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Alcoholics Anonymous and Reduced Impulsivity: A Novel Mechanism of Change

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Abstract

Reduced impulsivity is a novel, yet plausible, mechanism of change associated with the salutary effects of Alcoholics Anonymous (AA). Here, we review our work on links between AA attendance and reduced impulsivity using a 16-year prospective study of men and women with alcohol use disorders (AUD) who were initially untreated for their drinking problems. Across the study period, there were significant mean-level decreases in impulsivity, and longer AA duration was associated with reductions in impulsivity. In turn, decreases in impulsivity from baseline to Year 1 were associated with fewer legal problems and better drinking and psychosocial outcomes at Year 1, and better psychosocial functioning at Year 8. Decreases in impulsivity mediated associations between longer AA duration and improvements on several Year 1 outcomes, with the indirect effects conditional on participants' age. Findings are discussed in terms of their potential implications for research on AA and, more broadly, interventions for individuals with AUD.

Keywords

Alcoholics Anonymous; Impulsivity; Mechanism of Change

Among individuals with alcohol use disorders (AUD), Alcoholics Anonymous (AA) is linked to improved functioning across a number of domains [1, 2]. As the evidence for the effectiveness of AA has accumulated, so too have efforts to identify the mechanisms of change associated with participation in this mutual-help group [3]. To our knowledge, however, there have been no efforts to examine links between AA and reductions in *impulsivity*—a dimension of personality marked by deficits in self-control and self-regulation, and tendencies to take risks and respond to stimuli with minimal forethought.

In this article, we discuss the conceptual rationale for reduced impulsivity as a mechanism of change associated with AA, review our research on links between AA and reduced impulsivity, and discuss potential implications of the findings for future research on AA and, more broadly, interventions for individuals with AUD. To guide this work, we modified a conceptual framework [4], which delineates the context of drinking-related outcomes (Figure 1). This model posits an association between (I) personal characteristics (i.e., impulsivity) and (II) functioning across multiple domains (i.e., legal problems, alcohol misuse, psychosocial problems). Personal characteristics and functioning influence (III) help-seeking and potential exposure to the “active ingredients” of various types of help (i.e., AA principles/practices), which, in turn, leads to potential improvements in (IV)

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individuals' personal characteristics (i.e., reduced impulsivity) and (V) functioning. Although not explicitly represented in the model, we also focus on reduced impulsivity as a mediator of links between AA and improved functioning, and age as a moderator of the indirect effects of reduced impulsivity.

Conceptual rationale for reduced impulsivity as a mechanism of change associated with AA

Impulsivity and related traits of disinhibition are core risk factors for AUD [5, 6]. In cross-sectional research, impulsivity is typically higher among individuals in AUD treatment than among those in the general population [7] and, in prospective studies, impulse control deficits tend to predate the onset of drinking problems [8-11]. In addition, there are well-established links between impulsivity and poor functioning on a number of domains associated with alcohol misuse. For example, higher impulsivity predicts more legal problems [12]-e.g., more incidents of driving while intoxicated (DWI) [13], more avoidance coping-e.g., emotional discharge coping [14], and lower quality of social support [15, 16].

Although traditionally viewed as static variables, contemporary research has revealed that traits such as impulsivity can change over time [17]. For example, traits related to impulsivity exhibit significant mean- and individual-level decreases over the lifespan [18], as do symptoms of personality disorders that include impulsivity as an essential feature [21, 22]. Moreover, entry into social roles that press for increased responsibility and self-control predict decreases in impulsivity [16, 23, 24]. Hence, individual levels of impulsivity can be modified by systematic changes in one's life circumstances [25].

Substance use-focused mutual-help groups may promote such changes, given that they seek to bolster self-efficacy and coping skills aimed at controlling substance use, encourage members to be more structured in their daily lives, and target deficits in self-regulation [26]. Such "active ingredients" may curb the immediate self-gratification characteristic of disinhibition and provide the conceptual grounds to expect that AA participation can press for a reduction in impulsive inclinations. In turn, given the range of outcomes related to impulsivity (e.g., legal, alcohol-related, and psychosocial problems), decreases in impulsivity may account for part of the association between AA participation and improvements in these outcomes.

