the action dimension at admission ( $OR = 0.81, p = .04$ ) and being employed ( $OR = 0.37, p = .02$ ) were significant predictors of abstinence during treatment. This study confirms that treatment motivation contributes to the prediction of treatment outcome, even when controlling for other variables. In future research, the underlying mechanisms of treatment motivation should be further explored.

## **Introduction**

Alcohol use disorder (AUD) is a chronic disorder characterized by a relapsing trajectory. Data from Switzerland indicates that up to 40.0% of inpatients in abstinence-oriented inpatient treatment return to drinking during treatment (Klingemann et al., 2013), and at one-year follow-up, only about 40.5% of former inpatients report continued abstinence (Moggi et al., 2007). Several researchers have shown that drinking during treatment is a predictor of long-term alcohol misuse (Ludwig et al., 2013; Maisto, Roos, et al., 2016). Thus, it is important for patients to avoid drinking during treatment to ensure persistent abstinence.

In developing strategies to increase therapeutic success, researchers have investigated predictors of drinking that may be relevant. In particular, sociodemographic variables, substance-related variables, and motivational variables have been examined as potential predictors of drinking during treatment. With regard to sociodemographic variables, age and gender have been the most frequently studied variables; the partially inconsistent results are summarized in two reviews (Adamson et al., 2009; Sliedrecht et al., 2019).

Generally speaking, female gender and greater age are associated with a higher probability of remaining abstinent. Several studies have shown that social factors such as being employed are associated with a lower risk of relapse (Adamson et al., 2009). For substance-related variables, baseline alcohol consumption and the severity of AUD have been consistently linked to relapse in the literature (Adamson et al., 2009; Sliedrecht et al., 2019): Greater consumption of alcohol before entering treatment and more severe forms of AUD are both associated with a higher risk of relapse during treatment. We therefore included age, gender, and employment status as well as baseline alcohol consumption and the severity of AUD as covariates in the analyses.

Regarding motivational factors, treatment motivation and the drinking-related treatment goal seem especially relevant as predictors of drinking during treatment (Adamson et al., 2009; Berger et al., 2016). With respect to treatment motivation, the Transtheoretical Model of Behavior Change (TTM; Prochaska & DiClemente, 1983) is widely used to assess individual motivation for behavior change. The TTM is a phase model that describes an individual's readiness to change attitudes and behavior linked to a specifically defined problem behavior. In its original form, the central assumption

of the model proposes that a behavior change occurs in qualitatively different, mutual exclusive, and consecutive stages (“stages of change”). In the “precontemplation” stage, individuals do not intend to change their unhealthy behavior in the near future, as they may not yet be aware of the negative consequences. In the subsequent “contemplation” stage, individuals have formed an intention and in the “preparation” stage, they prepare to take action. In the “action” stage, individuals have changed their behavior and are still in the process of becoming healthier, while they must sustain their healthy behavior in the “maintenance” stage.

The TTM was originally developed in the 1980s, and its assumptions have been challenged and modified in the years since. The concept of mutually exclusive stages has been criticized by several researchers (Fecht et al., 1998; Sutton, 2000) who instead propose multiple independent motivational dimensions. The TTM has been applied to a number of health problems, including smoking (Spencer et al., 2002), insufficient physical activity (Marshall & Biddle, 2001), and substance abuse (Pantalon et al., 2002).

In alcohol-related research, the application of the TTM has produced inconsistent results in the prediction of relapse during treatment (i.e. predictive validity). Migneault et al. (2005) point out the practical utility of the TTM during treatment (e.g., improved therapeutic alliance, faster progress in therapy), but also emphasizes that the model is more descriptive than predictive, yielding mixed results for its validity. Similarly, Field et al. (2009) could not confirm the predictive validity of the TTM for treatment outcomes in their study. However, Zhang et al. (2006) demonstrate that the dimension of change is related to long-term alcohol use (i.e., patients scoring on the ambivalence dimension had a higher consumption of alcohol at nine-month follow up compared to patients on the action dimension). The reasons underlying these inconsistencies are still unclear and require further clarification.

Another factor that might play a considerable role in determining therapeutic success beyond an individuals’ motivation for behavior change is the content of the goal (Berger et al., 2016; Meyer et al., 2014). Although patients formally accept abstinence as the aim of abstinence-oriented relapse prevention treatment, they might have a different individual drinking-related treatment goal, such as reducing the amount or frequency of drinking (Meyer et al., 2014). Berger et al. (2016) show that patients with an abstinence-oriented drinking goal benefited the most from treatment.

Meyer et al. (2014) likewise demonstrate the effect of the individual drinking-related treatment goal on long-term alcohol use: Patients with the goal of abstinence exhibited the highest abstinence rate at one-year follow-up compared to those with other drinking-related treatment goals. Thus, assessing the specific drinking-related treatment goal in addition to treatment motivation will clarify whether an individuals' goal of abstinence or reduced drinking may contribute to explaining additional variance in treatment outcomes.

Taken into consideration several decades of research on the predictors of drinking during treatment, a combination of the sociodemographic, substance-related, and motivational variables that have been identified may hold the greatest promise to further improve our understanding. Consequently, we tested the following hypotheses: Based on the research reported above, abstinence during treatment will be predicted by sociodemographic (gender, age, employment status) and substance-related variables (severity of alcohol dependence, baseline alcohol consumption). Furthermore, we assume that when controlling for these factors treatment motivation will additionally predict abstinence during treatment, and including drinking-related treatment goals may also improve the model's predictive power.

## Method

### Study Sites and Treatment

In this observational study, participants were recruited from an inpatient treatment center for alcohol use disorder (Forel Clinic) in Switzerland. The preconditions for entering inpatient treatment at the clinic are (a) an age of  $\geq 18$  years, (b) a diagnosis of alcohol dependence according to ICD-10 (WHO, 1992), (c) abstinence since alcohol detoxification and (d) agreement to the drinking-related treatment goal of abstinence and commitment to abide by clinic rules.

The treatment program in the Forel Clinic is characterized by voluntariness and an open-door policy. It includes psychosocial relapse prevention provided in weekly individual psychotherapy sessions, and group therapy sessions, as well as through exercise therapy, occupational therapy, and social counseling. In general, the patients all receive the same therapies, although they can choose between additional offers. Treatment duration is normally set between 8 and 12 weeks, depending on disease severity, psychiatric comorbidity, and the patients' private professional situation.

Breathalyzer tests are employed when (a) patients reenter the clinic after weekend leaves or (b) clinical staff suspect a patient has used alcohol. Additional breathalyzer tests as well as urine and blood tests are conducted in a random and unannounced manner. Drinking during treatment is not a reason for exclusion from therapy; on the contrary, in the Forel Clinic, drinking during treatment is considered a symptom of the disease and the treatment concept encompasses drinking during treatment. The aim is for the patient to learn from the experience of drinking in order to return to abstinence.

### Design and Procedure

The study was conducted in accordance with the Declaration of Helsinki (WMA, 2013) and was approved by the Ethics Committee of the Canton Zurich.

The inclusion criteria for participation in the study were similar to the criteria for entering treatment (see above). Exclusion criteria were insufficient language comprehension skills to follow the staff instructions or to complete questionnaires,



cognitive deficits that would limit the patient's ability to provide informed consent and, acute suicidality or schizophrenia (as assessed by the research assistant at the first appointment).

Patients fulfilling the inclusion criteria were recruited by the research assistant within the first week of admission. After the objectives and procedures of the study were explained, patients were asked to grant their informed consent. The respondents then completed the questionnaires anonymously.

Data assessment took place between March 2014 and July 2016. During data collection, 183 patients entered into relapse prevention treatment and fulfilled the inclusion criteria. Of these 183 screened patients, 99 decided to take part in the study.

### **Outcome Measures and Instruments**

The primary outcome variable involves drinking behavior during the inpatient treatment program (return to any drinking vs. status of abstinence). A patient was classified as consistently abstinent if neither the results of the breathalyzer tests nor the patient's self-reports indicated alcohol consumption during his or her stay.

The selection of predictors was guided by previous research and included sociodemographic variables such as age, gender, and employment status and substance-related variables such as baseline alcohol consumption and the severity of AUD (Adamson et al., 2009; Sliedrecht et al., 2019). Motivational factors with a focus on treatment motivation and drinking-related treatment goals were additionally incorporated into the analyses (Adamson et al., 2009; Berger et al., 2016).

The sociodemographic variables (age, gender, and employment status) and the severity of AUD (defined as number of ICD-10 criteria of alcohol dependence; WHO, 1992) were gathered from the clinic information system; the other variables were measured using questionnaires.

Baseline alcohol consumption before entering treatment was assessed using the Timeline Follow Back method (TLFB; Sobell & Sobell, 1995) with pencil and paper during a clinical interview conducted by the research assistant. The TLFB assesses daily drinking retrospectively with the help of a calendar. The amount of drinking and consumption pattern one month before treatment admission was registered in terms of standard drinks (one Swiss standard drink equals 33 centiliters or 11 ounces of beer, 15 centiliters is 5 oz of wine, or 4 centiliters is 1.4 ounces of spirits). The number of

standard drinks per week and per drinking day were assessed, and the number of total drinks during one month before admission was calculated as a baseline score of alcohol consumption (internal consistency:  $\alpha = .99$ ).

Treatment motivation was measured using the University of Rhode Island Change Assessment Scale (URICA; McConaughy et al., 1983), in which the subscales assess the constructs of the TTM as independent dimensions.

In this study, we used the German 16-item short form of the URICA ("Veränderungsstadien-Skala", VSS-k) to assess the participant's readiness to change his or her drinking behavior. The URICA's four subscales - Precontemplation, Contemplation, Action, and Maintenance - consist of four items each, that are answered on a five-step scale from 1 (strongly disagree) to 5 (strongly agree). The German evaluation study by Fecht et al. (1998) identifies four factors (subscales), in contrast to the original 5-factor structure of the TTM. Furthermore, the authors propose use of the questionnaire as a dimensional instrument: In each stage of change, individuals may exhibit a combination of dimensions (e.g., a high value in precontemplation and at the same time a minimal expression in maintenance). Participants filled out the URICA on their own using paper and pencil. The URICA has been shown to have good psychometric properties (internal consistency in the current study: precontemplation  $\alpha = .51$ , contemplation  $\alpha = .54$ , action  $\alpha = .46$ , maintenance  $\alpha = .66$ ; Fecht et al., 1998). For the analyses in this study, the individual subscales were used. A higher score in the corresponding subscale indicates a stronger expression of the attitude; for example, a higher score on the precontemplation subscale indicates no intention to change the behavior, whereas a higher score on action means that someone is in the process of behavior change.

The drinking-related treatment goal was assessed by the individual psychotherapist at admission. Patients could choose between six different alternatives: temporally unlimited abstinence, temporally limited abstinence, controlled drinking, no restriction, not decided yet, or a different goal. For the analyses, the individual's drinking-related treatment goal was subdivided into abstinence-oriented (e.g., temporally limited or unlimited abstinence) and drinking-oriented goals (controlled drinking, no restriction). Although the Forel Clinic's treatment program is abstinence-oriented, other drinking-related treatment goals are acknowledged.

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## Data Analyses

The data were screened for descriptive information and frequencies. The normality of distribution was verified using the Kolmogorov-Smirnov test. The percentage of missing values across the variables of interest varied between 0.0% and 16.8%. We used multiple imputation to create and analyze 30 multiply imputed datasets. Incomplete variables were imputed under fully conditional specification, using the default settings of SPSS 24 (IBM Corp., 2016). Associations between the potential predictors and covariates were explored using stepwise logistic regression. The status of abstinence (categorical variable: return to any drinking (1) vs. status of abstinence during treatment (0)) was considered as outcome variable of the regression model. As outlined in the hypotheses, the variables were entered in two blocks: Block 1 encompassed the sociodemographic variables: age (continuous variable), gender (categorical variable: male (0), female (1)), and employment status (categorical variable: unemployed (0), employed (1)), as well as the substance-related variables: baseline alcohol consumption (continuous variable), and severity of AUD (continuous variable). Block 2 consisted of the subscales of the URICA questionnaire: precontemplation, contemplation, action, and maintenance (all continuous variables) and the drinking-related treatment goal (categorical variable: abstinence-oriented drinking goal (1) vs. drinking-oriented drinking goal (0)). We reported logits with their corresponding standard errors and 95% confidence intervals as well as odds ratios for the point estimates. All statistical analyses were two-tailed, with a significance level at  $\alpha < .05$ . Data were analyzed using SPSS 24 (IBM Corp., 2016).

## Results

### Participants

Overall, 99 inpatients participated in this study. The baseline sociodemographic characteristics are as follows: At admission, the mean age of the subjects was 48.0 years ( $SE = 1.085$ ); 37.6% were female. Of the participants, 38.2% were married and 53.1% were employed. Participants met on average 5.2 ( $SE = 0.14$ ) criteria of the 6 criteria of the ICD-10 diagnosis of alcohol dependence. A drinking-oriented treatment goal was stated by 17.3% of the participants; 82.7% expressed an abstinence-oriented goal.

### Substance-Related Behavior

On average, study participants started drinking in a problematic way at the age of 26.6 ( $SE = 1.30$ ). Upon admission, participants reported the number of standard drinks per day using the TLFB. On average, they consumed a mean of 8.7 standard drinks ( $SE = 1.35$ ) per day; they drank alcohol on 5.2 ( $SE = 1.89$ ) days per week, and per drinking day, they consumed 11.9 ( $SE = 4.56$ ) standard drinks. During treatment, 42.6% of the subjects ( $M = 0.81$ ,  $SE = 0.12$ ) had at least one alcohol relapse.

