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High Risk or Risky Highs: Understanding the Links Between Alcohol and Cannabis Use on the Transition From Suicidal Ideation to Attempts in Australian Men

Andre Mason , Benjamin C. Riordan, Kirsten Morley, Taylor Winter, Paul Haber, and Damian Scarf 

ABSTRACT

Alcohol and cannabis use are consistently associated with greater risk of suicide, particularly among men and in higher-income countries (e.g., Australia). Adult data ($n = 7,464$) from waves 1 and 2 of Ten to Men: The Australian Longitudinal Study on Male Health were used to explore whether alcohol and/or cannabis use increased the longitudinal risk of a suicide attempt among suicidal ideators. Cannabis use was associated with increased risk of transitioning from suicidal ideation to making a suicide attempt; no association was found for alcohol. Broadly, these findings indicate that greater cannabis but not alcohol use may increase risk of transitioning to making a suicide attempt among those who are thinking about suicide.

KEYWORDS

Alcohol use; Australian men; cannabis use; suicide

Suicide is a serious global public health concern, with more than 800,000 people dying from suicide every year (Roth et al., 2018). In Australia alone, approximately 3,000 individuals die by suicide each year (Australian Bureau of Statistics, 2017). In particular, suicide is especially concerning among Australian men who, in comparison to women, are more likely to die by suicide (Australian Institute of Health and Welfare, 2023); in some parts of Australia, suicide is the leading cause of death in midlife (Alston, 2012).

POSITIONING WITH CONTEMPORARY FRAMEWORKS

Contemporary models of suicide posit an ideation-to-action framework, which holds that the factors that contribute to the development of suicidal ideation are distinct from those that facilitate the transition toward a potentially lethal suicide attempt (Klonsky & May, 2014). The distinction between suicidal ideation and suicide attempts, and the transition between the two, is critical to understanding why some individuals who are thinking about suicide go on to attempt suicide while others do not. One particular model, the Integrated Motivational Volitional Model of Suicide (O'Connor, 2011; O'Connor & Kirtley, 2018), conceptualizes these factors as volitional moderators. That

is, if present while a person is experiencing suicidal thoughts, these factors may increase or decrease the risk of suicidal behaviors occurring.

Identifying factors that may contribute to the transition from ideation to a suicide attempt is critical to better inform the development of more effective prevention strategies for suicide (Wetherall et al., 2018). Two factors that may be involved in the transitional process are alcohol and cannabis use. Although neither alcohol nor cannabis are listed as volitional moderators (O'Connor & Kirtley, 2018), their psychopharmacological properties directly alter volitional moderators such as impulsivity (Choi et al., 2018; Rizk, Herzog, Dugad, & Stanley, 2021) and pain sensitivity (Hosking & Zajicek, 2008). Furthermore, both factors have been consistently associated with greater risk of suicidal thoughts, suicide attempts, and death by suicide (Borges et al., 2017; Borges, Bagge, & Orozco, 2016; Borges & Loera, 2010; Gobbi et al., 2019; Kim, 2021; Orri et al., 2021). These associations are particularly prominent in men (Amiri & Behnezhad, 2020; Kim, 2021) and, specifically for alcohol, in higher-income countries (Kim, 2021).

ALCOHOL, CANNABIS, AND SUICIDE

Alcohol use has been found to precede approximately one-third of suicide attempts (Bagge et al., 2015). Previous research has shown that acute alcohol use increases the risk of suicide attempts, particularly at higher levels (Borges et al., 2017). However, alcohol use appears to be indirectly related to suicide attempts, with the role of alcohol mediated by other substance use (Orri et al., 2021) or depressive symptoms (Choi et al., 2018; Grazioli et al., 2018). Cannabis use, on the other hand, is directly related to the risk of a suicide attempt (Orri et al., 2021), particularly among more frequent users (Borges et al., 2016; Schmidt, Tseng, Phan, Fong, & Tsuang, 2020). To the authors' knowledge, no studies to date have examined whether cannabis use is directly facilitating the transition to a suicide attempt, however.

