Testing a Matching Hypothesis for Emerging Adults in Project MATCH: During-Treatment and One-Year Outcomes

JORDAN P. DAVIS, M.S.W.,^{a,*} BRANDON G. BERGMAN, PH.D.,^b DOUGLAS C. SMITH, PH.D.,^a & JOHN F. KELLY, PH.D.^b

^aUniversity of Illinois at Urbana-Champaign, Urbana, Illinois

^bCenter for Addiction Medicine, Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts

ABSTRACT. Objective: Compared with older adults, emerging adults (18–29 years old) entering treatment typically have less severe alcohol use consequences. Also, their unique clinical presentations (e.g., modest initial abstinence motivation) and developmental contexts (e.g., drinking-rich social networks) may make a straightforward implementation of treatments developed for adults less effective. Yet, this has seldom been examined empirically. This study was a secondary analysis of Project MATCH (Matching Alcoholism Treatments to Client Heterogeneity) data examining (a) overall differences between emerging adults and older adults (≥30 years old) on outcomes during treatment and at 1-year follow-up, and (b) whether emerging adults had poorer outcomes on any of the three Project MATCH treatments in particular. **Method:** Participants were 267 emerging adults and 1,459 older adults randomly assigned to individually delivered cognitive-behavioral therapy (CBT), motivational enhancement therapy (MET), or 12-step facilitation (TSF).

Multilevel growth curve models tested differences on percentage of days abstinent (PDA) and drinks per drinking day (DDD) by age group and treatment assignment. **Results:** During treatment, compared with older adults, emerging adults reported more DDD but similar PDA. Further, emerging adults assigned to TSF had less PDA and more DDD than emerging adults and older adults assigned to CBT or MET during treatment (i.e., emerging adults in TSF has poorer outcomes initially), but this matching effect was not evident at 1-year follow-up. **Conclusions:** This study is among the first to test age group differences across three psychosocial interventions shown to be efficacious treatments for alcohol use disorder. Although emerging adults generally did as well as their older counterparts, they may require a more developmentally sensitive approach to bolster TSF effects during treatment. (*J. Stud. Alcohol Drugs*, 78, 140–145, 2017)

EMERGING ADULTHOOD (AGES 18–29)¹ is a recently delineated life stage between adolescence and established adulthood, often characterized by the development of financial independence from parents as well as stable romantic relationships and careers/vocations (Arnett, 2000, 2001, 2005). In most Western societies, perhaps because of the combination of decreased parental supervision, still-maturing prefrontal neurocircuitry (Casey et al., 2000, 2005; Wilens, 2006), and cultural norms of experimentation with alcohol and other drugs, emerging adulthood confers the greatest risk for the onset of substance use disorders (SUDs) and alcohol use disorder (AUD), in particular. For example, relative to adults age 30 years and older (i.e., older adults), emerging adults have the highest past-year rates of AUD (American Psychiatric Association, 2013; Grant et al., 2015)

¹Although researchers generally define this period as occurring between ages 18 and 25 or 18 and 29 years (see Arnett, 2014), we refer to the broader age range (18–29 years) because of the likelihood that substance use disorders will interfere substantially with developmental transitions (Arnett et al., 2014).

Received: September 26, 2015. Revision: August 15, 2016.

This study was supported by National Institute on Alcohol Abuse and Alcoholism (NIAAA) Grants K23AA017702 (to Douglas C. Smith) and K24AA022136-02 (to John F. Kelly). The NIAAA had no role in the study design, collection, or analysis; interpretation of results; writing of the manuscript; or decisions on publication outlet.

*Correspondence may be sent to Jordan P. Davis at the University of Illinois at Urbana-Champaign, 1010 W. Nevada Street MC-082, Urbana, IL 61801, or via e-mail at: jdavis37@illinois.edu.

and tend to be overrepresented in SUD treatment in the United States (Substance Abuse and Mental Health Services Administration, 2014).

Need for specific clinical focus on emerging adults

Prior research has shown that emerging adults may have worse psychosocial and SUD treatment outcomes than older adults, including a lower likelihood of completing treatment (McHugh et al., 2013; Mertens & Weisner, 2000; Schuman-Olivier et al., 2014; Vuoristo-Myllys et al., 2013) and greater substance use or less abstinence during or following treatment exposure (Dennis et al., 2009; Hoepfner et al., 2014; Schuman-Olivier et al., 2014; Sinha et al., 2003).