### Regression Analysis

#### Status of Abstinence during Treatment

The results of the analyses concerning a return to drinking during treatment are presented in Table 1.

Table 1. Results of the logistic regression analysis with return to drinking during treatment as the dependent variable.

Predictors	<i>B</i>	<i>SE (B)</i>	<i>OR</i>	<i>95% CI (B)</i>	<i>p</i>
<i>Step 1</i>					
Gender (male <sup>+</sup> )	-0.087	0.442	0.917	0.386 - 2.181	.845
Age <sup>a</sup>	-0.004	0.020	0.996	0.958 - 1.036	.851
Employment status (unemployed <sup>+</sup> ) <sup>a</sup>	-0.999	0.440	0.368	0.155 - 0.873	.023*
Severity of alcohol dependence	0.037	0.206	1.038	0.693 - 1.556	.856
Baseline alcohol consumption	0.000	0.001	1.000	0.998 - 1.002	.975
Constant	0.245	1.507	1.277	0.066 - 24.539	.871
<i>Step 2</i>					
Drinking-related treatment goal (drinking-oriented treatment goal <sup>+</sup> ) <sup>a</sup>	-1.468	0.781	0.230	0.050 - 1.069	.061
Precontemplation <sup>a</sup>	-0.064	0.120	0.938	0.741 - 1.187	.595
Contemplation <sup>a</sup>	0.129	0.112	1.138	0.913 - 1.419	.251
Action <sup>a</sup>	-0.214	0.105	0.807	0.657 - 0.992	.042*
Maintenance <sup>a</sup>	0.005	0.084	1.005	0.853 - 1.185	.950
Constant	2.535	2.497	12.612	0.094 - 1691.485	.310

Note: <sup>a</sup> = at admission, <sup>+</sup> = reference group, \**p* < .05, *B* = regression coefficient, *SE* = standard error, *OR* = odds ratio, *p* = P-Value

In the regression analysis on drinking during treatment, two predictors were identified as having an impact: employment status and the action sub-scale at admission (see Table 1). Analyses show that being employed ( $B = -0.99$ ,  $p = .02$ ) and scoring high on the action subscale at admission ( $B = -0.214$ ,  $p = .04$ ) are associated with a higher probability of remaining abstinent during treatment. This means, that patients who were employed had a significantly lower odds of relapsing during treatment compared to their unemployed counterparts ( $OR = 0.37$ ,  $p = 0.02$ ). Moreover, patients who had a higher score on the action subscale had a significantly lower odds of relapsing during treatment compared to patients who scored low on the action subscale ( $OR = 0.81$ ,  $p = 0.04$ ). The model explains 31.9% of the variance (*Nagelkerke's*  $R^2 = 0.319$ ) in the dependent variable, and 77.2% of the cases can be classified correctly. Interestingly, reporting an abstinence-oriented treatment goal at the beginning of the treatment is negatively related to drinking during treatment ( $B = -1.47$ ,  $p = .061$ , see Table 1), but this effect did not reach statistical significance.

## Discussion

This study's aim was to analyze the predictive value of various aspects of treatment motivation and additional predictors on return to drinking during relapse prevention treatment for alcohol use disorder.

The results indicate that patients scoring higher on the action subscale as described by the TTM had a lower risk of drinking during treatment. With regard to sociodemographic variables, only employment status was related to abstinence during treatment.

Previous research has shown that social factors such as employment play a crucial role in therapy outcomes, whereas other sociodemographic variables (age, gender) are not consistently associated with the outcomes (Adamson et al., 2009; Sliedrecht et al., 2019). In his review, Henkel (2011) pointed out the strong relationship between unemployment and risk of relapse. His explanation of this result involves the negative psychosocial effects of unemployment, such as financial strain, anxiety about the future, and loss of social support. These factors may also have contributed to the results in this study. Henkel (2011) emphasizes the importance of helping the unemployed patients to reintegrate into the professional world. Based on the results of this study, the Forel Clinic and other treatment programs should devote additional attention to the issue of unemployment.

Interestingly, in this study, substance-related variables did not contribute to the prediction of drinking during treatment, as has been described in other studies (Adamson et al., 2009; Sliedrecht et al., 2019). This may have to do with the fact that patients entering relapse prevention treatment at the Forel Clinic have already undergone detoxification for at least ten days and the impact of the individual drinking pattern on the risk to relapse has thereby been diminished.

With regard to motivational factors, the motivational dimension action as defined by the TTM was an especially significant predictor of drinking during treatment, even when controlling for other variables. It seems logical in the current study that the action dimension had the greatest predictive value in relation to relapse during treatment. The action dimension could be particularly relevant in the first week of treatment, as it is an early stage in the process of achieving abstinence. Patients entering the Forel Clinic have only recently become abstinent and do not feel that they have already achieved

anything that needs to be sustained (maintenance dimension); rather, they are learning to deal with problems and cravings without resorting to drinking. Moreover, patients that remain abstinent during their treatment in the Forel Clinic, may have already left behind the attitudes and behaviors of the precontemplation and contemplation dimensions (e.g., being aware of the negative consequences of drinking and forming an intention to change the drinking behavior). These assumptions are supported by results by Zhang et al. (2006) who shows that scoring high on the action dimension is related to lower consumption of alcohol in the long-term. Other researchers have demonstrated that drinking during therapy predicts drinking in the long run (Ludwig et al., 2013; Maisto, Roos, et al., 2016). This makes it even more important to strengthen therapy motivation during treatment in order to establish abstinence during as well as after treatment.

There was no significant association found between the type of drinking-related treatment goal and abstinence during treatment. This finding contrasted with the results from other studies, such as Berger et al. (2016) and Meyer et al. (2014) that have indicated a significant effect of the type of drinking-related treatment goal on therapy outcome. One explanation for our results could be the phenomenon that drinking-related treatment goals change during treatment, as other authors have shown (Hodgins et al., 1997; Öjehagen & Berglund, 1989). In this study, drinking-related treatment goals were only assessed at admission to treatment, so we cannot make a statement about the trajectory of patients' attitudes with respect to their drinking-related treatment goals. Furthermore, therapists assessed the drinking-related goal, addressing the following challenge: the therapeutic alliance should be stable enough for patients indicating their true goal (Horvath et al., 2011). Otherwise, the answer might be influenced by social desirability and thereby bias results (e.g. the goals stated do not reflect actual goals). Other researchers have suggested the construct of goal commitment as a measure of the strength of the intention to change one's behavior (Kelly & Greene, 2014). This construct should serve as a related, complementary motivational predictor in order to improve predictive validity of treatment motivation.

In general, it seems important to assess readiness for change, type of drinking-related treatment goal, and goal commitment over the course of treatment. These constructs may not only vary over the course of treatment, but also deviate from

previous statements of commitment. A patient's agreement to the treatment goal of abstinence at the beginning of inpatient treatment does not guarantee the stability of commitment over the further course of treatment, nor does the stated commitment – here, a precondition for inpatient admission – necessarily reflect true commitment to continuous abstinence. Accordingly, assessing a patients' commitment to various drinking-related treatment goals and any change throughout treatment is likely to increase the predictive value of stage of change models (Kelly & Greene, 2014).

In the field of addiction treatment, it must also be assumed that goals are not always compatible with each other (Kruglanski et al., 2002). For example, reaching an increased motivation to reduce drinking (e.g., “having only one drink per day”) might be associated with a reduced motivation to strive for continuous abstinence.

An application of the TTM to the field of addiction might further benefit from an extended elaboration of volitional and implicit processes. Intentional processes are responsible for the formation and the abandonment of intentions, whereas volitional processes are involved in the initiation and implementation of goals (e.g., delaying the short-term benefit of substance use in favor of long-term benefits; Baumeister & Heatherton, 1996; Oettingen & Gollwitzer, 2001; Prestwich et al., 2006). It would be interesting to investigate the interactions between intentional and volitional processes during relapse prevention treatment in order to obtain a more profound understanding of return to drinking and its therapeutic prevention.

## **Limitations**

Overall, the study's sample was relatively small ( $N = 99$ ), limiting the model's power to detect further effects. Although it was possible to explain additional variance in treatment outcome variables by assessing treatment motivation and drinking-related treatment goals, our model only explained about 31.9% of variance in the dependent variable. This is similar to the explanatory power of models from previous studies (Field et al., 2009; Pantaloni et al., 2002). In addition, the alpha levels of the internal consistencies of the subscales of the URICA were rather low. This may have led to slight biases in the results; nevertheless, the authors of the German short form of the URICA report good psychometric characteristics (Fecht et al., 1998), which justifies the application of this questionnaire in this and future studies. Another limitation concerns the method of measurement for some variables. For example, drinking-



related treatment goal and severity of alcohol use disorder were recorded by the therapist, using only one variable each. As a result, these variables may not have been captured comprehensively or objectively enough to identify an effect on the outcome variable. Finally, treatment motivation and drinking-related treatment goals were not continuously assessed; thus, nothing is known about how these constructs may have changed over the course of treatment. In future research, it would be desirable to continuously assess these attitudes in the form of a monitoring assessment. In this way, it may be possible to observe changes in patients at risk of terminating their treatment early and to respond to these changes.

### **Conclusion**

Treatment motivation measured in accordance with the TTM predicts return to drinking during treatment beyond sociodemographic and substance-related variables. This verifies the importance of enhancing treatment motivation in order to prevent relapses during treatment and thus foster abstinence in the long-term. This study confirms that the concepts of the TTM are relevant for addiction research.



## Research Paper II

# What is the Relapse Risk during Treatment? Survivor Analysis of Single and Multiple Relapse Events in Inpatients with Alcohol Use Disorder as Part of an Observational Study

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## **Abstract**

During treatment for alcohol use disorder (AUD), about 40% of patients return to drinking. Whether the risk of relapse changes during treatment and how relapses may affect the risk of subsequent relapse are unclear, however. The current study, therefore, aims to identify when and with what probability relapses occur. One hundred and three inpatients at an AUD treatment center participated in this observational study. The study documented relapse to drinking using breath analyzers, urine tests, and self-reported incidents for 42 days after the start of treatment. Time to the first relapse event and to any subsequent relapse event served as the outcome measures. The study determined the proportion of patients who had not experienced a relapse event at any given point by Kaplan-Meier estimates and Cox proportional hazards models. The study team computed the instantaneous probability of experiencing an event at any given point using generalized estimating equation (GEE) models of the binomial family with log-link and exchangeable correlation structure to estimate unadjusted and adjusted hazards. Whereas the hazards of experiencing a first relapse event declined steadily over the 42 days, the hazards of experiencing a subsequent relapse following an initial event remained stable. Both first-time and recurrent relapses were positively associated with the number of DSM-5 AUD criteria. Whereas the risk of relapse declines with each day of abstinence during treatment, it remains high after an individual relapse for the first time. This finding implies that therapy should focus on strengthening self-efficacy for low-risk groups and on relapse-prevention strategies for high-risk groups.

## **Introduction**

The harmful use of alcohol is a widespread phenomenon linked to high costs and detrimental effects on society, including more than 5% of the global burden of disease (WHO, 2018). Furthermore, harmful alcohol use is connected with an increased risk of committing or experiencing violence in partnerships (Lipsky et al., 2014). Alcohol use disorders (AUD), which number among the most prevalent mental disorders worldwide, are associated with high mortality and burden of disease, including liver disease, heart disease, and cancer (Carvalho et al., 2019).

The course of AUD treatment is often characterized by relapse to drinking, even when patients seek treatment voluntarily. However, “relapse” has been defined in a variety of ways in the literature (e.g., Brandon et al., 2007; Maisto, Witkiewitz, et al., 2016). The range of definitions extends from any return to drinking (e.g., drinking a single sip of alcohol) as a static, discrete event to a return to the original drinking pattern as a dynamic process (e.g., daily consumption of a large amount of alcohol). The various definitions mostly agree, though, that relapse represents a return to drinking after a period of abstinence. Maisto, Witkiewitz, et al. (2016) emphasized in their review, that more systematic research is needed to make the construct of “relapse” more scientifically and theoretically valuable.

Data from Switzerland show that 40% of inpatients in relapse-prevention treatment return to drinking during treatment (Klingemann et al., 2013), and at one-year follow-up, only about 40.5% of former inpatients report being abstinent (Moggi et al., 2007). Europe and the United States have similar relapse rates to that in Switzerland (e.g., Dandaba et al., 2020; Witkiewitz, 2011). Several studies have demonstrated that drinking during treatment is a predictor of long-term alcohol misuse (Gueorguieva et al., 2015; Ludwig et al., 2013; Maisto, Roos, et al., 2016).

Previous studies have investigated the predictors of relapse (Adamson et al., 2009; Senn et al., 2020; Sliedrecht et al., 2019), but research has explored much less the actual pattern of relapses. To the best of our knowledge, after searching the literature, only one attempt exists to identify patterns of relapses during treatment, undertaken by Charney et al. (2010). The authors established that relapsing at the beginning of treatment is associated with a worse prognosis. Witkiewitz and Masyn (2008), who investigated the pattern of relapses after treatment, discovered that after a relapse for

the first time following treatment, the majority of the affected individuals find their way back to infrequent, moderate drinking or abstinence. Despite these findings, which indicate the relevance of examining the temporal distribution and pattern of relapses, no other studies have sought to describe a specific pattern or a period of time in which the risk of relapse during treatment may increase. It is thus still unclear how the relapse risk is distributed over the course of treatment, whether it changes or remains stable, and how it can be affected by actual relapse events. Furthermore, to date and according to our knowledge, no studies have explored in depth multiple relapses during treatment; therefore, we do not know how the risk of multiple relapses might change after an initial relapse. The current study seeks to identify the risk of one relapse and of multiple relapses during the course of treatment to better understand when and why relapses occur, thereby facilitating the optimization of treatment procedures and the reduction of the relapse risk.

