

MINDFULNESS-ORIENTED RECOVERY ENHANCEMENT FOR VIDEO GAME
ADDICTION IN U.S. EMERGING ADULTS

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ABSTRACT

WEN LI: Mindfulness-Oriented Recovery Enhancement for Video Game Addiction in U.S.
Emerging Adults
(Under the direction of Matthew Howard)

An emerging literature suggests that video game addiction is increasingly prevalent among emerging adults; however, no evidence-based treatments for video game addiction have been identified. Mindfulness treatment shows positive effects for substance use and gambling disorders, and may be a promising intervention for video game addiction. However, mindfulness treatment has not, heretofore, been adapted and evaluated for video game addiction. To fill this gap, my three-paper dissertation involved adapting and pilot testing Mindfulness-Oriented Recovery Enhancement (MORE) treatment for emerging adults with video game addiction using a randomized controlled trial (RCT) design.

The first paper includes a systematic review of 49 peer-reviewed journal articles evaluating mindfulness treatment for substance misuse. Meta-analytic results revealed significant small-to-large effects of mindfulness treatment in reducing levels of substance misuse, intensity of craving for psychoactive substances, and stress levels. Further, mindfulness treatments were effective in increasing abstinence from cigarette smoking and enhancing levels of mindfulness at posttreatment compared to alternative treatments.

The second and third papers describe the development and evaluation of the adapted MORE treatment for video game addiction. The second paper presents a theoretical justification for mindfulness treatment of video game addiction and a study protocol for the RCT evaluating the adapted MORE treatment in emerging adults. The third paper reports the results of the RCT

evaluating effects of MORE for emerging adults with video game addiction. Thirty adults ($M_{age} = 25.0$, $SD = 5.4$) with video game addiction were randomized to 8 weeks of group-based MORE or 8 weeks of a support group [SG]. Outcomes included signs and symptoms of video game addiction, craving for video game playing, video gaming-related maladaptive cognitions, perceived stress, coping, and mindfulness, and were measured at pre-and posttreatment using standardized self-report instruments. Analysis of covariance revealed that participation in MORE was associated with significantly greater reductions in signs and symptoms of video game addiction, intensity of craving for video game playing, and negative feelings related to video game playing, and a significantly greater increase in positive coping at posttreatment compared to the SG. Findings suggest that MORE is a promising intervention for emerging adults with video game addiction.

To Mom and Dad, my mentor, Dr. Matthew O. Howard, and my partner and best friend, Blake Anthony. You have had a tremendous impact on who I am. I could not have accomplished this without each of you. Thank you for your encouragement, mentorship, and support.

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LIST OF ABBREVIATIONS

ANCOVA	Analysis of covariance
APA	American Psychiatric Association
CONSORT	Consolidated Standards of Reporting Trials
DSM	The Diagnostic and Statistical Manual of Mental Disorders
MORE	Mindfulness-Oriented Recovery Enhancement
SG	Support group
RCT	Randomized controlled trial

INTRODUCTION

MINDFULNESS-ORIENTED RECOVERY ENHANCEMENT FOR VIDEO GAME ADDICTION IN U.S. EMERGING ADULTS

Video gaming addiction — defined as a pattern of excessive and pathological video game playing — is characterized by signs and symptoms similar to those of substance use and gambling disorders (Kuss & Griffiths, 2012; Petry et al., 2014). A rapidly increasing number of empirical studies suggest that video game addiction is becoming more prevalent in emerging adults and is associated with physical and psychosocial impairments (e.g., Kuss & Griffiths, 2012; Petry et al., 2014). Internet Gaming Disorder, a subtype of video game addiction, is included in Section 3 of the Diagnostic and Statistical Manual of Mental Disorders-5th Edition (DSM-5; American Psychiatric Association [APA], 2013).

Video game addiction is a serious problem for 4% to 12% of “video gamers” (Kuss & Griffiths, 2012). Emerging adults with video game addiction often exhibit symptoms of impaired physical health, psychiatric distress, aggression, and co-occurring addictions (e.g., Dong, Lu, Zhou, & Zhao, 2011; Ferrie, De Marco, Grünewald, Giannakodimos, & Panayiotopoulos, 1994; Kohn, 2002). Moreover, emerging adults with video game addiction often experience interpersonal problems, poor employment records and/or problems with academic performance, and financial debt (e.g., Beranuy, Carbonell, & Griffiths, 2013; Chappell, Eatough, Davies, & Griffiths, 2006). The growing prevalence of video game addiction coupled with evidence of related negative consequences support the pressing need for interventions that can prevent this

problem from leading to severe psychosocial dysfunction. However, no evidence-based treatments for video game addiction have been identified.

Mindfulness treatment is considered an effective intervention for substance misuse and behavioral addictions (e.g., Chiesa & Serretti, 2014; Toneatto, Pillai, & Courtice, 2014). Current literature suggests that video game addiction and substance use disorder share similar risk mechanisms that may be malleable to mindfulness treatment (e.g., Decker & Gay, 2011; Hetzel-Riggin & Pritchard, 2011; Garland, Froeliger, & Howard, 2014; Peng & Liu, 2010). Thus, I hypothesized that mindfulness treatment might be an efficacious intervention for emerging adults who suffer from video game addiction. To test this hypothesis, my dissertation includes a systematic review of prior studies evaluating mindfulness treatment for substance misuse, adapts a mindfulness treatment (i.e., Mindfulness-Oriented Recovery Enhancement [MORE]; Garland, 2013) for use with people with video game addiction, and pilot tests the adapted MORE treatment for video game addiction in emerging adults using a randomized controlled trial (RCT) design.

Organization of the Dissertation

This dissertation is an integration of three papers. The first paper, “Mindfulness Treatment for Substance Misuse: A Systematic Review and Meta-Analysis,” reviews 49 studies evaluating effects of mindfulness treatment for substance misuse published in peer-reviewed journals by December, 2015. The first paper includes meta-analyses that examine the efficacy of mindfulness treatment vis-a-vis reducing substance misuse, craving for psychoactive substances, and levels of stress compared to alternative treatments. Findings of this systematic review and associated meta-analyses increase my understanding of mindfulness treatment for substance misuse, and suggested that mindfulness treatment may be effective in treating video game

addiction. This paper also reviews methodological characteristics of these treatment studies, which helps to inform my RCT adapting and evaluating a mindfulness treatment (i.e., MORE) for video game addiction.

The second paper, “Mindfulness-Oriented Recovery Enhancement for Video Game Addiction in U.S. Emerging Adults: Preparing to Conduct a Randomized Controlled Trial,” describes an adapted 8-session, 16-hour mindfulness treatment (i.e., MORE) for video game addiction, and determines the feasibility of conducting a RCT to evaluate the adapted MORE treatment for emerging adults with video game addiction. The second paper presents a theoretical justification for mindfulness treatment of video game addiction and a study protocol for the RCT evaluating the adapted MORE treatment, including a description of the MORE treatment manual adaptation, identification of key variables and measures, and a description of the sampling, recruitment, and eligibility screening protocols. The second paper discusses the feasibility and challenges associated with adapting the MORE treatment manual, the RCT protocol, and recruitment and eligibility screening using Internet-based technology.

The third paper, “Mindfulness-Oriented Recovery Enhancement for Video Game Addiction in U.S. Emerging Adults: An Early-Stage Randomized Controlled Trial,” reports the results of the RCT evaluating the effects of MORE vs. a support group (SG) in reducing severity of video game addiction. Thirty adults ages 18 to 35 with video game addiction were randomized to 8 weeks of MORE or SG interventions. Outcomes measured at pre- and posttreatment included signs and symptoms of video game addiction, severity of craving for video game playing, video gaming-related maladaptive cognitions, perceived stress, coping, and mindfulness. Analysis of covariance and intent-to-treat analyses were used for outcome evaluation. Taken together, the three papers fill important gaps in the video gaming and mindfulness literatures.

REFERENCES: INTRODUCTION

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
doi:10.1176/appi.books.9780890425596.744053
- Beranuy, M., Carbonell, X., & Griffiths, M. D. (2013). A qualitative analysis of online gaming addicts in treatment. *International Journal of Mental Health and Addiction*, 11(2), 149-161. doi:10.1007/s11469-012-9405-2
- Chappell, D., Eatough, V., Davies, M. N., & Griffiths, M. (2006). EverQuest—It's just a computer game right? An interpretative phenomenological analysis of online gaming addiction. *International Journal of Mental Health and Addiction*, 4(3), 205-216.
doi:10.1007/s11469-006-9028-6
- Chiesa, A., & Serretti, A. (2014). Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Substance Use & Misuse*, 49(5), 492-512. doi:10.3109/10826084.2013.770027
- Decker, S. A., & Gay, J. N. (2011). Cognitive-bias toward gaming-related words and disinhibition in World of Warcraft gamers. *Computers in Human Behavior*, 27(2), 798-810. doi:10.1016/j.chb.2010.11.005
- Dong, G. G., Lu, Q., Zhou, H., & Zhao, X. (2011). Precursor or sequela: Pathological disorders in people with Internet addiction disorder. *PLOS ONE*, 6, e14703.
doi:10.1371/journal.pone.0014703
- Ferrie, C. D., De Marco, P., Grünewald, R. A., Giannakodimos, S., & Panayiotopoulos, C. P. (1994). Video game induced seizures. *Journal of Neurology, Neurosurgery & Psychiatry*, 57(8), 925-931. doi:10.1136/jnnp.57.8.925
- Garland, E. L. (2013). *Mindfulness oriented-recovery enhancement for addiction, stress, and pain*. Washington DC: NASW Press.
- Garland, E. L., Froeliger, B., & Howard, M. O. (2014). Mindfulness training targets neurocognitive mechanisms of addiction at the attention-appraisal-emotion interface. *Frontiers in Psychiatry*, 4, 1-15. doi:10.3389/fpsyt.2013.00173
- Hetzel-Riggin, M. D., & Pritchard, J. R. (2011). Predicting problematic Internet use in men and women: The contributions of psychological distress, coping style, and body esteem. *Cyberpsychology, Behavior, and Social Networking*, 14, 519-525.
doi:10.1089/cyber.2010.0314
- Kohn, D. (2002). Addicted: Suicide over Everquest? Was he obsessed? Retrieved from <http://www.cbsnews.com/news/addicted-suicide-over-everquest/>

- Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction*, 10, 278-296. doi:10.1007/s11469-011-9318-5
- Peng, W., & Liu, M. (2010). Online gaming dependency: A preliminary study in China. *CyberPsychology, Behavior, and Social Networking*, 13(3), 329-333. doi:10.1089/cyber.2009.0082
- Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H. J., Möble, T., ... & O'Brien, C. P. (2014). An international consensus for assessing Internet Gaming Disorder using the new DSM-5 approach. *Addiction*, 109(9), 1399-1406. doi:10.1111/add.12457
- Toneatto, T., Pillai, S., & Courtice, E. L. (2014). Mindfulness-enhanced cognitive behavior therapy for problem gambling: A controlled pilot study. *International Journal of Mental Health and Addiction*, 12(2), 197-205. doi:10.1007/s11469-014-9481-6

PAPER I

MINDFULNESS TREATMENT FOR SUBSTANCE MISUSE: A SYSTEMATIC REVIEW AND META-ANALYSIS

High rates of relapse following substance misuse treatment highlight an urgent need for effective therapies. Although the number of empirical studies investigating effects of mindfulness treatment for substance misuse has increased dramatically in recent years, no prior review has examined findings of mindfulness studies published between 2012 and 2015. Thus, this systematic review examined methodological characteristics and substantive findings of studies evaluating mindfulness treatment for substance misuse published by 2015. The review also includes the first meta-analysis of randomized controlled trials of mindfulness treatment for substance misuse. Comprehensive bibliographic searches in PubMed, PsycInfo, and Web of Science, identified 49 pertinent studies. Meta-analytic results revealed significant small-to-large effects of mindfulness treatment in reducing the frequency and severity of substance misuse, intensity of craving for psychoactive substances, and severity of stress. Mindfulness treatment was also effective in increasing rates of posttreatment abstinence from cigarette smoking compared to alternative treatments. Mindfulness treatment for substance misuse is a promising intervention for substance misuse, although more research is needed examining the mechanisms by which mindfulness interventions exert their effects and the effectiveness of mindfulness treatment in diverse treatment settings.

