Published in final edited form as:

J Subst Abuse Treat. 2012 January ; 42(1): 78–86. doi:10.1016/j.jsat.2011.07.001.

Twelve-month follow-up of aftercare for adolescents with alcohol use disorders

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Abstract

Adolescents with alcohol use disorders previously completed a randomized controlled outpatient aftercare study (Kaminer, Burleson, & Burke, 2008) in which they were randomly assigned to In-Person, Brief-Telephone, or No-Active Aftercare. Youth were assessed at End of Aftercare, 3-, 6- and 12-Month Follow-up on frequency and quantity of alcohol use. It was predicted that Active Aftercare (In-Person and Brief Telephone) would be superior to No-Active Aftercare in reducing alcohol use, as shown in the original study. No subject or therapy group attributes were significant moderators of outcome. Active aftercare in general maintained shortterm favorable effects by reducing relapse in youth with AUD and should be considered as part of standard procedures in therapeutic interventions for all alcohol and other substance use. In-Person and the Brief-Telephone procedures did not differ in their effectiveness. Structured communications with AUD youth during and after treatment by use of electronic technology rather than in-person contact might therefore be more fully investigated.

1. Introduction

Abstinence rates have been consistently high among completers of treatment programs developed for adolescents with alcohol and other substance use disorders (AOSUD). Williams and Chang (2000) reported the average rate of sustained abstinence among treated youth to be approximately 40% at six months and 30% at 12 months. Other studies report that less than half of all treated adolescents remained firmly abstinent three months after discharge from outpatient treatment programs (Brown et al., 2001; Dennis et al., 2004; Kaminer, Burleson, & Goldberger, 2002; Winters, 2003). McLellan et al. (2000) have further proposed that AOSUD be viewed as a chronic relapsing disorder. Those with AOSUD might well require a continuum of care across a lifetime, referred to variously as aftercare or as continuing care (McKay, 2005; McLellan et al., 2005; Scott, Dennis, & Foss,

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2005). Godley et al. (2007) provided continued care for adolescents discharged from residential treatment and found that aftercare intervention lead to higher rates of abstinence when care linkage and retention were higher.

Kaminer, Burleson, & Burke (2008) previously reported the results of a randomized, controlled study in which two active aftercare interventions were shown to be more effective in slowing the expected post-treatment relapse for alcohol use among treated adolescents as compared to a no-active aftercare condition. Adolescents, 13–18 years of age ($n = 177$), diagnosed with DSM-IV AUD, participated in a 9-week, group cognitive behavioral therapy treatment. Completers of this initial, common treatment ($n = 144$) were randomized into one of three experimental conditions: (1) In-Person Active, (2) Brief-Telephone Active, or (3) No-Active Aftercare. Five sessions began two weeks after completion of the common treatment and continued at 2-week intervals for the two Active Aftercare groups. Abstinence rate, frequency of alcohol use, and frequency of heavy alcohol use were the main outcome measures for aftercare completers ($n = 130$).

Those who completed End of Aftercare assessment ($n = 121$) decreased significantly from 57.0% abstinence at End of Treatment to 33.9% at End of Aftercare. This is not unexpected, given the underlying increase in the predicted trajectory of alcohol use in adolescents as they age. As hypothesized, however, relative to No-Active Aftercare, Active Aftercare youth showed significantly less unfavorable change from 53.8% abstinence at End of Treatment ($n = 43/80$) to 37.5% at End of Aftercare ($n = 30/80$). No-Active Aftercare youth, by contrast, showed significantly more unfavorable change for Active Aftercare youth, from 63.4% abstinence ($n = 26/41$) to 26.8% abstinence ($n = 11/41$). Finally, the two Active Aftercare conditions did not differ significantly on any of these three measures for any of the preceding analyses.

In this paper we present the findings at 3-, 6- and 12-Month follow-up assessments of this adolescent aftercare study. Two hypotheses were: (1) Both Active Aftercare conditions will continue to show more relative reduction in frequency and quantity of alcohol use than the No-Active Aftercare, and (2) the two Active Aftercare conditions will remain non-significantly different. Due to space limitations and to the additional complexity of the analysis of the use of other drugs and associated disorders, only the results for alcohol use are presented in this study.