When examining relapse risk, it is important to take into account the risk factors that have already been identified by previous research, such as sociodemographic variables and substance-related variables. With regard to sociodemographic variables, age and gender have been the most studied, with partially inconsistent results summarized in two reviews (Adamson et al., 2009; Sliedrecht et al., 2019). Generally speaking, female gender and higher age are associated with a higher probability of remaining abstinent. For substance-related variables, the number of years since the onset of addiction and the severity of AUD have been consistently linked to relapses in the literature (Sliedrecht et al., 2019), in that younger age of onset of AUD and more severe forms of AUD are associated with a higher risk of relapse. We, therefore, include age and gender as well as number of years since onset of addiction and the severity of AUD as covariates in the analyses.

In light of several decades of research on the predictors of relapse, we suggest a complementary approach that focuses on the temporal distribution and patterns of relapse during treatment to better understand relapse risk and improve treatment. The objective of this article is to explore the patterns of one relapse and multiple relapses during the course of treatment, while including potential covariates. We use Kaplan-Meier estimates and Cox proportional hazards models to estimate the unadjusted and adjusted survivor functions, respectively.

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## Method

### Study Site and Treatment

The study recruited participants from an inpatient treatment center for alcohol use disorder treatment (Forel Clinic) in Switzerland. The preconditions for entering this inpatient treatment were (a) an age of  $\geq 18$  years, (b) a diagnosis of alcohol dependence according to ICD-10 (WHO, 1992), (c) abstinence since alcohol detoxification, and (d) agreement with the drinking-related treatment goal of abstinence and a commitment to abide by clinic rules. Psychiatric comorbidity, as determined by the presence of the criteria listed for each disorder in the ICD-10, was not a reason for treatment exclusion, with the exception of acute schizophrenia.

The treatment program in the Forel Clinic is characterized by voluntariness. It includes psychosocial relapse-prevention content provided in weekly individual psychotherapy sessions and group therapy sessions, as well as through exercise therapy, occupational therapy, and social counseling. The content of the therapy is basically the same for all patients. Patients transition from the detoxification unit to the inpatient treatment program when all withdrawal symptoms have fully resolved. Weekend leaves are permitted starting with the second weekend after transition. Patients are allowed to leave the clinic every weekend from that date on, to attempt abstinence in an every-day environment. If one is not feeling well (e.g., craving, illness), patients can decide autonomously to stay in the clinic or return to the clinic at any time during the weekend. Treatment duration is normally set between 8 and 12 weeks, depending on disease severity, psychiatric comorbidity, and a patient's private professional situation. Planned short-term therapy with a minimum duration of four weeks is also allowed. Due to the open structure of the clinic, premature termination of therapy by patients is possible but relatively rare.

Prior to entering treatment, patients agree to self-report any infringements of abstinence and to participate in alcohol and drug testing. The contact for the self-report of relapses is the nursing staff, who note the date and the amount of the relapse (e.g., the number of standard drinks) and send the information to the attending physician.

Breathalyzer tests are conducted with the AlcoTrueM model manufactured by Labtec. Its measuring principle consists of an electrochemical sensor with a precision sampling system, and it features a measuring range from 0.00 to 2.6 mg/l and 0.00 to

5.50‰. Breathalyzer tests are employed when (a) patients re-enter the clinic after a weekend leave or (b) clinical staff suspect a patient has used alcohol. Additional breathalyzer tests as well as urine and blood tests are conducted in a random and unannounced manner. Drinking during treatment is not a reason for exclusion from therapy; on the contrary, in the Forel Clinic, drinking during treatment is considered a symptom of the disease, and the treatment concept encompasses drinking during treatment (i.e., relapse prevention). However, any manipulation of urine tests (e.g., diluting or substituting a urine sample), refusal of treatment, or violations of the clinic rules (e.g., alcohol or drug use on clinic property, violent behavior) will result in the termination of treatment.

Due to the open structure of the clinic and the voluntary nature of the treatment, relapses can happen at any time. During the week, the inpatients can leave the clinic if they do not have therapy sessions. Weekends present another possibility for leaves. Typical relapse situations are: anxiety, depressed mood, positive mood, conflicts with family or friends, waiting (e.g., transportation), cravings, etc. (see also: Rösner et al., 2016).

When a relapse is detected, the patient must stay in his or her room; in the event of a severe relapse, the patient is transferred to the detoxification unit. As soon as a breathalyzer test shows an alcohol level of 0‰, the patient is allowed to participate in the normal therapy program and to leave the clinic campus again.

## **Design and Procedure**

The study team conducted this observational study in accordance with the Declaration of Helsinki (World Medical Association, 2013) and the Ethics Committee of the Canton Zurich approved this study.

The inclusion criteria for participation in the study were similar to the criteria for entering treatment (see above). Exclusion criteria were insufficient language comprehension skills to follow staff instructions or to complete questionnaires, cognitive deficits that would limit the patient's ability to provide informed consent, and acute suicidality or schizophrenia (as assessed by the research assistant at the first appointment).

Patients fulfilling the inclusion criteria were recruited by the research assistant within the first week of admission to the clinic. After the research assistant explained



the objectives and procedures of the study, they asked patients to grant their informed consent. The respondents then completed the questionnaires anonymously.

Data assessment took place between January 2016 and February 2017. During data collection, 163 patients entered into relapse-prevention treatment and fulfilled the inclusion criteria. Of these 163 screened patients, 103 decided to take part in the study. Of the 63 non-participants, 18 individuals did not show up for the first appointment and 45 individuals did not provide consent to participate in the study. We examined whether participants differed from patients who met the inclusion criteria but chose not to participate. Statistical testing showed that the two groups did not differ in terms of substance-related factors (years since onset of addiction, frequency of alcohol consumption prior to treatment, severity of addiction) or in sociodemographic characteristics (age, sex, civil status, nationality, employment status).

### **Outcomes and Covariates**

The outcome measures were time to the first relapse event (single-failure-per-subject) and time to the first or subsequent relapse event (multiple-failure-per-subject) within a 42-day period after the start of treatment. Analyses for both outcome variables were based on the same sample, consisting of 103 participants.

A patient was classified as consistently abstinent if neither the results of the breathalyzer tests nor the patient's self-reports indicated alcohol consumption during his or her stay. The study categorized this group of patients as "abstainers". Accordingly, we defined "relapse" as any infringement of abstinence, in terms of any drinking during the inpatient treatment program. When at least one relapse occurred, the study classified the patient in the dataset as a "relapser". The study recorded the exact dates of relapses and put in relation to the entry date to calculate the number of days until the relapse event. Premature termination of therapy by patients was not classified as a relapse.

The single-failure-per-subject sample comprised 103 patients, representing 796 observations and a total of 3206 days at risk. Patients remained in the sample until they experienced their first relapse event or were censored (i.e., the end of their recorded data was reached before a first relapse event occurred). The multiple-failure-per-subject sample comprised the same 103 patients, representing 969 observations

and a total of 3837 days at risk. Patients remained in the sample until they were censored (i.e., the end of their recorded data was reached).

Our selection of covariates was guided by previous research and included age, gender, years since the onset of addiction, and the number of DSM-5 criteria (Adamson et al., 2009; Sliedrecht et al., 2019). The research assistant assessed the covariates in the form of an interview conducted at the first appointment. The study defined “years since onset of addiction” as the number of years since the beginning of alcohol use disorder. Furthermore, adjusted multiple-failure-per-subjects models included a covariate reflecting the number of previous relapse events to capture the effects of previous relapse events on subsequent events. With the exception of gender, the study centered all covariates at their mean value.

Due to the standardized questionnaires and measurement instruments, the clear and unified procedures, the risk for measurement bias is minimized. In addition, the study invited all eligible patients to the first appointment, so a small probability exists for selection bias.

### **Statistical Analysis**

The study team used Kaplan-Meier estimates and Cox proportional hazards models to estimate the unadjusted and adjusted survivor functions, respectively; that is, the proportion of patients who had not experienced a relapse event at any given point. Relapse events are described as single or multiple-failure-per-subject. In the context of the survival analysis literature, failure is used in the sense of “event”, i.e., occurrence of a relapse. In statistics, this term is used in nonjudgmental way. The study used generalized estimating equation (GEE) models of the binomial family with log-link and exchangeable correlation structure to estimate unadjusted and adjusted hazards (i.e., the instantaneous probability of experiencing an event at any given point). Adjusted models included age, gender, years since the onset of addiction, the number of DSM-5 criteria, and the number of previous relapse events where appropriate. The study included these variables into the calculations of adjusted hazards, to adjust for confounding effects. Furthermore, all GEE models included a time covariate. We reported survivor functions (where appropriate), hazard ratios, and hazards with corresponding 95% confidence intervals (95% CI). Statistical significance was established at  $p < .05$ .

## **Results**

Overall, 103 inpatients participated in this study. Table 2 lists the characteristics of the participants. The baseline sociodemographic characteristics are as follows: At admission, the mean age of the subjects was 45.6 years, and 22.4% were female. Of the participants, 25.5% were married, 43.7% were employed, and 80.6% were Swiss citizens. Patients met a median of 8 DSM-5 criteria with an interquartile range of 3 DSM-5 criteria. They reported an average of 7.7 years since the onset of addiction. The participants who drank on a daily basis in the last six months before admission amounted to 79.4%. Furthermore, 15 patients (14.6%) were in a planned short-term therapy program.

Table 2. Characteristics of patients

	<i>Mean</i>	<i>SD*</i>	<i>Median</i>	<i>25th percen- tile</i>	<i>75th percen- tile</i>
Men (n, %)	80 (77.6)				
Women (n, %)	23 (22.4)				
Age	45.6	9.6	46	39	53
Civil status					
Single (n, %)	36 (38.3)				
Married (n, %)	24 (25.5)				
Separated (n, %)	2 (2.1)				
Divorced (n, %)	29 (30.9)				
Widowed (n, %)	1 (1.1)				
Registered partnership (n, %)	2 (2.1)				
Nationality: Swiss (n, %)	83 (80.6)				
Employment status: employed (n, %)	45 (43.7)				
Years since onset of addiction	7.7	7.4	5	2	11
Frequency of alcohol consumption in the last six months before admission					
Daily (n, %)	77 (79.4)				
4-6 days per week (n, %)	8 (8.2)				
2-3 days per week (n, %)	8 (8.2)				
1 day per week or less (n, %)	4 (4.2)				
Number of DSM-5 criteria	7.8	2.0	8	6	9
Planned short-term therapy (n, %)	15 (14.6)				

\*SD = Standard deviation

No significant differences existed in the sociodemographic variables between abstinent and relapsing patients.

In total, 594 announced and 357 unannounced alcohol tests were conducted in the overall sample, indicating a median per patient of 6 (IQR 5–7) announced tests and 3 (IQR 2–5) unannounced tests. Thirteen participants terminated the therapy prematurely at their own request.

We examined the distribution of alcohol tests and test results by weekdays (see Table 3). The empirical average probability of a positive test result over all weekdays was  $p = .047$ . The probability of a positive test was highest on Fridays ( $p = .133$ ) and Saturdays ( $p = .203$ ). The lowest probability ( $p = .015$ ) of a positive test was on Sundays—the day on which most of the tests were performed.

Table 3. Overview of the number of alcohol tests per day of the week and their result (positive/negative).

<b>Test result</b>	<b>Day of the week</b>							<b>Total</b>
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Negative (n, %)	590 (98.50)	72 (93.51)	55 (93.22)	63 (95.45)	57 (90.48)	39 (86.67)	47 (79.66)	923 (95.35)
Positive (n, %)	9 (1.50)	5 (6.49)	4 (6.78)	3 (4.55)	6 (9.52)	6 (13.33)	12 (20.34)	45 (4.65)
Total (n, %)	599 (100.0)	77 (100.0)	59 (100.0)	66 (100.0)	63 (100.0)	45 (100.0)	59 (100.0)	968 (100.0)

### First Relapse Event

Of the 103 patients, 33 (32.0%) experienced a first relapse during the observation period. The incidence rate was 0.0102932 first-time relapse events per treatment day, which amounts to approximately 10 first-time relapse events per 1000 treatment days.

The estimated unadjusted proportion of patients who had not experienced a first relapse declined steadily (Figure 1, panel A). After 7 days of treatment, 92.2% (95% CI 82.6–94.6) had not had a relapse. After 14, 21, and 28 days, the respective estimated percentages of relapse-free patients were 84.4% (95% CI 75.7–90.1), 79.3% (95% CI 70.1–86.0), and 71.7% (95% CI 61.6–79.5). At the end of the observation period, 65.3% (95% CI 54.5–74.0) of the patients had been continuously abstinent. Similarly, the adjusted proportion of patients, centered at the mean covariate values, declined steadily, reaching 73.3% at the end of the observation period (Figure 1, panel C). Moreover, both unadjusted and adjusted hazards of experiencing a relapse event declined over time (Figure 1, panels B and D) and were of similar magnitude across the two models. At day 7, the adjusted hazard was 0.0107 (95% CI:

0.0059–0.0155), whereas the unadjusted hazard was 0.0110 (95% CI: 0.0060–0.0162). The respective adjusted and unadjusted hazards for days 14, 21, 28, and 42 were 0.0095 (95% CI 0.0060–0.0130) vs. 0.0097 (95% CI 0.0062–0.0132), 0.0084 (95% CI 0.0050–0.0118) vs. 0.0085 (95% CI 0.0051–0.0119), 0.0075 (95% CI 0.0035–0.0116) vs. 0.0075 (95% CI 0.0034–0.0115), and 0.0056 (95% CI 0.0003–0.0108) vs. 0.0057 (95% CI 0.0004–0.0110).