The ambiguity regarding the pathways for how alcohol and cannabis use are related to the risk of a suicide attempt indicates the need for further research. Currently, the literature has focused on risk factors associated with suicidal thoughts and behaviors rather than whether these factors increase the risk of transitioning from ideation to attempts. To better inform policies related to suicide prevention, alcohol use, and cannabis legalization and use, it is essential to consider whether these factors are increasing the risk of a suicide attempt in those who are thinking about suicide.

CURRENT STUDY

The primary aim of the current study was to investigate the relationships between alcohol and cannabis use and suicide attempts in Australian men. Specifically, we sought to (a) replicate previous findings to determine whether alcohol and cannabis use predicted the likelihood of a suicide attempt and (b) extend the prior literature by investigating whether alcohol and/or cannabis use predicted the likelihood of attempting suicide among individuals who had previously been thinking about suicide (i.e., suicide ideation).

METHOD

Data Source

The study population consisted of adult males who participated in the Ten to Men: Australian Longitudinal Study on Male Health, a large-scale cohort study of Australian males aged 10 to 55 years at baseline. Briefly, a stratified, multi-stage cluster sampling design was used alongside self-completed paper questionnaires that inquired about a range of health and lifestyle factors (see Currier et al. 2016 for full details). All data documentation and technical reports can be found at <https://tentomen.org.au/data-access-and-usage/data-documentation>. Our paper examines longitudinal analyses of complete adult data ($n=7,464$) for the variables of interest collected across waves 1 (2013–2014) and 2 (2015–2016), namely suicidal ideation, suicide attempts, alcohol use, and cannabis use.

Measures

Alcohol Use

The Alcohol Use Disorder Identification Test (AUDIT) (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) is a 10-item screening measure for harmful and hazardous alcohol use. The AUDIT comprises of questions that ask about alcohol use (e.g., “How often do you have six or more drinks on one occasion?”), dependence (e.g., “How often during the past 12 months have you found that you were not able to stop drinking once you had started?”), and experience of alcohol-related consequences (e.g., “Have you or someone else been injured as a result of your drinking?”). Scores from each of the 10 items were summed to produce a continuous AUDIT score, with higher scores indicating more greater alcohol use.

Cannabis Use

Cannabis use was assessed via response to the item “How many times, if ever, have you smoked or used marijuana/cannabis (grass, hash, dope, pot) in the past 12 months?”. Responses were recorded on a seven-point Likert scale ranging from “none (0)” to “40 or more times (6).” Higher scores indicate heavier cannabis use.

Suicidal Ideation and Suicide Attempts

Suicidal thoughts and suicide attempts within the past 12 months were recorded as binary “Yes (1)” or “No (0)” responses to the questions “Have you seriously thought about killing yourself in the past 12 months?” and “Have you tried to kill yourself in the past 12 months?”.

Analysis

Analysis was conducted in R (version 4.2.0). Preliminary logistic regressions were used to examine whether alcohol or cannabis use increased the odds of a suicide attempt within the past 12 months overall. Given our research aim of understanding the

transition from ideation to attempt, we then explored how alcohol and cannabis may predict the presence of suicide attempts over time. Firstly, count data were used to understand the presence of suicidal ideation and suicide attempts at each time point, and Sankey plots (package: *ggsankey*; Sjonberg, 2022) were used to visualize change over time among no suicidal thoughts or attempts, suicidal ideation only, and suicide attempts. Individuals who had made a suicide attempt were considered to have also experienced suicidal thoughts. Secondly, individuals who endorsed experiencing suicidal thoughts in the past 12 months at wave 1 were classified based on their response at wave 2: (1) Ideation-No Suicidal Thoughts or Attempts (SI-Neither), (2) Ideation to Ideation (SI-SI), or (3) Ideation to Attempt (SI-SA). Using these three groups, descriptive statistics were calculated for alcohol and cannabis use, and binomial regressions were used to determine whether use at wave 2 predicted group classification.

RESULTS

Preliminary Analyses

Count data showing the number of individuals who endorsed experiencing suicidal ideation or who made a suicide attempt in the past 12 months at each wave are reported in Table 1. Logistic regressions showed that, within the overall sample, alcohol use (wave 1: OR = 1.04, 95% CI: 1.02–1.06, $p < .001$; wave 2: OR = 1.04, 95% CI: 1.02–1.05, $p < .001$) and cannabis use (wave 1: OR = 1.18, 95% CI: 1.11–1.25, $p < .001$; wave 2: OR = 1.22, 95% CI: 1.16–1.29, $p < .001$) were associated with greater odds of a suicide attempt at both waves (see Table 2).

