

How do people recover from alcohol dependence? A systematic review of the research on mechanisms of behavior change in Alcoholics Anonymous

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Abstract

Rigorous reviews of the science on the effectiveness of Alcoholics Anonymous (AA) indicate that AA and related 12-step treatment are at least as helpful as other intervention approaches. Exactly how AA achieves these beneficial outcomes is less well understood, yet, greater elucidation of AA's mechanisms could inform our understanding of addiction recovery and the timing and content of alcohol-related interventions. Empirical studies examining AA's mechanisms were located from searches in Pubmed, Medline, PsycINFO, Social Service Abstracts and from published reference lists. Thirteen studies completed full mediational tests. A further six were included that had completed partial tests. Mechanisms examined fell into three domains: (1) Common processes; (2) AA-specific practices; and (3) Social and spiritual processes. Results suggest AA helps individuals recover through common process mechanisms associated with enhancing self-efficacy, coping skills, and motivation, and by facilitating adaptive social network changes. Little research or support was found for AA's specific practices or spiritual mechanisms. Conclusions are limited by between-study differences in sampling, measurement, and assessment time-points, and by insufficient theoretical elaboration of recovery-related change. Similar to the common finding that theoretically-distinct professional interventions do not result in differential patient outcomes, AA's effectiveness may not be due to its specific content or process. Rather, its chief strength may lie in its ability to provide free, long-term, easy access and exposure to recovery-related common therapeutic elements, the dose of which, can be adaptively self-regulated according to perceived need.

Keywords: *Self-help, mutual-help groups, addiction, alcoholism, recovery*

Introduction

For clinical professionals, addiction patients, and laypeople alike, the topic of Alcoholics Anonymous (AA) can arouse strong emotion. Ranging from “AA is a cult” and “AA doesn’t work” to “AA saved my life” and “AA is the only way to recover”, opinions about its value and effectiveness vary widely (Vaillant 1983; Peele 1990; Bufe 1991; Ferri et al. 2006). Views may differ, but since its modest beginnings in the 1930s and 1940s in Ohio and New York in the US, AA has grown into an influential international organization (Mäkela 1996). Millions of individuals are current members in more than 180 countries, and more than 28 million AA “Big Books” (the main AA text) have sold making it one of the highest selling non-fiction books of all time (Humphreys 2004; AA 2008; Kelly and Yeterian 2008).

In the US, AA is the most commonly sought source of help for alcohol-related problems (Room and Greenfield 1993; Weisner et al. 1995) with roughly 55 000 groups holding meetings at least once per week (AA 2008; Kelly and Yeterian 2008). Recent US survey data estimate attendance at addiction mutual-help groups, such as AA, at five million persons annually (Substance Abuse and Mental Health Services Administration (SAMSHA) 2008). AA’s program and practices have also influenced professional treatment in the US with the vast majority endorsing at least some tenets of 12-step philosophy (Roman and Blum 1999; Drug Strategies 2003). Noteworthy too, is that regardless of the theoretical orientation of formal treatment programs, referral of alcohol-dependent patients to AA is the norm in the US (Humphreys 1997; Kelly et al. 2008b).

Rigorously conducted empirical reviews of AA-focused research indicate that AA participation is helpful for many different types of individuals in their recovery from alcohol dependence (Emrick et al. 1993; Tonigan et al. 1996; Kownacki and Shadish 1999; Kelly 2003; Humphreys 2004; Ferri et al. 2006; Kelly and Yeterian 2008). Determining exactly how and why AA is helpful has been a comparatively new, yet intriguing, line of inquiry that has gathered increasing momentum as the broader alcohol treatment and recovery field has moved toward understanding “mechanisms of behavior change” (Morgenstern and McKay 2007; Willenbring 2007). The renewed emphasis on mechanisms of change stems from the consistent finding that, despite a burgeoning of empirically-supported treatments for alcohol and other drug use disorders (Finney et al. 1996; Miller and Willbourne 2002; SAMHSA 2008), these theoretically disparate interventions appear to produce very similar outcomes under rigorous testing conditions (Project MATCH Research Group 1997; Crits-Christoph et al. 1999; Dennis et al. 2004; Anton et al. 2006; Imel et al. 2008; UKATT Research Team 2008). Prior reviews have covered the question of the effectiveness of AA and 12-step treatment in some detail. The current review is therefore focused on what is known regarding how AA helps individuals achieve sobriety.

To begin, we clarify some important distinctions between AA and 12-step-based treatments. Subsequently, for those unfamiliar with some of the research conducted on AA and related 12-step treatments, we present a very brief overview of the largest prospective 12-step-focused research studies. This is followed by a description of AA’s own purported theory of recovery-related change and a subsequent review of the empirical literature on what is known about how AA may exert its beneficial effects. In the final section, we discuss the limitations of existing knowledge and approaches, and offer some theoretical elaboration on how recovery-related change might occur as a function of AA participation.

AA versus “12-step treatment”

The community fellowship, Alcoholics Anonymous, can be confused with both “Twelve-Step Facilitation” (TSF) and “12-step treatment” (sometimes referred to as the Minnesota Model; McElrath 1997). To clarify, AA is a non-professional, community-based fellowship that provides help through a network of informal gatherings, convened at rented venues, such as churches and hospitals (AA owns no property; AA 1953). “TSF” is the name given to a professional, manualized, intervention designed to facilitate engagement in AA. When the phrase “12-step treatment” is used, it typically refers to a residential program in which patients receive various interventions, but also are educated in-depth about AA and the 12 steps and may formally work through some of these steps. Patients often attend AA during treatment and are strongly encouraged to continue post-discharge (McElrath 1997). Although professional treatments may incorporate AA practices and philosophy and refer patients to AA, AA itself is not affiliated with any professional entity or organization (AA 1953). Next, we describe some of the findings regarding the effectiveness of AA and related 12-step approaches.

Evidence regarding the effectiveness of AA and 12-step treatment approaches

Despite existing for more than 70 years and influencing both formal and informal approaches to alcohol and other drug-related treatment, it is only recently that AA has been subjected to rigorous scientific inquiry (e.g., Institute of Medicine 1990; Emrick et al. 1993; Tonigan et al. 1996; Kownacki and Shadish 1999; Ferri et al. 2006). Empirical reviews of the literature on AA and 12-step treatment consistently converge on the finding that AA is, at a minimum, helpful to many as they try to recover from alcohol dependence (Emrick et al. 1993; Tonigan et al. 1996; Kownacki and Shadish 1999; Kelly 2003; Humphreys 2004; Ferri et al. 2006; Kelly and Yeterian 2008).