2. Materials and methods

2.1. Subjects

A total of 294 adolescents, aged 13 to 18, were screened for the study, of whom 235 (79.9%) met eligibility criteria for current DSM-IV diagnosis of AUD (American Psychiatric Association, 1994). Signed Informed assent and consent were obtained from each of these 190 youth (80.7% of 235) and from their respective guardian(s). Both informed consent and all other procedures were in accord with the standards of, and were approved by the Institutional Review Board of the University of Connecticut Health Center. From these 190 youth, 179 (94.2%) successfully completed intake, and 177 (98.9% of 179) enrolled in the treatment phase of the study, as noted earlier. Youth who completed the common treatment numbered 146 (82.5% of 177), and 144 of these (98.6% of 146) were successfully randomized to one of three Aftercare conditions. Of these 144 enrolled, 32.6% were female, 13.2% Latino, 4.2% African-American, and 3.5% Bi-racial/other. The average age was 15.9 ($SD = 1.2$; $R: 13-18$). Those who successfully completed the Aftercare procedures numbered 123 youth (85.4% of 144). The descriptive statistics for the 121 youth (98.4% of 123) available for assessment at End of Aftercare are listed in Table 1. There was a trend toward significance for the non-random distribution of Other Substance Use Status, $p = .$

064, such that the No-Active Control group had a somewhat disproportionately lower percentage of youth with No Abuse or Dependence (4.9%, $n = 2/41$) relative to the sample overall (15.9%, $n = 19/121$), and a somewhat disproportionately higher percentage of youth with Dependence (90.29%, $n = 39/41$) relative to the sample overall (79.3%, $n = 96/121$). The other demographic variables did not show significantly differential distributions among the three treatment groups.

2.2. Procedures

This was a prospective, randomized, controlled study with an intent-to-treat design and analysis. It was comprised of three phases: treatment, aftercare, and follow-up: (1) the first phase consisted of a maximum of nine weekly, Cognitive Behavioral Therapy (CBT) group sessions for 177 youth. (2) In the second phase, only the youth who completed the common treatment phase were randomized to one of three aftercare conditions: (a) In-Person Aftercare (IP), (b) Brief Telephone Aftercare (BT), or (c) No-Active Aftercare (NA). (3) Upon completion of the experimental aftercare phase, all available study participants (i.e., including non-completers of treatment and aftercare, respectively) were assessed at 3-, 6-, and 12-month follow-ups.

2.3. Measures

Demographic measures—Youth Gender, Age, and Ethnicity were used as predictors in the analysis. Due to low numbers of minorities, Ethnicity was coded as White versus Non-White.

Diagnostic Interview Scale for Children—(DISC-IV; Shaffer et al., 2000). By use of the self-administered Voice-DISC at baseline (Wasserman et al., 2002), youth were coded positive for Internalizing Disorder if any were present (i.e., positive or intermediate for major depression, dysthymic disorder, or manic depression; or any anxiety disorder). Analogously, they were coded positive for Externalizing Disorder if any were present (i.e., positive or intermediate for conduct disorder, oppositional defiant disorder, or attention-deficit/hyperactivity).

End of Treatment Alcohol Use Status—In order to control for post-treatment differences still existing after randomization, the self-reported frequency of alcohol use during the last two of the nine common treatment sessions was calculated as a 3-level, scalar covariate (i.e., alcohol use at none, one, or both of the two sessions). This measure of alcohol use occurred before youth were randomized to Aftercare condition. This measure was not significantly skewed ($t[120] = 1.10$, $p[2-t] > .20$ [ns], nor was it significantly different among the three treatment groups.

Alcohol Consumption Questionnaire—(ACQ; Cahalan, Cisin, & Crossley, 1969). The ACQ is a self-report of frequency and quantity of alcohol consumption: (1) ACQ-1: Number of Drinking Occasions per Month, and (2) ACQ-3: Number of Drinks per Drinking Occasion. These measures were collected at End of Aftercare and at all three follow-ups. Both measures were originally coded on a scale from zero to 12. Values for Number of Drinking Occasions per Month were recoded to reflect actual number of frequency that alcohol was consumed (e.g., “I didn’t drink any alcohol” = 0; “Once per month” = 1; “Once per week” = 4.33; “Daily” = 30.4). Values for Number of Drinks per Drinking Occasion were recoded to reflect actual number of drinks per drinking occasion (e.g., “I didn’t drink any alcohol” = 0; “4 drinks” = 4; “9 to 10 drinks” = 9.5). The distributions of both of these re-scaled measures were found to be positively skewed, so each measure was natural log transformed (i.e., $\text{Ln of } [1 + \text{ACQ}]$), successfully reducing skewness to negligible levels for each time point.