Introduction

Substance misuse is a prevalent global public health concern. Approximately 250 million people worldwide used illicit drugs in 2013, and 27 million people were problem drug users, (United Nations Office on Drugs and Crime [UNODC], 2015). The global incidence of illicit drug use has increased in the past 5 years (UNOCD, 2015). In the United States, 9.4% (i.e., 24.6 million) of Americans 12 or older were current illicit drug users in 2013 (Substance Abuse and Mental Health Services Administration [SAMHSA], 2014). Further, approximately one-quarter (i.e., 60.1 million) of Americans 12 or older were binge drinkers, and 6.3% (i.e., 16.5 million) reported heavy drinking (SAMHSA, 2014). More than one-fifth (i.e., 55.8 million) of Americans 12 or older were current cigarette smokers (SAMHSA, 2014).

Substance misuse is costly to individuals, families, and society. Approximately 187,100 people worldwide died of drug-related causes in 2013 (UNODC, 2015). Substance misuse also has profound economic costs. The cost of substance misuse to the U.S. including crime, loss of work productivity, and health care, was recently estimated at more than 700 billion dollars annually (National Institute on Drug Abuse [NIDA], 2015).

Effective treatments for substance misuse are urgently needed. In 2013, an estimated 8% (i.e., 21.6 million) of Americans 12 or older met criteria for substance use disorders; however, less than 1% (i.e., 2.5 million) of people who needed treatment for substance misuse received treatment at a specialty facility (SAMHSA, 2014). Although a variety of evidence-based treatments (e.g., cognitive-behavioral therapy [CBT] and motivational interviewing) are available for substance misuse problems, outcomes remain unsatisfactory with relapse rates as high as 60% in the year following treatment (Maisto, Pollock, Cornelius, Lynch, & Martin, 2003;

Witkiewitz & Masyn, 2008). Consequently, cost-effective treatments that reduce substance use and prevent relapse need to be developed, evaluated, and widely implemented.

Mindfulness training is considered a promising treatment for substance misuse (e.g., Chiesa & Alessandro, 2014; Katz & Toner, 2013; Zgierska et al., 2009). “Mindfulness” refers to maintaining a moment-by-moment awareness of one’s thoughts, feelings, bodily sensations, and surrounding environment. “Mindfulness emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p.145). Mindfulness practice (e.g., meditation) could facilitate meta-cognition that enables people to become aware of their stream of consciousness. Enhancing cognitive awareness allows for better monitoring of automatic cognitive and emotional processes (Garland, Gaylord, & Park, 2009). Mindfulness also involves acceptance, meaning that people pay attention to their thoughts and feelings without judging them. When practicing mindfulness, people tune their thoughts to what they are sensing in the present moment rather than rehashing the past or imagining the future (Kabat-Zinn, 2003).

Many researchers have considered how mindfulness practices could modify risk mechanisms underlying addictive behaviors, craving, and relapse. Mindfulness practices could raise an individual’s metacognitive awareness of automatic processes associated with craving, substance seeking and using, and enhance attention to triggers and the presence of urges, thereby enabling an interruption of the cycle of cognitive, affective, and psychophysiological mechanisms through the use of learned positive coping strategies (Garland, et al, 2014; Witkiewitz, Bowen, et al., 2014). Mindfulness practice might also facilitate disengagement of attention from substance-related cues and diminish attentional-bias toward substance-related cues (Garland, Boettiger, Gaylord, Chanon, & Howard, 2012). Further, mindfulness training

could enable individuals not to react to stress or urges for substance use through cultivation of a metacognitive awareness of present moment experience (Garland, 2014). Metacognitive awareness of present-moment experience could enhance nonreactivity to unwanted thoughts and urges to use psychoactive substances, thereby preventing post-suppression rebound effects from exacerbating cognitions related to substance use that can promote relapse (Tiffany & Conklin, 2000; Garland et al., 2014; Garland, Roberts-Lewis, Tronnier, Graves, & Kelley, 2016). Further, mindfulness practice (e.g., mindful breathing and body scan exercises) could help individuals become desensitized to distressing experiences that trigger substance misuse and reorient their attention to the sensation of breathing or other health-promoting stimuli (Garland, Froeliger, & Howard, 2014a; Witkiewitz, Bowen, et al., 2014). In addition, mindfulness training could enhance stress management and reduce stress-precipitated substance use (Garland, Froeliger, & Howard, 2014b; Kabat-Zinn & Hanh, 2009). Current neurobiological evidence suggests that mindfulness practice may change brain function and cognitions associated with rumination and reactivity to substance-related cues, and thereby reduce risk for craving and relapse (Garland et al., 2014b; Holzel et al., 2011).

Many studies have evaluated different types of treatment for substance misuse based on formal mindfulness training, including Vipassana Meditation courses (e.g., Bowen et al., 2006), Mindfulness-Based Stress Reduction (e.g., Davis et al., 2007), Mindfulness-Based Relapse Prevention (e.g., Bowen et al., 2009), Mindfulness-Oriented Recovery Enhancement (e.g., Garland et al., 2014; 2016), modified mindfulness training for smoking cessation (e.g., Davis, Goldberg, et al., 2014; Davis, Manley, et al., 2014), and treatments combining mindfulness training with therapeutic community treatment (e.g., Marcus et al., 2009). These treatments have been empirically evaluated for their effects vis-a-vis increasing abstinence from substances, and

reducing substance misuse, craving for substances, and negative consequences of substance misuse. A broad range of secondary outcomes, including enhancement of patients' affective and behavioral functioning and psychosocial well-being, and treatment adherence have also been examined (Chiesa & Alessandro, 2014; Zgierska et al., 2009).

Vipassana Meditation (VM) courses teach participants transcendental meditation, a practice deeply rooted in the Buddhist tradition (Ahir, 1999). VM consists of a standard 10-day, group-based course that involves meditating in silence for 10 to 11 hours per day (Ahir, 1999). VM courses are designed to cultivate participants' acceptance of thoughts and awareness of experiences such as craving without reacting to such experiences, and re-orientation away from compulsive thought patterns through the practice of mindfulness meditation (Bowen et al., 2006). VM courses are effective in reducing recidivism, psychiatric symptoms (e.g., depression), and hostility (Alexander, Walton, Orme-Johnson, Goodman, & Pallone, 2003). The effects of VM courses in reducing substance misuse have been evaluated with people involved in the criminal justice system (e.g., Bowen et al., 2006).

Mindfulness-Based Relapse Prevention (MBRP) is a manualized treatment that integrates formal mindfulness practice (e.g., meditation and mindful breathing exercises), motivational interviewing, and relapse prevention cognitive therapy (Bowen & Chawla, 2011). MBRP was developed based on two evidence-based manualized mindfulness interventions: Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn & Hanh, 2009) that combines mindfulness meditation with cognitive therapy for stress and mental distress symptoms; and Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2012) that is designed to prevent relapse to major depressive episodes. MBRP used the same structure as MBSR and MBCT of 8-weekly, 2-hour group sessions and daily home practice (Bowen et al., 2009). MBRP

and MBSR have been modified to address the needs of diverse client populations (e.g., women; Witkiewitz, Warner, et al., 2014) with a variety of substance misuse problems (e.g., cigarette smoking cessation; Davis, Fleming, Bonus, & Baker, 2007).

Mindfulness-Oriented Recovery Enhancement (MORE) is a manualized treatment that integrates aspects of formal mindfulness training, “Third Wave” CBT, and positive psychology principles into a cohesive therapeutic approach (Garland, 2013). MORE was originally developed as a group-based treatment for people with alcohol dependence, consisting of 10-weekly, 2-hour group sessions and assigned homework. MORE has also been delivered as an 8-week group-based treatment to address prescription opioid misuse, chronic pain, and psychiatric distress. MORE translated findings from behavioral science and neuroscience into specific strategies that could modify maladaptive coping and automatic habits underlying addictive behaviors (Garland et al., 2014).

Three systematic reviews have been published that support the positive effects of mindfulness treatment on substance misuse; however, these reviews examined studies published before 2012 (Chiesa & Alessandro, 2014; Katz & Toner, 2013; Zgierska et al., 2009), and a large number of studies evaluating mindfulness treatment for substance misuse were published after 2011. Further, to our knowledge, no meta-analyses have been published that examined the efficacy of mindfulness treatment in reducing substance misuse and enhancing psychosocial well-being. Thus, we conducted a systematic review and meta-analysis that included studies of mindfulness treatment for substance misuse published by December, 2015. The aim of this systematic review was to evaluate the methodological characteristics and substantive findings of recent studies evaluating effects of mindfulness treatment for substance misuse. Meta-analyses were conducted to estimate treatment effects of mindfulness treatment on substance misuse,

abstinence rate, and affective and behavioral outcomes. Findings of this study will increase understanding of the relative benefits of mindfulness treatment compared to alternative treatments for substance misuse.

