

Research report

# Impulsive and non-impulsive suicide attempts in patients treated for alcohol dependence

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## Abstract

**Background:** Suicidal behavior has been recognized as an increasing problem among alcohol-dependent subjects. The aim of the study was to identify correlates of impulsive and non-impulsive suicide attempts among a treated population of alcohol-dependent patients.

**Methods:** A total of 154 patients with alcohol dependence consecutively admitted for addiction treatment participated in the study. Suicidal behavior was assessed together with severity of alcohol dependence, childhood abuse, impulsivity, and family history. A stop-signal procedure was used as a behavioral measure of impulsivity.

**Results and conclusions:** Lifetime suicide attempts were reported by 43% of patients in alcohol treatment; of which 62% were impulsive. Compared to patients without a suicide attempt, those with a non-impulsive attempt were more likely to have a history of sexual abuse (OR=7.17), a family history of suicide (OR=4.09), and higher scores on a personality measure of impulsiveness (OR=2.27). The only significant factor that distinguished patients with impulsive suicide attempts from patients without a suicide attempt and from patients with a non-impulsive suicide attempt was a higher level of behavioral impulsivity (OR=1.84–2.42).

**Limitations:** Retrospective self-report of suicide attempts and family history. Lack of diagnostic measure.

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**Keywords:** Suicide; Attempt; Alcohol dependence; Impulsive behavior; Poland

## 1. Introduction

Suicide is a major, potentially preventable, public health problem (Institute of Medicine, 2002; Office of

the Surgeon General, 1999). The rate of suicide varies significantly from one country to another with some of the highest rates in Eastern Europe, the Baltic Nations and Russia (World Health Organization, 2003). In Poland, suicide is the seventh leading cause of death, accounting for approximately 4000–5000 deaths each year (Komenda Główna Policji, 2008). These rates of suicide in the Polish population have remained relatively stable over the past two decades; however, others

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have noted the rates of suicide in some former Eastern European countries decreased during the period of time known as *Perestroika*, particularly in men (Varnik et al., 1998). At the present time, Poland has an annual rate of suicide comparable to that of the United States—12.1 per 100,000 in 2005 (Centers for Disease Control and Prevention, 2007).

Alcohol use and misuse are strongly linked to suicide risk. The estimated lifetime risk for completed suicide among individuals with alcohol dependence is 7% (Inskip et al., 1998), and those with alcohol dependence are at a 6.5 times greater risk for attempted suicide compared with those without alcohol dependence (Kessler et al., 1999). Consequently, many patients seeking alcohol dependence treatment have a prior history of suicide attempts (Hesselbrock et al., 1988; Roy, 2003; Whitters et al., 1985). Research on patients treated for drug and/or alcohol problems indicates that these patients remain at a high risk for suicidal behaviors following treatment (Ilgen et al., 2007a,b). Therefore, more work is needed to better understand suicidal behaviors in treatment-seeking alcohol-dependent individuals (Comelius et al., 2004).

In alcohol-dependent patients, those with prior suicidal behavior are more likely to be female, younger, unemployed, and divorced or separated compared to those without a lifetime suicide attempt (Hesselbrock et al., 1988; Preuss et al., 2002; Roy, 2001, 2003; Roy et al., 1990). Those with a prior attempt also report more depression and anxiety, higher rates of other drug use and dependence, more alcohol-related problems, and more alcohol consumed per day than other alcohol-dependent individuals without prior suicide attempts (Hesselbrock et al., 1988; Koller et al., 2002; Preuss et al., 2002; Roy, 2001; Roy et al., 1990; Whitters et al., 1985). Additionally, individuals with alcohol dependence and suicide attempts report higher rates of childhood physical and/or sexual abuse and more family members with a history of suicidal behaviors than those without an attempt (Kingree et al., 1999; Preuss et al., 2002; Roy, 2000, 2001, 2003).

Impulsivity is hypothesized to be a predisposing factor that places individuals with alcohol use disorders at increased risk for suicidal behaviors (Conner and Duberstein, 2004). Consistent with this theory, alcohol-dependent individuals with a history of suicidal behavior score higher on measures of impulsive traits than those without prior suicidal behavior (Koller et al., 2002). Similarly, many suicide attempts are impulsive, as defined by a limited amount of planning prior to the attempt, and these impulsive attempts may be particularly common in those with alcohol use disorders (Suominen et al., 1997). For example, Conner et al.