Indeed, until recently, many SUD treatments developed for adults have been implemented among emerging adults without modification (Dennis et al., 2003; Muck et al., 2001). This could be problematic because emerging adults may enter treatment with lower drinking severity as well as lower abstinence motivation and perceived treatment need than do older adults (Hedden & Gfroerer, 2011; Sinha et al., 2003).

Compared with older adults, emerging adults also often have more friends who support drinking and other drug use but have limited access to recovery-supportive peers and environments (Kelly & Myers, 2007; Kelly et al., 2012; Satre et al., 2003). Also, because emerging adults are underrepresented (13%) in 12-step mutual-help organizations such as Alcoholics Anonymous (2011), these widely avail-

able recovery support services may be less attractive for treatment-seeking emerging adults. For example, Hoepfner et al. (2014) showed that across Project MATCH (Matching Alcoholism Treatments to Client Heterogeneity) conditions, emerging adults were as likely as older adults to benefit from Alcoholics Anonymous. However, compared with older adults, emerging adults attended fewer meetings during treatment and their Alcoholics Anonymous benefit was less likely to be explained by increases in pro-abstinence peers in their social networks.

The rationale for encouraging 12-step facilitation (TSF) attendance flows from the disease model of addiction, which views alcohol dependence as an incurable illness and promotes abstinence as the optimal solution. This approach may be mismatched with some emerging adults who have both lower dependence severity and initial abstinence motivation. Thus, although TSF was as efficacious as or more efficacious than cognitive-behavioral therapy (CBT; Kadden, 1995) and motivational enhancement therapy (MET; Miller, 1995) on drinking outcomes in Project MATCH (Project MATCH Research Group, 1998), it may be less effective for emerging adults if delivered without special attention to their unique clinical profiles and developmental contexts.

The current study examined outcome differences between emerging adults and older adults in Project MATCH, overall, and specifically within each of the three psychosocial AUD treatments—CBT, MET, and TSF. In doing so, we build on Hoepfner et al.'s (2014) comparison of Alcoholics Anonymous participation and benefit among emerging adults and older adults. To our knowledge, this is among the first studies comparing older adults' and emerging adults' outcomes after they received manualized and randomly allocated AUD treatments.

Primary aims of the current study were (a) to compare emerging adults and older adults in Project MATCH on baseline demographic and clinical characteristics and (b) to examine drinking outcomes by age group and whether emerging adults, specifically, had a differential response to any of three Project MATCH treatments during treatment as well as (c) at 1-year follow-up. We hypothesized that emerging adults would have (Hypothesis 1) less severe substance use, lower abstinence motivation, and more network support for drinking and less network support for abstinence at baseline; (Hypothesis 2) poorer during-treatment response; and (Hypothesis 3) poorer 1-year follow-up outcomes. We also hypothesized (Hypothesis 4) that emerging adults would benefit less from TSF during treatment and at 1-year follow-up.

Method

Participants and procedures

Participants were adults ($N = 1,726$) participating in Project MATCH, an outpatient treatment study for AUDs. Study

methods have been described elsewhere (Project MATCH Research Group, 1993). Here we compared emerging adults (18–29 years; $n = 267$) and older adults (≥ 30 years; $n = 1,459$) during the 12-week treatment phase and across the 1-year follow-up (Months 4–15). Weekly follow-up data were collected during treatment (baseline through 12 weeks) and then on a monthly basis during the 1-year follow-up phase. Therefore, we analyzed data for Weeks 1 through 12 for the during-treatment phase and Months 4 through 15 for the 1-year follow-up phase.

Measures

Treatment outcomes. The Form 90 (Miller & Del Boca, 1994) assessed percentage of days abstinent (PDA), or the proportion of days in the follow-up period of no alcohol use. Drinks per drinking day (DDD), the typical number of drinks consumed on drinking days, as well as illicit drug use were also measured using the Form 90.

Psychiatric symptoms. Depression was measured by the Beck Depression Inventory (Beck et al., 1988) ($\alpha = .86$), with psychiatric severity measured by the Addiction Severity Index ($\alpha = .77-.89$; McLellan et al., 1992).

Readiness for change. The University of Rhode Island Change Assessment (URICA; Dozois et al., 2004) and the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996) both measured readiness for change.