With regard to the association between covariates and first-time relapses (Table 4, single-failure-per-subject), only the number of DSM-5 criteria was positively associated with relapse and was statistically significant. More specifically, the hazard of experiencing a first-time relapse was 44% higher for an increase of one DSM-5 criteria (HR = 1.44, 95% CI 1.17–1.79).

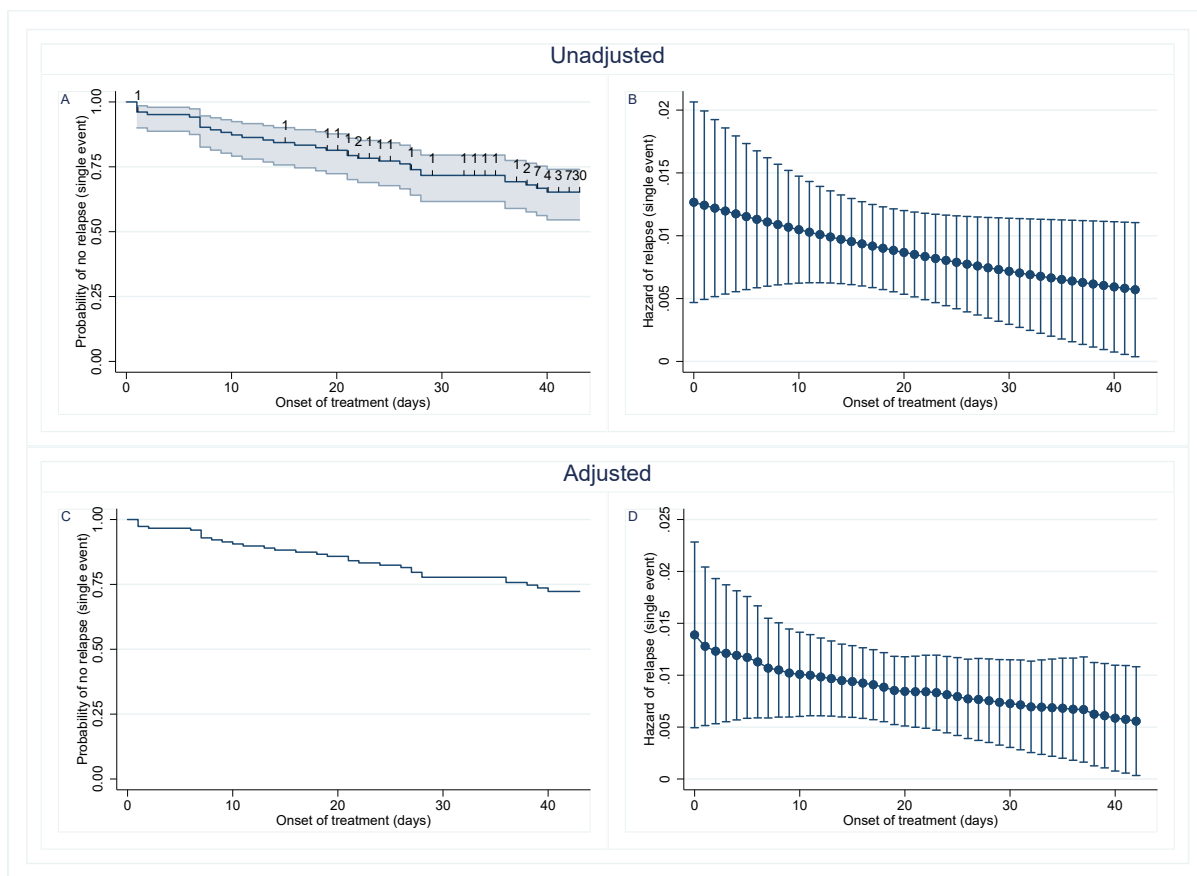


Figure 1. Single-failure-per-subject survivor function and hazard estimates for relapse during treatment.

Panel A: Kaplan-Meier survivor estimates. Panel B: generalized estimating equation (GEE)-based unadjusted hazard estimates. Panel C: Cox regression-based estimates adjusted for covariates centered at their mean. Panel D: GEE-based adjusted hazard estimates. Adjustment for age, gender, years since onset of addiction, and the number of DSM-5 criteria.

Table 4. Adjusted Cox regression results for relapse events during treatment.

<i>Variable</i>	<i>HR</i>	<i>SE</i>	<i>P</i>	<i>95% CI</i>
Single-failure-per-subject <sup>A)</sup>				
Women	1.00	Reference		
Men	1.18	0.5111	0.7030	0.50 - 2.76
Age	0.99	0.0198	0.6440	0.95 - 1.03
Onset of addiction (years)	0.96	0.0297	0.2240	0.91 - 1.02
Number of DSM-5 criteria	1.44	0.1580	0.0010	1.17 - 1.79
Multiple-failure-per-subject <sup>B)</sup>				
Women	1.00	Reference		
Men	1.00	0.3620	0.9900	0.49 - 2.03
Age	0.98	0.0159	0.3350	0.95 - 1.02
Onset of addiction (years)	0.98	0.0262	0.4160	0.93 - 1.03
Number of DSM-5 criteria	1.34	0.1242	0.0020	1.12 - 1.60
Number of previous events	1.28	0.3658	0.3850	0.73 - 2.24

HR = hazard ratio; SE = standard error; P = probability; 95% CI = 95% confidence interval

<sup>A)</sup> Number of subjects: 103, number of failures: 33, number of observations: 796.  $\chi^2(4) = 15.4, p < 0.01$

<sup>B)</sup> Number of subjects: 103, number of failures: 45, number of observations: 996.  $\chi^2(5) = 18.6, p < 0.01$

### First and Recurrent Relapse Events

The study recorded a total of 45 first or recurrent relapse events. The incidence rate for the multiple-failure-per-subject sample was slightly higher than for single events, amounting to approximately 12 relapse events per 1000 treatment days. Of the 33 patients who experienced at least one relapse event, 23 (22.3%) did not have any further relapse events during the observation period. Nine patients (8.7%) had a second relapse, and only one patient had a total of four relapse events.

In line with the single-failure-per-subject analyses, the estimated unadjusted proportion of patients who had not experienced any relapse declined over time (Figure 2, panel A). However, because patients were not censored after their first event, the proportion of relapse-free patients was approximately 2.5% lower on average. After 7 days of treatment, 89.7% (95% CI 82.1–94.1) of participants had not had any relapse. After 14, 21, and 28 days, the respective estimated percentage of relapse-free patients was 82.8% (95% CI 74.4–88.7), 77.0% (95% CI 68.1–83.7), and 69.4% (95% CI 60.1–76.9). At the end of the observation period, 61.0% (95% CI 51.3–69.3) of the patients



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at risk were relapse free. Similarly, the adjusted proportion of relapse-free patients, centered at the mean covariate values, declined steadily, reaching 68.2% at the end of the observation period (Figure 2, panel C). Unlike the single-failure-per-subject analyses, unadjusted and adjusted hazards of experiencing any relapse event did not markedly decline over time (Figure 2, panels B and D); these hazards were of similar magnitude in the two models. At day 7, the estimated adjusted hazard was 0.0125 (95% CI: 0.0071–0.0179), whereas the unadjusted hazard was 0.0126 (95% CI: 0.0065–0.0187). At days 21 and 42, the respective adjusted and unadjusted hazards were 0.0118 (95% CI: 0.0081–0.0156) vs. 0.0110 (95% CI: 0.0079–0.0161) and 0.0102 (95% CI: 0.0026–0.0178) vs. 0.0111 (95% CI: 0.0034–0.0190).

With regard to the association between covariates and recurrent relapse (Table 4, multiple-failure-per-subject), the number of DSM-5 criteria was again positively associated with relapse: the hazard of experiencing any relapse was 34% higher for an increase in one DSM-5 criteria (HR = 1.34, 95% CI 1.12–1.60). As with the single-failure-per-subject, the remaining covariates were not statistically significant.

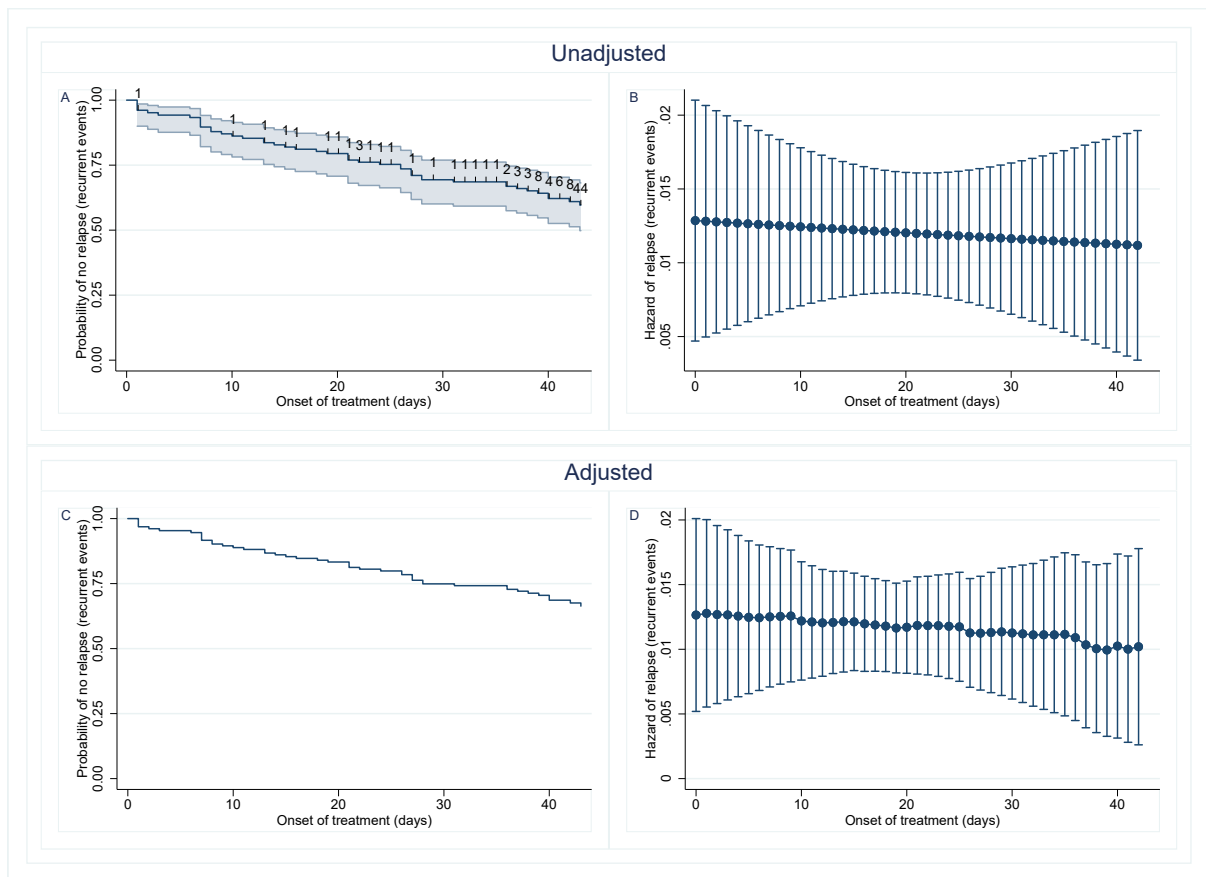


Figure 2. Multiple-failure-per-subject survivor function and hazard estimates for relapse during treatment

Panel A: Kaplan-Meier survivor estimates. Panel B: generalized estimating equation (GEE)-based unadjusted hazard estimates. Panel C: Cox regression-based estimates adjusted for covariates centered at their mean. Panel D: GEE-based adjusted hazard estimates. Adjustment for age, gender, years since onset of addiction, number of DSM-5 criteria, and number of previous relapse events.

## **Discussion**

In this article, we investigated whether and how the risk of relapse changed during treatment. To this end, we analyzed the unadjusted and adjusted survivor functions of one relapse and multiple relapses during the course of treatment, including potential covariates.

Results for the first and multiple relapse events show that both the adjusted and unadjusted proportions of patients who had not experienced a relapse declined steadily until the end of the observation period. These findings suggest that at no particular point in time does the relapse risk significantly spike or drop during treatment. In the analyses of single relapse events, the unadjusted and adjusted hazards of experiencing a relapse event also declined over time. The unadjusted hazards ranged between 0.0057 and 0.0110; the adjusted hazards between 0.0056 and 0.0107 for single relapse events. A value of for example 0.0057 in the current context means that 57 cases with relapses can be expected on a specific day when examining a patient population of 10,000 individuals.

In contrast, the unadjusted and adjusted hazards of experiencing any relapse event did not markedly decline over time with multiple relapse events. These findings imply different trajectories, such that the risk of relapse declines for abstinent patients during the course of treatment, whereas the risk of relapse after relapsing for the first time remains stable.