Transitional Analyses

A Sankey plot (see Figure 1) was used to summarize group classification over time (across waves). Most individuals ($n = 758$; 72.9%) who experienced suicidal ideation at wave 1 also experienced suicidal ideation at wave 2. Approximately one-fifth of ideators

TABLE 1. Count data of suicide outcomes across time.

Characteristic	Time	
	1	2
	($n = 7,464$)	($n = 7,464$)
Suicide ideation	1,333 (18%)	1,840 (25%)
Suicide attempt	324 (4.3%)	369 (4.9%)

TABLE 2. Logistic regression to determine association between alcohol consumption and cannabis use overall across time.

Predictors	Suicide attempt @ W1			Suicide attempt @ W2		
	Odds ratios	95% CI	p	Odds ratios	95% CI	p
Intercept	0.03	0.02–0.04	<0.001	0.03	0.03–0.04	<0.001
Alcohol use	1.04	1.02–1.06	<0.001	1.04	1.02–1.05	<0.001
Cannabis use	1.18	1.11–1.25	<0.001	1.22	1.16–1.29	<0.001
Observations	7,464			7,464		
R^2 Tjur	0.011			0.015		

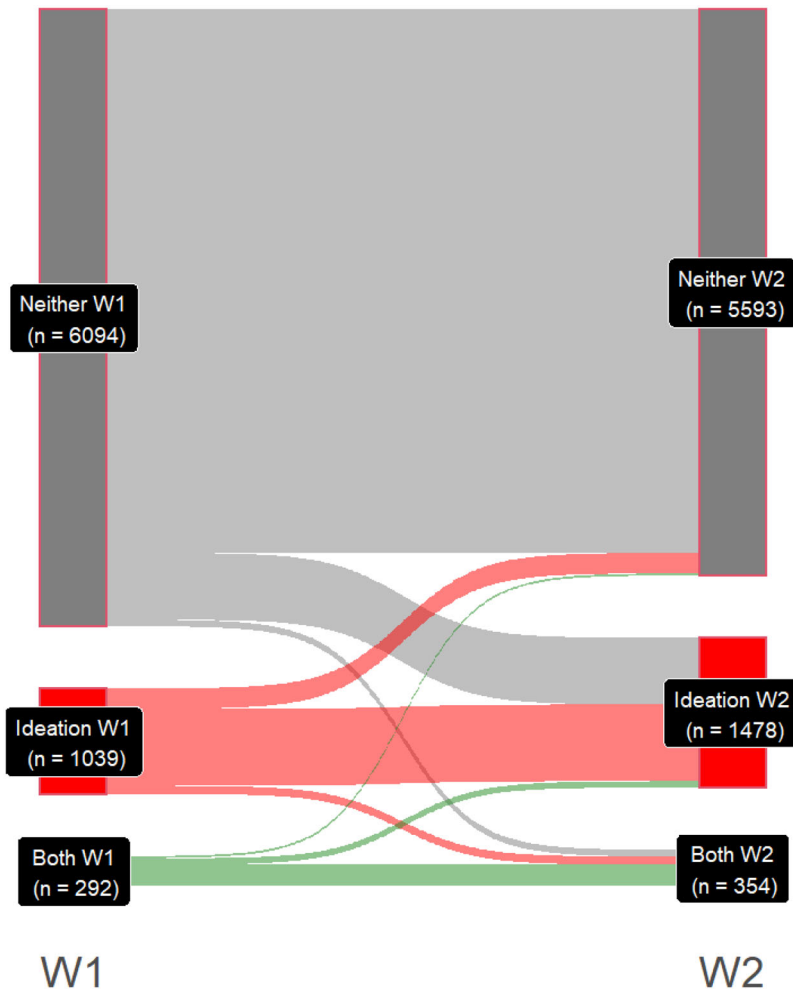


FIGURE 1. Sankey plot to show individuals' suicide outcome over time. W1 and W2 indicate wave 1 and wave 2 respectively showing change over time. Groups based on suicide outcome in past 12 months: neither = no suicidal ideation or suicide attempts; ideation = suicidal ideation; both = suicidal ideation and attempts.

at wave 1 did not experience any suicidal thoughts or behaviors at wave 2 ($n=201$, 19.3%), while 7.7% ($n=80$) of ideators at wave 1 had made an attempt within the past 12 months at wave 2.