(2006) found that over 50% of individuals with alcohol dependence and a suicide attempt reported that they had spent less than 1 week thinking about the attempt. Others have found that anywhere from 24% to 40% of individuals with a suicide attempt spent less than 5 min planning the attempt (Simon et al., 2001; Williams et al., 1980). In general, individuals with an impulsive suicide attempt tend to report lower levels of depression, hopelessness, and less expectation of lethality than those who make more planned attempts (Baca-García et al., 2001, 2005; Conner et al., 2006; Simon et al., 2001; Williams et al., 1980; Wyder and De Leo, 2007). Despite the lack of expectation of lethality, many impulsive attempts are still potentially life-threatening (e.g., Simon et al., 2001).

Somewhat surprisingly, self-report measures of impulsive traits do not readily distinguish those with an impulsive suicide attempt from those with a non-impulsive attempt (Wyder and De Leo, 2007). In a recent study of adolescents, Witte et al. (2008) found that those with an impulsive attempt reported *lower* levels of impulsivity than those with a planned attempt. However, other evidence indicates that those with impulsive attempts report a history of more impulsive aggressive behaviors than those who make a non-impulsive suicide attempt, suggesting that behavioral measures of impulsivity may be able to distinguish between those with impulsive and non-impulsive attempts (Simon et al., 2001). The stop-signal task is a measure of behavioral impulsivity that is associated with risk for developing alcohol and drug use (Nigg et al., 2004, 2006; Stoltenberg et al., 2008; Wong et al., 2006). To the best of our knowledge, no prior research has examined how stop-signal performance relates to suicidal behaviors.

Partially by definition, identifying individuals at risk for an impulsive suicide attempt is difficult because of the lack of warning given prior to an attempt. Additionally, these individuals may be missed by other efforts to reduce suicide risk that target more longstanding symptoms, such as depression (e.g., Szanto et al., 2007). The present study was undertaken to examine differences between alcohol-dependent patients in Poland who reported no prior suicide attempt, a prior non-impulsive attempt, and a prior impulsive attempt. Patients were compared on demographic features, alcohol use severity, family history, prior childhood abuse, as well as self-report and behavioral measures of impulsivity.

## 2. Methods

### 2.1. Participants

A total of 154 patients [117 (76%) men and 37 women (24%)] were recruited from four addiction treatment

centers (2 outpatient and 2 residential) in Warsaw, Poland. Participants ranged in age from 20 to 73 years (mean=43.7, SD=9.6) and all were Caucasian. In terms of educational status, approximately 12% of participants had completed elementary school, 57% graduated from high school, 17% attended some college, and 14% earned a university degree. With regard to marital status, 18% of study participants had never been married, 38% were married, 5% separated, 22% divorced, 7% widowed, and 10% were currently living with a partner. A total of 102 patients (67%) were unemployed at the time of assessment, and 107 patients (70%) described their financial situation as not satisfactory (i.e., not enough money for their needs), while 22 patients (15%) were mandated by a court to enter addiction treatment.

## 2.2. Procedures

This study was designed to describe the characteristics of suicidal and non-suicidal alcohol-dependent patients seeking treatment in Poland. The four addiction treatment programs were similar in terms of having abstinence as a treatment goal, combining group and individual therapy, with an emphasis on 12-step facilitation and relapse prevention. Only patients with a primary diagnosis of alcohol dependence were eligible to participate. Diagnoses for alcohol and other substance use disorders were made in accordance with the *Diagnostic and Statistical Manual for Mental Disorders, 4th Edition (DSM-IV-TR)* (American Psychiatric Association, 2000) by consensus of a multidisciplinary team of addiction specialists, including a psychiatrist and a therapist. Patients were not excluded if they had a co-occurring psychiatric disorder.

Patients completed standardized assessments including questions about demographics, family history, childhood abuse, substance use, impulsiveness, and suicide attempts. At the end of the study, the dataset was anonymized so that it could not be linked to personal identifiers. This research was approved by both the Medical Institutional Review Board at the University of Michigan and the Bioethics Committee at the Medical University of Warsaw.