Methods

Literature Search

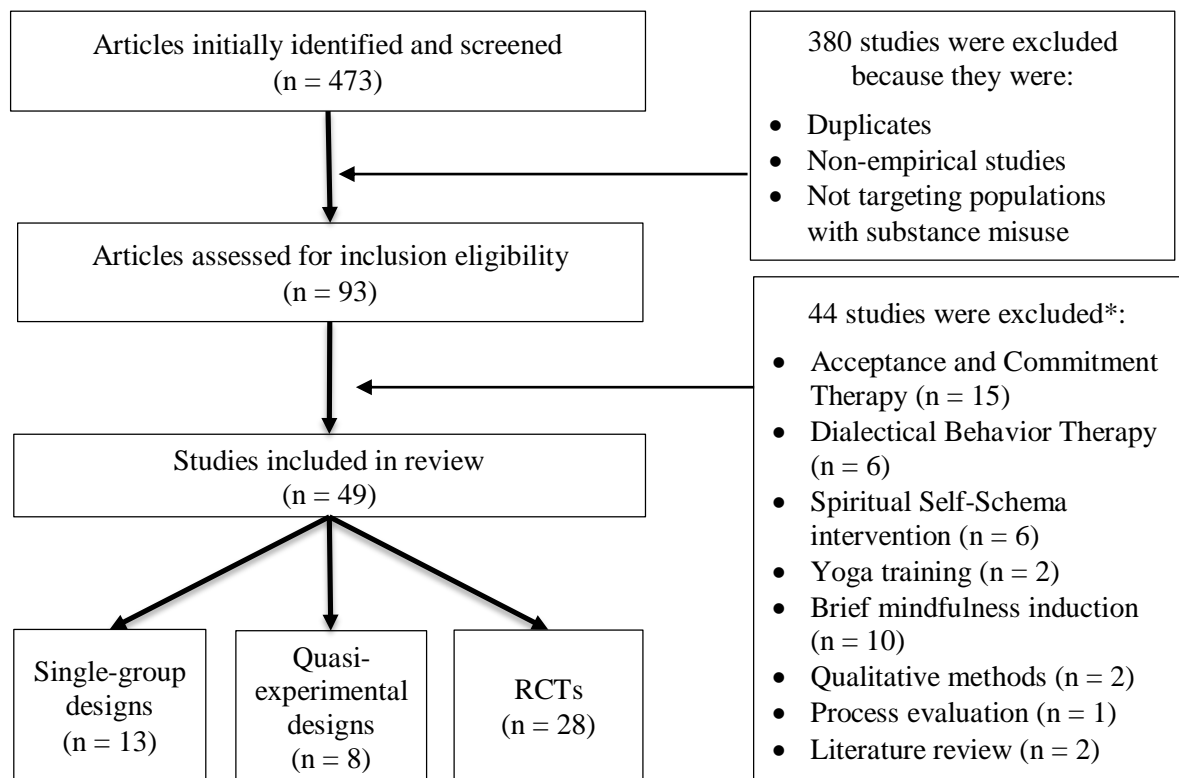
A literature search was conducted in the bibliographic databases *PubMed*, *PsycInfo*, and *Web of Science*. Reference sections of retrieved articles were also mined for relevant publications. Initial searches were conducted in May, 2015. The search phrases “substance *use,” and “mindfulness” were used to conduct free-text searches with no limits in all bibliographic databases. This search yielded 128 relevant records in *PubMed*, 203 records in *PsycInfo*, and 106 records in *Web of Science*. In addition, 32 articles were retrieved from reference sections of published literature reviews of mindfulness interventions/mindfulness meditation (Black, 2014; Chiesa & Alessandro, 2014; Goyal et al., 2014; Katz & Toner, 2013; Rösner, Willutzki, & Zgierska, 2015; Zgierska et al., 2009). To ensure a comprehensive literature search, more specific searches were conducted in December, 2015 combining the search terms “mindfulness intervention,” “addiction*,” “substance abuse,” “substance use disorder*,” “mindfulness meditation,” “mindfulness-based relapse prevention,” and “mindfulness-based stress reduction.” Four additional studies were identified and included in this systematic review during the second round of searches.

Selection of Studies

The search included all mindfulness studies published in English up to December 30th, 2015. Studies were included if they 1) examined effects of a mindfulness treatment; 2) used single-group research designs with repeated-measures, quasi-experimental designs with

repeated-measures, or randomized controlled trial (RCT) designs with repeated-measures; 3) targeted client populations with substance misuse problems; and 4) were published in peer-reviewed journals. Studies were excluded if they 1) were book reviews, books, book chapters, published abstracts, dissertations, systematic/literature reviews, or treatment guidelines or manuals; 2) only reported qualitative results (e.g., case studies); 3) did not assess substance use-related outcomes; and 4) examined interventions that did not teach formal mindfulness practices (e.g., Acceptance and Commitment Therapy, Dialectical Behavior Therapy, and Spiritual Self-Schema Therapy) or were brief mindfulness inductions in a laboratory setting (e.g., a 20-minute laboratory mindfulness induction; Ussher, Cropley, Playle, Mohidin, & West, 2009), because these studies may have limited clinical implications for interventions based on formal mindfulness training.

Figure 1.1. Flow chart for literature search and screening results.



Note: *These studies were excluded because they may have limited information and implications with regard to effects of interventions for substance misuse based on formal mindfulness training

I reviewed titles and abstracts of identified studies ($N = 473$) for relevance. After removing duplicates, non-empirical studies, and studies that did not target populations with substance misuse problems, 93 studies were assessed for inclusion criteria independently by three raters (W.L., E.L.G., and M.O.H.). There was near unanimity of the three raters with regard to identification of relevant articles and a consensus on the selection of pertinent studies was rapidly achieved via discussion. A total of 44 studies were excluded because they did not meet the selection criteria. Figure 1.1 presents a flow chart depicting the literature search process.

Outcome Variables

The primary outcomes examined in this systematic review and meta-analysis were decreases in substance misuse-related behaviors and problems, including severity of substance misuse, craving for substances, and substance use-related problems at posttreatment and follow-up assessments. The forms of substance misuse examined included polysubstance misuse, alcohol misuse, cigarette smoking, and other illicit drug misuse (e.g., marijuana, cocaine, and prescription opioid misuse). Primary treatment outcomes examined in this systematic review and meta-analysis also included abstinence from substance use at posttreatment and follow-up assessments. In addition, secondary outcomes were examined including a) improvements in affective and behavioral functioning (i.e., reductions in mental distress symptoms and stress) at posttreatment and follow-up assessments, 2) increase in mindfulness (e.g., acceptance, awareness, and nonjudgment of thoughts and feelings) at posttreatment and follow-up assessments, and 3) the treatment adherence and completion rates of selected studies.

Data Extraction and Synthesis

I developed a protocol to extract data from each selected study. Extracted data included study aims and hypotheses, sample sizes and characteristics, brief descriptions of the

mindfulness treatment and control conditions (e.g., treatment modality, length, and duration of each session, and treatment fidelity), outcome measures, and outcome results (e.g., means, standard deviations, and sample sizes). I pilot-tested the data extraction protocol on two randomly selected studies, and refined it accordingly. I then read all selected studies in their entirety twice and extracted the studies using the data extraction protocol. Dissertation Chair (M.H.O.) then read all studies independently to ensure the accuracy of extracted data.

Dissertation Chair (M.H.O.) reviewed all entries in Table 1, 2 and 3 to ensure their accuracy.

Meta-analyses were performed to estimate effect sizes of mindfulness treatment on treatment outcomes including substance misuse, abstinence, craving for substance use, stress, and mindfulness at posttreatment compared to control conditions. Only studies using RCT designs were included in the meta-analyses. Outcome variables used for meta-analyses included severity of substance use at posttreatment measured with standardized measures (e.g., TimeLine FollowBack), point-prevalence of abstinence, craving for substance use measured with standardized measures (e.g., Penn Alcohol Craving Scale), stress measured with standardized measures (e.g., Perceived Stress Scale), and mindfulness measured with standardized measures (e.g., Five Facet Mindfulness Questionnaire). These outcome variables were continuous variables except for point-prevalence of abstinence; therefore, meta-analyses were performed by computing standardized mean differences in posttreatment values of outcome variables between experimental and control groups (i.e., Cohen's d and associated 95% confidence intervals [CI]). Odd ratios and associated 95% CIs were computed and pooled for studies that reported point-prevalence of abstinence. Only studies that reported statistical results sufficient to compute Cohen's d (i.e., means and standard deviations of outcome variables at posttreatment

assessments, and sample size per condition) and odds ratios (i.e., number of participants who achieved abstinence and sample size per condition) were included in the meta-analyses.

Cohen's *d*/odds ratios and associated 95% CIs were computed for each study as appropriate and pooled, and then a synthesized effect size was computed for each treatment outcome (i.e., severity of substance misuse, point-prevalence of abstinence, craving, perceived stress, and mindfulness) using the Stata program *metan* (Bradburn, Deeks, & Altman, 1999). Considering that the true value of the estimated effect size for outcome variables might vary across different trials and samples, we used a random effects model rather than fixed effects model, given that the selected studies were not identical (e.g., did not have identical populations). The random effects model incorporates between-study variation into the study weights and estimated effect size (Bradburn et al., 1999; Harris et al., 2008). The magnitude of Cohen's *d* was interpreted using Cohen's description of .20 as small, .50 as medium, and .80 as large (Cohen, 1988). The *z* scores and *p* values associated with estimated effect sizes were also computed. In addition, heterogeneity among studies was assessed using I^2 and the chi-squared statistic (i.e., *Q*). I^2 measures the proportion of heterogeneity to the total observed dispersion; I^2 of 25% is considered low, 50% considered moderate, and 75% considered high (Higgins, Thompson, Deeks, & Altman, 2003). All analyses were completed using Stata 12 (StataCorp, 2011).

Results

Characteristics of Selected Studies

A total of 49 studies examined effects of mindfulness treatment for substance misuse and were included in this systematic review: 13 studies using single-group designs with repeated-

measures, 8 studies using quasi-experimental designs with repeated measures, and 28 studies using randomized controlled trial (RCT) designs with repeated measures.

Sample sizes of included studies ranged from 14 to 459. Of the 49 studies, four targeted adolescents with substance misuse problems (i.e., Bootzin & Stevens, 2005; Britton et al., 2010; Himmelstein, 2011; Himmelstein, Saul, & Garcia-Romeu, 2015). The remaining 45 studies evaluated mindfulness treatments for substance misusing adults, including seven focused solely on women (i.e., Amaro, Spear, Vallejo, Conron, & Black, 2014; de Dios et al., 2012; Nakamura et al., 2015; Price, Wells, Eonovan, & Rue, 2012; Witkiewitz, Greenfield, & Bowen, 2013; Witkiewitz, Warner, et al., 2014; Wupperman et al., 2012) and three solely focused on men (i.e., Lee, Bowen & An-Fu, 2011; Murphy, Pagano, & Marlatt, 1986; Tuab, Steiner, Weingarten, & Walton, 1994). In addition, nine studies evaluated mindfulness treatments for people involved with the criminal justice system (i.e., Bowen et al., 2006; Bowen, Witkiewitz, Dillworth, & Marlatt, 2007; Himmelstein, 2011; Himmelstein et al., 2015; Lee et al., 2011; Simpson et al., 2007; Witkiewitz, Greenfield, et al., 2013; Witkiewitz, Warner, et al., 2014; Wupperman et al., 2012).

Further, included studies evaluated different types of mindfulness treatment, including mindfulness training adapted from Mindfulness-Based Stress Reduction (MBSR) for smoking cessation (e.g., Brewer et al., 2011; Davis et al., 2007), Mindfulness-Based Relapse Prevention (MBRP; e.g., Bowen et al., 2009; Witkiewitz, Greenfield, et al., 2013), Mindfulness-Oriented Recovery Enhancement (MORE; e.g., Garland, Gaylord, Boettiger, & Howard, 2010; Garland et al., 2014; 2016), Vipassana Meditation (VM) courses (e.g., Bowen et al., 2006; 2007), mindfulness meditation training as an adjunct to goal management training (Alfonso, Caracuel, Delgado-Pastor, & Verdejo-García, 2011), combined motivational interviewing and mindfulness meditation for marijuana misuse (de Dois et al., 2012), mindfulness-based therapeutic

community treatment (e.g., Marcus et al., 2009), and mindfulness-based mind-body training (Price et al., 2012; Nakamura et al., 2015; Tang, Tang, & Posner, 2013). In addition, two studies evaluated a multi-component treatment that included components of MBSR for adolescents who were in recovery from substance misuse problems (Bootzin & Stevens, 2005; Britton et al., 2010).