Perhaps the largest and most rigorously conducted clinical trial examining 12-step treatment and AA participation among alcohol-dependent patients was conducted in the US (i.e., Project MATCH; Project MATCH Research Group 1993). This study found that the TSF condition was at least as effective as the two more empirically-established comparison treatments (cognitive-behavioral therapy [CBT], motivational enhancement therapy [MET]) in reducing the quantity and frequency of alcohol use at post treatment, and 1- and 3-year follow-ups (Project MATCH Research Group 1997, 1998a, 1998b). Moreover, TSF was superior at increasing rates of continuous abstinence. Specifically, 24% of the outpatients in TSF were continuously abstinent throughout the year after treatment, compared to 15% and 14% in CBT and MET, respectively. Abstinence rates at 3 years continued to favor TSF, with 36% reporting abstinence, compared to 24% in CBT and 27% in MET (Cooney et al. 2003).

Findings also suggested that TSF may be more effective with specific types of patients. Those with less psychiatric severity (Project MATCH Research Group 1997) and those with more severe alcohol dependence (Cooney et al. 2003) had better outcomes in TSF than in CBT at post-treatment and 1-year follow-up, respectively. More substantial effects were observed in relation to patients' social networks. Outpatients with networks supportive of drinking at intake had better 3-year outcomes in TSF than in both comparison treatments, and this difference was related to AA group attendance during

the follow-up (Longabaugh et al. 1998). Also, regardless of which original treatment patients got, individuals who attended AA had significantly better drinking outcomes (Tonigan et al. 2003).

Compelling evidence for the cost-benefit effects of 12-step approaches to treatment has also been shown. A large multi-site study of US Veterans Administration (VA) intensive treatment programs compared the 1-year outcomes of patients treated in either intensive CBT or 12-step treatment. Those treated in 12-step treatment settings had substantially greater 12-step group participation than patients treated in CBT programs, who received twice the number of outpatient visits and significantly more inpatient mental health days. This difference in professional service utilization resulted in 64% higher annual costs for CBT than for 12-step programs. Notably, the demographic and clinical characteristics of patients across the two types of programs at intake were comparable. The outcomes were comparable also, except that patients treated in 12-step programs had higher rates of abstinence (46% *vs.* 36%; Humphreys and Moos 2001).

A 2-year follow-up of the multi-site VA sample (Humphreys and Moos 2007) found a substantially higher abstinence rate among patients treated in 12-step (50%) compared to CBT (37%) programs. Again, patients from 12-step programs were more AA-involved than CBT patients, while CBT patients relied more on outpatient and inpatient mental health services. This resulted in 30% lower costs for those treated in 12-step programs (savings of \$2440 per patient) while achieving significantly better abstinence rates. These results were consistent with earlier findings in a non-VA sample that showed 45% lower treatment costs over a 3-year period for AA attendees compared to those electing outpatient care (Humphreys and Moos 1996).

The research reviewed shows abstinence and cost benefits of 12-step treatment. A large number of studies have also examined community AA group participation in relation to long-term outcomes following a variety of treatment approaches. These studies have found AA attendance over follow-up to be associated with enhanced abstinence outcomes and remission rates among different patient subgroups, including women, youth, dually-diagnosed individuals, and patients of varying ethnic backgrounds (e.g., Miller et al. 1997; Morgenstern et al. 1997; Ouimette et al. 1997; Kaskutas et al. 1999, 2005; Fiorentine et al. 2000; Timko et al. 2000; Tonigan et al. 2002; McKellar et al. 2003; Kissin et al. 2003; Moos et al. 2004, 2006; Dawson et al. 2006; Kelly et al. 2006, 2008b).

The vast majority of existing research has been conducted in the U.S. However, although research on AA has been rare in the United Kingdom, and clinician attitudes have been generally less favorable toward 12-step approaches (Humphreys 1999; Laudet 2003; Day et al. 2005; Kelly et al. 2008b), UK studies show similar AA-related recovery benefits post-treatment (Gossop et al. 2003, 2007).

Summary

From an intervention dissemination and impact perspective (e.g., Glasgow et al. 2003), AA has reach and effectiveness, appears to be readily adopted and implemented, and has evident staying power. Given the consistent recovery-related and cost-effectiveness findings associated with AA participation across time, a central question is how exactly AA helps its participants. This is the focus of the next section.

How does AA help individuals recover from alcohol dependence?

Contrary to AA's language and somewhat mystical terminology documented in its main texts (AA 1939, 1953, 2001) one might argue that its mechanisms could be explained by ordinary means, such as through common processes of change (e.g., by increasing and/or maintaining motivation, self-efficacy, and coping skills). With equal validity, one might argue that AA works through practices specific to AA (e.g., working the 12-steps) or by providing access to a low-risk social network. It may be through some combination, all, or none of the above. In this section, we attempt to clarify how AA works by first describing AA's own proposed mechanisms, and then by summarizing the empirical literature regarding what is currently known about how AA may exert its effects.

How change occurs from AA's own perspective

Given that AA grew out of a religio-spiritual tradition rather than an academic or scientific one, a coherent or consistent description of AA's purported mechanisms can be difficult to grasp from its main texts (AA 1939, 1953). Some change mechanisms (i.e., the 12-steps) and their effects are made clear: "The fact is just this, and nothing less: That we have had deep and effective spiritual experiences which have revolutionized our whole attitude toward life, toward our fellows, and toward God's universe" (AA 2001, p. 25). On the other hand, the social and fellowship aspects inherent in group meetings are more implicit in much of AA's writings, especially those in the Big Book (1939). This may be because the fellowship was largely non-existent at the time this book was written and published (with less than 100 members across two states, Ohio and New York; AA 2001) and the original main text body has not been changed, apart from forewords to each subsequent edition (AA 2001). However, we believe it is safe to say that AA facilitates change via two broadly defined components: the AA "program", exemplified in the 12 steps, and the AA "fellowship", characterized by the network of formal and informal social gatherings and communications between meetings.

The central proposed mechanism of recovery from alcohol addiction according to AA is through a "psychic change" (AA 2001, p. xxvi), "spiritual experience", or "spiritual awakening" (AA 2001, Appendix II) achieved through completion of the 12-step program (as noted in Step 12: "Having had a spiritual awakening as the result of these steps..."). A measurable definition of a spiritual "experience" or "awakening" has eluded many (Galanter 2007b). Although AA states that this "awakening" can take the form of a sudden shift in belief and perspective, it also characterizes this transformation as a gradual change of an "educational variety" that leads to "... a profound alteration in [his] reaction to life" (AA 2001, Appendix II). This is not only associated with belief in a "higher power", but also involves concrete changes in specific attitudes and behaviors. Alcohol treatment researchers have subsequently proposed that some of these attitudinal or behavioral shifts may be consistent with those mobilized in other behaviorally-oriented treatments (McCrary 1994). Thus, although the language and concepts may differ on the surface, underneath the same ultimate (common) processes may be operating. Therefore, AA identifies internal cognitive-affective and spiritual changes arising out of engagement in AA-prescribed behaviors, and, as will be explored in more detail shortly, varying alcohol researchers have alternately considered these purported mechanisms as AA-specific and as common factors of behavior change.

Although often implicit in AA's own writings on how AA conveys its beneficial effects, another major feature of Alcoholics Anonymous is the social or "fellowship" dimension.