## 2.3. Measures

### 2.3.1. Suicide attempts and impulsive suicide attempts

Lifetime suicide attempts were measured with questions drawn from the Mini International Neuropsychiatric Interview (M.I.N.I.) (Sheehan et al., 1998), a short, structured interview for *DSM-IV* psychiatric diagnoses with good validity and reliability in psychiatric patients (Sheehan et al., 1998). Participants were categorized as

either having made a suicide attempt in their lifetime or not. For those who reported a past suicide attempt, interviewers asked patients how long they had spent planning their most recent suicide attempt. Those attempts with less than 30 min of planning prior to the act were categorized as “impulsive suicide attempts.” This approach was based on a similar method used previously by other research groups (Conner et al., 2006; Simon et al., 2001). Participants also reported whether or not they were using alcohol at the time of the suicide attempt. Finally, all participants who reported a past attempt were asked to describe the method of attempt. ICD-10 codes (World Health Organization, 1992) were used to classify attempts as having involved violent methods (X70–X82), or nonviolent methods (X60–X69, X83–X84) (Asberg et al., 1976; Maes et al., 1994).

### 2.3.2. Demographics, family history, and childhood abuse

At the start of the assessment, participants completed a modified version of the *University of Arkansas Substance Abuse Outcomes Module* (SAOM), a self-administered questionnaire that asks about race, ethnicity, gender, age, employment, education, substance use, and family history of alcohol and other drug problems (Smith et al., 1996). The SAOM was modified to gather information about prior depression, family history of suicidal behaviors, and questions about whether or not participants had ever been physically or sexually abused as children.

### 2.3.3. Alcohol and drug use

The *Michigan Alcoholism Screening Test* (MAST) was used as an index of lifetime severity of alcohol dependence. The MAST is a self-administered 25-item questionnaire, originally designed to identify probable cases of alcoholism (Selzer, 1971).

### 2.3.4. Impulsiveness

Because of the central role of impulsivity in this project, three measures were used. The first measure of impulsiveness as a personality trait was the *Barratt Impulsiveness Scale* (BIS-11) (Barratt, 1959; Patton et al., 1995). This is a 30-item self-report questionnaire that has been validated to assess impulsiveness as long-term patterns of behavior in various populations, including substance-dependent individuals and violent suicide attempters (e.g., Patton et al., 1995; Allen et al., 1998). Others have found evidence for the validity of this measure; BIS-11 scores are higher in patients with substance abuse problems (Moeller et al., 2002, 2001; Patkar et al., 2004).

Additionally, participants were administered 8 questions related to impulsiveness from the Impulsiveness Facet of the NEO Personality Inventory—Revised (NEO-PI-R). The impulsiveness facet of NEO-PI-R has good reliability, was designed to measure the inability to resist cravings and urges, and is not directly related to spontaneity, risk-taking or rapid decision time (Costa and McCrae, 1992).

A computerized measure of inhibitory control was used as an objective neurophysiologic measure of *behavioral impulsivity* (Logan et al., 1984). This measure is typically referred to as the *stop-signal task* in the cognitive science and clinical literatures (Lansbergen et al., 2007; Logan et al., 1997; Nigg et al., 2004; Schachar et al., 2000) and involves a two-choice reaction time task. Occasionally, a “stop-signal” occurs to indicate that the response should be withheld. Interpretation is based on a cognitive model where there are competing activating and inhibiting processes. The two processes “race” each other, and the process that is completed first “wins”. People with good inhibition have relatively fast inhibition processes and can inhibit prepotent responses more often. After a total of 64 practice trials, four blocks of 64 trials were administered, and stop-signal reaction times were calculated and averaged from the final three blocks. Altogether, practice and testing took about 20 min. Longer stop-signal reaction times indicate more difficulty inhibiting a response or, conversely, greater impulsivity. The construct validity of the stop-signal task has been demonstrated previously. Measures of a similar paradigm were highly correlated with other measures of impulsivity in the alcohol literature (Nigg et al., 2004; Rubio et al., 2007; Stoltenberg et al., 2008), as well as other samples (Logan et al., 1997; Swann et al., 2002).