2.4. Analyses

Units of analyses, sample size and missing data—A two-level, hierarchical linear model (HLM) assessed the effects of three aftercare conditions on frequency and quantity of alcohol use, respectively, among youth. Level-1 units of analysis in HLM characterize the measure of time within each individual youth, represented by the consecutive day from End of Aftercare throughout three Follow-Up periods. Since each youth was assessed on differing number of days, a time-variant model (Singer & Willett, 2003) was employed for the Level-1 measures, such that the initial day (Day Zero) was the assessment at the End of Aftercare. Level-2 units in HLM are the data that characterize the 139 of the 144 original analyzable individual youth. A total of 497 (89.4% of the possible $4 \times 139 = 556$ time point measures) were available for the analyses. Various missing data within the four time points are shown in Table 1. There were 23 intact (i.e., closed enrollment) therapy groups ranging in initial size from three to eight youth ($M = 6.3$, $SD = 1.7$). Multilevel modeling was implemented by use of the HLM2 procedures of the HLM 6.0 statistical software (Raudenbush, Bryk, & Congdon, 2004).

Two-level hierarchical model—In the present longitudinal analyses time is nested within subjects. Variances associated with initial response (intercepts) and in change (slopes) are estimated by setting intercepts and slopes to be random effects. The unit of analysis (youth subject) is set as a random effect, while the experimental condition and other covariates were set as fixed effects. A two-level hierarchical model was selected in order to assess the change in the frequency and quantity of alcohol use as a function of Time (End of Aftercare, 3-, 6-, and 12-Month Follow-Up) and subject attributes.¹ This hypothesized model's main predictors of interest were the three-level aftercare variable (In-Person, Brief-Telephone, and No-Active Aftercare). Aftercare was modeled as two a priori orthogonal contrasts: (a) Active versus No-Active Aftercare, and: (b) In-Person versus Brief-Telephone Aftercare. Time was modeled as the linear rate of change from End of Aftercare through the three Follow-Up Assessments. For exploratory purposes the linear change across time as a function of 11 other covariates as well as their interactions with the Aftercare variable were also modeled: (a) Gender, (b) Age, (c) Ethnicity, (d) Externalizing Disorders, (e) Internalizing Disorders, (f) Other Substance Use (predominantly cannabis) Status, (g) Criminal Justice Involvement, (h) Additional Services Obtained, (i) End of Treatment Alcohol Use Status, (k) Therapy Attendance Rate, and (l) Aftercare Attendance Rate.

3. Results

3.1 Follow-up rates

At each of the three follow-up assessments there was a significantly higher success rate of contacting the youth for those who were assigned to the two Active aftercare conditions than for those assigned to No Active Aftercare: (1) at 3-M Follow-Up: Active Aftercare = 98%, No-Active Aftercare = 80%, Fisher's exact test $p < .001$; (2) at 6-M Follow-Up: Active Aftercare = 96%, No-Active Aftercare = 85%, Fisher's exact test $p = .017$; and (3) at 12-M Follow-Up: Active Aftercare = 95%, No-Active Aftercare = 76%, Fisher's exact test $p = .002$.

¹An initial three-level hierarchical model assessing the effects on alcohol use as a function of Time (Level 1), Individual Youth (Level 2) and Intact Therapy Group (Level 3) was explored. An analysis of the intercepts and slopes of all Level 2 and Level 3 covariates along with the Aftercare variable showed that none of the Level-3 main or interaction effects were significant. In addition, the use of the two-level model did not significantly change the results derived from use of the additional group-level hierarchical structure. The simpler two-level model was adopted, therefore, for all subsequent analyses.

3.2. Model selection criteria, effect size and power

The statistics reported are variance estimates (σ^2) and fixed effects coefficients (γ), each with robust standard errors (in Tables 3 and 4). Parameters for slopes are based on rate of change per 30-day period in order to standardize the parameter and standard errors. In each model the degrees of freedom of the model ranged from $df = 138$ to 135 . Predictors were retained if they reached at least a trend (i.e., $p < .10$) level of significance, in order to make sure that the overly strict criteria for elimination of a predictor did not significantly change the other, remaining predictors, especially the Active versus No-Active Aftercare, and the In-Person versus Brief- Telephone Aftercare contrasts. For a Type I (α) error = .05 (2-tailed), power estimates for the Active ($n = 98$) versus No-Active Aftercare ($n = 41$) contrasts in classical GLM analyses indicate that a medium effect size, $d = .50$ (Cohen, 1988), indicated a power of $(1 - \beta) = .76$ (the standard being .80), while a detectable effect size with a power of .80 indicated a $d = .53$. Power estimates for the In-Person ($n = 50$) versus Brief-Telephone Aftercare ($n = 48$) contrasts indicated that $d = .50$, a power of $(1 - \beta) = .69$, while a detectable effect size with a power of .80 would be $d = .58$. Finally, three different measures of variance accounted for by each model are utilized: (1) ρ , the intraclass correlation is the proportion of total between-subjects variance to total error variance; (2) pseudo R^2_e , the decrease in within-person residual variance; and (3) pseudo R^2_0 , the decrease in between-person intercept residual variance (Singer & Willett, 2003).