Importantly, age may moderate the indirect effects of reduced impulsivity in links between AA participation and better outcomes. Specifically, normative declines in impulsivity are most common in young adulthood-i.e., ages 18-30 [18, 19]. Thus, to the extent that (a) AA participation is associated with reduced impulsivity and (b) reduced impulsivity mediates associations between AA and better outcomes, such effects may be conditional on age-i.e., significant only for individuals in young adulthood.

In this article, we review our findings on associations between AA attendance and changes in impulsivity [27-30] and propose reduced impulsivity as a plausible mechanism of change that may account for part of the salutary effects of AA. Although the idea of reduced impulsivity as a mechanism of change is novel to the AA literature, it is consistent with contemporary definitions of recovery from substance use disorders that emphasize improved citizenship and global health [31], AA's vision of recovery as a broad transformation of character [32], and efforts to explore individual differences in emotional and behavioral functioning as potential mechanisms of change (e.g., negative affect [33, 34]).

Methods

Study design and participants

Participants were individuals initially untreated for AUDs who took part in a prospective study examining factors associated with receipt of help for drinking and the impact of such help on drinking patterns and psychosocial functioning [35]. The study included repeated measurements of impulsivity, receipt of help for drinking, and legal, alcohol-related, and psychosocial outcomes; therefore, it was uniquely suited to test impulsivity as a novel mechanism of change associated with AA.

At baseline, 628 individuals (296 women) were screened on-site by staff from information and referral centers and detoxification programs and deemed eligible for the study based on (1) an AUD as indicated by one or more drinking-related problems/dependence symptoms, drinking to intoxication in the past month, and/or the perception that their drinking was problematic; and (2) no prior professional substance use disorder treatment. These individuals provided informed consent and were administered a baseline interview to assess their substance use and psychosocial functioning. At baseline, participants were, on average, 34.7 years of age ($SD=9.4$) with 13.1 years of education ($SD=2.3$) and an annual income of \$12,225, and were primarily Caucasian (81%), single (79%), and unemployed (60%).

Following the baseline assessment, participants were recontacted by phone and mail after 1, 8, and 16 years and asked to complete an inventory that was largely identical to the baseline protocol. Out of the baseline sample, 515 (82%) and 466 (81% of the 575 individuals who were still alive) individuals participated in the 1- and 8-year follow-ups, respectively, and 405 participants (80% of the 507 individuals who were still alive) completed the 16-year follow-up.

Measures

The primary measures, which were administered at each time point, are summarized here according to the domains in our conceptual model (Figure 1). Descriptive statistics and psychometrics for each variable (e.g., means/SDs, internal consistency estimates) are provided in prior papers [27-30].

Personal characteristics

Impulsivity—The impulsivity scale from the Differential Personality Inventory [36] consisted of 10 items rated on a four-point scale (0=strongly disagree, 3=strongly agree). Items reflected participants' level of agreement with statements related to impulsive behavior and risk-taking (e.g., I act more impulsively than most people) and lack of planning (e.g., I like to do things on the spur of the moment). Higher scores denoted greater levels of impulsivity.

Functioning

Legal problems—Using principal components analyses, a composite of *legal problems* was formed based on participants' responses to six items. Participants were asked, "In the last six months, how often have you had the following problem as a result of your drinking: DWIs; hitting someone; police trouble. Responses to these three items were coded on a five-point scale (0=never, 4=often). Participants were also asked three dichotomous (yes/no) questions about whether they had experienced any of the following in the past year: personally assaulted; trouble with the law; put in jail.

Drinking outcomes—Participants rated their past month *drinking pattern* on a six-point scale (1=did not drink at all; 6=occasional drinking binges). *Alcohol use problems* was a

composite of the average of standardized scores on drinking-related problems and alcohol dependence severity [27]. Drinking-related problems were measured with nine items from the Health and Daily Living Form [37] rated on a five-point scale (0=never, 4=often) and summed to index the frequency with which participants experienced problems due to drinking in the past six months (e.g., work, financial, health). Alcohol dependence severity was the sum of 11 items from the Alcohol Dependence Scale [38] rated on a five-point scale (0=never, 4=often), which assessed physical symptoms due to drinking in the past six months (e.g., shakes when sobering up). *Self-efficacy to resist drinking* was assessed with 14 items from the Situational Confidence Questionnaire [39]. Items were rated on a six-point scale (0=not at all confident, 5=very confident) and concerned situations involving positive and negative emotions and interpersonal conflict.