#### 2.4. Statistical analysis

The analyses focused on identifying the association between all variables (demographics, alcohol use severity, family history, prior victimization, and three separate measures of impulsivity) and impulsive and non-impulsive suicide attempts. We began by examining the bivariate relationships between any lifetime suicide attempt versus no attempt on all the variables using chi square analyses, *t*-tests or Mann–Whitney tests, when appropriate. We then conducted a similar set of bivariate analyses that compared impulsive to non-impulsive attempters. Finally, we conducted a multivariate multinomial logistic regression analysis to examine the characteristics that best distinguished between the three groups: no attempt, non-impulsive attempt and impulsive attempt.

### 3. Results

#### 3.1. Suicide attempts in the study sample

Approximately 43% of the sample ( $n=66$ ) reported making a suicide attempt in their lifetime as previously reported by our research group (Wojnar et al., 2008). Of those who made an attempt, 45 patients (68%) reported making an attempt during a heavy drinking period, and 41 (62%) reported that they spent less than 30 min planning the attempt; these were classified as impulsive attempts. Among all suicide attempters, 55% ( $n=36/66$ ) reported a violent suicide attempt. The most common method of attempt was overdosing on medication ( $n=27-41\%$ ), mostly with sedatives or antidepressants, followed by hanging ( $n=16; 24\%$ ), cutting ( $n=9; 14\%$ ), jumping from a height ( $n=9; 14\%$ ), poisoning with gas or other toxic substances ( $n=3; 5\%$ ), and using a gun ( $n=2; 3\%$ ). Men were more likely to make violent suicide attempts than women ( $p=0.043$ ).

#### 3.2. Suicide attempters vs. non-attempters

Bivariate comparisons of those with and without a prior attempt are presented in Table 1. Lifetime suicide attempters in comparison to non-attempters were younger ( $p=0.015$ ) and had higher MAST scores ( $p=0.019$ ). Moreover, individuals who attempted suicide more frequently experienced sexual abuse ( $p=0.019$ ) or physical abuse ( $p=0.007$ ) in their childhood, and more frequently reported a family history of suicide ( $p=0.019$ ) than alcohol-dependent individuals without a history of suicide attempts. Suicide attempters also scored higher than other patients on impulsivity as measured by both the NEO-PI-R ( $p=0.001$ ) and BIS-11 ( $p=0.016$ ). By contrast, there was no significant difference between the two groups with respect to behavioral impulsivity as measured by response inhibition times in the stop-signal task ( $p=0.240$ ).

The next group of bivariate analyses was intended to better understand the characteristics of those who made an impulsive suicide attempt relative to those who reported a non-impulsive attempt (Table 2). Compared to those who made a non-impulsive attempt, impulsive attempters less frequently reported a family history of attempted or completed suicide ( $p=0.045$ ), and were less likely than non-impulsive attempters to be employed at the time of assessment ( $p=0.024$ ). Individuals who made an impulsive suicide attempt in the past had longer stop reaction times in the behavioral laboratory measure of impulsiveness than those who performed non-impulsive attempts ( $p=0.017$ ). However, there was no difference

Table 1

Bivariate comparisons of alcohol-dependent patients with and without a prior suicide attempt.

Characteristics	Suicide attempt	No suicide attempt	$p^a$
	$N=66$	$N=88$	
<i>Demographics</i>			
Age (years)	41.48 (9.56)	45.27 (9.43)	0.015
Gender (men)	51 (77.3)	66 (75.0)	0.744
Married	22 (33.3)	36 (40.9)	0.337
Education (years)	12 (10–12.75)	12 (11–15)	0.164
Employed	18 (27.3)	33 (37.5)	0.166
<i>Alcohol use and personal history</i>			
Age of onset of drinking (years)	20.96 (7.32)	22.71 (8.19)	0.182
MAST total score	37.74 (8.93)	34.13 (9.69)	0.019
History of sexual abuse	9 (13.6)	3 (3.4)	0.019
History of physical abuse	31 (47.0)	23 (26.1)	0.007
History of depression	16 (24.2)	16 (18.2)	0.359
<i>Family history</i>			
Parent alcohol use problems	42 (63.6)	48 (54.5)	0.193
Parent drug use	5 (5.7)	3 (3.4)	0.281
Parent suicide or suicide attempt	15 (22.7)	8 (9.1)	0.019
<i>Impulsiveness</i>			
Barratt Impulsiveness Scale (BIS-11)	73.98 (11.33)	69.89 (9.36)	0.016
NEO-PI-R Impulsiveness Facet ( $T$ -score)	56.42 (8.89)	51.17 (9.89)	0.001
Stop-signal reaction time (ms)	229.7 (70.35)	216.1 (71.19)	0.240

Values in the table are reported as  $N$  (%), means (SD), or medians (interquartile range).