This vital social context in which recovery behaviors are learned, modeled, and supported, as noted above, is less explicitly documented as an essential curative component in AA's main texts, but is captured in the preamble read at the start of nearly all AA meetings (AA 1947):

Alcoholics Anonymous is a fellowship of men and women who share their experience, strength and hope with each other that they may solve their common problem and help others to recover from alcoholism. The only requirement for membership is a desire to stop drinking. There are no dues or fees for A.A. membership; we are self-supporting through our own contributions. A.A. is not allied with any sect, denomination, politics, organization or institution; does not wish to engage in any controversy; neither endorses nor opposes any causes. Our primary purpose is to stay sober and help other alcoholics to achieve sobriety.

The explicit emphasis is on mutual "sharing", or communication, of experiences in an attempt to help oneself and others. Sharing of addiction and recovery experiences may impart important technical aspects of living sober, evoke a sense of empathy and belonging, and instill hope. As alluded to in the preamble's last sentence, a central goal of 12-step organizations invokes the "helper principle" (Riessman 1965), which is quite simply the notion that "helping you helps me". As AA states: "Practical experience shows that nothing will so much insure immunity against drinking as intensive work with other alcoholics" (AA 1939, 2001, p. 89). Thus, within the dimension of fellowship lie the proposed processes of mutual sharing and helping others (Zemore and Kaskutas 2004; 2008; Pagano et al. 2007), but alternative interpretations include principles of observational learning (Bandura, 1969) and group theory dynamics (Yalom 1995; Yalom and Leszcz 2005) as well as health-promoting social network changes (Kaskutas et al. 2002).

In summary, one can deduce that AA-related changes occur via intrapersonal, behavioral, and social processes. A number of these are specifically tied to AA's philosophy and prescription for change, and treatment researchers have debated the existence of AA-specific, *versus* common, processes. This latter point connects to the complexity involved in establishing a mechanism of behavior change.

What is a mechanism of behavior change?

"A mechanism of change refers to the process or series of events through which one variable leads to or causes change in another variable" (Nock 2007, p. 5S). "Mechanisms" of behavior change, of course, can be conceptualized at multiple levels of scale. Thus, the exact same change in behavior can be simultaneously explained by social, psychological, behavioral, and neurobiological processes. Thus different mechanisms thought to account for behavior change during a defined time period might justifiably be measured at all of these different levels, and statements such as, "AA works by exposure to abstinent role models", and, "AA works by increasing self-efficacy" and, "AA works by increasing individuals' density of dopamine D2 receptors" are all mechanisms that may be empirically supported and occur simultaneously. Also, AA is a complex entity. Thus, no single mechanism is likely to account for its entire effects. These mechanisms are also likely to change over time; the mechanisms through which AA may help individuals achieve sobriety may not be the same as those sustaining it.

Statistical mediation will satisfy some, but not all, of the criteria for identifying a mechanism of change (Kazdin and Nock 2003). The requirements for demonstrating the operation of a "mechanism of change" combines both the criteria for statistical

mediation (e.g., Baron and Kenny 1986; MacKinnon et al. 2002) and the criteria for inferring causal relations (Hill 1965; Cook and Campbell 1979). Seven criteria have been proposed: association, temporality, specificity, gradient, plausibility and coherence, consistency, and, ideally, validation via experimental manipulation (Kazdin and Nock 2003; Nock 2007). Because research employing statistical tests of mediation (or a close approximation) is the focus of this review, the first three of the Kazdin and Nock (2003) criteria will be emphasized. The association is the first step (i.e., the variables must covary). The causal inference is strengthened by temporality (i.e., the cause occurs before the effect), and specificity (i.e., the mechanism is specific solely to the particular intervention). Promising mechanisms of change in AA should therefore be correlated with the AA variable, follow it in time and occur before the measured outcome, and ideally, possible confounding variables should be eliminated as alternative explanations.

Literature search and criteria for inclusion in this review

We conducted a literature search to identify studies examining mediators of AA's effect on alcohol or other drug use outcomes. The search strategy included a title, abstract, and keyword search in Pubmed, Medline, PsycInfo and Social Services Abstracts using the following search terms: AA OR Alcoholics Anonymous OR Self-help OR 12-step AND mediators OR mechanisms or process. References from articles identified in the preceding step and from relevant reviews of the AA literature (e.g., Emrick et al. 1993; Kassel and Wagner 1993; Khantzian and Mack 1994; Tonigan et al. 1996; Kelly 2003; Kelly and Myers 2007; Moos 2008) were searched to identify additional eligible studies. The studies identified for inclusion were English language published between 1990 and 2007 (inclusive). Of central interest were (1) primary analyses from naturalistic research on community groups or 12-step oriented programs or (2) secondary analyses from controlled clinical trials on TSF. Included studies conducted formal tests of statistical mediation or an approximation.

A "formal" test of mediation was defined as the casual steps outlined by Baron and Kenny (1986) and extended by MacKinnon and Dwyer (1993). To establish mediation, the following conditions should be met: (1) the "a" path (e.g., AA participation) should predict the outcome ("c"; e.g., reduced alcohol consumption/abstinence) (2) the a path should predict the mediator ("b"; e.g., self-efficacy), (3) the mediator should predict the outcome, and (4) the direct effect of a on c should be reduced or eliminated when b is controlled. The mediated effect can be identified by a reduction in coefficient magnitude (Baron and Kenny 1986; MacKinnon and Dwyer 1993) or a test of the joint significance of the $a \rightarrow b$ and $b \rightarrow c$ paths (Sobel 1982; MacKinnon et al. 2002). Studies formally testing mediation were relatively few ($n = 13$). Therefore to allow for a broader discussion of the literature and particularly of the range of mediators that have been considered in relation to AA's effects, research examining the a to b paths and the b to c paths was also considered ($n = 6$).

The extracted studies' mechanisms of focus generally fell into three classes: (1) common factors (i.e., self-efficacy, commitment to abstinence, active coping efforts; see Table I), (2) specific AA practices (i.e., AA behaviors/activities, AA beliefs/cognitions; see Table II), and (3) more explicit constructs related to AA's theory of change (e.g., social network variables, spirituality variables; Table III). These are detailed next starting with common factors.

Table I. Studies examining common therapeutic factors.