Psychosocial outcomes—*Emotional discharge coping*—an index of avoidance coping—was measured with five items adapted from the Coping Responses Inventory [40]. Items were measured on a four-point scale (1=no, 4=fairly often) and indicated the frequency with which participants engaged in various activities to reduce tension (e.g., taking it out on others). *Social support* was a composite of the average of standardized scores on quality of support from friends and relatives using items adapted from the Life Stressors and Social Resources Inventory [41]. Support from friends was measured with six items and support from relatives with three items, all rated on a five-point scale (0=no, 4=often).

Receipt of help

AA attendance—At each follow-up, participants were asked whether or not they had attended AA since the prior assessment. Participants who responded in the affirmative reported the duration (number of weeks) of attendance. The reliability and validity of self-reported AA attendance has been documented in prior research [42, 43].

Analyses

Four sets of analyses were conducted. First, a repeated measures analysis of variance (RM-ANOVA) examined mean-level changes in impulsivity. Second, multiple regression analyses examined whether AA attendance predicted decreases in impulsivity, and whether decreases in impulsivity predicted a subsequent decline in legal problems and, more specifically, in DWIs. Third, multiple regression analyses tested whether reduced impulsivity mediated associations between AA attendance and Year 1 and 8 drinking and psychosocial outcomes, with mediation established if (1) AA attendance was associated with a decrease in impulsivity, (2) a decrease in impulsivity was associated with the outcome, and (3) the AA-outcome link was reduced when the decrease in impulsivity was entered into the model [44]. Fourth, conditional indirect effects models [45] tested whether associations between AA attendance and Year 1 outcomes, via decreases in impulsivity, were conditional on age (i.e., moderated mediation). Decreases in impulsivity were measured as change scores in which higher scores denoted a greater decline in impulsivity over the time.

Results

Mean-level decreases in impulsivity

Figure 2 shows the mean-level changes in impulsivity over 16 years [29]. To facilitate interpretation of effect sizes, raw scores at baseline were transformed into T-scores across the total sample ($M=50$, $SD=10$) and T-scores at Years 1 and 16 were computed after standardizing the baseline scores. Per the RM-ANOVA, the main effect of impulsivity was highly significant and indicated a substantial decrease over 16 years, which was comparable for men ($d=-.56$, $p<.01$) and women ($d=-.63$, $p<.01$).

Associations between AA attendance, reduced impulsivity, and legal problems

Table 1 provides the results of regression models that tested (a) the duration of AA attendance in the prediction of decreases in impulsivity over 1 and 16 years, and (b) the duration of AA attendance and decreases in impulsivity in the prediction of legal problems over these time periods [29]. Separate models were run for each predictor. Controlling for baseline impulsivity, longer AA duration was associated with a significant decrease in impulsivity from baseline to Year 1, Years 1 to 16, and from baseline to Year 16. These effects remained significant and essentially unchanged when controlling for the decline in drinking patterns over these time intervals. Controlling for baseline legal problems, longer AA duration was associated with a significant decrease in legal problems from baseline to Year 1, but not from Years 1 to 16 or from baseline to Year 16. However, greater decreases in impulsivity were associated with greater declines in legal problems over all time periods.

Reduced impulsivity as a mediator of associations between AA attendance and DWIs

To expand on these findings, we performed a logistic regression model to examine whether AA attendance was associated with a decrease from baseline to Year 1 in DWIs—an important component of legal problems—and whether the decrease in impulsivity in that timeframe mediated any such association [30]. Controlling for DWIs at baseline, any AA attendance in Year 1 was associated with a decrease in DWIs ($AOR=0.47, p<.05$). Decreases in impulsivity were associated with a lower likelihood of DWIs at Year 1 ($AOR=0.91, p<.05$). When entering both AA attendance and decreases in impulsivity into the model, the effect of decreases in impulsivity on DWIs remained significant ($AOR=0.93, p<.05$). The association between any AA attendance and DWI was reduced, but remained significant ($AOR=0.49, p<.05$). The indirect effect of decreases in impulsivity was significant based on the Sobel test ($p<.05$).