Drinking consequences were measured using the 50-item ($\alpha = .70-.80$) Drinker Inventory of Consequences (DrInC; Miller et al., 1995).

Self-efficacy was measured using the 20-item ($\alpha = .93$) Alcohol Abstinence Self-Efficacy Scale (DiClemente et al., 1994).

Social support. Support for abstinence and consumption was measured using the Important People and Activities Instrument (Clifford & Longabaugh, 1991). Support for abstinence is the percentage of abstinent or recovering individuals in participants' networks, and support for drinking is the frequency and percentage of drinking or heavy drinking peers. Social support from friends and family was measured using the Perceived Social Support Questionnaire (Procidano & Heller, 1983) ($\alpha = .90$). Social functioning was assessed using the social functioning subscale from the Psychological Functioning Inventory (Fergane et al., 1983) ($\alpha = .75-.88$).

Data analysis

PDA was transformed with arcsine transformation, and DDD was transformed using a square root transformation due to nonnormality.

We first examined whether the proportion and clinical characteristics of emerging adults were similar across treatment arm (outpatient vs. aftercare) and treatment assign-

FIGURE 1. Effect of emerging adult status on percentage of days abstinent for 12-step facilitation (TSF) versus cognitive behavioral therapy (CBT) during the treatment response phase

ment (CBT vs. MET vs. TSF). Assessing during-treatment and 1-year follow-up outcomes, we fit four separate multilevel growth models (Singer & Willett, 2003), each consisting of three models using SAS PROC MIXED Version 9.3 (SAS Institute Inc., Cary, NC). For each growth model, we first fit unconditional growth models (Model 1), allowing both intercepts and slopes (e.g., no predictors) to vary randomly. This allowed us to establish plausible growth for emerging adults' PDA and DDD trajectories. To adjust for site-level differences, we estimated a third level random intercept for site. We then ran a main effects model (Model 2) in which all variables of interest and control variables were entered. Our final model (Model 3) included interactions such as Emerging Adult Status $\times$ Time (cross-level interaction) and Emerging Adult Status $\times$ Treatment Assignment. Reductions in -2 log likelihood was used to assess model fit.

Missing data in Project MATCH were minimal, occurring for alcohol use outcomes for 4.3% of individuals at 3 months, 4.9% at 6 months, 6.4% at 9 months, 7.6% at 12 months, and 8.9% at 15 months. To address missing data, we used maximum likelihood estimation (Schafer & Graham, 2002); as such, each individual contributes whatever data they have to the likelihood function (see Dempster et al., 1977).

Results

Baseline differences between emerging adults and older adults

Apart from a greater proportion of emerging adults in the outpatient arm relative to the aftercare arm, in general, no differences were revealed by treatment condition. Results appear in Supplemental Tables 1–3.

During-treatment differences in percentage of days abstinent and drinks per drinking day

For PDA, we did not find a significant cross-level interaction for age group over time ($b = -0.004$, $p = .720$), suggesting that emerging adults and older adults had similar PDA during treatment. A significant interaction between age group and treatment assignment revealed that, compared with emerging adults assigned to TSF, emerging and older adults assigned to CBT ($b = 0.140$, $p = .024$; Figure 1) and MET ($b = 0.152$, $p = .012$; Supplemental Figure 1) had significantly higher PDA. No significant differences were found between CBT and MET ($b = -0.012$, $p = .843$; Supplemental Table 4).

For DDD, emerging adults (relative to older adults) had significant increases during treatment ($b = 0.021$, $p = .027$).

Consistent with hypotheses, emerging adults assigned to CBT had fewer DDD during treatment compared with those assigned to TSF ($b = -0.529, p = .005$). Similarly, emerging adults assigned to MET, compared with those in TSF, had fewer DDD ($b = -0.362, p = .062$); however, this just missed significance. No differences in DDD were found between CBT and MET for emerging adults ($b = -0.138, p = .466$; Supplemental Figure 2 and Supplemental Table 5).

One-year follow-up

For PDA, we found a marginally significant cross-level interaction ($b = 0.006, p = .050$), with emerging adults showing higher PDA across the follow-up period compared with older adults (Supplemental Figure 3). We did not find any differences for PDA across treatment assignment for emerging adults or older adults (Supplemental Table 6).