Study References	Type of sample (N)	Demographic characteristics	Primary outcome	Mediator/s	Findings
Connors et al. (2001)	Outpatient and aftercare arms; Project MATCH (N = 924)	Mean age 40 Male 75% Caucasian 82%	PDA 7–12mo alcohol use	Self-efficacy	AA participation _{1-6mo} → self-efficacy _{6mo} → PDA _{7-12mo} ^{a,b}
Tonigan et al. (2003)	Outpatient and aftercare arms; Project MATCH (N = 952)	Mean age 40 Male 75% Caucasian 82%	PDA 33–36mo alcohol use	Self-efficacy Spirituality	AA participation _{1-6mo} → self-efficacy _{6mo} → PDA _{33-36mo} ^{a,b}
Bogenschutz et al. (2006)	Outpatient and aftercare arms; Project MATCH (N = 1284)	Mean age 40 Male 77% Caucasian 81%	PDA 10–15mo alcohol use	Self-efficacy	AA attendance _{4-6mo} → self-efficacy _{9mo} → PDA _{10-15mo} ^{a,c}
Morgenstern et al. (1997)	Inpatient 12-step program (N = 100)	Mean age 34 Male 58% Caucasian 63%	PDU 1–6mo substance use	Self-efficacy Commitment Coping Primary appraisal	AA affiliation _{1mo} → self-efficacy _{1mo} → PDU _{1-6mo} ^d commitment _{1mo} coping _{1mo} primary appraisal _{1mo}
Morgenstern et al. (1998)	Inpatient 12-step Program (N = 118)	Mean age 36 Male 58% Caucasian 66%	PDU 1–6mo substance use	Self-efficacy Commitment Negative expectancy	12-step Program → self-efficacy _{1mo} → PDU _{1-6mo} ^e commitment _{1mo}
Kelly et al. (2000)	Inpatient 12-step program (N = 99)	Mean age 16 Male 40% Caucasian 78%	PDA 3–6mo substance use	Self-efficacy Commitment Coping	AA attendance _{1-3mo} → commitment _{3mo} → PDA _{3-6mo} ^{a,f}
Kelly et al. (2002)	Inpatient 12-step program (N = 74)	Mean age 16 Male 38% Caucasian 70%	PDA 4–6mo substance use	Self-efficacy Commitment Coping	AA affiliation _{1-3mo} → commitment _{3mo} → PDA _{4-6mo} ^{a,f}

Notes: Demographic data rounded to nearest whole number. PDA = percent days abstinent; PDU = percent days used; NDA = number days used; NDU = number days used; AA = Alcoholics Anonymous; TSF = Twelve-Step Facilitation; VA = Veterans Administration; CB = Cognitive Behavioral; ASI = Addiction Severity Index; mo = month; post = posttreatment; beh = behavior; abs = abstinence; dep = dependence symptoms.

^aTested by Baron and Kenny (1986)/MacKinnon and Dwyer (1993) method in Structural Equation Model.

^bIntake symptomatology predicted AA participation; results not moderated by treatment group.

^cResults not moderated by alcoholism typology.

^dTested by Baron and Kenny (1986) method in series of linear regression models.

^eResults moderated by cognitive impairment; process variables were stronger predictors of outcome for unimpaired compared to impaired individuals via linear regression analyses.

^fBaseline severity predicted AA attendance and affiliation; impact of AA attendance on month 3 commitment mediated by AA affiliation.

Table II. Studies examining general AA practices and principles.

Study References	Type of sample (N)	Demographic characteristics	Primary outcome	Mediator/s	Findings
Morgenstern et al. (1995)	Inpatient and outpatient 12-step programs (N = 79)	Mean age 35 Male 68% Caucasian 68%	Abstinence 1mo substance use	12-step cognitions Common cognitions	¹ 12-step program → change in 12-step cognitions _{post} ^a ¹ 12-step program → change in general cognitions _{post} ^a change in common cognitions _{post} → abstinence _{1mo} ^b ¹ 12-step program → change in 12-step cognitions _{post} ^a ¹ 12-step program → change in common cognitions _{post} ^a ² change in 12-step cognitions _{post} → PDA _{9-12mo} ^b ¹ coping X 12-step program → substance coping _{post} ^c ¹ symptoms X 12-step program → substance coping _{post} ^c ¹ Dep X 12-step program → 12-step behaviors _{post} ^c ² 12-step behaviors _{post} → 12-step behavior _{post} → abstinence _{12mo} ^d 12-step program → abstinence _{goal} ^e goal _{post} → abstinence _{12mo} ^e 12-step reading _{post} ^e 12-step program → abstinence _{goal} ^e goal _{1,2mo} → abstinence _{1,2m} ^e 12-step reading _{1,2mo} ^e # self-help meetings _{12mo} having a sponsor _{12mo} TSF X change in 12-step beh/cog _{post} → NDA _{3-6mo} ^b
Morgenstern et al. (2002)	Inpatient and outpatient 12-step programs (N = 370)	Mean age 36 Male 62% Caucasian 49%	PDA 9-12mo substance use	General cognition 12-step cognitions Common cognitions	
Ouimette et al. (1999)	Inpatient VA programs CB and 12-step-oriented (N = 1873)	Mean age 43 Male 100% Caucasian 50%	Abstinence 12mo substance use	12-step behaviors 12-step cognitions CB cognitions Substance coping General coping	
Johnson et al. (2006)	Inpatient VA programs CB and 12-step-oriented (N = 1873)	Mean age 43 Male 100% Caucasian 50%	Abstinence 12mo substance use	12-step behaviors 12-step cognitions CB cognitions Substance coping General coping	
Brown et al. (2001)	Aftercare relapse prevention or TSF group treatment (N = 131)	Mean age 38 Male 70% Caucasian 93%	Composite outcome 6mo substance use	12-step behaviors 12-step cognitions Temptation Confidence	
Critts-Christoph et al. (2003)	Outpatient individual and group 12-step counseling (N = 325)	Mean age 34 Male 77% Caucasian 58%	ASI 1-6mo cocaine use	12-step behaviors 12-step cognitions	12-step counseling → 12-step beh/cog _{1-6mo} → ASI _{1-6mo} ^f

Notes: Demographic data rounded to nearest whole number. PDA = percent days abstinent; PDU = percent days used; NDA = number days used; NDU = number days used; AA = Alcoholics Anonymous; TSF = Twelve-Step Facilitation; VA = Veterans Administration; CB = Cognitive Behavioral; ASI = Addiction Severity Index; mo = month; post = posttreatment; beh = behavior; abs = abstinence; dep = dependence symptoms.

^aTested by *t*-test.

^bTested by binary logistic or linear regression.

^cTested by analysis of variance.

^dTested by bivariate correlation.

^eTested by Baron and Kenny (1986) method in series of binary logistic regression models.

^fTested by analysis of Baron & Kenny (1986) method in series of generalized mixed-model; final step tested by proportion decrease in *F* ratio for direct effect.

Table III. Studies examining AA-proposed intra- or interpersonal changes.