Reduced impulsivity as a mediator of associations between AA attendance and drinking and psychosocial outcomes

Subsequently, we tested whether decreases in impulsivity from baseline to Year 1 mediated associations between duration of AA attendance in Year 1 and changes in drinking and psychosocial outcomes at Years 1 and 8 [27]. The results of the linear regression models are presented in Figure 3 for the Year 1 outcomes of alcohol use problems (Panel A) and self-efficacy (Panel B). Longer AA duration was associated with fewer alcohol use problems and more self-efficacy to resist drinking. Decreases in impulsivity were associated with reductions in alcohol use problems and increases in self-efficacy (2). For alcohol use problems, the effect for impulsivity remained significant when entered concurrently with AA duration, and the link between AA duration and alcohol use problems was reduced, but remained significant (3). For self-efficacy, the effect for decreases in impulsivity remained significant when entered concurrently with AA duration and the association between AA duration and self-efficacy became nonsignificant (3). The indirect effect for decreases in impulsivity, per Sobel tests, was significant for both drinking outcomes ($p<.01$).

For the psychosocial outcomes (Figure 4), longer AA duration was associated with less emotional discharge coping (Panel A) and more social support (Panel B). Decreases in impulsivity were associated with reductions in emotional discharge coping and increases in social support (2). In the prediction of emotional discharge coping, the effect for decreases in impulsivity remained significant when entered concurrently with AA duration, but the AA duration-emotional discharge coping link was reduced to nonsignificance (3). For social support, the effect for the decrease in impulsivity remained significant when entered concurrently with AA duration, and the association between AA duration and social support was reduced, but remained significant (3). The indirect effect for decreases in impulsivity, per Sobel tests, was significant for both psychosocial outcomes ($p<.05$).

As a test of temporal precedence, we examined the indirect effects of decreases in impulsivity from baseline to Year 1 in the link between AA duration (Year 1) and emotional discharge coping and social support at Year 8 [27]. When entered concurrently with AA duration in the models, decreases in impulsivity remained a significant predictor for both emotional discharge coping ($\beta = -0.15$, $p < .01$) and social support ($\beta = 0.13$, $p < .01$) at Year 8, and the indirect effects for decreases in impulsivity, per Sobel tests, were significant for both outcomes ($p < .05$).

Age as a moderator of the indirect effects of reduced impulsivity in associations between AA attendance and outcomes

Based on prior work demonstrating that mean- and individual-level decreases in impulsivity are most prominent in young adulthood [18, 19], we examined whether the indirect effects of reduced impulsivity, in associations between AA attendance and Year 1 outcomes, were conditional on age [27]. In the prediction of decreases in impulsivity from baseline to Year 1, the interaction between AA duration and baseline age reached trend-level significance ($\beta = -.08$, $p = .07$), and post-hoc tests of conditional moderators [46] revealed that longer AA duration was related to reduced impulsivity among individuals 1 SD below (< 25.4 years; $\beta = .22$, $p < .001$), but not those 1 SD above the mean age at baseline (> 44.2 years; $\beta = .06$, *ns*). Subsequently, we tested age-conditioned indirect effects for decreases in impulsivity in the links between AA duration and the Year 1 outcomes (Table 2). For each outcome, the conditional indirect effect of decreases in impulsivity was significant for younger (-1 SD) but not older individuals ($+1$ SD).