3.3. Initial Models

Number of Drinking Occasions per Month—As shown in Table 3, an initial, unconditional Model A (i.e., one with no predictors) showed a significant intercept for Number of Drinking Occasions per Month ($\gamma_{00} = 1.100$, $p < .001$), as well as significant Level-1, within-person variance ($\sigma^2_e = 0.346$, $p < .001$), and significant Level-2, initial-status variance ($\sigma^2_0 = 0.533$, $p < .001$, the last two indices showing that significant, unaccounted for variance existed for which additional Level-1 and Level-2 variables might account. A subsequent, unconditional growth model (Model B; i.e., one assessing only the overall linear, longitudinal change) was seen to be significantly better than the unconditional (non-growth) Model A, $\chi^2(3) = 20.41$, $p < .001$. The significant positive slope ($\gamma_{10} = 0.020$, $p < .001$) reflected a reliable overall increase in Number of Drinking Occasions per Month from End of Aftercare through 12-Month Follow-up for all youth generally. This overall positive slope remained strongly significant and virtually unchanged from Models B through E. A series of successive nested models were tested, each one containing the predictors of the previous model plus an additional Level-2 covariate, with the final model testing for significant effects of (1) Active No-Active Aftercare, and (2) In-Person versus Brief-Telephone Aftercare. The final Model E was devoid of all predictors not showing at least a trend toward significance, thereby producing the best overall fit for frequency of alcohol use.

Number of Drinks per Drinking Occasion—As shown in Table 4, the identical series of models was also produced for the Number of Drinks per Drinking Occasion outcome. An initial, unconditional model showed a significant intercept for Number of Drinks per Drinking Occasion ($\gamma_{00} = 1.550$, $p < .001$), as well as significant Level-1, within-person variance ($\sigma^2_e = 0.376$, $p < .001$), and significant Level-2, initial-status variance ($\sigma^2_0 = 0.391$, $p < .001$, as shown in Model A). A subsequent, unconditional growth Model B was, therefore, seen to be significantly better than the unconditional Model A, $\chi^2(3) = 20.27$, $p < .001$. The significant positive slope ($\gamma_{10} = 0.023$, $p < .001$) reflected a reliable overall increase in Number of Drinks per Drinking Occasion from End of Aftercare through 12-Month Follow-up for all youth generally. Again, this overall positive slope remained strongly significant and virtually unchanged from Models B through E. Model E was also devoid of all predictors not shown to have at least a trend toward significance.

3.4. Final Models

Number of Drinking Occasions per Month—While Table 2 shows the raw means and standard deviations of the outcome measures, these are noted for illustrative purposes since the hierarchical modeling procedure transposes the data into intercepts and slopes. Model C proved a significantly better fit than Model B, $\chi^2(1) = 6.60$, $p < .05$, in that the Youth Age intercept was significant, $\gamma_{01} = 0.149$, $p < .004$ (while Youth Age slope was not), meaning that the older the youth, the higher the frequency of drinking at any time point generally. Model D proved a significantly better fit than Model C, $\chi^2(1) = 6.52$, $p < .05$, in that the Externalizing Disorder intercept was significant, $\gamma_{02} = 0.394$, $p < .008$ (while Externalizing Disorder slope was not), meaning that youth with an Externalizing Disorder had a higher frequency of drinking at any time point generally than those without the disorder. Model E showed a trend toward a significantly better fit than Model D, $\chi^2(1) = 2.89$, $p < .10$. The significant effects of Age and Externalizing Disorder, introduced in the earlier models, were retained in Model E. Model E also showed that the Active versus No-Active intercept produced a trend toward significance, $\gamma_{03} = -0.121$, $p = .085$. This final model, insofar as predictors of the rate of change, produced only the significant overall slope, $\gamma_{10} = 0.021$, $p = .001$, reflecting a reliable increase in frequency of alcohol use for youth generally from End of Aftercare to 12-Month, as shown in Figure 1 (and in Table 2). Neither The In-Person versus Brief-Telephone contrast nor any other predictors of the slope reached even a trend level of significance. This differential intercept, combined with the aforementioned significant overall slope, means that youth receiving Active Aftercare had a somewhat lower frequency of drinking generally at all time points relative to those receiving No-Active Aftercare (as shown in Figure 1).

This is consistent with the original finding (Kaminer, Burleson, & Burke, 2008), which noted a trend toward significance for a lower frequency of alcohol use for those in Active versus those in No-Active Aftercare, but for no differences between the two types of Active Aftercare. Active Aftercare youth maintained their advantage over No-Active youth from End of Aftercare through 12-Month Follow-up, even as both groups increased their frequency of alcohol use across time. Phrased alternatively, Active Aftercare youth showed parallel increases in frequency of use from End of Aftercare to 12-Month compared to No-Active youth.