Studies Using Single-Group Designs with Repeated-Measures

Methodological characteristics. Table 1.1 presents detailed information regarding study characteristics and major findings of 13 investigations that examined effects of mindfulness treatments using single-group designs with repeated-measures. Studies using single-group designs cannot establish whether components of mindfulness training contributed to improvements in treatment outcomes as opposed to other factors (e.g., participant's level of motivation). Further, more than half of the studies had small samples (i.e., less than 50 participants), which suggests that many studies had low power to detect treatment effects. Further, treatment effects could have easily been affected by outliers in the small samples. Despite the fact that a few studies used objective measures including urinalysis, breathalyzer, and exhaled carbon monoxide measurement to verify participants' self-reported substance use, most studies relied solely on participants' self-reports of substance misuse, psychosocial functioning, and treatment compliance. Additionally, approximately half of the studies did not report information regarding treatment fidelity assessment. Thus, it is often unclear to what extent interventions were delivered as intended.

Effects of mindfulness treatment on substance misuse. Studies using single-group designs with repeated-measures showed mixed findings for effects of mindfulness treatment on substance misuse problems. Specifically, five of 13 studies evaluated effects of mindfulness

treatments on polysubstance misuse (i.e., alcohol and drug use; Amaro et al., 2014; Bootzin & Stevens, 2005; Britton et al., 2010; Courbasson, Nishikawa, & Shapira, 2010; Grow, Collins, Harrop, & Marlatt, 2015). Three studies found that mindfulness treatments significantly reduced participants' severity and frequency of substance misuse, and substance misuse-related problems at posttreatment and up to 12-month follow-up assessments (Amaro et al., 2014; Courbasson et al., 2010; Grow et al., 2015); however, Grow and colleagues (2015) found that the magnitude of treatment effects was not maintained at 4-month follow-up assessment. Two studies found that mindfulness treatments significantly reduced participants' craving for alcohol, tobacco, and other drugs over a 4-month follow-up period (Elwafi, Witkiewitz, Mallik, Thornhill & Brewer, 2013; Grow et al., 2015). In contrast, two studies (Bootzin & Stevens, 2005; Britton et al., 2010) did not find evidence suggesting that a multi-component program including MBSR treatment was effective in reducing substance use and increasing abstinence among 55 adolescents.

In addition, two studies examined effects of mindfulness treatments on alcohol misuse (Wupperman et al., 2012; Zgierska et al., 2008). One study evaluated a mindfulness treatment for smoking cessation (Davis et al., 2007); another study evaluated a mindfulness treatment for cannabis/cocaine dependence (Dakwar & Levin, 2013). Wupperman et al. (2012) and Zgierska et al. (2008) found positive effects of mindfulness treatment for adults with alcohol misuse problems. Participants receiving the mindfulness treatment had a significant reduction in frequency of drinking and heavy drinking at posttreatment, and the reduction in frequency of heavy drinking was maintained at 4-week follow-up assessment (Zgierska et al., 2008). Further, Davis et al. (2007) found that more than half of participants who received mindfulness treatment for smoking cessation maintained abstinence during the 6-weeks following their quit day. Similarly, Dakwar and Lavin (2013) found that 57% of participants with cannabis dependence

and 55% of participants with cocaine dependence achieved abstinence from substance use after 10 weeks of mindfulness treatment.

Effects of mindfulness treatment on secondary outcomes. Identified studies examined changes in secondary outcomes, including stress, psychiatric distress, sleep, impulsiveness, and mindfulness as a result of mindfulness treatment. Participation in mindfulness treatment was significantly associated with decreases in co-occurring behavioral addictions (e.g., binge eating disorder; Courbasson et al., 2010), stress (Amaro et al., 2014; Davis et al., 2007; Zgierska et al., 2008), psychiatric distress (Britton et al., 2010; Davis et al., 2007) and mental disorders (e.g., PTSD, depression; Amaro et al., 2012; Zgierska et al., 2008), impulsiveness (Himelstein, 2011), and physical aggression (Wupperman et al., 2012) at posttreatment and subsequent follow-up assessments. Studies also found that mindfulness treatment was effective in enhancing participants' mindfulness (Bowen & Kurz, 2012; Zgierska et al., 2008) and sleep quality (Bootzin & Stevens, 2005; Britton et al., 2010) at posttreatment.

Treatment completion rates (i.e., participants attended at least half of designated treatment sessions) varied from 36% to 93%. Six studies examined the relationship between amount of meditation practice between-sessions/at home and changes in treatment outcomes. Frequency of mindfulness meditation practice between-sessions/at home was significantly positively associated with increases in participants' self-reported sleep quality (Bootzin & Stevens, 2005) and self-efficacy to resist substance use relapse at posttreatment (Bootzin & Stevens, 2005). Further, amount of time spent on mindfulness practice between sessions/at home was significantly positively related to levels of mindfulness at posttreatment (Bowen & Kurz, 2012), and likelihood of maintaining abstinence from cigarette smoking at 6-weeks post-quit day (Davis et al., 2007). Amount of time spent on mindfulness practice was significantly negatively

related to severity of craving, anxiety and depressive symptoms, and stress at posttreatment assessment (Zgierska et al., 2008).

Studies Using Quasi-Experimental Designs with Repeated-Measures

Methodological characteristics. Table 1.2 presents detailed information regarding characteristics and major findings of 8 studies that evaluated mindfulness treatments using quasi-experimental designs with repeated-measures. Compared to single-group studies, quasi-experimental designs allow for a comparison of effects between a mindfulness treatment and an alternative treatment program (e.g., treatment as usual [TAU]). Comparing a mindfulness treatment to a control condition could suggest whether or not components of mindfulness practice contributed to changes in treatment outcomes. All identified studies compared mindfulness treatment to TAU (e.g., Bowen et al., 2006) or to treatment programs that were matched to the mindfulness treatment in terms of duration, dosage, and group structure (e.g., Chen, Comerford, Shinnick, & Ziedonis, 2010).

Further, a majority of quasi-experimental studies assigned participants to mindfulness and control groups that were matched on sociodemographic characteristics (e.g., age, gender, and education) and levels of substance misuse at baseline. Such matches controlled for some pre-existing differences between participants in the mindfulness and control conditions. To better control for preexisting differences, some studies used analytic strategies such as mixed linear modeling or analysis of covariance (ANCOVA; e.g., Bowen et al., 2006; Chen et al., 2010; Marcus, Fine, & Kouzekanani, 2001; Simpson et al., 2007). Although quasi-experimental designs are more rigorous than single-group studies, findings of these studies were limited by participants' self-selection into treatment or control conditions. A lack of random assignment implies that improved treatment outcomes might be attributable to pretreatment differences

between treatment and control groups that were not adequately controlled for, such as participants' level of motivation to change.

Virtually all quasi-experimental studies relied on self-report measures to assess substance misuse, psychosocial characteristics, mindfulness, and treatment adherence. A few studies had small samples, short-term or no follow-up assessments, and little or no information about treatment fidelity assessment. These limitations might have affected the validity and generalizability of study findings.

Effects of mindfulness treatment on substance misuse. Studies showed consistently positive findings with regard to mindfulness treatment of alcohol and drug misuse in adults (Alfonso et al., 2011; Bowen et al., 2006; 2007; Chen et al., 2010; Simpson et al., 2006). Specifically, mindfulness treatment was more effective in reducing the amount and frequency of substance misuse at posttreatment and subsequent follow-up assessments across all included studies compared to a control condition except for Alfonso et al. (2011). Additionally, mindfulness treatment outperformed control conditions vis-a-vis reducing craving for substance use (Chen et al., 2010), withdrawal symptoms (Chen et al., 2010), and substance use-related consequences (Bowen et al., 2006; 2007; Simpson et al., 2006) at posttreatment and follow-up assessments.

Bowen and colleagues (2006) conducted a quasi-experimental study that compared effects of a 10-day VM course as an adjunct to TAU to TAU alone for adult jail inmates who had substance misuse problems prior to incarceration. Participants who received VM training had significantly greater reductions in alcohol and drug use over the three-month post-release compared to those who received TAU alone. A secondary analysis of Bowen et al. (2006) established that decreased thought suppression in the VM group relative to TAU partially

mediated the relationship between participation in VM courses and reduced alcohol use and alcohol-related consequences at 3-month follow-up (Bowen et al., 2007). Simpson et al. (2007) concluded that PTSD severity at baseline was not related to inmates' decisions to participate in the VM condition vs. TAU and that VM was associated with superior treatment outcomes irrespective of PTSD severity.

Similarly, Alfonso et al. (2011) evaluated an intervention combining mindfulness meditation and goal management training (for executive dysfunction) in 34 adults with substance misuse, and found the intervention to be effective in improving the duration of abstinence from substance use at posttreatment, but the improvement was not significantly superior to that of TAU ($M = 12.7$ months, $SD = 15.9$ vs. $M = 4.7$ months, $SD = 8.1$). However, the study found that participation in mindfulness meditation was associated with significantly greater improvements in neuropsychological functions associated with response inhibition and decision-making relative to TAU.

Effects of mindfulness treatment on secondary outcomes. Quasi-experimental studies had treatment completion rates ranging from 57% to 97%. Compared to control conditions, participants receiving mindfulness treatment reported significantly greater reductions in thought suppression (i.e., suppressing unwanted thoughts and urges for substance use; Bowen et al., 2007), psychiatric distress (e.g., depression and anxiety; Bowen et al., 2006; Chen et al., 2010), negative emotions and moods (Chen et al., 2010; Liehr et al., 2010), and stress (Marcus et al., 2009), and significantly greater enhancements in substance use-related locus-of-control (Bowen et al., 2006), optimism (Bowen et al., 2006), and neuropsychological functions such as working memory, response inhibition, and decision-making ability at posttreatment and follow-up assessments (Alfonso et al., 2011).

Additionally, one quasi-experimental study examined the relationship between meditation practice between-sessions and treatment outcomes, and found that participants' self-rated quality of meditation practice moderated effects of a mindfulness treatment on reducing withdrawal symptoms, craving for substance use, and anxiety symptoms (Chen et al., 2010).

Studies Using Randomized Controlled Trials (RCTs) with Repeated-Measures

Methodological characteristics. Table 1.3 presents detailed information regarding study characteristics and major findings of 28 studies that evaluated mindfulness treatment using RCT designs with repeated-measures. Of the 28 RCT studies, 16 used an alternative psychotherapeutic treatment matched to the mindfulness treatment in terms of intensity, group structure, and dosage as a control condition (e.g., Davis, Manley, et al., 2014; Garland et al., 2010; Garland et al., 2016); 10 studies used TAU as a control condition (e.g., Bowen et al., 2009; Nakamura et al., 2015); and two studies used an inactive control condition (de Dios et al, 2012; Mermelstein & Garske, 2014). All studies reported the degree to which randomization successfully equated the groups at pretreatment. When randomization was not completely successful in equating treatment and control conditions, the studies used advanced analytical strategies (e.g., mixed linear modeling and ANCOVA) to control for pre-existing group differences in sociodemographic and outcome variables between participants in the treatment and control conditions.