Discussion

Several findings are notable from our research on associations between AA attendance and reduced impulsivity. First, consistent with the idea of impulsivity as a dynamic construct [18, 19], mean-levels of impulsivity decreased significantly in our AUD sample. Second, consistent with the notion that impulsivity can be modified by contextual factors [25], individuals who participated in AA longer tended to show larger decreases in impulsivity across all assessment intervals. These findings were not accounted for by decreases in participants' pattern of drinking. Third, decreases in impulsivity were associated with fewer legal problems and better drinking and psychosocial outcomes. Further, decreases in impulsivity mediated associations between AA attendance and improvements in legal, drinking, and psychosocial outcomes at Year 1, thus providing preliminary support for reduced impulsivity as a mechanism of change associated with the beneficial effects of AA. Fourth, the indirect effects of reduced impulsivity in links between AA and Year 1 outcomes were conditional on age-i.e., significant only for individuals 25 years of age or younger. These findings align with evidence that AUD interventions may yield their greatest impact on behavioral change for individuals in young adulthood [47], and recent work demonstrating the benefits of AA for those in emerging adulthood [48].

Implications for research on mechanisms of change associated with AA

Our findings suggest several directions for future research on AA and associated mechanisms of change. First, given that AA appears to promote reduced impulsivity, it becomes important to identify "active ingredients" of AA that may account for this effect. For example, it remains to be seen whether involvement in the principles and practices of AA are linked to reduced impulsivity-e.g., helping others, working the steps [49, 50]. Further, several common social processes that appear to underlie the principles and practices of substance-use focused mutual-help groups should be examined in future work [26]. Specifically, such groups encourage members to be more structured and goal-directed, which may translate into greater efforts to delay gratification of one's impulses. In addition,

mutual-help groups seek to improve clients' general coping skills (e.g., reduce avoidance coping) and self-efficacy to resist drinking, which has been shown to mediate the link between impulsivity and alcohol misuse in an AUD treatment-seeking sample [51].

Second, the findings highlight the potential significance of reduced impulsivity as a mechanism of change, given that impulsivity is a risk factor for a host of problematic behaviors and outcomes beyond drinking-e.g., drug abuse [52], reckless driving and sexual practices [53], criminality [12], lower quality of interpersonal relationships [54], and poor health [55]. Moreover, in the present sample we found higher impulsivity at baseline and Year 1 to be associated with increased risk for mortality from Years 1 to 16 [28]. Notably, this effect was buffered by a higher quality of social support-a probable active ingredient of AA. Thus, the impact of reducing impulsivity may be widespread across a range of outcomes that are critical for long-term sobriety. Nonetheless, more research is needed to test whether the effects of reduced impulsivity are independent of other known mechanisms of AA (e.g., increased self-efficacy, social network changes). In addition, with the exception of Year 8 outcomes [27], most of the mediational models were cross-sectional. Thus, future work must tease apart the direction of effects between reduced impulsivity, reduced drinking patterns, and functional outcomes.

Third, our analyses were limited to a single self-report measure of impulsivity, which was composed largely of items related to non-planfulness (e.g., I usually act upon the first thought that comes into my head). However, impulsivity is a multi-faceted construct comprising a number of tendencies including sensation-seeking, risk-taking, poor decision-making, poor delay of gratification, and emotion regulation deficits [56]. Future studies should examine which facets of impulsivity are most affected by specific active ingredients of AA, and thus most likely to benefit from involvement in this mutual-help group.

Potential practical implications for interventions with individuals with AUD

Our findings highlight the importance of assessing and monitoring impulsivity in the treatment of individuals with AUDs, and suggest that it may behoove informal and formal AUD interventions to emphasize therapeutic techniques that target impulse control problems. For example, "negative urgency" is a facet of impulsivity associated with diminished ability to regulate negative affect and tendencies to act impulsively to reduce distress [56], which predicts negative reinforcement patterns of drinking-i.e., drinking to cope [57]. Thus, interventions, such as AA, that focus on improving emotion regulation skills may be especially helpful in reducing impulsivity among individuals with AUDs [58-60]. In addition to AA, community reinforcement approaches [61] that assist individuals to (a) embed themselves in situations that militate against impulsive actions or (b) find socially constructive outlets for dispositional tendencies that motivate substance use (e.g., sensation-seeking) may also be beneficial, given that a key source of stability for traits involves "niche picking" (i.e., selecting situations that match one's personality).