For DDD, we did not find evidence for a significant cross-level interaction with time ($b = -0.008, p = .445$) or any differences between emerging adult status and treatment assignment. This indicates that emerging adults and older adults had similar slopes over time and DDD did not differ by treatment assignment for emerging adults during the 1-year follow-up (Supplemental Table 7).

Discussion

The current study investigated whether emerging adults receiving CBT, MET, or TSF within Project MATCH had different outcomes during treatment or at 1-year follow-up relative to older adults. Emerging adults had poorer during-treatment response compared with older adults such that emerging adults assigned to TSF had lower PDA compared with individuals assigned to MET or CBT.

Partially supporting our hypotheses, emerging adults assigned to TSF had lower PDA and higher DDD during treatment compared with older adults assigned to TSF and to all participants, including both emerging adults and older adults, assigned to MET or CBT. However, there were no differences between emerging adults and older adults for 1-year follow-up outcomes by treatment assignment.

Why might emerging adults in TSF do worse during the 12 weeks of treatment than older adults in TSF and emerging adults in CBT or MET but have similar drinking outcomes during the year after receiving treatment? One possibility is that emerging adults are less engaged with treatment if assigned to TSF, with several possible explanations.

First, as mentioned above, emerging adults' clinical profiles, marked by lower initial alcohol dependence severity and greater network support for drinking, may not fit as well with standard TSF's strong emphasis on a disease model of alcohol addiction and abstinence. Second, standard TSF's emphasis on enhancing spirituality as a strategy to help one maintain abstinence may not engage emerg-

ing adults as well because of their typically lower levels of spirituality than that seen in older adults (Brown et al., 2013). This can be seen in Supplemental Table 3, where emerging adults had significantly lower spirituality scores than older adults at baseline.

Third, as discussed above and shown in Hoepfner et al. (2014) and Mason and Luckey (2003), after treatment, emerging adults are less likely than older adults to attend 12-step mutual-help groups such as Alcoholics Anonymous. Because TSF therapists in Project MATCH endorse Alcoholics Anonymous participation as the primary purported clinical mechanism of AUD recovery and strongly recommend Alcoholics Anonymous attendance, standard TSF may not fit as well for emerging adults because they tend to be less interested in Alcoholics Anonymous participation compared with older adults. Future work may use a multilevel, statistical mediation framework (Preacher et al., 2010, 2011) to examine what explains emerging adults' initial—but ultimately decayed—poorer response to TSF.

Research detecting how differences in clinical characteristics between emerging adults and older adults change dynamically, as well as how such changes predict substance use outcomes, could inform potential treatment modifications for this age group. Such research should determine if any mediators of treatment outcome differences are developmentally specific to emerging adults, ruling out the possibility that treatment outcomes merely reflect outcome differences at different moments in the course of alcohol dependency (i.e., less severe in emerging adults and more severe in older adults).

Despite the need for more in-depth investigation, one immediate clinical implication is that TSF therapists may wish to approach emerging adults from a developmentally sensitive perspective. For example, therapists may engage emerging adults specifically with young persons' meetings, as these have been shown to enhance initial Alcoholics Anonymous engagement and better outcomes (Labbe et al., 2013). Therapists may also emphasize the ability of young persons' meetings to help emerging adults feel a greater sense of belonging and connection to others in similar situations and to deemphasize 12-step-specific concepts (e.g., the need to attend meetings to facilitate spiritual growth in order to address AUDs; Labbe et al., 2014).

This analysis extended prior findings showing poorer treatment outcomes for emerging adults (Satre et al., 2004) by exclusively focusing on alcohol outcomes and sampling emerging adults and older adults from a randomized study. Nevertheless, results should be interpreted with caution in light of several limitations. First, although our analysis allowed us to examine differences in treatment outcomes between emerging adults and older adults, Project MATCH data apply to emerging adults in the late 1990s. Research is needed with contemporary emerging adults. Second, our limited sample size of emerging adults may have reduced the

statistical power needed to detect age effects and prohibited the inclusion of more covariates in multilevel models.

Further, we have unequal (or unbalanced) sample sizes between emerging adults and older adults, which may lead to biased estimates. To test our models we ran separate analysis of variances models with both type 2 and type 3 sums of squares. Using type 2 sums of squares adjusts means based on unbalanced designs due to population effects (e.g., age differences) rather than random unbalance (e.g., attrition). Both models revealed robust results to our final growth curve models. Nevertheless, Project MATCH is possibly the only true experiment with enough age diversity to compare outcomes across age groups, as other studies compared treatment response by age in quasi-experimental designs (Satre et al., 2003; Smith et al., 2011).