Despite the strengths of the RCT design, identified studies suffered from several limitations regarding study design and data analyses. Many studies relied on self-report measures to assess substance misuse, mindfulness, and psychosocial outcomes. Almost half of the studies had small samples ($N < 50$); these studies may have been under powered to detect treatment effects. Further, many studies had high attrition rates at posttreatment and follow-up

assessments, and did not use intent-to-treat (ITT) analyses. In such cases, randomization may have been compromised and biases may have been introduced by differential attrition.

Effects of mindfulness treatment on substance misuse. Virtually all studies found that mindfulness treatment was associated with superior substance misuse treatment outcomes at posttreatment and follow-up assessments compared to control conditions (with the exception of Brewer et al., 2009). Specifically, mindfulness treatment was superior to control conditions (e.g., TAU, relapse prevention treatment, CBT, and active support group) in reducing the frequency and amount of alcohol and drug use, number of alcohol and drug-related problems, and levels of craving for substance use, and in increasing abstinence rates (e.g., Bowen et al., 2009; 2014; Garland et al., 2014; 2016; Witkiewitz, Warner, et al., 2014).

Five RCTs compared mindfulness treatment combined with TAU to TAU alone in samples of adults and adolescents with alcohol and drug misuse problems (Alterman, Koppenhaver, Mulholland, Ladden, & Baime, 2004; Bowen et al., 2009; Himmelstein et al., 2015; Nakamura et al., 2015; Price et al., 2012). Mindfulness treatment plus TAU was more effective in reducing number of days of substance use, craving, and substance-related problems, and in increasing number of days of abstinence during follow-up periods, compared to TAU alone (Bowen et al., 2009; Nakamura et al., 2015; Price et al., 2012). However, two secondary analyses of Bowen et al. (2009) established that the effects of MBRP were not maintained at 4-month follow-up (Hsu, Collins, & Marlatt, 2013; Witkiewitz, Bowen, Douglas, & Hsu, 2013). Witkiewitz and Bowen (2010) found that MBRP participation moderated the mediation effects of craving on substance use outcome; compared to TAU recipients, MBRP recipients were less likely to experience craving in response to depressive symptoms at 2-month follow-up; and the

attenuated reactivity to depressive symptoms and reduced craving led to significantly fewer days of substance use at 4-month follow-up among MBRP recipients.

Another RCT compared MBRP to CBT and relapse prevention treatment in substance-misusing adults and found that MBRP had more enduring treatment effects in reducing craving and enhancing abstinence at follow-up compared to CBT and relapse prevention interventions (Bowen et al., 2014; Witkiewitz, Warner, et al., 2014). Contrary to the positive findings described above, Brewer et al. (2009) did not observe significant differences between a mindfulness treatment and CBT in reducing the number of days of alcohol and/or cocaine use at posttreatment. However, this study may have been limited by low statistical power due to a small sample size ($N = 14$).

The RCTs consistently found greater effects of mindfulness treatments on cigarette smoking cessation compared to an alternative treatment (with the exception of Davis, Manley, et al., 2014). Four RCTs indicated that participation in mindfulness treatment for smoking cessation was associated with significantly greater increases in abstinence at follow-up compared to the American Lung Association's Freedom from Smoking Program and Wisconsin Tobacco Quit Line (Brewer et al, 2011; Davis et al., 2013; Davis, Goldberg, et al., 2014). Further, Tang et al. (2013) documented greater effects of a mindfulness treatment in reducing cigarette smoking compared to a relaxation training program. Additionally, Ruscio et al. (2015) found greater effects of a brief mindfulness treatment that was implemented on a Personal Digital Assistant (PDA) on reducing the number of cigarettes smoked per day over the course of a 2-week intervention compared to a guided sham-meditation practice that was implemented on a PDA.

Two RCTs evaluated effects of Mindfulness-Oriented Recovery Enhancement (MORE) compared to an active support group and CBT in adults with alcohol misuse problems, and found

that MORE was superior in reducing levels of craving for alcohol at posttreatment compared to CBT (Garland et al., 2016), and in decreasing attentional bias toward alcohol-related cues and thought suppression at posttreatment (Garland et al., 2010). Further, Mermelstein and Garske (2014) compared a brief mindfulness treatment that consisted of an “urge surfing” exercise and mindfulness meditation to an inactive control condition in university students with binge drinking problems. Students who received mindfulness training had a significantly greater decrease in number of binge drinking episodes over the 4-week follow-up compared to students who received no intervention. Contrary to the positive findings, three RCTs evaluating mindfulness treatments in alcohol-misusing adults did not observe significant effects of mindfulness treatments vis-a-vis decreasing alcohol consumption compared to CBT (Brewer et al., 2009), EMG Biofeedback (Tuab et al., 1994), and running exercises (Murphy et al., 1986).

Pertaining to other drug abuse, two RCTs demonstrated that mindfulness treatments were more effective in reducing prescription opioid abuse in adults misusing prescription opioids for chronic pain at posttreatment, compared to a support group (Garland et al., 2014; 2014b); and were more effective in reducing frequency of marijuana use at follow-up compared to an inactive control condition in a sample of adult women (de Dios et al., 2012). Garland et al. (2014) concluded that effects of MORE on prescription opioid misuse were mediated by increase in nonreactivity; and participation in MORE was associated with a decreased correlation strength of craving and opioid misuse. A secondary analysis of the parent investigation indicated that MORE participants evidenced less opioid cue-reactivity compared to support group participants (Garland et al., 2014b).

Effects of mindfulness treatment on secondary outcomes. Treatment completion rates ranged from 43% to 100%. Compared to control conditions, mindfulness treatment was superior

in reducing psychiatric distress and negative affective states (Brewer et al., 2009; Garland et al., 2016; Price et al., 2012; Ruscio et al., 2015; Tuab et al., 1994), negative outcome expectancies of drug use (Lee et al., 2011), stress (Davis, Manley, et al., 2014; Garland et al., 2010; 2016; Price et al., 2012), dissociation experiences (Price et al., 2012), and pain severity and functional interference (Garland et al., 2014). Compared to control conditions, mindfulness treatment significantly increased mindfulness (e.g., Bowen et al., 2009; Davis, Manley, et al., 2014; Garland et al., 2016; Mermelstein & Garske, 2014), emotion regulation (Davis, Goldberg, et al., 2014), attentional control (Davis, Goldberg, et al., 2014), self-efficacy to refuse substance use (Lee et al., 2011; Mermelstein & Garske, 2014), and self-control capacity (Tang et al., 2013) to a greater level.

Studies that examined the relationship between amount of mindfulness meditation practice between sessions/at home and changes in treatment outcomes found that amount of meditation practice between sessions/at home was significantly positively associated with abstinence from cigarette smoking (Brewer et al., 2011), and significantly negatively associated with amount of cigarette smoking (Brewer et al., 2011), likelihood of marijuana use (de Dios et al., 2012), and amount of alcohol consumption (Murphy et al., 1986). Additionally, changes in mindfulness significantly mediated effects of mindfulness treatment on changes in craving and posttraumatic stress symptoms (Garland et al., 2016; Witkiewitz, Bowen, et al., 2013).

Table 1.1
Systematic Review of Studies of Mindfulness Treatments Using Single-Group Designs with Repeated-Measures (N = 13)

*Refer to footnote for Acronyms/Abbreviations

Study	Data collection time points	Types of treatments	Sample Characteristics	Outcome measures	Results	Limitations
Amaro et al. (2014)	Baseline, & 6- & 12-mo post baseline	Modified MBRP: 9 weekly, 1.5-2 hr group sessions. The 7th session consisted of a 4-hr silent retreat. The intervention was tailored to issues of addiction, and treating psychiatric disorders of the sample of low-income women from culturally diverse backgrounds with substance misuse problems.	318 low-income women in tx for substance misuse: Mage = 33.9 (SD = 7.3); 20.1% White or other, 34.6% Black, and 45.3% Hispanic. There were no significant differences in baseline demographic and outcome variables among participants who attended 0, 1-4 or 5-9 tx sessions.	Alcohol and drug misuse was assessed with the ASI. Stress was assessed with the PSS, PDSS, and LSC-R.	Participants had significant reductions in ASI-drug use scores at 6- and 12-mo follow-ups. Participants attending 5-9 sessions had significantly greater reductions in ASI-alcohol and ASI-drug use scores compared to participants attending no sessions at 6- and 12-mo follow-ups. All participants had a significant reduction in perceived stress at 12-mo follow-up. Participants attending in 9 sessions had a significant reduction in perceived stress compared to participants attending no sessions at 12-mo follow-up. All participants had a significant reduction in posttraumatic stress sx's at 12-mo follow-up. Completion rates: 44.3% did not attend any group sessions, 19.8% attended 1-4 sessions, and 35.8% attended 5-9 sessions.	Relied on self-report measures. No control condition. No information regarding tx fidelity assessment.

Bootzin & Stevens (2005)	Baseline, posttx, & 3- & 12-mo follow-ups	Multi-component tx, including MBSR components: 6-weekly, 90-min sessions with 10 mins/day of prescribed homework, 6 days/wk, and CBT for sleep problems.	55 adolescents with sleep problems who had completed outpatient substance misuse tx: ages = 13-19; 62% male; 66.7% White. There were no significant differences in baseline demographic or outcome variables between completers (n = 23) and non-completers (n = 32), except for total sleep time ($M_{\text{completers}} = 439.4$ min, $SD = 75.5$ vs. $M_{\text{non-completers}} = 495.5$ min, $SD = 73.7$).	Substance misuse was measured with the GAIN-SPI and the DMSF. Sleep was measured with daily sleep diaries, saliva sample, and the ESS. Mental distress was measured with the GAIN-GMHI. Self-efficacy to resist substance use was measured with the GAIN-SEI. Worry was measured with the PSWQ.	Participants had nonsignificant increases in substance use over the course of tx. Participants had significant reductions in sleepiness, worry, and mental health distress index. Participants who completed tx had significant improvements in sleep efficiency, sleep onset latency, # of awakenings, total sleep time, and self-rated sleep quality and soundness of sleep over the follow-up periods compared to participants who did not complete tx. Completion rates: 42.0% (n = 23) attended 4+ sessions and were considered to have completed tx; 30.4% attended all sessions.	Small sample size. Relied on self-report measures of substance misuse. No control condition. No information regarding tx fidelity assessment. It was unclear whether MBSR components vs. other tx components contributed to tx effects.
Britton et al. (2010). Secondary data analysis of Bootzin & Stevens (2005)	Baseline, & 8-, 20-, & 60-wk post-baseline follow-ups	Multi-component tx including MBSR components: 6-weekly, 90-min sessions with 10 mins/day prescribed homework, 6 days/wk, and CBT for sleep problems.	55 adolescents with sleep problems who had completed outpatient substance misuse tx: ages = 13-19; 62% male; 66.7% White. 23 youth (42%) completed tx. 18 youth completed tx and reported their mindfulness practices (10 were meditators with 1+ practice session a wk; 8 were non-meditators). Meditators and non-meditators did not differ significantly in baseline demographics	Substance misuse was measured with the GAIN-SPI and the DMSF. Sleep was measured with daily sleep diaries, saliva sample, and the ESS. Mental distress was measured with the GAIN-GMHI. Self-efficacy to resist substance use was measured with the GAIN-SEI. Worry was measured with the PSWQ.	Participants had a significant increase in frequency of substance use and no change in severity of substance use over the 60-wk follow-up. Participants who completed tx had significantly greater decreases in sleepiness severity compared to non-completers at 60-wk follow-up. All participants had a significant reduction in mental health distress at 60-wk follow-up. Frequency of meditation practice was significantly positively correlated with increases in self-reported sleep quality scores, and self-efficacy to resist substance use relapse. Increases in self-reported sleep quality were significantly positively correlated with decreases in worry at posttx, higher self-efficacy, and decreased substance misuse-related problems at 20-wk follow-up. Completion rates: 42.0% (n	Small sample size. Relied on self-report measures of substance misuse. No control condition. It is unclear whether MBSR components vs. other tx components contributed to tx effects.