Study References	Type of sample (N)	Demographic characteristics	Primary outcome	Mediator/s	Findings
Humphreys et al. (1999)	Inpatient VA programs (N = 2867)	Mean age 43 Male 100% Caucasian 45%	NDU 9–12mo Substance use	Coping Friendship quality Network support for abstinence	2-step involvement _{post} → coping _{1,2mo} → NDU _{0-12mo} ^a friendship quality _{12mo} network support _{1,2mo}
Kaskutas et al. (2002)	Inpatient and outpatient community programs (N = 654)	Mean age 38 Male 58% Caucasian 67%	Problem Severity 12mo Alcohol use Abstinence 36mo	Social network size Network support for drinking	AA involvement _{0-12mo} → net sup drink _{12mo} → sev _{0-12mo} ^a
Bond et al. (2003)	Inpatient and outpatient community programs (N = 655)	Mean age 38 Male 56% Caucasian 60%	Alcohol use	Social network size% network drinker Network sup abs AA sup abs Social support	AA involvement _{0-12mo} → AA sup abs _{1,2mo} → abs _{33-36mo} ^b
Laudet et al. (2004)	Double Trouble Recovery (DTR) group members (N = 310)	Mean age 40 Male 72% Caucasian 24%	PDU 12–24mo Substance use		DTR affiliation _{0-12mo} → soc support _{1,2mo} → PDU _{12-24mo} ^c
Owen et al. (2003)	Inpatient 12-step program (N = 112)	Mean age 38 Male 53% Mean age 40	NDA 12mo	Lifestyle changes Response to life events	AA involvement _{0-12mo} → lifestyle ch _{0-12m} → NDA _{0-12mo} ^a
Magura et al. (2003)	Double Trouble Recovery (DTR) group members (N = 310)	Male 72% Caucasian 24%	Abstinence 12mo Substance use -health behavior 12mo	Locus of control Sociability Spirituality hope	DTR affiliation _{0-12mo} → locus of control _{12mo} → abs _{0-12mo} ^d sociability _{12mo} DTR affiliation _{0-12mo} → loc cont _{1,2mo} health beh _{0-12mo} ^d sociability _{12mo} spirituality _{1,2mo} hope _{1,2mo}

Notes: Demographic data rounded to nearest whole number. PDA = percent days abstinent; PDU = percent days used; NDA = number days used; NDU = number days used; AA = Alcoholics Anonymous; TSF = Twelve-Step Facilitation; VA = Veterans Administration; CB = Cognitive Behavioral; ASI = Addiction Severity Index; mo = month; post = posttreatment; beh = behavior; abs = abstinence; dep = dependence symptoms.

^aTested by Baron and Kenny (1986)/MacKinnon and Dwyer (1993) method in Structural Equation Model.

^bTested by Baron and Kenny (1986) method in series of linear regression models.

^cTested by Baron and Kenny (1986) method in series of binary logistic regression models.

^dTested by Baron and Kenny (1986) method in series of binary logistic regression models.

A review of research on mechanisms of behavior change in AA

Common factors

A number of studies have examined cognitive (e.g., self-efficacy, motivation for abstinence) and behavioral (e.g., active coping) changes thought to be important to recovery regardless of the treatment received, but that have been more explicitly implicated in treatments other than 12-step approaches (e.g., CBT). Using data from Project MATCH, Connors et al. (2001) looked at 6-month self-efficacy as a mediator of the relationship between AA participation (including attendance, step-work, spirituality) during the first 6 months of treatment and abstinence at 7–12 month follow-up. Self-efficacy accounted for a significant reduction in the direct effect of AA participation on later drinking, and this mediational effect held in both the outpatient and aftercare samples and across treatment conditions (i.e., TSF, CBT, MET; Connors et al., 2001). The effect of self-efficacy was maintained at 3-year follow-up, and showed that AA step-work in particular was related to perceived confidence to avoid drinking in social situations and when experiencing negative affect (Tonigan 2003). Thus, one way that AA appears to work is by boosting confidence in participants' perceived ability to handle common relapse-related situations or circumstances. In both of these studies, greater alcohol use severity was associated with more AA participation. The benefit of AA for these patients appeared to be at least partially explained by changes in beliefs in their capacity to abstain from alcohol.

Research with community samples has examined common therapeutic factors as mechanisms of behavior change. In an inpatient sample, Morgenstern et al. (1997) found that the positive effects of an aggregated measure of AA affiliation (e.g., AA attendance, talking with sponsor, group service, step-work) on 6-month substance use were mediated by a set of common factors measured at 1 month (i.e., self-efficacy, commitment to abstinence, active coping efforts, primary appraisal [i.e., recognition of sustained or anticipated consequences of use]). A subsequent study found that these factors were stronger predictors of later abstinence among 12-step treatment program patients without cognitive impairment when compared to impaired individuals (Morgenstern and Bates 1999). In an adolescent sample, Kelly et al. (2000) examined self-efficacy, motivation for abstinence, and coping as mechanisms of the effect of AA attendance in the first 3 months following inpatient treatment on subsequent 4 to 6-month substance use outcomes. Here, only motivation for abstinence mediated the effect of AA, and similar to the finding among adults receiving TSF (Connors et al. 2001; Tonigan 2003), more severely substance-involved patients attended AA more frequently. In a follow-up study, active AA involvement (e.g., talking with sponsor, group service, step-work) was shown to be a more important predictor than attendance alone, and the central mediating role of motivation for abstinence remained consistent (Kelly et al. 2002). Thus, similar to adults, baseline alcohol use severity in adolescents is a predictor of AA attendance and affiliation, and both age groups show increases in common therapeutic factors of self-efficacy, motivation, and active coping. However, in younger patients, only motivation for abstinence mediated the effect of 12-step involvement on outcome, suggesting AA-derived therapeutic benefits may differ developmentally. Findings from these studies are strengthened by formal meditational tests and temporality maintained across causal pathways (Nock 2007).

Specific AA practices

A series of studies has examined and compared AA-specific cognitive and behavioral changes to other potential non-specific change mechanisms. Morgenstern et al. (1995)

tested three groups of cognitive change factors post-treatment: AA-specific (e.g., acceptance of powerlessness, belief in a higher power, commitment to AA, disease attribution); abstinence specific (i.e., commitment to abstinence, intent to avoid high-risk situations), and general psychotherapy (i.e., reduction in self-criticism), in relation to 1-month follow-up abstinence. The study found that inpatient 12-step treatment resulted in both AA-specific and general psychotherapy changes, but it was commitment to abstinence and intention to avoid high-risk situations that predicted abstinence at follow-up. However, among patients who relapsed, AA-related commitment and belief in a higher power were associated with lower relapse severity. A follow-up study demonstrated that while patients made both AA-specific and common cognitive changes, AA cognitions at discharge predicted better outcomes at 6 and 12 months, and findings held with baseline use severity and psychopathology controlled (Morgenstern et al. 2002). These studies did not conduct formal tests of statistical mediation, but showed that 12-step oriented treatment resulted in AA-related cognitive changes and such changes predicted reduced severity of relapse in the short- as well as longer-term.