A pure, TSF-focused approach may lead to slightly poorer drinking outcomes during treatment for emerging adults, but this had no bearing on their later drinking outcomes. Taken together with other studies focused on 12-step mutual-help participation among emerging adults (Bergman et al., 2015; Hoepfner et al., 2014; Labbe et al., 2013), the current study suggests that a more developmentally sensitive approach may be needed to bolster emerging adults' initial response to TSF. This might include deployment of additional therapeutic strategies (e.g., CBT) and linkage to young person's meetings.

References

- Alcoholics Anonymous. (2011). *Twelve steps and twelve traditions*. Alcoholics Anonymous World Services, New York.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: Author.
- Arnett, J. J. (2000). Emerging adulthood. A theory of development from the late teens through the twenties. *American Psychologist*, 55, 469–480. doi:10.1037/0003-066X.55.5.469
- Arnett, J. J. (2001). Conceptions of the transition to adulthood: Perspectives from adolescence through midlife. *Journal of Adult Development*, 8, 133–143. doi:10.1023/A:1026450103225
- Arnett, J. J. (2005). The developmental context of substance use in emerging adulthood. *Journal of Drug Issues*, 35, 235–254. doi:10.1177/002204260503500202
- Arnett, J. J. (2014). *Emerging adulthood: The winding road from the late teens through the twenties*. Oxford Press, New York.
- Beck, A. T., Steer, R. A., & Carbin, M. G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review*, 8, 77–100. doi:10.1016/0272-7358(88)90050-5
- Bergman, B. G., Hoepfner, B. B., Nelson, L. M., Slaymaker, V., & Kelly, J. F. (2015). The effects of continuing care on emerging adult outcomes following residential addiction treatment. *Drug and Alcohol Dependence*, 153, 207–214. doi:10.1016/j.drugalcdep.2015.05.017
- Brown, I. T., Chen, T., Gehlert, N. C., & Piedmont, R. L. (2013). Age and gender effects on the Assessment of Spirituality and Religious Sentiments (ASPIRES) scale: A cross-sectional analysis. *Psychology of Religion and Spirituality*, 5, 90–98. doi:10.1037/a0030137
- Casey, B. J., Giedd, J. N., & Thomas, K. M. (2000). Structural and functional brain development and its relation to cognitive development. *Biological Psychology*, 54, 241–257. doi:10.1016/S0301-0511(00)00058-2
- Casey, B. J., Tottenham, N., Liston, C., & Durston, S. (2005). Imaging the developing brain: What have we learned about cognitive development? *Trends in Cognitive Sciences*, 9, 104–110. doi:10.1016/j.tics.2005.01.011
- Clifford, P. R., & Longabaugh, R. (1991). *Manual for the administration of the Important People and Activities Instrument*. Adapted for use by Project MATCH, unpublished manuscript. Providence, RI: Center for Alcohol and Addiction Studies, Brown University.
- Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society. Series B (Methodological)*, 39, 1–38. Retrieved from <http://www.jstor.org/stable/2984875>