			or outcome measures, or # of sessions they attended.	= 23) attended 4+ sessions and were considered to have completed tx; 30.4% attended all sessions.		
Bowen & Kurz (2012). Secondary data analysis of Bowen et al. (2009)	Baseline, posttx (8-wk), & 2- & 4-mo follow-ups	MBRP: 8 weekly 2-hr group sessions.	93 adult substance misuser who had completed inpatient or outpatient tx and were randomly assigned to the tx condition in Bowen et al. (2009): Mage = 40.8 (SD = 10.2); 64.5% men; 63% White, 23% African American, 10% American Indian, and 6% Hispanic.	Therapeutic alliance was measured with the WAI. Mindfulness was measured with the FFMQ.	MBRP participants had a significant increase in mindfulness at 4-mo follow-up. The amount of time spent on mindfulness practice between sessions was significantly positively associated with levels of mindfulness at posttx. Client-reported extent of therapeutic alliance was significantly positively associated with levels of mindfulness at posttx and 2-mo follow-up, but not at 4-mo follow-up assessment.	Relied on self-report measures. No information regarding tx fidelity assessment.
Courbasson et al. (2010)	Baseline & posttx (16-wk)	Mindfulness-based Action Based CBT: 16 weekly, 2-hr group sessions, 6-12 men/women in each group.	38 participants with comorbid binge eating disorder and substance misuse: Mage = 42 (SD = 11.0); 21.1% men. There were no significant differences baseline in demographic or outcome variables between tx completers (76.3%) and non-completers (23.7%).	Alcohol and drug misuse was assessed with the ASI. Eating disorders behaviors were measured with the EDEQ. Depression was measured with the BDI.	Participants had significant pre-to-posttx decreases on the ASI-alcohol and ASI-drug use subscales, objective binge eating episodes, eating concern, shape concern, weight concern, and global scores on the EDEQ and BDI, BDI cognitive affective subscale scores, and BDI somatic performance subscale scores. Completion rate was 76.3%.	Small sample size. Relied on self-report measures. No control condition. No information regarding tx fidelity assessment. No follow-up assessments posttx.
Dakwar & Levin (2013)	Baseline & posttx (10-wk)	Mindfulness-based psychotherapy : 10 weekly, 50-min individual sessions and 4 additional wks	25 participants with cannabis or cocaine dependence; among the 14 participants with cannabis dependence: Mage = 33.7 (SD = 7.4), 43% men, and 64% White;	Cannabis or cocaine use was measured with weekly urinalysis and the TLFB.	For the 14 cannabis dependent patients, the abstinence rate was 57%; for the 11 cocaine dependent patients, the abstinence rate was 55%. All participants who completed tx also completed the 4-wk supportive therapy. Abstinence rates did not change by the end of the 4-wk supportive therapy. For the 14 cannabis	Small sample size. No control condition. No follow-up assessments posttx. Study did not test for significant

	of supportive tx.	among 11 participants with cocaine dependence: Mage = 38.9 (SD = 8.3), 64% men, 55% White.	dependent patients, the retention rate was 79%; for the 11 cocaine dependent patients, the retention rate was 73%. 72% of cannabis dependent patients and 55% of cocaine dependent patients practiced at-home mindfulness exercises at least once between sessions and on most wks. Completion rate was 74%.	differences in demographic or outcome variables at baseline between completers and non-completers.		
Davis et al. (2007)	Baseline, 1- & 8-day, & 6-wk post-quit-day assessments	Modified MBSR for smoking cessation: 8 weekly, 2-hr group sessions.	18 participants reported smoking ≥ 10 cigarettes per day; Mage = 44.5% men; Mage = 45.2 (range = 22-67); all Caucasian. The average # of cigarettes smoked per day was 19.9 (range = 10-40) and the average # of yrs smoked was 26.4 (range = 4-44).	Cigarette smoking was assessed with 7-day smoking calendars and 7-day carbon monoxide breath tests. Stress was measured with the PSS. Mental distress was measured with the SCL-90-R. Mindfulness practice at home was assessed with 7-day meditation calendar.	Smoking abstinence rate at the 6-wk post-quit day was 55.6%. The post-quit day abstinence rate was 100%, 40%, and 0% among highly, moderately, and non-compliant meditators. The amount of time participants spent on meditation, participants' interests in meditation, and baseline distress were significantly associated with smoking abstinence at 6-wk post-quit day. Highly compliant meditators had significantly greater decreases in perceived stress compared to moderately compliant meditators at the quit day. Completion rate was 72.2%. 5 non-compliant meditators dropped out of the intervention.	Small sample size. No control condition. No information regarding tx fidelity assessment.
Elwafi et al. (2013). Secondarily data analysis of Brewer et al. (2011)	Baseline, posttx (4-wk), 6-wk, & 3-wk, & 4-mo post tx initiation	MTS: 4-wk, twice a wk, 1.5-hr group sessions.	33 participants who were randomized to MTS in Brewer et al. (2011) and who completed the mindfulness training sessions: Mage = 46; 66.0% men; 59.0% White.	Cigarette smoking was assessed with the TLFB. Urge to smoke was assessed with the QSU-B.	Correlations between craving and cigarette use were attenuated posttx; however, the positive association between craving and cigarette use reemerged and grew stronger at follow-up assessments. Mindfulness practice at home significantly predicted cigarette use, and informal mindfulness practice moderated the relationship between craving and cigarette use at posttx. MTS participants who initiated tx attended an average of 6.7 (SD = 1.7) of 8 sessions.	Small sample size. Relied on self-report measures. No information regarding tx fidelity assessment. Study did not test for significant differences in baseline

demographic or outcome variables between completers and non-completers.				
Grow et al. (2015). Secondary data analysis of Bowen et al. (2009)	Baseline, posttx (8-wk), & 2-4-mo follow-up assessments	MBRP: 8 weekly 2-hr group sessions.	93 adult substance misusers who had completed inpatient or outpatient tx and were randomly assigned to the MBRP condition in Bowen et al. (2009): Mage = 40.8 (SD = 1.1); 64.5% men; 63.4% White, 22.6% African American, and 9.7% American Indian.	<p>Substance misuse was measured with the TLFB. Craving of substance use was measured with the PACS.</p> <p>Mindfulness practice at home was self-reported by participants.</p> <p>Participation in MBRP was associated with significantly increased mindfulness practice at home; increased home practice was associated with significantly lower alcohol and drug use over the follow-up period. The magnitude of the tx effect on substance use decreased during the follow-up period. MBRP participants had a significant decrease in craving at follow-up assessments. The amount of time spent on mindfulness practice at home was significantly negatively associated with substance use and craving. Greater time spent on mindfulness practice at home predicted significant decreases in craving; however, the magnitude of the decrease was reduced at the 2- and 4-mo follow-ups.</p> <p>Relied on self-report measures. No information regarding tx fidelity assessment.</p>
Himmelstein (2010)	Baseline & posttx (8-wk)	Mindfulness-based substance misuse tx: 8 weekly, 1.5-hr group sessions.	48 juvenile delinquent male inmates: Mage = 16.3 (range = 15-18); 66.7% Latino, 12.5% African American, 8.3% mixed-ethnicity All participants were residents of a detention camp in CA with standard stays of 6 - 9 mos.	<p>Perceived risks of drug use were measured with the MFQ. Impulsivity was measured with the TCSIS. Self-regulation was measured with the HSR.</p> <p>Participants had a significant pre-to-posttx increase in perceived risks of drug use. Participants had a significant decrease in impulsiveness at posttx relative to pretx. Completion rate was 80%.</p> <p>Relied on self-report measures. No control condition. No information regarding tx fidelity assessment. No follow-up assessments posttx. Study did not test for significant differences in</p>

	baseline demographic or outcome variables between completers and non-completers.
Staiger et al. (2014)	<p>Relied on self-report measures. No control condition. No information regarding tx fidelity assessment.</p> <p>Changes in mindfulness significantly predicted drug use severity at 3-mo post-discharge.</p> <p>Substance misuse was measured with the SDS and TLFB. Impulsivity was measured with the EIQ-IS. Mindfulness was measured with the KIM.</p> <p>Subsample of a RCT study. 144 participants with substance misuse problems who were randomly assigned to the tx condition: Mage = 32.5 (SD = 6.8); 88.2% were born in Australia or New Zealand; 67% men.</p> <p>Mindfulness-based tx: 5 sessions in addition to TAU.</p> <p>Baseline & 3-mo post discharge; mindfulness was measured at wk 10 of tx.</p>
Wupperman et al. (2012)	<p>Small sample size. No control condition. No information regarding tx fidelity assessment. No follow-up assessments posttx.</p> <p>Participants had a significant pre-to-posttx decrease in # of drinking days in the past 4 wks, the average # of drinks per drinking day in the past 4 wks, and self-reported physical aggression. Participants who reported drug misuse at baseline (n=9) had a significant decrease in # of days of drug use in the past 4 wks at posttx compared to baseline. Completion rate was 93%.</p> <p>Substance misuse was measured with the TLFB, breath-analyzer and urinalysis. Physical aggression was measured with the TLFB.</p> <p>14 women who were recently arrested for domestic violence and had alcohol abuse/dependence: Mage = 38.0 (SD = 13.4); 42.9% African American, 28.6% Hispanic, and 28.6% White.</p> <p>MMT: 12 weekly, 1-hr individual sessions (the first session was 90 mins). Participants were allowed to complete tx within 20 wks.</p> <p>Baseline & posttx (12-wk)</p>
Zgierska et al. (2008)	<p>Small sample size. Relied on self-report measures for alcohol use. No control condition. No information regarding tx</p> <p>Participants had significantly fewer heavy drinking days at posttx and 12-wk follow-up compared to baseline. Participants had significantly fewer total # of drinks and fewer heavy drinking days at mid-tx and posttx compared to baseline. During the 16-wk follow-up, 47% of participants reportedly had complete abstinence from alcohol. Participants had significantly</p> <p>Alcohol use was measured with the TLFB. Mental distress was measured with the SCL-90-R Depression and Anxiety subscales. Stress was</p> <p>19 adults with alcohol dependence who had completed 2-4 wks of usual tx within 1-2 wks of the intervention were recruited. 15 participants who completed the study were included for</p> <p>Modified MBRP: 8 weekly, 2-hr group sessions as an adjunct to usual tx in a community setting.</p> <p>Baseline, & 4-, 8-, & 12-, & 16-wk post-baseline assessments.</p>