These results have important implications for clinical practice. First, the risk of experiencing one relapse declines over the course of therapy. This finding means that the risk of relapse decreases day by day until the end of treatment. This knowledge could be actively used in therapy to strengthen a patient's therapy motivation and persistence: By communicating this study result, the patient can set the goal of abstinence one day at a time. Repeating this goal every day and achieving it, if possible, promotes the patient's own motivation, since the goal is achievable and clearly defined. In comparison, a period of six weeks (duration of treatment) may seem uncertain and difficult for the patient to achieve.

According to Bandura's social cognitive theory (1989), self-efficacy is defined as the confidence to carry out the courses of action necessary to accomplish desired goals. By achieving goals, self-efficacy is strengthened and further goals are more

likely to be achieved. In the current context, this means that experiencing the ability to remain abstinent fosters the development of self-efficacy and in turn influences therapy outcomes (Ludwig et al., 2013; Sliedrecht et al., 2019). Avoiding relapses during treatment also leads to better long-term prognoses (Gueorguieva et al., 2015; Ludwig et al., 2013; Maisto, Roos, et al., 2016).

Significantly, however, our results indicate that after experiencing one relapse, the risk of experiencing further relapses does not decline. This finding implies that after an inpatient has relapsed, the therapist must become even more vigilant to prevent further relapses. Interventions suggested by the widely applied relapse-prevention model proposed by Marlatt and Gordon (1985), such as coping skills training, cognitive restructuring, or decision matrices, may be useful in these situations and help to lead the patient back to abstinence. Although the Forel Clinic already offers such relapse-prevention training, the clinic should possibly intensify this training for relapsed patients.

Of all the covariates, only the number of DMS-5 criteria was positively and statistically associated with first and multiple relapse events. An increase of one DSM-5 criterion escalated the hazard of experiencing a first-time relapse by 44%, and that of experiencing any relapse by 34%. These results indicate that patients who suffer from a severe addiction have a higher risk of relapse during treatment. Thus, research and practitioners might find it useful to focus more on relapse-prevention strategies within this risk group.

Previously established associations among sociodemographic factors (i.e., age and gender), substance-related factors (i.e., younger age of onset of AUD) and relapses have not been confirmed in the current study. Studies have reported inconsistent results concerning sociodemographic variables; however, the age of onset of AUD has been a fairly reliable predictor of relapse (Adamson et al., 2009; Sliedrecht et al., 2019). The observation period of 42 days in this study may have been too short to make such effects visible. Alternatively, the age of onset in this sample may be irrelevant, as the severity of AUD already explains a great deal of the variance in the outcome variables.

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## Limitations of the Study

With 37% of the invited patients not providing consent to participate in the study, only two thirds of patients participated. Most of the nonparticipants indicated that they were not interested in participating in the study. The study did not assess the exact reasons for the lack of interest. Possible reasons could be: no interest in research, the time required for the study, no financial compensation for study participation, or concerns that information about drinking events could be provided to therapeutic staff. However, our analyses showed that the participants did not differ from the nonparticipants in substance-related factors or sociodemographic characteristics.

The sample of this study consisted of 103 participants, yielding 796 and 969 observations, respectively. However, the comparably small number of participant clusters might have had an influence on the detection of statistically significant time-invariant covariates. Thus, future research should replicate the results with a larger sample and a new dataset.

Weekend leaves are allowed by the participating clinic after detoxification but are considered a risk factor. Our analyses showed that the days with the most positive alcohol tests are Fridays and Saturdays. Sundays, when patients come back from their weekend leaves, had the fewest positive tests. We conclude that the weekend leaves represent a definite risk factor for the patients; however, they are necessary to test abstinence in everyday life. Treatment providers should discuss relapse events therapeutically and develop new coping strategies with patients.

Fifteen patients in our sample decided to do a short-term therapy program of a minimum of four weeks. One might argue that these individuals do not fit into the study design. However, we assume that relapses are similarly distributed in both types of therapy (short-term and long-term), because, for example, patients did not differ in background variables, they receive the same therapy, and they are also exposed to the same risk situations; that is, fewer or more relapses should not occur in short-term therapy before the termination of treatment, and the relapses should not occur earlier or later than in long-term therapy. The short-term therapy patients would thus strengthen our results and, therefore, we included them in the analyses.

Another limitation of the study is that not all predictors of relapses found by Adamson et al. (2009) or Sliedrecht et al. (2019) could be included in the analyses (e.g., supportive social network, psychiatric comorbidity). On one hand, no indication

existed of how the data should be assessed in an objective, reliable, and valid manner (e.g., definition and differentiation of the term “social network”). On the other hand, many variables had already been recorded so we had to have a restriction so as not to place an additional burden on the participants.

The combination of subjective and objective indicators assessing the participants' states of abstinence was one strength of the study. Within the spectrum of objective testing methods, we mainly relied on breathalyzer tests due to reasons of practicability, cost, and acceptance. Breathalyzer tests only provide a narrow detection window, which means that some drinking events might have remained undetected. Nevertheless, our analyses have shown a comparatively strong correspondence between subjective and objective data, which could be seen as a validation of the nonjudgmental attitude and atmosphere in the clinic. Although the Forel Clinic is abstinence-oriented, drinking during treatment is recognized as part of the disease. Due to the clinic's guidelines on the concept of relapse, we had to choose the “any use” criterion of relapse. We are aware that ambiguity and disagreement exist around the term (Maisto, Witkiewitz, et al., 2016). However, the advantage of accurately categorizing relapse as yes or no was that we could clearly define outcome measures and we could distinctly interpret them.

Furthermore, we studied only the risk of relapse during treatment. We do not know how this hazard evolves after treatment. Whether the different risk patterns for abstinent and relapsing patients continue as they had during treatment, or whether new patterns develop after treatment would be interesting for future research to determine. The study by Witkiewitz and Masyn (2008) could possibly provide an important hint. In their study, the authors examined patients in an outpatient setting. They also showed that the risk of relapse decreased over time. Further, they found three subgroups within patients who relapsed (infrequent moderate drinking, heavier drinking with decreased frequency, and frequent heavy drinking). The group of infrequent moderate drinkers represented the largest group. Combining the results of our study with the findings of Witkiewitz and Masyn (2008) and implementing them within a new study could be interesting.

Last, our results may not be generalizable to other study samples, treatment environments, and so on. Our results may not be replicated in similar institutions with similar treatment programs. The current study comprised a broad spectrum of patients

in terms of age, gender, employment backgrounds, and history of addiction, which should allow us to generalize the results to others of similar age, gender, and so on; however, conducting a multi-center study would be helpful to attain clarity about our findings' generalizability to varying contexts.

## **Conclusion**

The risk of relapse declines steadily for abstinent patients during the course of treatment, whereas the risk for patients who experience one or more relapses remains stable during treatment. For patients who stay abstinent over the course of a treatment program, this finding implies that the number of breathalyzer tests could be reduced as treatment progresses, that weekend leaves could be scheduled later in the program, and that treatment periods might be extended to improve self-efficacy beliefs and thereby the likelihood of remaining abstinent after treatment. For patients suffering from a more severe addiction and for those who relapse at least once during treatment, the findings suggest a stronger focus on relapse-prevention strategies. For instance, treatment providers should analyze the conditions and triggers of relapse and apply adapted, personalized therapeutic strategies to reduce relapse risks and prevent or manage critical situations. Overall, the different trajectories that the current study has demonstrated for patients who remain abstinent over the course of treatment, relative to those who relapse at least once, provide specific starting points for improving treatment and reducing relapse risk.





## **Research Paper III:**

# **Improving Relapse Prevention in Inpatients with Alcohol Use Disorder Using Mental Contrasting with Implementation Intentions (MCII): A Single-Blind Randomized-Controlled Trial**

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## Abstract

Despite relapse-prevention techniques and guideline adherence, treating alcohol use disorder (AUD) remains challenging, as relapses are frequent. Craving and impaired self-regulation seem to play an important role in this context. Mental contrasting with implementation intentions (MCII) is an effective and efficient self-regulation strategy derived from motivation psychology that supports individuals in overcoming obstacles to reach their goals. The aim of the present study is to implement MCII as a self-regulation strategy in order to reduce craving and drinking during relapse prevention treatment for AUD. In this single-blind randomized controlled trial, 122 inpatients from an inpatient treatment center for AUD participated. Participants were divided into a group receiving MCII and a group receiving a module from a relapse prevention model, which served as an active control group. Craving was assessed using a visual analogue scale, whereas return to drinking was recorded by a research assistant based on patients' self-reports, breathalyzer and urine tests, and reports from others. Data analyses were performed using a contrast analysis and an independent *t*-test. Craving decreased more in the MCII group compared to the active control group at the beginning of treatment, but it did not decrease more over the course of further measurements. Also, over the course of the inpatient treatment, there was no difference in the number of drinking events between the MCII group and the active control group. MCII reduced craving as compared to the active control group at the beginning of treatment. However, over time, when the normative context of the clinic took over, the MCII group did not differ from the active control group, neither in craving nor in the number of drinking events. Future research should verify this result by assessing MCII effects on relapse prevention of alcohol use in an outpatient context.

## **Introduction**

### **Alcohol Use Disorder**

The harmful use of alcohol has high social and economic costs. The WHO estimates that worldwide over 3 million deaths occur each year due to excessive alcohol consumption (World Health Organization, 2018). This corresponds to 5.3% of all deaths (World Health Organization, 2018). Further estimates suggest that 5.1% of the global burden of disease and injury is caused by harmful alcohol use. “AUD is defined as a chronic relapsing brain disorder characterized by an impaired ability to stop or control use despite adverse social, occupational, or health hazards.” (NIAAA 2020). Alcohol use disorder (AUD) is a relatively widespread phenomenon: a survey by the WHO, which was conducted in many countries worldwide, suggested that the lifetime prevalence of AUD is 8.6% (Glantz et al., 2020). Excessive alcohol use shows a high comorbidity with other mental disorders (e.g., depression, attention-deficit hyperactivity disorder; Castillo-Carniglia et al., 2019) and a host of physical diseases (e.g., liver and heart diseases, cancer; Carvalho et al., 2019). In addition to health impairments, excessive alcohol consumption also results in immense costs in other life domains. For example, in Switzerland it has been estimated that harmful alcohol use causes social costs in the amount of 4.2 billion Swiss francs per year (Fischer et al., 2014). Globally, estimates suggest that excessive alcohol use is responsible for 1.3–3.3% of all healthcare costs (Baumberg, 2006).

### **Alcohol Use Disorder and Treatment**

Based on these facts, the development of effective treatments for individuals with AUD is a central public health concern. Today’s treatment recommendations (e.g., S3-guidelines for German-speaking countries, see Mann et al., 2017; for international recommendations, see National Collaborating Centre for Mental Health (UK), 2011) assume that people with AUD need medically supervised detoxification. Moreover, in the case of AUD, it is recommended to add relapse prevention treatment after detoxification. When abstinence is recommended as a treatment goal, relapse prevention is an important component of the inpatient treatment of AUD.

The antecedents of possible relapse were addressed in the well-known relapse prevention model by Marlatt and Gordon (1985). The model defines therapeutic strategies to avoid relapse and maintain abstinence (e.g., detecting risk situations, developing coping skills). Many studies have demonstrated the clinical effectiveness of applying the principles from the model (for an overview, see: Hendershot et al., 2011), and its relapse prevention modules have become standard in the treatment of AUD. However, despite the fact that professionals follow the guidelines and use relapse prevention techniques, outcomes for treating AUD remain disappointing. Multiple relapses and dropout from therapy are frequent, particularly for inpatient treatment. For example, data from Switzerland show that only about 60% of inpatients in abstinence-oriented inpatient treatment programs stay abstinent while they are still undergoing treatment (Klingemann et al., 2013; Senn et al., 2020). Very similar results are also seen 1 year after treatment: only about 40% succeed at remaining abstinent 1 year after treatment (Graser et al., 2021; Meyer et al., 2014; Moggi et al., 2007). This was despite the fact that all (Graser et al., 2021) or 80% of patients (Meyer et al., 2014) having had an abstinence-oriented drinking goal. International data from Europe and the United States show similar relapse rates to those in Switzerland (e.g., Dandaba et al., 2020; Witkiewitz, 2011). These results emphasize the pressing need to advance AUD treatments.

### **Craving and Self-Regulation as Promising Intervention Foci in Treating AUD**

Recent research has outlined the importance of craving in substance use disorders. Craving seems to be a good predictor of clinical outcomes in substance use disorders and, in particular, of relapse (for an overview, see Sayette, 2016). The importance is also reflected in its inclusion as a diagnostic criterion for substance use disorder in the DSM 5 (American Psychiatric Association, 2013). Regarding AUD, Murphy et al. (2014) demonstrated that craving is related to AUD severity and relapse in treatment-seeking individuals, and Stohs et al. (2019) showed that alcohol craving has a high temporal stability: craving measured at the end of treatment was connected to elevated alcohol craving 3 months after treatment. These findings support the scientific and clinical relevance of craving as a construct for predicting and preventing relapse.