- Dennis, M. L., Dawud-Noursi, S., Muck, R. D., McDermeit, M., Stevens, S., & Morral, A. (2003). The need for developing and evaluating adolescent treatment models. In S. Stephens & A. R. Morral (Eds.), *Adolescent substance abuse treatment in the United States: Exemplary models from a national evaluation study* (pp. 3–34). Binghamton, NY: Haworth Press.
- Dennis, M. L., White, M. K., & Ives, M. L. (2009). Individual characteristics and needs associated with substance misuse of adolescents and young adults in addiction treatment. In C. G. Leukefeld, T. P. Gullotta, & M. Staton-Tindall (Eds.), *Adolescent substance abuse: Evidence-based approaches to prevention and treatment* (pp. 45–72). New York, NY: Springer.
- DiClemente, C. C., Carbonari, J. P., Montgomery, R. P., & Hughes, S. O. (1994). The Alcohol Abstinence Self-Efficacy scale. *Journal of Studies on Alcohol*, 55, 141–148. doi:10.15288/jsa.1994.55.141
- Dozois, D. J., Westra, H. A., Collins, K. A., Fung, T. S., & Garry, J. K. (2004). Stages of change in anxiety: Psychometric properties of the University of Rhode Island Change Assessment (URICA) scale. *Behaviour Research and Therapy*, 42, 711–729. doi:10.1016/S0005-7967(03)00193-1
- Feragne, M. A., Longabaugh, R., & Stevenson, J. F. (1983). The psychosocial functioning inventory. *Evaluation & the Health Professions*, 6, 25–48. doi:10.1177/016327878300600102
- Grant, B. F., Goldstein, R. B., Saha, T. D., Chou, S. P., Jung, J., Zhang, H., . . . Hasin, D. S. (2015). Epidemiology of DSM-5 alcohol use disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions III. *JAMA Psychiatry*, 72, 757–766. doi:10.1001/jamapsychiatry.2015.0584
- Hedden, S. L., & Gfroerer, J. C. (2011). Correlates of perceiving a need for treatment among adults with substance use disorder: Results from a national survey. *Addictive Behaviors*, 36, 1213–1222. doi:10.1016/j.addbeh.2011.07.026
- Hoepfner, B. B., Hoepfner, S. S., & Kelly, J. F. (2014). Do young people benefit from AA as much, and in the same ways, as adult aged 30+? A moderated multiple mediation analysis. *Drug and Alcohol Dependence*, 143, 181–188. doi:10.1016/j.drugalcdep.2014.07.023
- Kadden, R. (1995). *Cognitive-behavioral coping skills therapy manual: A clinical research guide for therapists treating individuals with alcohol abuse and dependence*. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism.
- Kelly, J. F., & Myers, M. G. (2007). Adolescents' participation in Alcoholics Anonymous and Narcotics Anonymous: Review, implications and future directions. *Journal of Psychoactive Drugs*, 39, 259–269. doi:10.1080/02791072.2007.10400612
- Kelly, J. F., Urbanoski, K. A., Hoepfner, B. B., & Slaymaker, V. (2012). "Ready, willing, and (not) able" to change: Young adults' response to residential treatment. *Drug and Alcohol Dependence*, 121, 224–230. doi:10.1016/j.drugalcdep.2011.09.003
- Labbe, A. K., Greene, C., Bergman, B. G., Hoepfner, B., & Kelly, J. F. (2013). The importance of age composition of 12-step meetings as a moderating factor in the relation between young adults' 12-step participation and abstinence. *Drug and Alcohol Dependence*, 133, 541–547. doi:10.1016/j.drugalcdep.2013.07.021