MAST—Michigan Alcoholism Screening Test; NEO-PI-R—NEO Personality Inventory—Revised.

<sup>a</sup> Chi-square,  $t$ -test or Mann–Whitney test were performed where appropriate.

on self-report measures of impulsivity between the two groups.

Among those who reported a lifetime suicide attempt, those who made impulsive attempts, and those who made non-impulsive attempts, were similar in terms of age of first attempt, number of previous attempts, and methods used (Table 2). Patients who attempted suicide impulsively were more likely to have used alcohol before or during an attempt than those with non-impulsive attempts ( $p=0.017$ ).

### 3.3. Multinomial logistic regression analysis

Next, we focused on variables that were significant in the prior bivariate analyses. Multinomial logistic regres-

sion showed that individuals were more likely to make a non-impulsive suicide attempt if they had experienced sexual abuse in their childhood ( $OR=7.17$ ;  $p=0.032$ ), had a history of attempted or completed suicide in their families ( $OR=4.09$ ;  $p=0.030$ ) or were more impulsive on the NEO-PI-R ( $OR=2.27$ ;  $p=0.008$ ) (Table 3). The only significant factor to discriminate between an impulsive suicide attempt, and either no attempt or a non-impulsive attempt was a higher level of behavioral

Table 2

Bivariate analyses comparing alcohol-dependent patients with impulsive suicide attempts to those with non-impulsive suicide attempts.

Characteristics	Impulsive attempt	Non-impulsive attempt	$p^a$
	$N=41$	$N=25$	
<i>Demographics</i>			
Age (years)	42.29 (8.92)	40.16 (10.59)	0.378
Gender (men)	34 (82.9)	17 (68.0)	0.367
Married	14 (34.1)	8 (32.0)	0.858
Education (years)	12 (10–12)	11.5 (10–15.5)	0.753
Employed	7 (17.1)	11 (44.0)	0.024
<i>Alcohol use and personal history</i>			
Age of onset of drinking (years)	21.23 (7.64)	20.54 (6.91)	0.720
MAST total score	38.24 (8.20)	36.92 (10.14)	0.563
Sexual abuse	4 (9.8)	5 (20.0)	0.239
Physical abuse	16 (39.0)	15 (60.0)	0.098
History of depression	8 (19.5)	8 (32.0)	0.251
<i>Family history</i>			
Parent alcohol use problems	23 (56.1)	19 (76.0)	0.103
Parent drug use	1 (2.4)	4 (16.0)	0.055
Parent suicide or suicide attempt	6 (14.6)	9 (36.0)	0.045
<i>Impulsivity</i>			
NEO-PI-R Impulsiveness ( $T$ -score)	55.34 (8.86)	58.2 (8.82)	0.236
Barratt Impulsiveness Scale (BIS-11)	73.51 (10.62)	74.76 (12.59)	0.668
Stop-signal reaction time (ms)	249.0 (76.4)	200.9 (63.7)	0.017
<i>Characteristics of previous suicide attempts</i>			
Age of the 1st attempt	25.45 (11.62)	30.08 (10.40)	0.103
Number of prior attempts	2.76 (2.31)	2.0 (1.28)	0.244
Violent method of suicide	24 (58.5)	12 (48.0)	0.504
Alcohol use at time of attempt	32 (78.0)	13 (52.0)	0.017

Values in the table are reported as  $N$  (%), means (SD), or medians (interquartile range).

MAST—Michigan Alcoholism Screening Test; NEO-PI-R—NEO Personality Inventory—Revised.

<sup>a</sup> Chi-square,  $t$ -test or Mann–Whitney test were performed where appropriate.

Table 3

Multinomial logistic regression analysis for the comparison of predictors of impulsive suicide attempts vs. non-impulsive suicide attempts vs. no suicide attempts.