analyses: Mage = 38.4 (SD = 8.6); 84% White; 47% men. There were no significant differences in baseline demographic or outcome variables between tx completers and non-completers.	measured with the PSS, stress-responsive biomarkers, and liver enzymes. Craving for alcohol was measured with the OCDS. Mindfulness was measured with the MAAS. Tx satisfaction was measured with the STS. Mindfulness practice at home was self-reported by participants.	lower levels of stress, depression, and significantly higher levels of mindfulness at 12-wk post-baseline compared to baseline. At wk-16 post baseline, meditation practice (min/day) was significantly negatively associated with severity of craving, anxiety, depression, and stress. Changes in craving and stress were significantly correlated with changes in the % of abstinent days and total # of drinks. Changes in mindfulness were significantly correlated with changes in stress. For example, reductions in craving and stress were significantly correlated with increases in the % of abstinent days and total # of drinks. Increases in mindfulness were significantly correlated with reductions in stress. Completion rate was 78.9%.	fidelity assessment.
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Acronyms/Abbreviations: ASI = Addiction Severity Index; BDI = Beck Depression Inventory; CA = California; CBT = Cognitive behavioral therapy; DMSF = Drug Matrix Substance Frequency; EDEQ = Eating Disorder Examination Questionnaire; EIQ-IS Eysenck Impulsiveness Questionnaire-Impulsivity Scale; ESS = Epworth Sleepiness Scale; FFMQ = Five Facet Mindfulness Questionnaire; GAIN-GMHI = Global Appraisal of Individual Needs General Mental Health Index; GAIN-SEI = Global Appraisal of Individual Needs Self-Efficacy Index; GAIN-SPI = Global Appraisal of Individual Needs Substance Problem Index; hr = hour; HSR = Healthy Self-Regulation Scale; KIM = Kentucky Inventory of Mindfulness; LSC-R = Life Stressor Checklist-Revised; MAAS = Mindful Attention Awareness Scale; MBRP = Mindfulness-Based Relapse Prevention; MBSR = Mindfulness-Based Stress Reduction; MFQ = Monitoring the Future Questionnaire; min = minute; MMT = Mindfulness & Modification Therapy; mo = month; MTS = Mindfulness Training for Smoking Cessation; OCDS = Obsessive Compulsive Drinking Scale; PACS = Penn Alcohol Craving Scale; PDSS = Posttraumatic Diagnostic Symptom Scale; PSS = Perceived Stress Scale; PSWQ = Penn State Worry Questionnaire; QSU-B = Questionnaire of Smoking Urges-Brief; SCL-90-R = Symptom Checklist-90-Revised; SDS = Severity of Dependence Scale; STS = Subject Tx Satisfaction; TCSIS= Teen Conflict Survey Impulsiveness Scale; TLFB = Timeline Followback; tx = treatment; WAI = Working Alliance Inventory; wk = week; # = number; % = percent or percentage.

Table 1.2

Systematic Review of Studies of Mindfulness Treatments Using Quasi-Experimental Designs with Repeated-Measures (N = 8)

*Refer to footnote for Acronyms/Abbreviations

Study	Data collection time points	Tx condition	Control condition	Sample characteristics	Outcome measures	Results	Limitations
Alfonso et al. (2011)	Baseline & posttx (7-wk)	Combined MM and GMT as an adjunct to standard community tx: 7-wk, twice a wk, 90-min group sessions; and 7-wk, twice a wk, 60-min MM training sessions.	TAU: usual psychotherapeutic intervention.	34 Spanish adults (GMT + MM: n = 18; TAU: n = 16) with substance dependence: 94.1% men. Of GMT + Mindfulness participants, Mage = 41.0 (SD = 7.6). Of TAU participants, Mage = 34.9 (SD = 10.3). There were no significant differences between tx and control groups in baseline demographic or outcome variables.	Neuropsychological functions associated with substance misuse were assessed with the LNS, WAIS-III Arithmetic and Digit Span, Stroop, TMT, and IGT.	GMT + MM participants had significantly greater pre-to-posttx improvements in working memory, response inhibition, and decision-making compared to TAU participants.	Small sample size. Nonrandom assignment to tx or control conditions. No information regarding attrition rates or tests for significant differences between participants who completed and did not complete posttx assessment. No information regarding tx fidelity assessment. No follow-up assessments posttx.
Bowen et al. (2006)	Baseline, 3- & 6-mo post release from a minimum	VM courses as an adjunct to TAU; 10 daily, 8-10 hr sessions. Participants	TAU: usual standard care including chemical dependency tx, substance	305 adult inmates who reported substance misuse prior to incarceration were recruited and 173 participants (VM: n =	Substance misuse was measured with the DDQ, DDTQ, and SIP. Self-control was measured with the	VM participants had significantly greater reductions in # of drinks per peak drinking wk, % of days of crack cocaine and Mj use, and SIP scores	Nonrandom assignment to tx or control conditions. Relied on self-report measures. No

security jail rehab facility	were housed separately from other inmates and not allowed outside contact. During each session, participants practiced meditation 8-10 hr.	use education, and educational and vocational programs.	57; TAU: n = 116) completed the study and posttx assessment. Mage = 37.5 (SD = 8.7); 79.2% men; 61.1% White, 13% African American, 8% Latino/a, 8% American Indian, and 1.2% other. 87 (VM: n = 29; TAU: n = 58) completed 3-mo follow-up assessment. There were no significant differences between tx and control groups in baseline demographic or outcome variables.	LCS-D. Thought suppression was measured with the WBSI. Mental distress was measured with the BSI. Optimism was measured with the LOT.	compared to TAU participants at 3-mo post-release from the facility. Participation in VM was associated with a significantly greater decrease in psychiatric sxs and significantly greater increases in internal drinking-related locus-of-control and optimism at 3-mo post-release from the facility compared to TAU. Completion rates were 90.5% and 47.9% for VM and TAU groups.	information regarding tx fidelity assessment. Study did not test for significant differences between participants who completed and did not complete assessment at posttx and follow-up.
Bowen et al. (2007). Secondary data analysis of Bowen et al. (2006)	Baseline, 3- & 6-mo post release from a minimum security jail rehab facility	TAU: usual standard care including chemical dependency tx, substance use education, and educational and vocational programs.	Same sample as Bowen et al. (2006).	Substance misuse was measured with the DDQ, DDTQ, and SIP. Thought suppression was measured with the WBSI.	VM participants had significantly fewer total drinks per peak drinking wk, and significantly lower-levels of alcohol-related negative consequences at 3-mo post-release from the facility compared to TAU participants. VM participants had a significantly greater decrease in thought suppression at 3-mos follow-up compared to TAU participants. Changes in thought suppression partially mediated tx effects on alcohol use and alcohol-related	Nonrandom assignment to tx or control conditions. Relied on self-report measures. No information regarding tx fidelity assessment. Study did not test for significant differences between participants who completed and did not complete assessments at posttx and follow-up.

consequences at 3-mos post-release from jail.							
Chen et al. (2010)	Baseline, mid-tx (2-wk), & posttx (4-wk)	QM: 2 weekly, 90-min group seminars, and 2 daily, 25-min sessions of QM practice for 2 wks (at least 5 days/wk).	SMRT: 2 weekly, 90-min group seminars and 2 daily sessions of relaxation skills practice for 2 wks (at least 5 days/wk).	350 adults in residential addiction rehabilitation facilities were recruited, 248 completed the study, and 207 (QM: n = 126; SMRT: n = 81) were included in data analyses. Of QM participants, Mage = 35.9 (SD = 10.9); 69.8% men; 72.8% White. Of SMRT participants, Mage = 30.7 (SD = 8.9); 77.8% men; 77.8% White. There were no significant differences between QM and SMRT participants in baseline demographic characteristics or outcome variables, except age, degree of spirituality (M = 4.7, SD = 2.4 vs. M = 5.5, SD = 2.4) and % of participants who reported alcohol as their main problem (22.2% vs. 38.9%).	Withdrawal from substance misuse was measured with the ARSW. Craving for substance use was measured with the SSCS and VC/NMS. Depression was measured with the CES-D. Anxiety was measured with the STAI. Quality of mindfulness practice was measured with a 4-item index.	Participants in both conditions had significant pre-to-posttx decreases in negative mood, craving, withdrawal sxs, anxiety, and depression. QM participants had a marginally significant (p < .10) greater reduction in craving compared to SMRT participants over the tx. Gender and quality of meditation practice had moderating effects on tx outcomes regarding withdrawal sxs, craving, and anxiety. Completion rates were 92% for QM group and 78% for SMRT group.	Nonrandom assignment to tx or control conditions. Relied on self-report measures. No information regarding tx fidelity assessment. Study did not test for significant differences between participants who completed and did not complete assessments at posttx. Outcomes were only assessed at posttx.
Liehr et al. (2010). Secondary data analysis of	Baseline, 1-, 3-, 6-, & 9-mo post baseline.	MBTC as an adjunct to standard usual care in a therapeutic	TAU: TC usual care	393 adult substance misusers and enrolled at TC (MBTC: n = 253; TAU: n = 140); Mage = 35.1 (SD = 10.0); 82%	Stories of stress as indicators of self-change	Participants in both conditions had significant decreases in negative emotion and anxiety word-use and a significant	Nonrandom assignment to tx or control conditions. Relied on self-report

Marcus et al. (2009)	community: 6, 2.5-3 hrs weekly group sessions.	male; 56% White, 30% Black, and 13% Hispanic. There were no significant differences in thinking and feeling word use at baseline between MBTC and TAU participants.	increase in positive emotion word-use over the 9-mo period; however, the reduction did not differ significantly between MBTC and TAU participants. MBTC participants used a significantly smaller % of negative emotion words than TAU participants over the 9-mo period. 60%, 36%, 27%, and 16% of MBTC participants vs. 58%, 29%, 16%, and 12% of TAU participants completed the 4 assessments over the 9-mo period.	measures. No information regarding tx fidelity assessment. Study did not test for significant differences between participants who completed and did not complete assessments at posttx.
Marcus et al. (2001)	Baseline & posttx (8-wk) MBSR in TC as an adjunct to TAU: 8, 2.5-hr group sessions; 45-min to 1-hr, 6 days/wk meditation sessions and homework.	TAU: TC usual care 36 adults (tx condition: n = 18; TAU: n = 18) with alcohol and drug dependency. Of participants in the tx condition, Mage = 32 (SD = 9.0); 88.9% were men. Of participants in the control condition, Mage = 36 (SD = 9.0); 100% men. There were no significant differences between tx and TAU participants in demographic characteristics or yrs of substance use at baseline.	Coping was measured with the WCCL. Mental distress was measured with the SCL-90-R.	Nonrandom assignment to tx or control conditions. Small sample size. Relied on self-report measures. No information regarding tx fidelity assessment. No follow-up assessments posttx.