- Labbe, A. K., Slaymaker, V., & Kelly, J. F. (2014). Toward enhancing 12-step facilitation among young people: A systematic qualitative investigation of young adults' 12-step experiences. *Substance Abuse, 35*, 399–407. doi:10.1080/08897077.2014.950001
- Mason, M. J., & Luckey, B. (2003). Young adults in alcohol-other drug treatment: An understudied population. *Alcoholism Treatment Quarterly, 21*, 17–32. doi:10.1300/J020v21n01_02
- McLellan, A. T., Kushner, H., Metzger, D., Peters, R., Smith, I., Grissom, G., . . . & Argeriou, M. (1992). The fifth edition of the Addiction Severity Index. *Journal of Substance Abuse Treatment, 9*, 199–213.
- McHugh, R. K., Murray, H. W., Hearon, B. A., Pratt, E. M., Pollack, M. H., Safren, S. A., & Otto, M. W. (2013). Predictors of dropout from psychosocial treatment in opioid-dependent outpatients. *American Journal on Addictions, 22*, 18–22. doi:10.1111/j.1521-0391.2013.00317.x
- Mertens, J. R., & Weisner, C. M. (2000). Predictors of substance abuse treatment retention among women and men in an HMO. *Alcoholism: Clinical and Experimental Research, 24*, 1525–1533. doi:10.1111/j.1530-0277.2000.tb04571.x
- Miller, W. R. (1995). *Motivational enhancement therapy manual: A clinical research guide for therapists treating individuals with alcohol abuse and dependence* (Project MATCH Monograph Series Volume 2). Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.
- Miller, W. R., & Del Boca, F. K. (1994). Measurement of drinking behavior using the Form 90 family of instruments. *Journal of Studies on Alcohol, Supplement 12*, 112–118. doi:10.15288/jas.1994.s12.112
- Miller, W. R., & Tonigan, J. S. (1996). Assessing drinkers' motivation for change: The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). *Psychology of Addictive Behaviors, 10*, 81–89. doi:10.1037/0893-164X.10.2.81
- Miller, W. R., Tonigan, J. S., & Longabaugh, R. (1995). *The Drinker Inventory of Consequences (DrInC): An instrument for assessing adverse consequences of alcohol abuse: Test manual*. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.
- Muck, R., Zempolich, K. A., Titus, J. C., Fishman, M., Godley, M. D., & Schwebel, R. (2001). An overview of the effectiveness of adolescent substance abuse treatment models. *Youth & Society, 33*, 143–168. doi:10.1177/0044118X01033002002
- Preacher, K. J., Zhang, Z., & Zyphur, M. J. (2011). Alternative methods for assessing mediation in multilevel data: The advantages of multilevel SEM. *Structural Equation Modeling: A Multidisciplinary Journal, 18*, 161–182. doi:10.1080/10705511.2011.557329
- Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*, 209–233. doi:10.1037/a0020141
- Procidano, M. E., & Heller, K. (1983). Measures of perceived social support from friends and from family: Three validation studies. *American Journal of Community Psychology, 11*, 1–24. doi:10.1007/BF00898416
- Project MATCH Research Group. (1993). Project MATCH: Rationale and methods for a multisite clinical trial matching patients to alcoholism treatment. *Alcoholism: Clinical and Experimental Research, 17*, 1130–1145. doi:10.1111/j.1530-0277.1993.tb05219.x
- Project MATCH Research Group. (1998). Matching alcoholism treatments to client heterogeneity: Treatment main effects and matching effects on drinking during treatment. *Journal of Studies on Alcohol, 59*, 631–639. doi:10.15288/jsa.1998.59.631
- Satre, D. D., Mertens, J., Areán, P. A., & Weisner, C. (2003). Contrasting outcomes of older versus middle-aged and younger adult chemical dependency patients in a managed care program. *Journal of Studies on Alcohol, 64*, 520–530. doi:10.15288/jsa.2003.64.520
- Satre, D. D., Mertens, J. R., Areán, P. A., & Weisner, C. (2004). Five-year alcohol and drug treatment outcomes of older adults versus middle-aged and younger adults in a managed care program. *Addiction, 99*, 1286–1297. doi:10.1111/j.1360-0443.2004.00831.x
- Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147–177. doi:10.1037/1082-989X.7.2.147
- Schuman-Olivier, Z., Weiss, R. D., Hoepfner, B. B., Borodovsky, J., & Albanese, M. J. (2014). Emerging adult age status predicts poor buprenorphine treatment retention. *Journal of Substance Abuse Treatment, 47*, 202–212. doi:10.1016/j.jsat.2014.04.006
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, NY: Oxford University Press.
- Sinha, R., Easton, C., Renee-Aubin, L., & Carroll, K. M. (2003). Engaging young probation-referred marijuana-abusing individuals in treatment: A pilot trial. *American Journal on Addictions, 12*, 314–323. doi:10.1080/10550490390226905
- Smith, D. C., Godley, S. H., Godley, M. D., & Dennis, M. L. (2011). Adolescent community reinforcement approach outcomes differ among emerging adults and adolescents. *Journal of Substance Abuse Treatment, 41*, 422–430. doi:10.1016/j.jsat.2011.06.003
- Substance Abuse and Mental Health Services Administration. (2014). *Treatment episode data set (TEDS): 2002–2012. National admissions to substance abuse treatment services* (BHSIS Series S-71, HHS Publication No. (SMA) 14-4850). Rockville, MD: Author. Retrieved from http://www.samhsa.gov/data/sites/default/files/TEDS2012N_Web.pdf
- Vuoristo-Myllys, S., Lahti, J., Alho, H., & Julkunen, J. (2013). Predictors of dropout in an outpatient treatment for problem drinkers including cognitive-behavioral therapy and the opioid antagonist naltrexone. *Journal of Studies on Alcohol and Drugs, 74*, 894–901. doi:10.15288/jsad.2013.74.894
- Wilens, T. E. (2006). Attention deficit hyperactivity disorder and substance use disorders. *American Journal of Psychiatry, 163*, 2059–2063. doi:10.1176/ajp.2006.163.12.2059