The intraclass correlation, p , the proportion of total between-subjects variance to total error variance (Table 3) was 62%. The Pseudo R^2_{ε} was seen to decrease in within-person residual variance to 16%. The Pseudo R^2_0 was seen to decrease in between-person intercept residual variance to be .04 for Model C, .07 for Model D, and .11 for Model E. The differential increments were, therefore, 4% from Model B to C, 3% from Model C to D, and 4% from Model D to E, each indicating variance increments in the medium-small range (Cohen, 1988).

Number of Drinks per Drinking Occasion—Model C showed a trend toward a significantly better fit than Model B, $\chi^2(1) = 3.38$, $p < .10$, in that the Youth Age intercept was significant, $\gamma_{01} = 0.095$, $p = .044$ (while Youth Age slope was not), meaning that the older the youth, the higher the quantity of drinking at any time point generally. Model D proved a significantly better fit than Model C, $\chi^2(1) = 18.01$, $p < .001$, in that the Externalizing Disorder intercept was significant, $\gamma_{02} = 0.574$, $p < .001$ (while Externalizing Disorder slope was not), meaning that youth with an Externalizing Disorder had a higher quantity of drinking at any time point generally than those without the disorder. Finally, Model E showed a trend toward a significantly better fit than Model D, $\chi^2(1) = 2.82$, $p < .10$. Model E, as noted earlier, retained only the significant overall slope, $\gamma_{10} = 0.023$, $p = .001$, reflecting a reliable increase in quantity of alcohol use for youth overall from End of

Aftercare to 12-Month. Neither The In-Person versus Brief-Telephone contrast nor any other predictors of the slope reached even a trend level of significance. Model E also showed that the Active versus No-Active intercept showed a trend toward significance, $\gamma_{03} = -0.104$, $p = .091$. This differential intercept, combined with the aforementioned significant overall slope, means that youth receiving Active Aftercare had a somewhat lower quantity of drinking at any time point generally than those receiving No-Active Aftercare, similar to the frequency of drinking. The significant effect of Externalizing Disorder, introduced in the earlier models, was retained in Model E, but the significant effect of Age was reduced to a trend in the final model. Again, Active Aftercare youth maintained their advantage over No-Active youth from End of Aftercare through 12-Month Follow-up, even as both groups increased their quantity of alcohol use across time.

The intraclass correlation, ρ , was 59%, Pseudo R^2_{ϵ} was 16%, and Pseudo R^2_0 was .02 for Model C, .09 for Model D, and .14 for Model E. The differential increments were, therefore, 2% from Model B to C, 7% from Model C to D, and 5% from Model D to E, indicating variance increments in the small range for Age, in the medium range for Externalizing Disorder, and in the medium-small range for Active versus No-Active, respectively (Cohen, 1988).

4. Discussion

The adolescents in the present study generally increased their number of drinking occasions per month (frequency) across the one-year follow-up period. This is not surprising since alcohol and substance use among adolescents has been shown to increase until they reach their early twenties (Labovie, 1996). The trajectory of increased frequency of alcohol use, therefore, compromises the likelihood of favorable response to treatment and increases the odds for relapse during the post-treatment phase. Of interest was that overall, youth also increased the number of drinks per drinking occasion (quantity) across time during the one-year follow-up period. It should be noted that in the present analyses, the results of frequency of heavy drinking exactly paralleled those of frequency of (any) drinking, such that these analyses on heavy drinking were eliminated.

Overlaying this gradual increase in frequency of use attributed to aging, however, was the fact that both active aftercare interventions showed efficacy in maintaining treatment gains for AOSUD throughout the 12-month follow-up. In fact, the relative positive difference obtained at the end of aftercare, while only at the trend level (Kaminer, Burleson, & Burke, 2008) was seen to hold completely throughout all the follow-up time periods. Hence, the first hypothesis showed a trend toward confirmation: Combined Active Aftercare conditions were associated with relatively better outcomes than No-Active Aftercare condition after 12 months follow-up.

While these differences did not reach significance at the conventional level (i.e., $p < .05$), they nevertheless represent an effect strong enough to warrant additional efforts to assess the content and structure of aftercare procedures. The present implementation of aftercare did not last more than approximately ten weeks after completion of the common substance abuse group therapy treatment. Extending this time period and/or enhancing the brief procedures contained in the present protocol could well prove to be more effective still in thwarting relapse.

Our findings are consistent with Lash and colleagues (Lash et al., 2004), in which participants receiving social reinforcement showed higher abstinence from alcohol use at 6-month follow-up (76%) than did standard care participants (40%). Our results are also consistent with Rus-Makovec and Cebasek-Travnik (2008) who found that adult alcohol-

dependent patients who received four telephone contacts in two years were significantly higher on subjective well being than those who did not, although abstinence rates were not different.