Research with VA samples has also considered AA-specific proximal changes, and has provided more stringent tests via comparison of 12-step to cognitive-behavioral (CB) treatment. In a naturalistic study across five 12-step and five CB inpatient programs, Ouimette et al. (1999) examined a series of retrospective treatment matching effects among male veterans. This study evinced some surprising findings. Specifically, compared to CB patients, patients treated in 12-step programs made greater changes in an important proximal outcome thought to be specific to CB treatment (i.e., substance-specific coping), and this effect was moderated by lower coping and higher psychological severity at intake. Patients in 12-step programs with higher alcohol use severity made greater changes in 12-step behaviors (e.g., meeting attendance, reading AA literature, step-work), and these behaviors were related to better 12-month outcomes (Ouimette et al. 1999). A subsequent study with this sample conducted tests of mediation and “dismantled” these AA-related cognitions and behaviors. Only abstinence as a goal and reading AA literature at post-treatment were mediators of the effect of program type on 12-month substance use. At follow-up (with mediators measured at the same time-point), in addition to these variables, having a sponsor and attending a greater number of AA meetings, were additionally predictive of better outcomes (Johnson et al. 2006). It is noteworthy that patients treated in both types of programs did not differ on CB-related proximal changes, which speaks to the accumulating body of evidence identifying the importance of not only 12-step cognitive shifts and engagement in prescribed behaviors, but also of common factors of change.

Two final studies tested composite measures of change in 12-step cognition and behavior. A comparison of TSF to CB-based outpatient group therapy found that participants may make similar changes in variables thought to be treatment-specific. Here, TSF patients had greater within treatment change in the composite 12-step measure than CB patients and CB patients similarly changed more in confidence/self-efficacy. However, these differences were not maintained at 6-month follow-up. The interaction of TSF group and change in 12-step proximal outcome, however, accounted for a significant portion of the variance in 6-month addiction-severity (Brown et al. 2001). Therefore, differences in treatment-specific proximal outcomes were not maintained at follow-up, but 12-step within-treatment changes were associated with better outcome among TSF patients.

In a study that included outpatient 12-step individual and group counseling with individuals with cocaine use disorders, Crits-Christoph et al. (2003) found that a measure of 12-step cognition and behavior was a partial mediator of 6-month drug use. The significant relationship between the 12-step-oriented treatment condition and the composite 12-step

mediator path was accounted for primarily by the comparison with the supportive-expressive, and not the cognitive therapy treatment conditions that were the other treatments in the trial. However, the authors further noted more fine-grained temporal analyses that did not show changes in the mediator preceding changes in drug use.

This series of studies provides a complex picture of putative mechanisms of AA and professionally-delivered 12-step treatments. While comparison to other psychosocial treatments, formal meditational tests, and attention to temporality are present in some analyses, it is difficult to know the extent to which these changes are due exclusively to AA. Thus, determining the mechanisms' "specificity" (Kazdin and Nock 2003) is not possible. Individuals appear to make predicted AA-specific cognitive and behavioral shifts, but it is unknown whether these same changes would be accounted for equally well by other "common process" measures.

Social and spiritual changes

The literature reviewed thus far has examined common therapeutic factors as well as measures of AA-specific factors. Some explicit beliefs (i.e., abstinence as a goal; Johnson et al. 2006) and behaviors (i.e., step-work, AA reading; Tonigan 2003; Johnson et al. 2006) have been identified and it appears that common processes (e.g., self-efficacy, commitment to abstinence, active coping; Morgenstern et al., 1997; Kelly et al. 2000; Connors et al. 2001; Kelly 2001; Tonigan 2003) may also play a role in recovery through AA. Relatively less work has been done in relation to constructs specifically highlighted in the AA literature. The concept of fellowship in AA has been studied, but has most often been reframed as social networks. Spirituality has also been of interest, but mediation studies are rare. First, we examine the research on social factors followed by emerging work on spirituality.

Social change mechanisms. Using a large male VA sample, Humphreys et al. (1999b) found 12-month cognitive and behavioral coping, friendship quality, and network support for abstinence to partially mediate the relationship between 12-step involvement post inpatient treatment and 12-month substance use outcomes. Similarly, in a mixed sample of inpatients and outpatients, Kaskutas et al. (2002) found that social network influences were partial mediators of 12-month abstinence (see Table III). Specifically, a larger social network and greater network support were shown to explain the relationship between greater AA involvement and better substance use outcomes. In tests of individual predictors, reducing pro-drinking influences and increasing AA-related support for abstinence were shown to be important (Kastukas et al. 2002). These two studies examined variables during the same time-period, which limits casual conclusions, but research has supported the role of social networks, particularly AA-related abstinent role models, in ongoing recovery. In fact, a subsequent analysis showed that among variables related to social network size (i.e., the percent of drinkers in the network and network support for abstinence), only AA-specific network support mediated alcohol abstinence 3 years following treatment (Bond et al. 2003). Although mutual support was not specifically measured, social support in the first 12 months of mutual-help involvement has also been shown to mediate the relationship between affiliation and substance use 2 years later among individuals with co-occurring substance and mental health disorders (Laudet et al. 2004).

There are a number of potential dimensions of "fellowship" as a mechanism of behavior change, but with respect to social network support for abstinence, the evidence derived from mediation research is quite compelling. The task of further research is to continue to parse

out the construct of fellowship, to maintain temporality in pathways, and to provide evidence of specificity through mediation analyses that include comparison to other psychosocial treatments or psychosocial processes. Critical too will be to place these social mechanisms within a multi-level theoretical framework that describes how social changes influence change mechanisms at other levels (e.g., individual-psychological and neurobiological) and vice-versa, in what is most likely a reciprocal process that changes dynamically over time.

Spiritual change mechanisms. The 12-step philosophy is explicitly spiritual in nature, and the stated mechanism of action for recovery, as noted previously, is a “spiritual awakening” attained by working the 12-step program. A majority of AA meetings also include prayers adopted from religious organizations (AA 1984). Yet very few studies have formally tested spiritual mediators of AA or professionally delivered 12-step treatment. Research has shown that atheists or agnostics who attend AA do not benefit any less than more religious patients, but they are less likely to seek recovery help through AA (Winzelberg and Humphreys 1999; Tonigan et al. 2002; Kelly et al. 2006). Another study of mutual-help group participants from five different organizations, including 12-step, found that degree of spiritual/religious beliefs was unrelated to staying sober (Atkins and Hawdon 2007). A study that considered both self-efficacy and the extent of endorsed “spiritual awakening” as mediators among Project MATCH patients found that greater AA participation in the first 6 months was associated with greater 6-month spirituality, but spirituality did not predict subsequent outcome 3 years following treatment (Tonigan 2003). Among community mutual-help participants with co-occurring substance use and mental health disorders attending an AA-based dual-focused recovery group (i.e., Double Trouble in Recovery), 12-month locus of control and sociability were mediators of 12-month abstinence, while spirituality and hope mediated other health behaviors (Magura et al. 2003). Other research examining specific links in the causal chain suggests a complex picture. For example, AA members were found to have more spiritual beliefs and external locus of control than SMART Recovery (Ellis and Velton, 1992) members (Li et al. 2000), but internal locus of control has been associated with long-term sobriety among AA members (Murray et al. 2003). Long-term AA sobriety has also been related to a shift from recovery-specific, to more general community, helping, as well as endorsement of religiosity or “theism” (Kaskutas et al. 2003).