To understand the role of alcohol and cannabis use in the transition from ideation to attempt, individuals who endorsed experiencing suicidal ideation (SI) at wave 1 were naturally grouped by their response at wave 2: No ideation or attempt (SI-Neither), ideation only (SI-SI), or both ideation and attempt (SI-SA). Basic descriptive data for alcohol and cannabis use over wave by group is presented in [Table 3](#).

Binomial regressions were used to determine whether alcohol and cannabis use predicted the likelihood of transition from suicidal ideation at wave 1 to either attempting suicide at wave 2 or experiencing no suicidal thoughts (see [Table 4](#)). The odds of transitioning from ideation to having made a suicide attempt were greater among those who

TABLE 3. Descriptive statistics of alcohol consumption and cannabis use for each transition group.

Time	<i>n</i>	Alcohol use (SD)	Cannabis use mean (SD)
SI-Neither			
1	201	8.17 (7.07)	0.93 (1.90)
2	201	7.11 (6.45)	0.79 (1.78)
SI-SA			
1	80	7.78 (6.59)	0.89 (1.71)
2	80	8.03 (7.42)	1.43 (2.20)
SI-SI			
1	758	7.46 (6.24)	0.84 (1.82)
2	758	6.97 (6.15)	0.86 (1.85)

TABLE 4. Binomial regression to determine association between alcohol consumption and cannabis use and suicide outcome.

Predictors	SI-Neither vs. SI-SI			SI-SI vs. SI-SA			SI-Neither vs. SI-SA		
	Odds ratios	95% CI	<i>p</i>	Odds ratios	95% CI	<i>p</i>	Odds ratios	95% CI	<i>p</i>
(Intercept)	3.84	3.04–4.88	<.001	0.08	0.06–0.12	<.001	0.32	0.21–0.48	<.001
Alcohol use	0.99	0.97–1.02	.683	1.02	0.98–1.05	.396	1.01	0.97–1.05	.762
Cannabis use	1.02	0.94–1.12	.594	1.13	1.01–1.25	.026	1.16	1.02–1.33	.025
Observations		959			838			281	
<i>R</i> ² Tjur		0.000			0.009			0.022	

used cannabis, relative to those who experienced suicidal ideation only at each wave (OR = 1.13, 95% CI: 1.01–1.25, $p < .026$) and those who transitioned from ideation to not experiencing suicidal thoughts (OR = 1.16, 95% CI: 1.02–1.33, $p < .025$). Thus, for every 1-point increase in cannabis use in the past 12 months, transitioning from ideation to attempt was 1.13 and 1.16 times more likely than continuing to ideate only or transitioning to no suicidal thoughts, respectively, in our sample.

Alcohol use was not associated with the transition from suicidal ideation to suicide attempts (SI-SI vs. SI-SA: OR = 1.02, 95% CI: 0.98–1.05, $p = .396$; SI-Neither vs. SI-SA: OR = 1.01, 95% CI: 0.97–1.05, $p = .762$).

DISCUSSION

The current study aimed to identify whether heavier alcohol and cannabis use was associated with a greater risk of suicidal behaviors and the transition between suicidal thoughts and behaviors within Australian males. Across both waves, heavier alcohol and cannabis use were associated with greater odds of suicide attempts. Furthermore, among individuals who experienced suicidal thoughts at wave 1, heavier cannabis use but not alcohol predicted greater odds of having made a suicide attempt at wave 2, relative to those who continued to experience suicidal ideation only or who no longer experienced any suicidal thoughts. Broadly, these findings indicate that individuals' greater cannabis use may increase risk of transitioning to making a suicide attempt among those who are thinking about suicide.