A concept that is closely linked to craving is self-regulation (e.g., Sayette, 2016). Several studies from the last decades have shown that craving reduces the success

of self-regulatory efforts and that the impaired success of such efforts in turn leads to an inability to resist temptations and an increased probability of relapse (e.g., Creswell & Sayette, 2022; Gauggel et al., 2010; Vohs & Heatherton, 2000). The theoretical framework for these results can be found, for example, in cognitive neuroscience research (Heatherton & Wagner, 2011; Robinson & Berridge, 1993; Volkow et al., 2019). According to the findings in this field, self-regulatory failure occurs due to an imbalance of effective self-regulation caused by strong impulses or an impaired functioning of the prefrontal cortex (Heatherton & Wagner, 2011). The widely known incentive-sensitization theory of addiction (Robinson & Berridge, 1993) assumes that strong impulses arise due to the pathologically increased incentive salience of alcohol in individuals with AUD. In the context of craving, this means that experiencing a strong craving over a longer time period challenges success in self-regulation and makes it difficult to remain abstinent in risk situations, or even that through many years of heavy alcohol use, the function of the prefrontal cortex is so severely impaired that it no longer functions properly when deciding to drink or not to drink. These assumptions are supported by neurobiologically measurable changes in dopaminergic processes in the mesolimbic systems, as various studies have demonstrated (Berridge & Robinson, 2016).

In general, but also in the context of AUD, self-regulation is particularly important when obstacles are encountered (e.g., negative or euphoric mood, temptations, and risk situations). Given the importance of the concept of self-regulation, it has been adopted in various therapy approaches in the clinical context. Techniques to promote self-regulation can be found in cognitive behavioral therapy (e.g., Marlatt & Donovan, 2005) as well as in mindfulness- and acceptance-based therapies (e.g., Bowen et al., 2021).

### **Self-Regulation by Mental Contrasting with Implementation Intentions (MCII)**

In the field of motivation psychology, the self-regulation strategy mental contrasting with implementation intentions (MCII; Oettingen & Gollwitzer, 2010) has been developed and successfully applied in several interventions, which makes it a candidate to improve the success of AUD treatments.

Mental contrasting consists of imagining a desired future and contrasting it with the critical obstacle of the present reality. This process leads to the release of energy and

increases goal commitment, goal striving, and goal attainment (Oettingen, 2000; Oettingen et al., 2001). For example, a person with AUD may think of the personal wish to become abstinent. After the person is clear about this wish, the next step is to imagine vividly the best positive outcome when attaining the wish (e.g., becoming a better parent, being promoted in one's job, feeling healthier, or living a life without craving). Thereafter, an inner obstacle that is potentially critical in the pursuit of the wish is identified and imagined (e.g., peer pressure, arguing with one's spouse, being annoyed because of work, being overburdened with one's children). The best outcome (e.g., becoming a better parent) and subsequently the main inner obstacle (e.g., peer pressure) are mentally contrasted with each other.

Research has shown that mental contrasting creates, outside of people's awareness, strong associative links between the outcome and the obstacle and between the obstacle and the behavior to overcome the obstacle. In addition, mental contrasting changes the meaning of reality so that it is now interpreted as an obstacle. All these nonconscious processes, in turn, mediate effective behavior change and propel people toward wish fulfillment (Kappes et al., 2013) by effectively overcoming obstacles on the way to wish fulfillment. The effect of mental contrasting on the achievement of wishes and goals has been shown in many areas of life, for example, in the academic and professional domain, in well-being, fitness, and health, in the educational domain, and with respect to the control of emotions (summaries by Oettingen, 2012; Oettingen et al., 2018).

Mental contrasting sets the foundation for the next step: forming implementation intentions (Gollwitzer, 2014). Implementation intentions are if-then plans in which individuals specify when, where, and how to strive for a goal. They are composed using the following cue-response format: "If the critical situation X is encountered, then I will perform the goal-directed response Y!" The if component specifies a critical event (e.g., an obstacle), and the then component specifies how to react in a goal-directed way. For a person with AUD, risk situations represent a central obstacle. Thus if-then planning is helpful when it comes in the form of "if ... obstacle, then I will ... behavior to overcome obstacle." That is, the obstacle, as defined in the process of mental contrasting, is included in the if part of the plan. The best option to overcome this obstacle (e.g., ordering a nonalcoholic beverage) is then included in the then part of the plan after considering several possible means for overcoming it. In a last step, the

obstacle and the solution are phrased into an if-then plan (“If I feel peer pressure, then I will order a nonalcoholic beer!”). Many studies have demonstrated that forming if-then plans lead to more goal-directed behavior and that goals are more likely to be attained. The effect of implementation intentions on goal attainment has been demonstrated for many areas of life, such as health, sports, social relationships, and academic achievements (see these meta-analyses for an overview: Adriaanse et al., 2011; Bélanger-Gravel et al., 2013; Gollwitzer & Sheeran, 2006).

Combining mental contrasting and implementation intentions into MCII reinforces the positive effects of both approaches: whereas mental contrasting strengthens goal commitment with subsequent goal striving and goal attainment (i.e., the self-regulation of goal setting), implementation intentions foster the instrumental action for behavior change (i.e., the self-regulation of goal striving), especially when the obstacle is hard to overcome (e.g., impulses, strong emotions). The effectiveness of MCII has been shown in many studies and different areas of life (for a review, see: Oettingen, 2012; Oettingen & Gollwitzer, 2018). For example, in the area of health, MCII has been shown to help study participants adopt a healthier lifestyle. Studies have demonstrated that by using MCII, participants can become more physically active (Stadler et al., 2009), reduce smoking (Mutter et al., 2020), follow a healthier diet (Stadler et al., 2010), and succeed in downregulating negative emotions (Houssais et al., 2013; Schweiger Gallo et al., 2018). In addition to these effects in healthy individuals, MCII has also been proven to have an impact in clinical samples. For example, with the help of MCII, chronic back pain patients were able to increase their physical capacity (S. Christiansen et al., 2010), stroke survivors were more likely to improve physical activity and reduce their body weight (Marquardt et al., 2017), and patients with schizophrenia were able to translate their exercising intentions into action (Sailer et al., 2015).

### **Mental Contrasting with Implementation Intentions (MCII) and Alcohol Use Disorder**

Most relevant for the present research, MCII has also been investigated in alcohol research. For example, Hagger et al. (2012) showed that undergraduate students were able to reduce their alcohol consumption by using implementation intentions. Another study by Armitage (2009) demonstrated that forming if-then plans led to a decrease of drinking in the general population. A recent meta-analysis (Malaguti et al., 2020)

showed that implementation intentions had a small but significant effect in reducing alcohol use ( $g = 0.31$ ) in students and in the general population. MCII was successfully applied in a study that aimed to help people at risk for hazardous drinking to reduce their drinking (Wittleder et al., 2019). In summary, MCII has been shown to be effective in reducing alcohol consumption in non-clinical groups as well as in the context of a person's daily life.

However, it still remains unclear whether MCII is effective in the clinical population of individuals with AUD and whether it can be successfully applied in the context of an inpatient treatment program, as MCII has only been studied in participants' daily lives and not in a narrowly organized health setting such as in controlled hospital or rehabilitation settings. Evidence from the literature indicates that the social context may influence the effectiveness of MCII (Kizilcec & Cohen, 2017; Oettingen, 1997, 2012). In traditional cultures with a high demand for norm-oriented behavior, individuals are pressured to conform to the norms, so they pursue fewer individual goals and self-regulate less. By contrast, in modern cultures with few norm-oriented rules, people want to shape their own environment, pursue individual goals, and need to self-regulate more (Bieleke et al., 2021; Kizilcec & Cohen, 2017; Oettingen, 1997; Oettingen et al., 2008). In brief, it can be stated that contexts with a higher degree of autonomy require more individual self-regulation compared to highly structured environments, and MCII seems to operate better in autonomous situations. For example, the above-mentioned study by Sailer et al. (2015) found that in autonomy-focused settings, participants of the MCII intervention group were more likely to translate their exercising intentions into action compared to the control group. In contrast, in the highly structured setting, there was no difference between the two groups.

### **Present Research**

Building on the need for effective AUD treatments and the promising results of the MCII self-regulation strategy in non-clinical samples and for people with high-risk drinking, the present research explored the research question of whether MCII can reduce craving and relapses in individuals with AUD in the highly structured environment of a clinical inpatient setting. Using a single-blind randomized control trial, we compared the MCII group with a strong, active control group that received a module from the



relapse prevention model (Marlatt & Gordon, 1985). As outcomes, we focused on patients' craving during the intervention and on relapse events. We assumed that MCII would strengthen self-regulation, which in turn would help inpatients with AUD to cope with temptations and remain abstinent in risk situations when craving is high. We further assumed that MCII, in contrast to the control group, would be particularly effective at the beginning of therapy, as the normative context would not yet be established at this early stage of treatment. As statistical tests of the effectiveness of the interventions that incorporate the craving variable, a contrast analysis and an independent *t*-test were conducted.

## Method

### Study Site and Treatment

Participants were recruited from an inpatient treatment center for AUD (Forel Clinic) in Switzerland. Preconditions for entering inpatient treatment were (a) an age of  $\geq 18$  years, (b) a diagnosis of AUD according to DSM 5 (American Psychiatric Association, 2013), (c) abstinence since alcohol detoxification, and (d) agreement with the drinking-related treatment goal of abstinence and commitment to abide by the clinic's rules.

The treatment program at Forel Clinic is characterized by a highly structured therapy program with a narrow framework and rules that apply equally to all patients. It corresponds to the above mentioned traditional, norm-oriented environment. The treatment program is standardized for all patients and includes psychosocial relapse prevention provided in weekly individual and group psychotherapy sessions, as well as exercise therapy, occupational therapy, and social counseling. The therapy contents are basically the same for all patients. The procedures and rules are also identical for all patients. Patients transition from the detoxification unit to the inpatient treatment program when all withdrawal symptoms have fully resolved, on average after 10 days. In addition to participating in therapeutic services, patients live next door to each other, take their meals together at the same time, and spend their leisure time together. They thus share a common environment. Another characteristic feature of Forel Clinic is its remote location, which additionally fosters the creation of a local community. Treatment is normally planned for 8 to 12 weeks, depending on disease severity, psychiatric comorbidity, and the patients' private and professional situation. During the week, the inpatients can leave the clinic if they do not have therapy sessions. Starting with the second weekend after the transition from detoxification to long-term inpatient treatment, patients are allowed to leave for the weekend in order to maintain their social contacts and to test their ability to stay abstinent.

Prior to entering treatment, patients agree to self-report any violation of abstinence to the nursing staff and to participate in alcohol and drug testing. It is important to note that drinking during treatment is not a reason for exclusion from therapy; instead, at Forel Clinic, drinking during treatment is considered a symptom of the disease, and the treatment concept encompasses failures to stay abstinent during treatment in the relapse prevention modules.

There are three situations in which breathalyzer tests are conducted: (a) each time a patient reenters the clinic after a weekend leave, (b) in a random and unannounced manner (on average 1.6 times a week) in addition with urine tests (on average 0.3 times a week), and (c) in case the clinical staff suspects a patient has used alcohol. The tests are conducted with the AlcoTrueM model manufactured by Labtec. Its measuring principle consists of an electrochemical sensor with a precision sampling system, and it features a measuring range from 0.00 to 2.6 mg/l and 0.00 to 5.50‰.

When a relapse is detected, the patient must stay in his or her hospital room or, in the event of a severe relapse, the patient is transferred to the withdrawal ward. In each case, the nursing staff documents the date of the relapse as well as the quality and quantity of alcohol consumption during relapse (e.g., number of standard drinks) and then forwards the information to the attending physician. Alcohol levels are measured at regular intervals several times an hour with breathalyzer tests to monitor the patient's health status. In order to be allowed to participate in the normal therapy program and to leave the area of the clinic again, a breathalyzer test showing an alcohol level of 0‰ is required. According to the clinic's rules, treatment will be terminated if urine tests are manipulated (e.g., diluting or substituting a urine sample) or if patients refuse treatment or violate the clinic's rules (e.g., alcohol or drug use on clinic property, violent behavior). Patients can also terminate the therapy at any point as the therapy is voluntary. However, a premature termination of therapy by patients is uncommon (10-15%, see Senn et al., 2022)

### **Design and Procedure**

This single-blind randomized controlled trial was conducted according to the Declaration of Helsinki (World Medical Association, 2013). The study protocol was approved by the Ethics Committee of the canton of Zurich. Patients who fulfilled all the following inclusion criteria were eligible for the study: declaration of informed consent as documented by signature, diagnosis of AUD according to DSM 5 (American Psychiatric Association, 2013), minimum age of 18. Exclusion criteria consisted of cognitive deficits, language problems, and a high psychological burden (e.g., suicidality, acute psychosis). Eligible patients were invited to participate in the study within the 1st week of admission (T0) by the research assistant. At this informational appointment, the research assistant explained the objectives and procedures of the

study to the patients. Patients took part in the study after giving their written, informed consent (see Figure 3 for an overview of the procedure).

Data collection and the administration of the intervention took place at four times during the treatment: at the entrance appointment in the 2nd week after admission (T1), at two intermediate appointments during the 4th and the 6th weeks after admission (T2, T3), and at a final appointment during the last 7 days before discharge (T4).