Alternatively, recent work on the efficacy of working memory training to increase control over automatic impulses to drink highlights the potential value of cognitive rehabilitation techniques for executive functioning deficits [62]. Finally, despite mixed support for the efficacy of matching patients to treatment modalities [61], work by Conrod and colleagues [63, 64] suggests that a brief coping skills intervention matched to substance users' personality profiles and motives (particularly those marked by impulsivity/sensation-seeking) may be effective in reducing post-treatment substance use.

In sum, the present review highlights reduced impulsivity as a novel, yet plausible, mechanism of change associated with the beneficial effects of AA. Although our work is preliminary, the findings are robust across a range of outcomes closely associated with

alcohol misuse. Moreover, the notion of reduced impulsivity as a mechanism of change is well supported by theoretical models that span both the personality development [25] and AA literatures [26]. Future efforts to identify the key mechanisms associated with the benefits of AA would be well served to measure and test for changes in impulsivity.

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Figure 1. Conceptual model of associations between reduced impulsivity, receipt of help for drinking, and improved functioning over time.

Figure 2. Mean-level change in impulsivity over 16 years among men and women with alcohol use disorders (controlling for age at baseline).

Figure 3.

Decreases in impulsivity (baseline to Year 1) as mediator of associations between Alcoholics Anonymous attendance (Year 1) and drinking outcomes at Year 1 (controlling for age and the outcome measures at baseline, and decreases in drinking pattern from baseline to Year 1). Values shown are standardized coefficients. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 4.

Decreases in impulsivity (baseline to Year 1) as mediator of associations between Alcoholics Anonymous attendance (Year 1) and psychosocial outcomes at Year 1 (controlling for age and the outcome measures at baseline, and decreases in drinking pattern from baseline to Year 1). Values shown are standardized coefficients. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 1

Alcoholics Anonymous (AA) attendance in the prediction of impulsivity over 1 and 16 years, and AA attendance and decreases in impulsivity as predictors of legal problems over these time periods.

Predictors	Outcomes (β)			
	Impulsivity		Legal Problems	
	Year 1	Year 16	Year 1	Year 16
<i>Baseline to Year 1:</i>				
AAattendance	-.09 [*]	--	-.14 ^{**}	--
Decreases in impulsivity	--	--	-.19 ^{**}	--
<i>Year 1 to Year 16:</i>				
AAattendance	--	-.13 ^{**}	--	-.08
Decreases in impulsivity	--	--	--	-.11 [*]
<i>Baseline to Year 16:</i>				
AAattendance	--	-.12 ^{**}	--	-.06
Decreases in impulsivity	--	--	--	-.15 ^{**}

Notes. All models controlled for age, gender, education, and marital status at baseline, as well as the baseline scores on either impulsivity or legal problems. AA attendance = number of weeks. Decreases in impulsivity = higher scores denote greater reductions in impulsivity over time.

^{*}
 $p < .05$

^{**}
 $p < .01$.

Table 2

Moderated mediation of associations between Alcoholics Anonymous attendance (Year 1) and drinking and psychosocial outcomes, via decreases in impulsivity (baseline to Year 1), by level of age (baseline).

Outcome	Level of age	Conditional Indirect Effect (SE)	z
Alcohol use problems	-1 SD	.0020 (.0007)	2.78 **
	+1 SD	.0005 (.0006)	0.80
Self-efficacy to resist drinking	-1 SD	.0342 (.0146)	2.34 *
	+1 SD	.0094 (.0105)	0.89
Emotional discharge coping	-1 SD	-.0056 (.0023)	-2.46 *
	+1 SD	-.0016 (.0018)	-0.89
Social support	-1 SD	-.0012 (.0005)	-2.36 *
	+1 SD	-.0002 (.0004)	-0.54

Note. Levels of age correspond to 1 SD below (<25.4 years) and above (>44.2 years) the mean age at baseline, respectively. Conditional indirect effects are unstandardized coefficients. Age and the outcome measure at baseline and decreases in drinking pattern (baseline to Year 1) were controlled in all models.

*
 $p < .05$

**
 $p < .01$.