As in the original study (Kaminer, Burleson, & Burke, 2008), however, the non-significant difference between the In-Person and the Brief-Telephone interventions was also evidenced for the Follow-Up period. The second (original) hypothesis, therefore, was once again not confirmed: that Brief Telephone intervention was no more efficacious in maintaining aftercare gains as an In-Person intervention for adolescents with AOSUD. Again, our findings replicate McKay et al. (2005) who showed equivalent results for adult substance users for telephone versus in-person interventions. Because In-Person and Brief-Telephone procedures were seen to be almost identical in their outcome, it is encouraging to consider that the Brief-Telephone procedure has many promising advantages: the lowered cost of transportation of the youth, the flexibility in scheduling, the potential for many more brief interactions, the extension of possible times of day for communication, the familiarity of the use of electronic communication among youth, the ubiquity of cell phones, and the enhanced possibilities for youth-initiated calls. Structured communications with AUD youth during and after treatment by use of electronic technology might therefore be more fully investigated.

The present analyses provide evidence for the extended efficacy of Aftercare. Aftercare should be considered, therefore, in treatment discharge plans for adolescents with AOSUD in order to reduce the expected post-treatment relapse rates. The short-term relapse prevention effect associated with active aftercare was maintained during the follow-up assessment period. When no additional continued care was provided following completion of the initial therapy, higher relapse rates ensued, similar to those reported for adolescents upon treatment completion (Brown et al., 1989; Dennis et al., 2004; Kaminer et al., 2002; Winters, 2003).

More specifically, it has been reported that upon discharge from treatment, adolescents with substance use disorders might have different use trajectories for short- and long-term. For example, studies evaluating the natural trajectories (i.e., without addressing potential reentry to treatment) reported that four main sub-groups of patients can be characterized by outcomes: (1) complete abstinence; (2) partial abstinence with negative consequences; (3) partial abstinence with non-problem drinking/drug use; and (4) no-abstinence status (Brown et al., 2001; Chung et al., 2003; 2004; Godley et al., 2004; Maisto et al., 2002; Winters, 2003). These findings led to recommendations for lengthy case monitoring and management in order to maintain or improve on treatment gains (Stout et al., 1999). Models of on-going monitoring and early re-intervention include components such as: (a) proactively tracking patients and providing regular “checkups,” (b) screening patients for early evidence of problems, (c) motivating people to maintain or make changes including return to treatment, (d) assistance negotiating access to additional formal care, and (e) early formal re-intervention when problems do arise (Dennis et al., 2003).

4.1. Limitations and generalizability

Those receiving In-Person and Brief-Telephone Aftercare were seen to have significantly higher follow-up rates at 3-M, 6-M, and 12-M than those receiving No Active Aftercare, the differences ranging from 11% to 19%. These findings are consistent with past research on aftercare for substance abuse treatment. For example, Lash et al. (2001) analyzed adults treated in aftercare group therapy who received social reinforcement. They were seen to have significantly higher attendance rates than those in standard care. Lash et al. (2004) found that adults in a similar program were significantly more likely to spend more months in aftercare in social reinforcement than in standard care. The In-Person and Brief-

Telephone aftercare procedures in the present study, which provided social reinforcement among other therapeutic components of care, were analogous in their differential adherence rates.

While randomization produced non-significant differences in frequency among the three groups on Gender, Ethnicity, Internalizing Disorder, and Externalizing Disorder (as shown in Table 1), there was a trend toward significance for the differential distribution of Other Substance Use Disorder: Those in the No-Active condition were significantly more likely to have either a Dependence or Abuse diagnosis (95.1%) than those in either the In-Person condition (78.9%) or in the Brief-Telephone condition (78.6%), $p = .064$. It might be supposed that No-Active youth would be less likely to be abstinent from alcohol use at every time point due to their higher tendency to be in the Abuse or Dependency category. This would reduce the difference between the Active and the No-Active conditions, effectively working against the hypothesis that the Active Aftercare conditions would show superior abstinence rates.

A number of procedures in the study strengthen its generalizability. The study procedures included subject recruitment from both urban and suburban areas, transportation provided to therapy site, randomization to one of two conditions (experimental versus control), active aftercare conditions that were standardized via manualization, the use of appropriate assessment instruments with good psychometric properties, personalized assessment of referral needs along with appropriate referral for other care, high retention rates in both aftercare and during follow-up assessment, and for the relatively good representation of Latino youth (13.2%). As during the active aftercare, all participants, regardless of their attendance status, were contacted multiple times, at all times of the day and the week for each follow-up assessment point. Limitations to the study include (1) underrepresentation of female (32.6%), and especially African-American (4.2%) and Bi-racial/other youth (3.5%). Since group therapy was utilized for all sessions, youth in need of individual therapy may have received less than ideal treatment despite structured procedures for outside referral for flagged conditions or emergencies.