Characteristics	Impulsive attempts vs. non-attempters	Non-impulsive attempts vs. non-attempters	Impulsive attempts vs. non-impulsive attempts
	OR (95%CI)	OR (95%CI)	OR (95%CI)
Age	0.97 (0.93–1.02)	0.97 (0.91–1.03)	1.01 (0.95–1.07)
Gender	1.26 (0.42–3.79)	0.55 (0.15–2.09)	2.27 (0.52–10.03)
Childhood sexual abuse	2.63 (0.47–14.58)	7.17 (1.18–43.48)*	0.36 (0.06–2.16)
Childhood physical abuse	1.30 (0.53–3.21)	2.99 (0.97–9.27)	0.43 (0.13–1.42)
Parent suicide or suicide attempt	1.67 (0.50–5.60)	4.09 (1.15–14.56)*	0.41 (0.10–1.53)
Impulsiveness (BIS-11)	1.01 (0.96–1.05)	0.99 (0.94–1.05)	1.01 (0.95–1.07)
Impulsiveness (NEO-PI-R)	1.44 (0.91–2.29)	2.27 (1.24–4.16)**	0.63 (0.34–1.18)
Stop-signal reaction time	1.84 (1.02–3.31)*	0.76 (0.34–1.73)	2.42 (1.04–5.59)*
Severity of alcohol dependence (MAST)	1.04 (0.99–1.10)	1.03 (0.97–1.10)	1.01 (0.94–1.08)

\* $p < 0.05$  \*\* $p < 0.01$  Nagelkerke  $R^2 = 0.312$ .

BIS-11—Barratt Impulsiveness Scale; MAST—Michigan Alcoholism Screening Test; NEO-PI-R—NEO Personality Inventory—Revised.

impulsivity as measured by the stop-signal reaction time (vs. non-attempters: OR = 1.84;  $p = 0.042$ ; vs. non-impulsive attempts: OR = 2.42;  $p = 0.039$ ). Impulsive attempters did not differ from the other groups on self-report measures of impulsivity.

#### 4. Discussion

Prior suicide attempts were common in patients seeking treatment for alcohol use disorders in Poland, and the majority of these attempts were impulsive. Individuals with higher severity of alcohol use, prior sexual or physical abuse, a family history of suicidal behaviors, and self-reported impulsivity were more likely to make a suicide attempt. Those individuals with non-impulsive suicide attempts had a similar set of correlates. Of the features examined, only the behavioral measure of impulsivity could readily distinguish those with impulsive suicide attempts from those without. Thus, although impulsive suicide attempts are common in individuals with alcohol use disorders, the characteristics of those who make impulsive attempts are not well elucidated. Prevention efforts designed around more traditional sets of suicide risk factors (e.g., individuals with a family history of suicide) could potentially miss individuals at risk for an impulsive attempt.

The rates of impulsive suicide attempts in the present sample are somewhat higher than those that have been reported previously. In part, this is likely due to the use of 30 min to define an impulsive attempt as compared to the shorter interval of 5 min used in other research (e.g., Simon et al., 2001; Williams et al., 1980). However, Conner et al. (2006) defined impulsive attempts based on an interval of 1 week and found rates of approx-

imately 50%. Thus, differences in the ways in which impulsive suicide attempt are operationalized do not fully explain the higher rates in this sample. It is possible that our rate of 62% reflects a more severe pattern of alcohol dependence in the present sample. In addition, this is the only study of impulsive suicide attempts in a Polish sample that we know of, so it is possible that cultural factors may have accounted for this difference.

The factors that distinguished those with and without suicide attempts were broadly consistent with similar studies of alcohol-dependent individuals. Suicide attempts were more common in those who were younger, had more severe alcohol dependence, higher rates of childhood sexual or physical abuse, higher prevalence of suicidal behaviors in a parent, and higher self-reports of impulsivity. This pattern of findings is generally consistent with what has been described previously in the literature (Hesselbrock et al., 1988; Kingree et al., 1999; Koller et al., 2002; Preuss et al., 2002; Roy, 2000, 2001, 2003; Roy et al., 1990; Swann et al., 2005; Whitters et al., 1985).