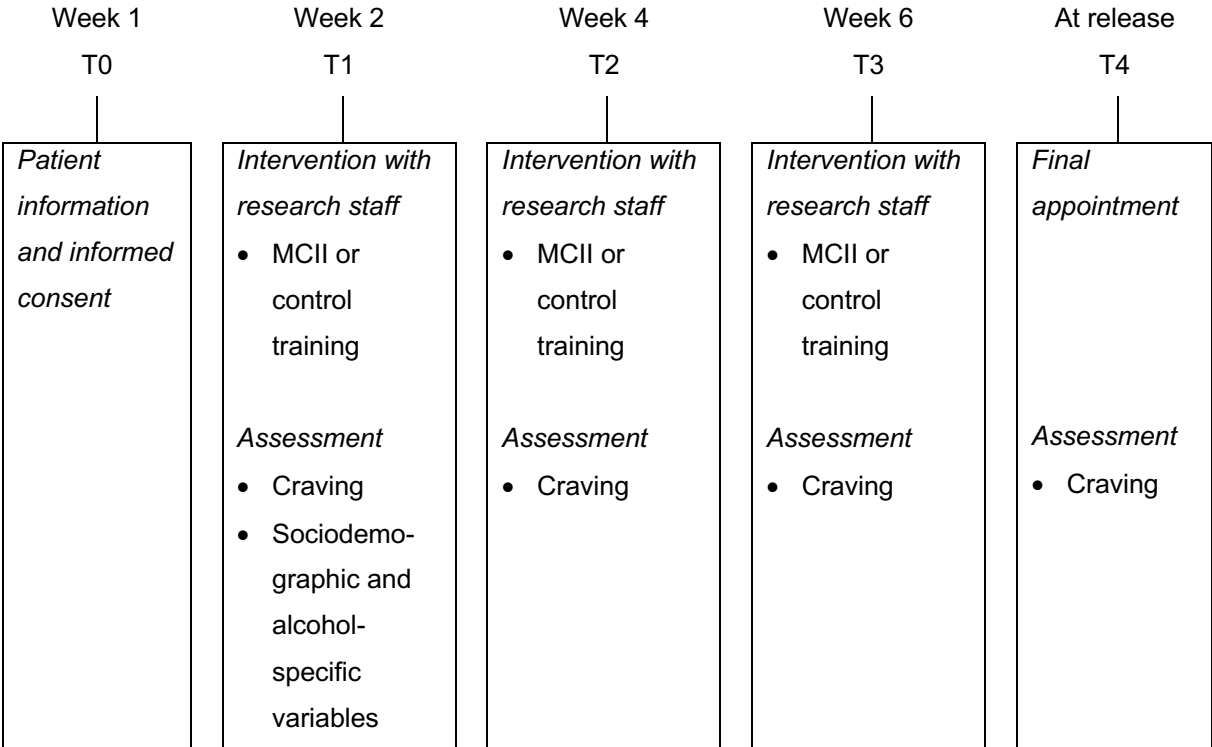


Figure 3: Temporal progression of the study (MCII = mental contrasting with implementation intentions).

**Outcome Measures and Instruments**

Drinking behavior during inpatient treatment (return to any drinking vs. status of abstinence) served as the primary outcome. A patient was classified as consistently abstinent if neither the results of the breathalyzer tests nor the patient’s self-reports or reports by others indicated alcohol consumption during their stay. This group of patients was categorized as “abstainers”. Accordingly, “non-abstainers” were defined as participants who exhibited any violation of abstinence in terms of any drinking during

the inpatient treatment program. When at least one relapse occurred, the patient was classified in the data set as a “non-abstainer”. The frequency of drinking during treatment was assessed at each appointment by the research assistant in collaboration with the patient. To adjust for the influence of the varying length of treatment, a ratio of the number of relapses to the number of treatment days was calculated (“ratio drinking during treatment” = frequency of drinking during treatment / number of days in treatment).

In order to assess craving, we measured subjective craving with a single-item rating, as it is commonly done (e.g., Sayette, 2016; Tiffany & Wray, 2012). We used a visual analogue scale to measure craving before and after the intervention. The scale ranged from 0 (no craving) to 9 (an irresistible urge to have a drink) and was filled out in a paper-pencil format. In addition, to determine the change in craving, the difference between pretest and posttest for each of the four points of measurement was calculated and used as the dependent variable (“difference in craving” = craving posttest – craving pretest).

We further assessed sociodemographic and alcohol-specific variables to check whether they are distributed differently between the groups (participants vs. non-participants, experimental group vs. control group). The sociodemographic variables included age, gender, and employment status. As alcohol-specific variables, we assessed years since the onset of the AUD and the number of DSM 5 criteria of AUD (American Psychiatric Association, 2013). The number of fulfilled criteria served as an indicator of the severity of the AUD. All of these variables were recorded by the research staff using a checklist at the first appointment.

### **Study Intervention**

The study was conducted as a single-blind randomized controlled trial. Participants were allocated to the intervention or active control group using randomization with an emphasis on equal group sizes in the control and experimental groups. There were no restrictions such as block randomization or stratification. The randomization list was generated by the research staff with the online tool Research Randomizer (Urbaniak & Plous, 2013), which uses the JavaScript math randomization method for generating its random numbers. When a patient decided to participate in the study, the research staff consulted the randomization list and assigned the participant a subject number

and corresponding group (control group vs. experimental group). Thus, the research staff was aware of the allocation, but the participants were blinded to the conditions (single-blind). In addition, they did not know that there were two different interventions.

In this study, we had an experimental group receiving MCII and a control group receiving a control training. Both groups received three trainings: in the 2nd, 4th, and 6th weeks after admission. The training was carried out together with research staff from the Forel Clinic research department. The staff members conducted both the interventions for both groups to reduce the possibility of an experimenter demand effect.

The participants in the control group received a control training in addition to the regular treatment at Forel Clinic in order to have a strong reference group. The control training was based on the relapse prevention model by Marlatt and Gordon (1985), which consists of several interventions (e.g., cognitive restructuring, coping-skills training). In our study, the intervention of decision matrices was conducted in the control group: the control training consisted of a  $2 \times 2$  contingency table, in which participants had to list advantages and disadvantages of being abstinent and of drinking. Afterward, the two most important arguments from each field of the  $2 \times 2$  contingency table were written down on a small card and were given to the participants. Participants were asked to consider the card on a daily basis until the next visit. Patients were also encouraged to form the intention to stay abstinent (opposed to intending to engage in controlled drinking). Furthermore, risk situations or relapses that had occurred since the last appointment were reappraised and talked about, and possible risk situations that might occur until the next appointment were identified and discussed. The control group did not receive other individual motivational strategies.

Participants of the experimental group worked through MCII together with trained research staff from the Forel Clinic research department at each of the three appointments. In the MCII group, the abstinence-oriented drinking goal was predefined, but the next steps were elaborated individually with the participants. The four steps of the MCII procedure were applied: choosing the wish (being abstinent), imagining the most positive outcome when attaining the wish (e.g., feeling free and independent), considering inner obstacles standing in the way of attaining the wish and choosing the main inner obstacle (e.g., feeling lonely), finding a specific behavior to overcome the obstacle (e.g., calling a friend), and phrasing an if-then plan (e.g., "If I

feel lonely, then I will call a friend!”). The individual MCII results were written down on a small card and were handed out to the participant. Patients were asked to practice MCII individually with the help of the card on a daily basis until the next visit.

## Data Analysis

Our a priori calculation of the required sample size was based on the outcome variable (return to any drinking during treatment). Since previous implementation intentions and MCII intervention studies have reported inconsistent effect sizes ranging from Cohen’s  $d = 0.34$  (e.g., Wang et al., 2021) to  $d = 0.65$  (e.g., Gollwitzer & Sheeran, 2006) and  $d = 0.99$  (e.g., Toli et al., 2016), we agreed on a moderate effect size of an odds ratio (*OR*) of 0.6, which was assessed using multiple logistic regressions. Based on previous observations at Forel Clinic, we assumed that under the  $H_0$ , 35% of patients would experience at least one drinking event. Given  $\alpha = 0.05$  and  $1 - \beta = 0.80$ , a one-sided Z-test yielded a required sample size of 122 participants, that is, 61 subjects in the experimental group and 61 subjects in the control group.

We employed a contrast analysis and an independent *t*-test to estimate the effectiveness of the interventions on drinking during treatment and on craving. Since we had an a priori hypothesis on the decrease of craving to be maximal in the MCII group at the first point of measurement (T1) in contrast to the control group and in comparison to the other three different points of measurement (T2, T3, T4), we implemented a contrast analysis. Contrast analyses with planned contrasts have the advantages of testing specific a priori hypotheses and of controlling for type I errors (e.g., Wiens & Nilsson, 2017). In this study we had a 2 (group)  $\times$  4 (points of measurements) design, which yielded the following contrasts: contrast 1: MCII group (1) against control group (-1) and contrast 2: T1 (1) against T2 (-1/3), T3 (-1/3) and T4 (-1/3). An independent *t*-test was conducted to estimate the effectiveness of the interventions on drinking during treatment. To adjust for the influence of the varying length of the treatment, a ratio of the number of relapses to the number of treatment days was calculated (“ratio drinking during treatment” = frequency of drinking during treatment divided by the number of days in treatment). In addition, to determine the change in craving, the difference between pretest and posttest for each of the four points of measurement was chosen as the dependent variable to statistically adjust for the entry level of craving (“difference craving” = craving posttest minus craving pretest).

At all four points of measurement, there was no significant difference between the two groups in the initial level of craving (T1:  $t(119) = -0.383$ ,  $p = .703$ ; T2:  $t(115) = -0.318$ ,  $p = .751$ ; T3:  $t(108) = -0.887$ ,  $p = .377$ ; T4:  $t(94) = -0.356$ ,  $p = .723$ ). All statistical tests were two-sided and a  $p$  value  $< 0.05$  was considered statistically significant. Statistical analyses were performed with SPSS 28 (IBM Corp., 2021).



## Results

### Enrolment and Baseline Characteristics

Data assessment took place between August 2017 and December 2018 and ended when the required number of participants was reached ( $N = 122$ ). During data collection, a total of 441 patients entered the relapse prevention treatment at Forel Clinic, 286 of whom fulfilled the inclusion criteria. Of these 286 patients, 122 decided to take part in the study (see Figure 4). The majority of patients who did not participate in the study indicated that they were not interested.

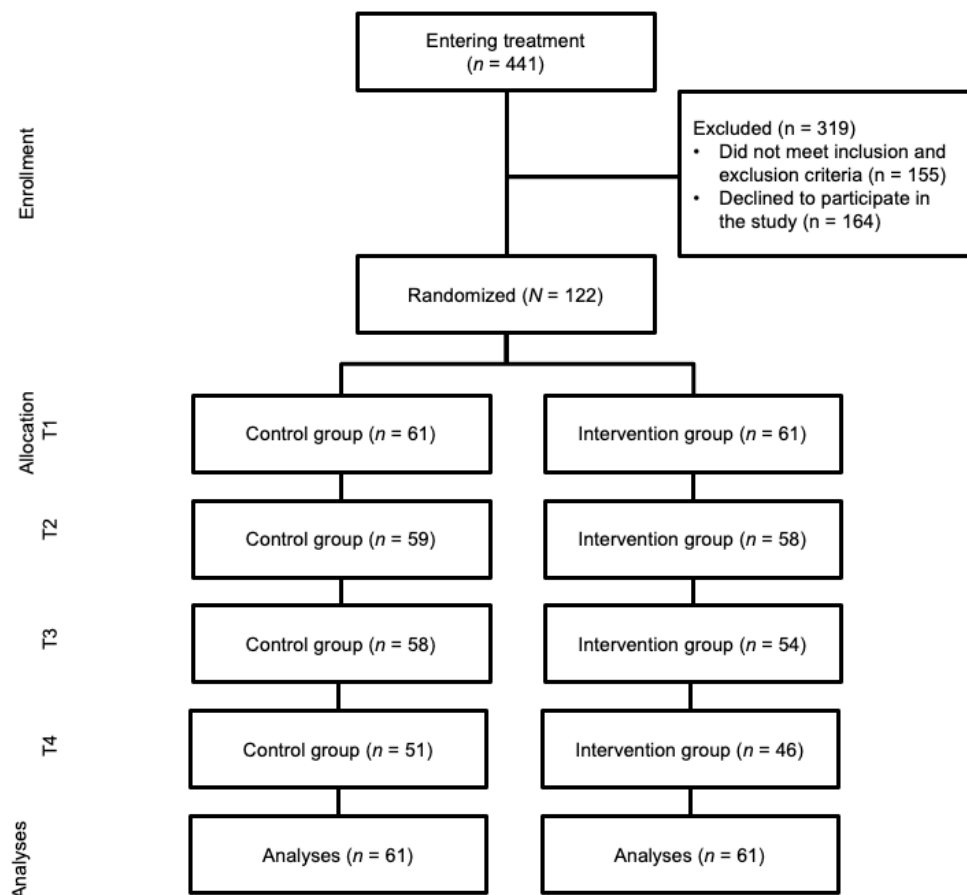


Figure 4: Flow chart of participants' progress through each stage of the randomized controlled trial.

The participants who decided to take part in the study were randomly allocated to the experimental group ( $n = 61$ ) or the control group ( $n = 61$ ).

Regarding the baseline sociodemographic characteristics of the participants at admission, the mean age of the subjects was 46.22 years ( $SD = 10.60$ ), 78.7% were male, 73.0% Swiss, 27.3% married, and 40.7% employed (see Table 5).

Table 5. Characteristics of patients.