There is considerable debate in the HLM literature concerning the calculation of effect sizes and proportion of variance explained. Caution is advised concerning the utilization of any classical estimates of variance accounted for, such as those reported herein (Roberts, 2002; Roberts & Monaco, 2006; Singer & Willett, 2003; Snijders & Bosker, 1999). Roberts and Monaco (2006) present alternative algorithms for consideration for use in complex hierarchical linear modeling, but note that their use in practical applications is limited by the lack of standardized software. Hence, variance proportion parameters were presented here as descriptive pending future consensus and the development of appropriate software.

In conclusion, continued research addressing improvement of relapse prevention for youth with AOSUD is warranted. One of the most important approaches should be investigating different models as well as varying intensities of aftercare. This may include case monitoring and case management, as well as different dosage, frequency and length of aftercare activities. Finally, the assessment of demographic and diagnostic factors that predispose some youth toward more positive outcomes should be addressed.

Acknowledgments

This study was supported by grant RO1-AA-012187-O1-02 from the National Institute on Alcohol Abuse and Alcoholism. A shorter version of this manuscript was presented as a poster at the 2009 Joint Scientific Meeting of the Research Society on Alcoholism and the International Society for Biomedical Research on Alcoholism, San Diego, CA.

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Figure 1.
Intercepts and Slopes of (Natural Ln) Number of Drinking Occasions per Month as a
Function of Active versus No-Active Aftercare

Table 1

Means and Standard Deviations, and Sample Size and Percentages of Predictor Variables

Predictor Measures	Brief									
	In-Person (n = 38)		Telephone (n = 42)		No-Active (n = 41)		Total (n = 121)			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	p	
Age	16.1	1.0	16.1	1.3	15.8	1.2	16.0	1.2		.41
	n	%	n	%	n	%	n	%		
Gender (% Male)	22	57.9%	28	66.7%	30	73.2%	80	66.1%		.36
Ethnicity (% White)	29	76.3%	37	88.1%	33	80.5%	99	81.8%		.38
Other Substance Use Disorder ^a	30	78.9%	33	78.6%	39	95.1%	102	84.3%		.064
Internalizing Disorder ^b	10	26.3%	12	28.6%	12	29.3%	34	28.1%		.96
Externalizing Disorder ^b	17	44.7%	20	47.6%	24	58.5%	61	50.4%		.43

^a % Dependence or Abuse versus None

^b % Positive or Intermediate versus None

Table 2
Means and Standard Deviations of Number of Drinking Occasions per Month and Drinks per Drinking Occasion

Dependent Measures	End of Aftercare (n = 121)		3-M Follow-Up (n = 125)		6-M Follow-Up (n = 128)		12-M Follow-Up (n = 123)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>a</i> Number of Drinking Occasions per Month								
Total	3.1	4.6	4.1	5.8	3.8	5.6	4.4	5.5
In-Person	3.0	5.3	4.1	6.6	3.5	5.6	3.8	4.7
Brief Telephone	2.3	3.4	3.7	5.1	3.6	4.8	4.7	5.9
No-Active	4.0	4.9	4.7	5.6	4.7	6.6	4.9	6.0
<i>b</i> Number of Drinks per Drinking Occasion								
Total	5.0	4.6	5.2	4.2	5.5	4.4	6.0	4.1
In-Person	4.8	5.1	4.9	4.0	5.6	4.4	5.4	4.1
Brief Telephone	4.3	4.0	4.4	3.8	4.8	4.2	6.3	4.0
No-Active	6.0	4.7	6.7	4.6	6.4	4.7	6.5	4.0

a ACQ-1: recoded from original 12-point scale (R: 0 – 11) to indicate actual number of drinking occasions per month

b ACQ-3: recoded from original 12-point scale (R: 0 – 11) to indicate actual number of drinks per drinking occasion

Table 3
Parameters (and Standard Errors) for Multilevel Models for Change on Ln of Number of Drinking Occasions per Month (n = 139)