The evidence to date regarding spirituality is as yet too limited to support or refute a central role for spirituality in recovery through AA; further research is needed (Galanter 2007a). From the standard scientific perspective, defining and measuring spirituality has presented a consistent challenge. It may be also that spiritual processes interact with other mechanisms and spiritual changes in particular may be more important at specific stages of recovery, such as maintaining, rather than attaining, sobriety, or be related to indices other than abstinence, such as enhancing quality of life (Spaulding and Metz 1997).

Discussion

AA has been shown to be beneficial for many different types of individuals seeking help for alcohol problems and professionally-delivered 12-step treatment shows at least comparable efficacy and appears more cost-effective than other treatments to which it has been compared. AA’s pragmatic community approach was never designed to facilitate empirical validation and many AA constructs have eluded explicit operationalization. Consequently, what we know is colored by the research lens that observes it. However, a limited, but

growing body of research provides support for three broad areas through which AA may exert its beneficial effects: (1) common factors; (2) specific AA practices; and, (3) social and spiritual factors related to AA's theory of change.

Common factor mechanisms

Research examining common processes tells a beginning story about the effects of AA as at least partially transmitted through these constructs. This line of research has its theoretical roots in social cognitive learning theory (Bandura 1986) and the more specifically related cognitive-behavioral relapse prevention (RP) theory explicated by Marlatt and Gordon (1985). RP highlights the importance of coping and self-efficacy as critical mediators in increasing or decreasing the probability of relapse. Studies measuring these constructs have primarily conducted proper mediational tests and maintained temporality of the constructs in assessment and analysis. Findings suggest that self-efficacy, motivation for abstinence and commitment to recovery, and behavioral coping, are mechanisms through which AA exerts its beneficial effects. The effects of AA participation among Project MATCH treatment participants were partially explained by self-efficacy to resist drinking for up to 3 years following treatment (Connors et al. 2001; Tonigan 2003). Also of note is this finding's salience with more severely involved alcohol patients. Changes not only in self-efficacy, but also in commitment for abstinence and active coping have mediated the effects of AA affiliation on 6-month substance use (Morgenstern et al. 1997). Although similar constructs were examined with adolescent inpatients, only abstinence commitment was found to mediate subsequent outcome (Kelly et al. 2000, 2002). Mechanisms may thus differ developmentally, but for both adolescents and adults, greater addiction severity predicts more AA involvement.

AA practice mechanisms

Regarding the specificity of AA's effects (Nock 2007), research on AA practices has moved forward by conducting comparative tests of the treatment to mediator ($a \rightarrow b$) path. These efforts to identify "active AA ingredients" have, however, met with mixed results. Most often, 12-step treatment will predict changes in AA-specific cognitions and behaviors, but such changes will not necessarily lead to changes in alcohol or other drug use. Variables predictive of outcome often reflect a return to proposed common factors such as commitment to abstinence (Morgenstern et al. 1995; Johnson et al. 2006) or intention to avoid high-risk situations (Morgenstern et al. 1995). AA-specific cognitive commitment and belief in a higher power were associated with reduced severity of relapse (Morgenstern et al. 1995), but these were not mediational tests. One specific behavior, reading AA literature, was found to mediate 12-month substance use (Johnson et al. 2006). However, as mentioned previously, this immediately evokes the subsequent question as to what exactly it is about reading AA literature that leads to better outcomes. For example, it is possible that reading AA literature leads to increased coping, self-efficacy, and motivation for abstinence. In sum, research on AA-specific practices is less conclusive than that on common therapeutic factors. This is partially due to less methodological consistency regarding mediational tests and difficulties in construct definition and measurement.

Social and spiritual change mechanisms

The majority of extant research on other constructs of relevance to AA's theory of change has addressed social and spiritual themes. It may be due to the comparative difficulty inherent in explicating these concepts, but the evidence regarding the importance of social support and social network changes in recovery through AA is, to date, more compelling than that on the role of spirituality. Specifically, these measures have fallen into two classes: general social support and changes in health-promoting networks. General friendship quality (Humphreys et al. 1999b), network support for abstinence (Humphreys et al. 1999a), and reduced pro-drinking influences (Kaskutas et al. 2002) have shown partial mediating effects on later reductions in drinking, and AA-specific network support has demonstrated mediation effects 3 years later (Bond et al. 2003). Moreover, general social support plays a similarly vital role among individuals with co-occurring substance and mental health disorders (Laudet et al. 2004). These aspects fit within the broader social-cognitive learning theory framework (Bandura 1986; Moos 2008).

With respect to spirituality, a large number of studies have examined a number of themes including religiosity, meaning seeking, hope, and internal *versus* external locus of control. However, in the two mediation studies that we were able to locate, spirituality did not mediate 3-year outcomes (Tonigan 2003), but was important to other health behaviors among an AA-based, but dual-diagnosis focused, mutual-help group (Magura et al. 2003). Spiritual change or awakening through acceptance of one's condition and ultimately through service to others is a core process in the AA literature. Research in this regard, is an important direction for future mechanisms investigations (Pagano et al. 2004; Zemore and Kaskutas 2004, 2008; Galanter 2007a).

Limitations of existing mechanisms research

The available research in this area contains several limitations. The vast majority of studies are naturalistic and thus possess inherent problems of self-selection (Rosenbaum 1995). They also mostly involve treatment samples in the early phases of stabilization and recovery. Little is known about non-treatment AA samples or the processes involved in maintaining recovery-related changes over the long-term, which may well differ. Also, some treatment programs may strongly emphasize AA participation while others do not, and this is rarely assessed, reported, or included in analyses. There may also be large differences on baseline demographic and clinical characteristics across study samples, and on the constructs measured as well as the measures used. Available measures frequently lack adequate psychometric validation and may have insufficient content validity in terms of capturing the construct of interest. Also, not all studies included here conducted mediational analyses that took temporality into account, thus weakening firm conclusions about cause and effect relations. All of these additional variables can create inconsistencies across findings making conclusions difficult, especially when the number of studies is small. However, this is an important, emerging field, and appropriate methodology is becoming better known (Stout 2007). We anticipate that studies in this area will increase in quantity, consistency, and quality.

Finally, due to the bias on measuring purely alcohol/drug outcomes in most studies of recovery from substance dependence, this review contained studies that focused exclusively on how AA affects changes in alcohol/drug use behavior. Noteworthy, however, is the fact that almost half of all AA attendees have been sober for five or more years (AA 2008). This suggests that there may be other positive quality of life factors that

keep many attending AA well beyond the achievement of full sustained remission from alcohol dependence. The influence of AA participation on other indicators of functioning such as physical and psychological well-being may be worthy areas for future mechanisms investigation.