Characteristics	All participants ( $N = 122$ )
	$n$ (%) or $M$ ( $SD$ )
Gender	
Male	96 (78.7%)
Age ( $M$ ( $SD$ ))*	46.22 (10.60)
Civil status	
Single	52 (43.0%)
Married	33 (27.3%)
Separated (legally)	7 (5.8%)
Divorced	23 (19.0%)
Widowed	6 (4.9%)
Registered partnership	0 (0.0%)
Nationality	
Swiss	89 (73.0%)
Employment status	
Employed	48 (40.7%)
Education	
No degree	0 (0.0%)
Compulsory education	14 (12.1%)
Specialized upper secondary school	3 (2.6%)
Matura diploma (university-matriculation exam)	8 (6.9%)
Vocational education	52 (44.8%)
Professional education	21 (18.1%)
University or university of applied sciences	18 (15.50%)
Number of previous detoxifications	2.46 (1.89)
AUD severity (number of DSM 5 criteria)	8.73 (1.65)
Years of problematic drinking	10.98 (8.60)

\*  $M$  = mean,  $SD$  = standard deviation

In the next step, we examined whether the experimental group differed from the control group on sociodemographic and substance-related variables. There were no significant differences between the experimental group and the control group.

We also computed analyses comparing the participants of the study with the patients who met the inclusion criteria but did not participate in the study (non-participants) with regard to their sociodemographic and substance-related variables. The results showed that the participants of the study represented the overall population of the patients at Forel Clinic in most of the relevant characteristics. As exceptions, three differences between the non-participants and the participants were found. Compared to non-participants, participants were more often male ( $\chi^2(1) = 8.475, p = 0.004$ ), had a higher AUDIT score ( $U = 13057.00, z = 2.564, p = 0.01$ ) and reported having undergone more detoxifications prior to the current stay ( $U = 19738.00, z = 2.057, p = 0.04$ ).

### **Substance-Related Behavior**

On average, the 122 study participants started drinking in a problematic way 10.98 years ago ( $SD = 8.60$ ), met 8.73 criteria ( $SD = 1.65$ ) of the DSM 5 diagnosis of AUD, and stayed for 80.54 days at Forel Clinic in the inpatient treatment program (without detoxification,  $SD = 29.93$ ). During treatment, 30.52 breathalyzer tests ( $SD = 12.74$ ) and 3.68 urine tests ( $SD = 2.63$ ) were carried out per patient. Of the subjects, 38.5% ( $n = 47$ ) had at least one alcohol relapse during treatment and 15.6% ( $n = 19$ ) terminated treatment early (see Table 1).

### **Effect of MCII on Craving**

As mentioned in the Methods section, we implemented a planned comparison approach to examine our hypothesis regarding a greater decrease in craving in the MCII group at the first point of measurement (T1) in contrast to the control group and in comparison to the other three different points of measurement (T2, T3, T4).

The contrast analysis showed that there was a statistically significant difference in craving between the MCII group ( $M = -0.43, SD = 0.87$ ) and the control group ( $M = 0.13, SD = 0.99$ ),  $t(428.66) = -3.49, p < .001$  at T1. The differences in the two mean values show that craving decreased for the MCII group and increased for the control group at T1 from preintervention to postintervention.

When looking at the other three points of measurement (T2, T3, T4), there were no differences between the two groups in the expression of craving (see Figure 5 for

an overview), meaning that craving developed similarly in both groups: craving decreased at all points of measurement in both groups.

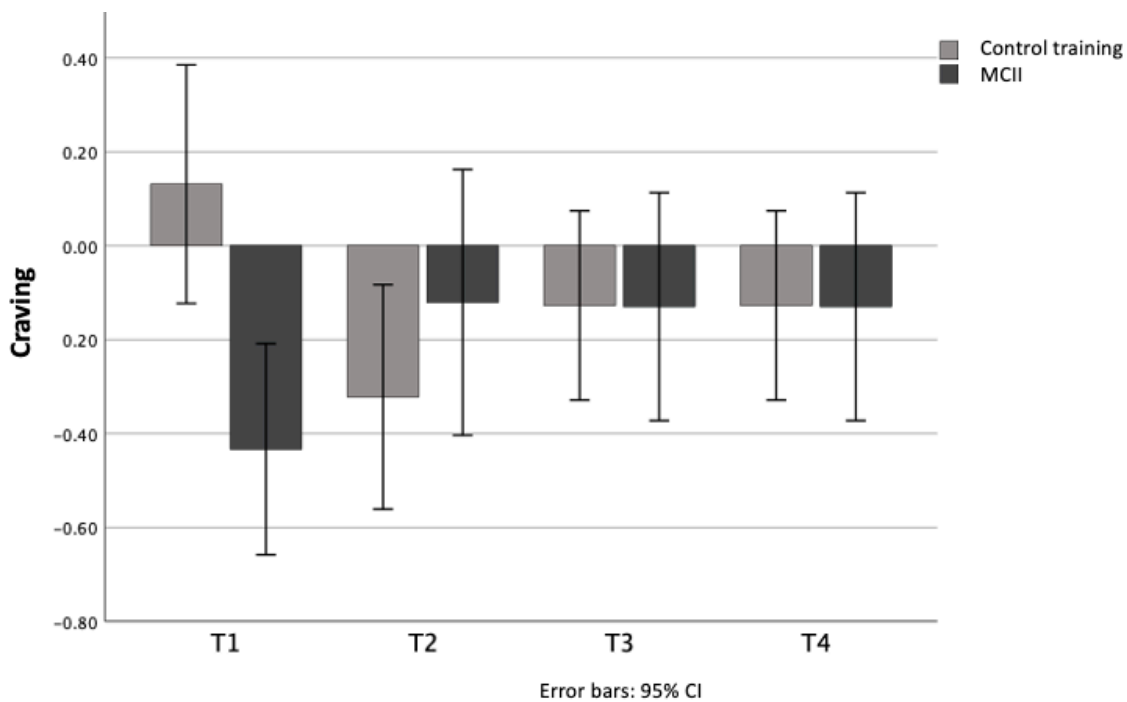


Figure 5: Means for craving measurement in the group MCII (dark grey bars) and the group control training (light grey bars) at the four points of measurements (higher values indicate higher ratings of craving), error bars (95% CI).

### Effect of MCII on Drinking during Treatment

A *t*-test was performed to compare the effect of MCII and the control training on the “ratio drinking during treatment”. It revealed that the ratio of drinking during treatment between the group MCII ( $M = 0.0125$ ,  $SD = 0.0185$ ) and the group control training ( $M = 0.0081$ ,  $SD = 0.0164$ ) did not differ,  $t(120) = -1.381$ ,  $p = .085$ . This implies that there was no difference between the two groups in the number of relapses in relation to the number of days in treatment.

## **Discussion**

This study aimed to investigate the effect of MCII on craving and relapse during inpatient treatment in comparison to an active control condition. Whereas a reduced craving at the first appointment from pre-intervention to post-intervention was found in the MCII intervention group, an increased craving was observed in the control group. No differences in craving were found between the two groups for the other three points of measurement. However, it was found that craving in both groups decreased from pre-intervention to post-intervention as measured 4 and 6 weeks after admission and 1 week before discharge. Regarding relapses adjusted for the number of days in treatment, no difference was found between the two groups. Overall, these findings imply that MCII is not more or less effective than active control training, which was derived from the relapse prevention model (Marlatt & Gordon, 1985). As the relapse prevention model is a widely recognized theory in psychotherapy and is applied as the treatment as usual for AUD, the equivalent results point to the effectiveness of MCII, as it was able to compare with an active control training using a firmly established method.

As expected, there was a difference at the first point of measurement in the amount of craving that patients in the MCII group and the control group reported. This suggests that MCII must have worked differently than the control training, at least at the beginning of treatment. This finding provides initial support for our preliminary assumption that MCII would have an enhancing effect on self-regulation and subsequently on attenuating craving at this early stage of treatment. However, this difference between the conditions disappeared over the course of treatment. We assume that this disappearance had to do with the normative context in the clinic. The first appointment took place in the 2nd week after entering treatment. During this time, patients are arriving and becoming familiar with the clinic and its rules, and the normative context has not yet been established for the individual patient. Thus, patients may rely more on their self-regulation than on normative influences on their behavior in this arrival phase. However, we can assume that during the course of the inpatient treatment, the rules and possible consequences of breaking the rules become more salient and influential on patients' behavior. The relative increase in behavioral guidance in the normative context probably led to the disappearance of the initial

difference between the groups. In line with these assumptions, prior research (e.g., Bieleke et al., 2021; Oettingen, 1997; Oettingen et al., 2008) has found that in cultures or contexts with high demands for norm-oriented behavior, individuals try to conform to the norms, pursue fewer individual goals, and self-regulate less. This shift in behavioral control might have happened in the context of the present study: due to the well-established and very clearly defined rules of the inpatient clinic, there was little need for individual self-regulation. Patients could hand over the regulation of their behavior to the clinic: instead of taking individual action to self-regulate their behavior, they had to adhere to the clinic's strict established norms.

Similarly, MCII has been shown to operate better for individuals in autonomous rather than highly structured environments. For instance, Sailer et al. (2015) showed that MCII only improved the translation of schizophrenic patients' intention to become more physically active in an autonomous ward setting. In a highly structured ward setting, there were no differences between the MCII group and the control group. Our results indicate that the same effect occurred in our study. Determining whether MCII operates better in more autonomous settings (e.g., an outpatient setting) for individuals with AUD would require further testing. It would be interesting to see if MCII can persistently strengthen self-regulation in such settings and thus improve coping with craving and even prevent relapses.

In addition to the normative context, the assumptions of the incentive-sensitization theory of addiction (Robinson & Berridge, 1993) may also explain the presented results. The pathologically increased incentive salience of alcohol demands an enormous effort of self-regulation, which may seem to function well at the beginning of addiction treatment. However, in the course of treatment, the demand on self-regulation could increase to such an extent that it overrides the anticipation of if-then plans or makes it more difficult for patients to maintain abstinence and overcome other motivational effects.

### **Limitations of the Study**

Patient recruitment was difficult because only 65% of all entering patients fulfilled the inclusion criteria. Of the eligible patients, in turn, only 43% participated in the study. In most cases, patients indicated that they were not interested in participating in the study because of the time required and the lack of financial compensation. Our analyses

comparing the participants and non-participants showed that the sample was similar to the overall patient population at Forel Clinic in many variables. However, in total, more men and patients with a more severe AUD participated in our study. One might say that this self-selection effect limits the validity of the results and the scope of the intervention. But the differences also show that patients who have a more severe AUD and have already undertaken several therapy attempts see a need for new forms of therapy and are motivated to address their problem in a different way.

Besides the normative context within the clinic, there are the weekends where patients are allowed to leave. One may argue that these take place outside the clinic and that the normative context at the clinic no longer affects patients' behavior. However, patients know that they are going back to the clinic, and they know the consequences if they drink alcohol. There is no punishment, as Forel Clinic considers relapse a symptom of the disease, but the person affected has to reflect on the relapse and address the relapse therapeutically both individually and in the group. And due to the shared environment, the relapse can also become a topic of discussion during leisure time. It can therefore be assumed that patients do not behave on these weekends as they would in normal everyday life and that the normative context persists even on the weekend leaves.

Another limitation of the study is that it was restricted to inpatients at Forel Clinic. Although we had a wide range of patients in our study with regard to age, gender, and history of addiction, the results cannot be extended one-to-one to other populations. The patient populations at other clinics should, however, be similar, so the results should also be valid for other clinics.

Furthermore, we only studied an inpatient setting, so we cannot address the effectiveness of MCII in outpatient settings. Expanding the setting and population—for example, by running a study in an outpatient clinic—would certainly yield compelling new insights and make it possible to test the discussed norm-development assumption.

## **Conclusion**

Originally derived from motivation science, MCII proved to be equally effective as a module from the relapse prevention model (Marlatt & Gordon, 1985) at influencing abstinence in an inpatient treatment setting. Regarding craving, MCII even exhibited a

enhanced positive effect at the beginning of the treatment, where MCII significantly reduced craving compared to the active control group. This effect disappeared, however, over the course of treatment. The initial difference in craving between the two groups suggests that the normative context of the clinic might not be immediately operative, whereas MCII may have been able to develop its effect on the spot in a still existing autonomous environment.

In order to verify our results and interpretations, it would be interesting to investigate the application of MCII toward the end of inpatient treatment as an instrument for preparing patients for the time after discharge. After their stay in a clinic, patients return to their personal everyday environment, where the external control and normative context of the clinic disappear. They then have to use their individual self-regulation strategies to stay abstinent. Similarly, it would be interesting to apply MCII in an outpatient setting within psychotherapy sessions.

Overall, this study demonstrated the first indication of the utility of MCII in the field of AUD in a clinical setting. However, to improve treatment outcomes and reduce the risk of relapse, more research is needed on how to empower patients with AUD.



## **Eigenabgrenzung**

Die Forschungsartikel der vorliegenden Dissertation sind im Rahmen von Kooperationen entstanden. Ich danke den Ko-Autoren vielmals für die Zusammenarbeit, für die investierte Arbeit, ihr Fachwissen und Ihre Ideen. Folgende Beiträge habe ich selbst zu den jeweiligen Artikeln geleistet:

### **Forschungsartikel I**

Präzisierung der Fragestellung, Inhaltliche Einordnung, Patientenrekrutierung, Betreuung der Datenerhebung, Datenanalyse, Erstellung des Manuskripts.

### **Forschungsartikel II**

Entwicklung der Studienidee, Erstellung des Versuchsaufbaus, Präzisierung der Fragestellung, Inhaltliche Einordnung, Patientenrekrutierung, Betreuung der Datenerhebung, Mitwirkung an Datenanalyse, Erstellung des Manuskripts.

### **Forschungsartikel III**

Entwicklung der Studienidee, Erstellung des Versuchsaufbaus, Präzisierung der Fragestellung, Inhaltliche Einordnung, Patientenrekrutierung, Betreuung der Datenerhebung, Datenanalyse, Erstellung des Manuskripts.



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