Fixed Effects	Factor	Parameter	Model A	Model B	Model C	Model D	Model E
			Unconditional (UC)	Unconditional Growth UCG)	Model B + Age (I)	Model C + External (I)	Model D + Act vs NA (I)
Initial (I) Status, π_{0i}	Intercept	γ_{00}	1.100*** (0.068)	0.984*** (0.073)	0.547*** (0.154)	0.284 (0.180)	0.313* (.176)
	Age	γ_{01}			0.149** (0.050)	0.137** (0.051)	0.145** (0.050)
	Externalizing (EXT)	γ_{02}				0.394** (0.146)	0.390** (0.144)
Slope(S)/Rate Change, π_{1i}	Aftercare: Active v. Non-Active	γ_{03}					-0.121* (0.070)
	Intercept			0.020** (0.006)	0.020** (0.006)	0.020** (0.006)	0.021** (0.006)
<u>Variance Components</u>							
Level-1	Within-Person	δ^2_{ϵ}	0.346*** (0.026)	0.291*** (0.027)	0.291*** (0.027)	0.292*** (0.027)	0.293*** (0.027)
Level-2	In Initial Status	δ^2_{θ}	0.533*** (0.077)	0.531*** (0.090)	0.510*** (0.088)	0.492*** (0.086)	0.473*** (0.083)
	In Rate of Change	δ^2_1		0.0013* (0.0007)	0.0014* (0.0007)	0.0013* (0.0007)	0.0013* (0.0007)
	Covariance	$\delta^2_{\theta 1}$		-0.0019 (0.0058)	-0.0028 (0.0058)	-0.0044 (0.0058)	-0.0036 (0.0057)
<u>Level-1 Reliability Estimates</u>							
	Intercept		0.84	0.71	0.70	0.69	0.68
	Time		-	0.26	0.27	0.26	0.26
<u>Pseudo Statistics and Goodness-of-Fit</u>							
	Deviance Statistic		1137.92	1117.50	1110.90	1104.38	1101.49
	Model df		3	6	7	8	9
	χ^2_{Δ}		-	20.41***	6.60*	6.52**	2.89+
	df $_{\Delta}$		-	3	1	1	1
	AIC		1143.9	1129.5	1124.9	1120.4	1119.5
	BIC		1144.3	1130.4	1125.9	1121.5	1120.8
	R^2_{ϵ}			.158	.159	.156	.154
	R^2_{θ}				.039	.071	.109
	R^2_1				-.015	-.008	.008

Table 4
Parameters (and Standard Errors) for Multilevel Models for Change on Ln of Number of Drinks per Drinking Occasions (n = 139)

Fixed Effects	Factor	Parameter	Model A	Model B	Model C	Model D	Model E
			Unconditional (UC)	Unconditional Growth UCG	Model B + Age (I)	Model C + External (I)	Model D + Act vs NA (I)
Initial (I) Status, π_{0i}	Intercept	γ_{00}	1.550*** (0.060)	1.419*** (0.073)	1.141*** (0.155)	0.767*** (0.165)	0.793*** (.162)
	Age	γ_{01}			0.095* (0.047)	0.075 (0.046)	0.081+ (0.045)
	Externalizing (EXT)	γ_{02}				0.574*** (0.133)	0.570*** (0.133)
	Aftercare: Active v. Non-Active	γ_{03}					-0.104+ (0.061)
Slope(S)/Rate Change, π_{1i}	Intercept	γ_{10}		0.023*** (0.006)	0.023*** (0.006)	0.022*** (0.006)	0.023*** (0.006)
<u>Variance Components</u>							
Level-1	Within-Person	δ^2_{ϵ}	0.376*** (0.028)	0.329*** (0.030)	0.329*** (0.030)	0.328*** (0.030)	0.329*** (0.030)
Level-2	In Initial Status	δ^2_0	0.391*** (0.061)	0.496*** (0.089)	0.487*** (0.088)	0.449*** (0.084)	0.425*** (0.081)
	In Rate of Change	δ^2_1		0.0010 (0.0007)	0.0010 (0.0007)	0.0011 (0.0007)	0.0010 (0.0007)
	Covariance	δ^2_{01}		-0.011+ (0.006)	-0.011+ (0.006)	-0.013* (0.006)	-0.012+ (0.006)
<u>Level-1 Reliability Estimates</u>							
	Intercept		0.78	0.67	0.66	0.65	0.63
	Time		-	0.19	0.19	0.20	0.20
<u>Pseudo Statistics and Goodness-of-Fit</u>							
	Deviance Statistic		1135.71	1115.44	1112.06	1094.05	1091.23
	Model df		3	6	7	8	9
	χ^2_{Δ}		-	20.27***	3.38+	18.01***	2.82+
	df $_{\Delta}$		-	3	1	1	1
	AIC		1141.7	1127.4	1126.1	1110.1	1109.2
	BIC		1142.1	1128.3	1127.1	1111.2	1110.5
	R^2_{ϵ}			.126	.126	.126	.126
	R^2_0				.018	.094	.143
	R^2_1				.000	-.092	-.041