Toward a more comprehensive theory of AA-related change

Perhaps existing research reflects an approach of feasibility rather than comprehensiveness or theoretical cohesiveness. It may be out of convenience that we have looked to common psychological constructs. These measures are tangible, have been assessed with some success, and possess established psychometric properties (e.g., self-efficacy). Yet, we have ignored a complex reality and phenomenology of individuals who speak of “hitting bottom”, “guilt”, “shame”, “loneliness”, “fear”, “anger”, “self-loathing”, “hope”, “freedom”, and “gratitude”. Researchers have struggled with defining and measuring constructs such as these and even defining recovery itself (Betty Ford Institute Consensus Panel 2007; Laudet 2007; White 2007). As Albert Einstein once remarked: “Not everything that can be counted counts, and not everything that counts can be counted”. These constructs would appear to be common aspects of what is described under the phenomenological rubric of the addiction-recovery experience. However, these experiences are rarely explicated in theories of recovery-related change.

The general model of therapeutic change proposed by Howard et al. (1993) may provide a useful transtheoretical developmental framework for examining AA-related change. It emphasizes a sequential recovery process beginning with “remoralization” (the enhancement of subjective well-being), followed by “remediation” (symptomatic relief), and “rehabilitation” (the unlearning of pervasive, maladaptive patterns of functioning and the learning of more adaptive approaches). This broader framework provides a structure in which AA practices may operate producing different stage-related benefits. Table IV shows this developmental framework, along with some potential parallel AA-related dimensions and elements. Also described are some potential intermediate outcomes, or mechanisms, associated with the framework and AA-related dimensions.

AA itself, at least in its core texts, may have ignored explicating perhaps its most potent influence on individuals’ recovery – that of social group dynamics in the AA meeting, the broader fellowship, and the expression of support that can be healing to many. Explicit in its meeting preamble, the “...fellowship of men and women who share their experience, strength and hope with each other...” may be the most critical element of AA’s effectiveness. The potency of the non-specific group dynamic elements associated with the 12-step and 12-tradition organizational template (AA 1953) may be supported by the fact that in addressing a diverse set of problems and disorders and problems of living (e.g., drug addiction, sexual compulsivity, gambling, mental illness, shopping, eating, debt) popular support groups have emerged that use the same template (e.g., Narcotics Anonymous, Sex Addicts Anonymous, Schizophrenics Anonymous, Depression Anonymous, Gamblers Anonymous, Overeaters Anonymous). However, research on these other organizations remains scarce. AA-influenced adaptive social context changes are supported by available evidence. The “down-stream” mechanisms of these social changes are likely to be stimulus control (i.e., absence of alcohol and related cues), recovering role models, access to low-risk social activities, and strong social reinforcement for abstinence (Moos 2008).

Table IV. Theoretical elaboration of AA's active ingredients and mechanisms.

AA elements	Therapeutic developmental stage		
	Remoralization (abstinence)	Remediation (sobriety)	Rehabilitation (recovery)
AA program-, or fellowship-related activity	Meeting attendance; observational learning: (hearing and seeing how others recovered); positive attention and strong social reinforcement for abstinence and participation.	Sharing at meetings; having and using AA sponsor; AA connections between meetings by phone or in person; self-assessment and collaborative appraisal of personal strengths and weaknesses.	Sharing of personal story: addiction and recovery experiences (chairing meetings); continued self- assessment, increase spiritual practice; helping and sponsoring others; AA service work.
A Relevant AA steps	1-3	4-9	10-12
Effect (intermediate outcome or mechanism)	Instillation of hope; decreased sense of aloneness; increase self-esteem; realization that personal experience can be of value to others.	Decreased shame, guilt, and fear; increased sense of belonging; human connectedness (spiritual experience); consistency of behavior with personal values (cognitive consonance).	Increased self-esteem; mastery; increased identity as recovering person; community and social re-engagement.
Potential explanatory theoretical principle	Instillation of hope; interpersonal learning; social-cognitive learning.	Universality; diminished self-discrepancies between "actual-ideal- ought" sense of self.	Altruism (Group therapy theory); helper principle; spirituality.

One prime function of AA is that the reported testimony and personal stories of "... what happened, what we use to be like, and what we are like now" (AA 2001, p. 58) expose meeting attendees to stories similar to their own that can revive fading or suppressed aversive memories regarding past painful alcohol-related negative experiences. These ongoing reminders in conjunction with positive (sober) experience and observable examples of recovery may serve to continually re-motivate individuals tipping the decisional balance toward ongoing recovery and AA participation. This common aspect of AA meetings may be a more specific active ingredient of AA worthy of investigation.

Conclusions

Why have spiritually-oriented organizations, like AA, become so popular among alcohol and other drug addicted individuals and not as popular among those suffering from other kinds of mental disorders? One reason perhaps is that the disinhibiting effects from heavy alcohol and drug use frequently generate deviations from one's own moral code or set of values. Repeated over and over this "Jekyll and Hyde" scenario can lead to a sense of profound moral failing, self-blame and self-loathing. As structural and functional brain alterations

caused by continued alcohol use exacerbate impairment over the regulation of drinking behavior negative feelings may intensify and be deepened and reinforced further by the reproach of affected onlookers and significant others. For many, the sense of “salvation”, historically and implicitly embedded within AA philosophy and in many other recovery mutual-help societies throughout US history (White 1998), may feel cleansing and self-soothing, providing a framework for self-forgiveness. This may account for the rather odd AA mix of spirituality and, “alcoholism as a medical disease” (see the Doctors’ Opinion, xxv; AA 1939, 2001), which may have been initially a purely pragmatic hybrid constructed to alleviate common feelings of guilt, shame, and self-loathing that serve as barriers to salutary change. The attenuation of these feelings and self-perceptions as a function of AA exposure may be more specific to the spiritual/disease framework of AA and worthy of future mechanisms research.

Despite AA’s clearly “spiritual” roots, language, and emphasis, this central aspect of AA has received very limited research attention. The few studies that have examined spirituality, have not found it to be a clear mechanism. This important dimension warrants more research. It may be that, for the most part, underneath there is little unique or miraculous about the specific content or format of AA; the same common therapeutic elements inherent in most, if not all, formal and informal group and individual interventions may be similarly operating in AA (Moos 2007, 2008). These elements appear to help individuals stay motivated and gain the ability and confidence to cope with the demands of recovery within a supportive context. Arguably, in the same way that we observe similar outcomes from studies of different professional treatments, if alcohol-dependent individuals were to attend other recovery-focused mutual-help groups (e.g., SMART Recovery, Secular Organization for Sobriety) at the same intensity, it is conceivable that they may experience benefits similar to those derived from AA. However, these other organizations have seldom been studied and, as yet, cannot approach AA’s widespread availability (Kelly and Yeterian 2008). The main benefit of AA in aiding addiction recovery may lie in its accessibility and its long-term, “extensive”, focus (Humphreys and Tucker 2002). The fact that individuals can gain exposure to these therapeutic elements “on demand” at a self-regulated dosing intensity for as long as desired, makes AA a highly adaptive recovery management tool (White 2008). The fact that it is free and widely available in almost every community on every day of the week, notably during high-risk relapse periods when professional services are often not available (i.e., on Holidays/nights/weekends), also makes AA a highly cost-effective public health resource in helping alleviate the massive burden of disease attributable to alcohol problems.

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