There were no differences between alcohol-dependent patients who made an impulsive and non-impulsive attempt on general scores of self-report impulsivity (Barratt Impulsiveness Scale and Impulsiveness facet of the NEO-PI-R Inventory). Moreover, when compared to individuals with no history of suicide attempts, only those with non-impulsive attempts showed higher levels of impulsiveness using self-assessment instruments. Although seemingly counterintuitive, this pattern of findings is consistent with two additional studies that failed to find higher levels of self-reported impulsivity in those with an impulsive attempt (Witte et al., 2008; Wyder and De Leo, 2007). The present study also

included a laboratory measure of behavioral impulsivity. On this measure, individuals with a prior impulsive suicide attempt reported greater difficulty with response inhibition, suggesting a higher level of behavioral impulsiveness. These findings reinforce the idea that impulsiveness is a complex concept, which likely entails different aspects of personality and behavior (Evenden, 1999; Reynolds et al., 2006; Rubio et al., 2007).

Previously, Simon et al. (2001) found that individuals with impulsive suicide attempts reported higher rates of aggressive behaviors than those who made a non-impulsive suicide attempt. They hypothesized that poor behavioral control was an important indicator of risk for impulsive suicide attempts. It is possible that unplanned attempts are uniquely related to a lack of behavior inhibition, but unrelated to the other aspects of impulsivity such as lack of reflection, poor planning or premeditation, or impaired attention processes.

In the present study, a subset of analyses was only possible in those who reported a suicide attempt. In these bivariate comparisons, the methods of attempt and potential lethality of these methods were similar between those with an impulsive and a non-impulsive attempt. These findings are consistent with those of Simon et al. (2001), and highlight the fact that non-planned attempts still have the significant potential to be lethal. However, a higher proportion of those with an impulsive suicide attempt reported using alcohol at the time of attempt (78%) than those with a non-impulsive attempt (52%). Others have reported that impulsive and non-impulsive attempters did not differ in their use of alcohol at the time of attempt (Conner et al., 2006; Simon et al., 2001; Williams et al., 1980). However, the present findings may reflect the overall higher rate of impulsive attempts in this sample, and the high level of severity of alcohol problems at baseline.

When compared to impulsive suicide attempts, the identification of non-impulsive attempts was based on greater number of variables during multivariate analyses. The pattern of findings related to non-impulsive attempts indicates that these individuals reported many of the same factors that previously distinguished suicidal from non-suicidal individuals. In particular, compared to non-suicidal individuals, those with a non-impulsive attempt were more likely to report childhood sexual abuse, a parent who engaged in suicidal behavior, and higher trait-level measures of impulsivity. Thus, existing research on suicide and alcohol use is likely to accurately reflect a set of important risk factors for non-impulsive attempts. However, these correlates may not apply to the examination of impulsive attempts.

#### 4.1. Limitations

The results of the present study should be interpreted with caution for several reasons. First, all analyses are cross sectional and the measures of suicidal behaviors are based on self-report of lifetime suicidality. These measures are likely to be influenced by recall bias. Furthermore, no additional data are available to validate the self-report of suicidal behavior, or the length of time spent planning this behavior. Future studies of impulsive suicide attempts should measure the association between such attempts and concurrent hopelessness and/or suicidal intent using well-validated measures.

The present study did not have a strong measure for lifetime diagnosis of depression. Previous research has identified negative affect as an important factor for distinguishing between those with, and those without an impulsive attempt (e.g., Conner et al., 2006). Self-reported history of depression did not differentiate between any of the groups of interest. The inclusion of a stronger measure for negative affect and/or depression at the time of a suicide attempt may have influenced results in regard to the multivariate models used. More broadly, future work should include structured clinical diagnostic interviews to yield more detailed data about the nature and timing of co-occurring psychiatric disorders. In addition, sample size may have impacted results, as there may have been insufficient power to detect differences between impulsive and non-impulsive suicide attempters. Finally, the extent to which the results generalize to other Polish samples, or individuals in other countries, is unknown.

#### 4.2. Implications

Despite these limitations, to our knowledge this is the first study to compare how self-report and behavioral measures of impulsivity relate to lifetime impulsive and non-impulsive suicide attempts in individuals seeking alcohol treatment. Although impulsive suicide attempts are common, they are difficult to identify and do not necessarily fit the pattern of established risk factors for suicide. Individuals at risk for an impulsive attempt are likely to be missed by existing suicide prevention interventions aimed at those who report these more traditional characteristics. More research is needed to identify and intervene in those at risk for impulsive suicide attempts. The present findings indicate that behavioral measures of impulsivity may be one potential way to identify these individuals, and to assist in predicting future “unpredictable” impulsive attempts.

### Conflict of interest

All authors declare that they have no conflicts of interests.

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