Our findings that heavier alcohol and cannabis use is associated with greater odds of a suicide attempt within the past 12 months are consistent with previous research (Borges et al., 2016, 2017; Borges & Loera, 2010; Gobbi et al., 2019; Kim, 2021; Orri et al., 2021). The size of these effects was perhaps smaller than expected, which may be

due to the use of self-reports rather than toxicology reports (Borges et al., 2016) or hospital admissions (Borges et al., 2017).

Looking at the suicidal outcomes in each wave, our findings align with evidence that most individuals who consider suicide do not go on to make an attempt (Klonsky & May, 2014). Among those who did go on to attempt suicide, however, the risk was increased by more frequent cannabis use but not heavier alcohol use. The lack of association for alcohol use is generally consistent with evidence that alcohol use is not directly related to suicide attempts (Grazioli et al., 2018; Orri et al., 2021) and thus, would not be expected to increase the risk of transitioning between ideation to attempt over time. This is interesting given studies showing that acute alcohol use was associated with greater suicide risk (Borges et al., 2017). One possible explanation is that the intervals between waves were not sensitive enough to assess acute use. However, we also see only a very small effect between alcohol use and suicide attempts, so it is more likely that alcohol is not directly increasing the risk of transitioning from ideation to attempt.

Furthermore, the increased risk of suicide attempts in heavier cannabis users is consistent with prior research that demonstrates an overall association (Borges et al., 2016; Gobbi et al., 2019; Morley, Sitharthan, Haber, Tucker, & Sitharthan, 2014; Orri et al., 2021; Schmidt et al., 2020). This finding is somewhat unexpected given the lack of meta-analytic evidence for acute cannabis use on an increased risk of suicide attempts in adults (Borges et al., 2016). One possibility is that the risk of acute cannabis use has shifted over time as more recent evidence, albeit among adolescents, has found that cannabis use is associated with greater risk of suicide attempts on the day the cannabis is used (Sellers, Diaz-Valdes Iriarte, Wyman Battalen, & O'Brien, 2019) or within the past 30 days since cannabis was used (Carvalho et al., 2019). Alternatively, it may be that the mechanisms through which cannabis use increases the likelihood of transitioning to an attempt is not limited to acute use and is related to effects of using cannabis over time. Further research is required to better understand why cannabis use may increase the risk of a suicide attempt.

The current findings emphasize the need for prevention strategies and frameworks to consider the greater risks associated with heavier cannabis use among individuals experiencing suicidal ideation. While this study is unable to comment on the mechanism underlying this relationship, greater cannabis use appears to contribute to the transitional process and increase the risk of engaging in a suicide attempt. Given the increased discussion and trials related to the potential for cannabis products to be involved in medical and psychiatric treatments, particularly for conditions known to be associated with elevated risk for suicide (e.g., chronic pain; Hooley, Franklin, & Nock, 2014; Racine, 2018), further research must examine how cannabis is involved in the volitional phase of a suicide trajectory.

STRENGTHS AND LIMITATIONS

The current data are a large-scale representative sample of Australian men, who are consistently overrepresented in Australia's suicide statistics. Consequently, they offer insight into risk factors within the transition from ideation to attempt that are generalizable to men within the Australian community. Unfortunately, however, the time-lagged nature of

the assessment waves means that the current data lacked the time sensitivity to test acute relationships. Given the previously identified association between acute alcohol use and suicide attempts (Borges et al., 2017), it is possible that any effects of acute alcohol use on risk of transitioning from ideation to attempt could not be assessed.

IMPLICATIONS AND CONCLUDING REMARKS

Overall, we found that heavier alcohol and cannabis use are associated with suicidal ideation and suicide attempts and that greater cannabis use increases the odds of a suicide attempt occurring in individuals who were previously thinking about suicide. These findings offer critical insight into the risk of prevalent lifestyle behaviors catalyzing the shift from ideation to attempt and emphasize the importance for clinicians and policy-makers to be mindful of these risks when working with patients or developing cannabis legislation. Greater research is needed to understand this relationship better so that more effective suicide prevention strategies can be developed.

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AUTHOR CONTRIBUTIONS

DS and BR conceived the initial idea for the manuscript. AM, BR, TW conducted the analyses. AM wrote the initial draft and BR, DS, TW, PH, and KM all reviewed and edited the manuscript.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the author(s).

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