Marcus et al. (2009)	Baseline, 1-, 3-, 6-, & 9-mo post baseline.	MBTC as an adjunct to TAU: 6, 2.5-3 hrs group sessions; twice a wk for the first 2 wks, and once a wk for the next 2 wks; 45-min, 6 days/wk meditation sessions.	TAU: 6 hrs of tx a wk, including chemical dependency tx, life skills training, cognitive reconstructing, vocational training, and individual and group counseling.	459 adult substance misusers (MBTC: n = 295; TAU: n = 164). Of MBTC participants, Mage = 34.3; 85.5% men; 53.6% White, 29.8% Black, and 16.9% Hispanic and others. Of TAU participants, Mage = 36.2; 76.2% men; 57.3% White, 29.9% Black, and 12.8% Hispanic and others. There were no significant differences between MBTC and TAU participants in baseline demographic or outcome variables, except gender (14.2% women vs. 23.8% women).	Stress was measured with the SOSI and cortisol sample. Level of engagement was measured on a 5-point scale.	Participants in both conditions had a significant decrease in stress during the first 3-mos. MBTC participants had significantly greater reductions in stress at the 9-mo follow-up compared to TAU participants. Among MBTC participants, an increase in participation level was significantly associated with a decrease in the likelihood of dropping out of the therapeutic community. 70% of MBTC participants completed \geq 10 hrs of classes; 33.3% completed all 17 hrs.	Nonrandom assignment to tx or control conditions. Study did not test for significant differences between participants who completed and did not complete assessments at posttx and follow-ups.
Simpson et al. (2007). Secondary data analysis of Bowen et al. (2006)	Baseline, 3- & 6-mo post-release from a minimum security jail rehab facility.	VM courses as an adjunct to TAU: 10 daily, 8-10 hr sessions. Participants were housed separately from other inmates and not allowed outside contact. During each session,	TAU: usual standard care including chemical dependency tx, substance use education, and educational and vocational programs.	303 inmates were recruited. 88 participants (VM: n = 29; TAU: n = 59) who completed assessment at 3-mo follow-up were included in analyses. Of all participants, Mage = 37.6 (SD = 8.7); 67.2% men; 59.3% White, 12.9% African American, 6.6% Latino/a, and 7.3% Native American. There were no significant	Substance misuse was measured with the DDQ, DDTQ, and SIP. Mental distress was measured with the BSI. Stress was measured with the PCL-C.	After controlling for baseline drinking and gender, participation in VM tx was significantly negatively associated with # of drinks and frequency of drug use during the peak wk of drinking or drug use, and consequences of drinking at 3-mos post release from jail. PTSD sxs were significantly positively associated with consequences of drinking	Nonrandom assignment to tx or control conditions. Relied on self-report measures. No information regarding tx fidelity assessment.

participants practiced meditation 8-10 hr.	differences between tx and control groups in demographic or outcome variables at baseline. There were no significant differences in baseline demographic or outcome variables between participants who completed and did not complete 3-mo follow-up assessment.	at the 3-mos post release from jail.
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Acronyms/Abbreviations: ARSW = Adjective Rating Scale for Withdrawal; BSI = Brief Symptom Inventory; CES-D = Center for Epidemiologic Studies-Depression; DDQ = Daily Drinking Questionnaire; DDTQ = Daily Drug-Taking Questionnaire; hr = hour; LCS-D = Locus of Control Scale-Drinking-related; GMT = Goal Management Training; IGT = Iowa Gambling Task; LNS = Letter # Sequencing; LOT = Life Orientation Test; MBSR = Mindfulness-Based Stress Reduction; MBTC = Mindfulness-Based Therapeutic Community; min = minute; Mj = Marijuana; MM = Mindfulness Meditation; mo = month; PCL-C = PTSD Checklist-Civilian Version; QM = Qigong Meditation; SCL-90-R = Symptom Checklist-90-Revised; SOSI = Sxs of Stress Inventory; SIP = Short Inventory of Problems; SMRT = Stress Management and Relaxation Training; SSCS = Substance-specific Craving Scale; STAI = State-Trait Anxiety Inventory; sxs = symptoms; TAU = Tx as usual; TC = Therapeutic Community; TMT = Trail Making Test; tx = treatment; VC/NMS = Voris Craving/Negative-mood Scale; VM = Vipassana meditation; WAIS-III = Wechsler Adult Intelligence Scale; WBSI = White Bear Suppression Inventory; WCCL = Ways of Coping Checklist; wk = week; yr = year; # = number; % = percentage/percent.

Table 1.3

Systematic Review of Studies of Mindfulness Treatments Using RCT Designs with Repeated-Measures (N = 28)

*Refer to footnote for Acronyms/Abbreviations

Study	Data collection time points	Tx condition	Control condition	Sample	Outcome measures	Results	Limitations
Alterman et al. (2004)	Baseline, posttx (8-wk), & 5-mo follow-up	MM + TAU: 8 weekly, 2-hr group sessions, and one 7-hr workshop of MM practice; 30-45 min daily group meditation during the rest of wk days.	TAU: recovery house providing 12-step focused substance misuse tx, behavioral modification-based tx, HIV counseling, and other medical, psychiatric, and work-related tx programs.	31 adult substance misusers (MM: n = 18; TAU, n = 13) who had been in a recovery house for up to 2 mos. Of all participants, 41.9% White and 58.1% African American. Of MM participants, Mage = 36.1 (SD = 9.4); 38.9% men; 83.3% participated in the assessment at posttx and 5-mos follow-up. Of TAU participants, Mage = 37.0 (SD = 11.7); 53.8% men; 76.9% participated in the assessment at posttx and 5-mo follow-up. There were no significant differences between tx and control groups in baseline demographic or outcome variables, but MM participants had significantly more days of heroin use in the past 30 days (M = 4.1, SD = 8.6 vs. M = .2, SD = .8).	Substance misuse was measured with the TLFB, ASI and urinalysis. Spirituality was measured with the SAS. Personal meaning was measured with the LAP-R-Purpose and Coherence Subscales. Optimism was measured with the LOT. Affect was measured with the PANAS. Health was measured with the SF-36.	MM Participants had a significantly greater decrease in ASI-assessed medical problems over the 5-mo follow-up compared to TAU participants. Participants in the MM and TAU conditions had significant reductions in ASI-assessed alcohol, drug, family, and social problems at posttx and 5-mo follow-up.	Small sample size. No information regarding tx fidelity assessment. Attrition rates were high at posttx and follow-up assessments, and ITT analyses were not used.

yrs of heroin use ($M = 3.4$, $SD = 7.0$ vs. $M = .31$, $SD = 1.1$), and ASI-assessed medical ($M = .5$, $SD = .3$ vs. $M = .2$, $SD = .3$) and psychiatric problems ($M = .4$, $SD = .3$ vs. $M = .2$, $SD = .2$) compared to TAU participants at baseline.

Bowen et al. (2009)	Baseline, posttx (8-wk), 2-, & 4-mo follow-ups	MBRP + TAU: 8 weekly 2-hr group sessions.	TAU: standard outpatient aftercare groups designed to maintain abstinence through a 12-step process-oriented format: 1.5-hr group sessions, 1-2 times weekly	168 adult substance misusers (MBRP: $n = 93$; TAU: $n = 75$) who had completed inpatient or outpatient tx: Mage = 40.5 ($SD = 10.3$); 63.7% men; 51.8% White, 28.6% African American, 15.3% multiracial, and 7.7% Native American. There were no significant differences between MBRP and TAU groups in baseline demographic or outcome variables, except the MBRP group had a significantly higher proportion of White participants compared to the TAU group (63% vs. 45%). Attrition did not differ significantly between groups at any assessment.	Substance misuse was measured with the TLFB and SIP. Craving for substance was measured with the PACS. Mindfulness was measured with the FFMQ. Acceptance of negative experience was measured with the AAQ. Mindfulness practice at home was self-reported by participants.	Participants in MBRP and TAU groups had significant decreases in # of days of substance use in the past 2 mos and negative consequences of substance use at 4-mo follow-up. MBRP participants had significantly greater reductions in # of days of substance use and craving compared to TAU participants by 4-mo follow-up. MBRP participants had a significantly greater increase in acceptance compared to TAU participants at 4-mo follow-up. However, the effects were not maintained at 4-mo follow-up. MBRP participants had a significant increase in acting with awareness whereas TAU participants had a decrease in acting with awareness at 4-mo follow-up. MBRP participants attended 65% of	Relied on self-report measures. No information regarding tx fidelity assessment.
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tx sessions. There was a significant difference of MBRP and TAU groups in # of tx hrs received during the 8-wk intervention period (M = 12.8, SD = 4.9 vs. M = 9.8, SD = 8.2).							
Bowen et al. (2014)	Baseline, 3-, 6-, & 12-mo follow-ups	MBRP + TAU: 8 weekly 2-hr group sessions.	Cognitive-behavioral-based RP: 8 weekly, 2-hr group sessions; TAU: standard outpatient aftercare; based on 12-step program; 1-2 times/wk, 1.5-hr group session.	286 adult substance misusers (MBRP: n = 103; RP: n = 88; TAU: n = 95) who had completed inpatient or outpatient tx. Of MBRP participants, Mage = 39.1 (SD = 10.9); 73.8% men; 55.3% White, 25.2% African American, 8.7% Hispanic. Of RP participants, Mage = 38.9 (SD = 10.9); 63.6% men; 48.9% White, 14.8% African American, 11.4% Hispanic. Of TAU participants, Mage = 37.2 (SD = 10.8); 72.6% men; 48.4% White, 23.2% African American, 13.7% Hispanic. There were no significant differences between tx and control groups in baseline demographic or outcome variables, except that TAU participants (M = 8.5, SD = 4.4) had a	Substance misuse was measured with the TLFB and ASI.	MBRP and RP participants showed a 54% decreased risk of relapse to drug use and 59% decreased risk of relapse to heavy drinking compared to TAU participants. MBRP participants showed a 21% increase in risk of relapse to drug use compared to RP participants. Among participants who reported heavy drinking days during the follow-up period, RP and MBRP participants reported 31% fewer days of heavy drinking compared to TAU participants. RP and MBRP participants had significantly higher probabilities of abstinence from drug use and heavy drinking compared to TAU participants at 6-mo follow-up. Among participants who reported drug use during the follow-up period, MBRP participants reported 31% fewer drug use days compared to RP participants. MBRP participants had	Relied on self-report measures. High attrition rates at follow-up assessments. Participants who had missing values at follow-up assessments were excluded from the analysis (i.e., ITT analyses was not used).

	significantly lower mean Severity of Dependence score than MBRP (M = 9.5, SD = 4.2) and RP participants (M = 10.3, SD = 3.7). Follow-up completion rates were not significantly different across the 3 conditions. Missing data were not significantly associated with participants' baseline demographic characteristics or levels of substance use, except for age.		significantly higher probabilities of not engaging in any heavy drinking compared to RP participants at 12-mo follow-up. 46.3%, 48.9%, and 46.6% of participants attended 75% of tx sessions for MBRP, RP, and TAU groups, respectively.				
Brewer et al. (2009)	Baseline & posttx (9-wk); substance use was assessed once a wk over the tx sessions	MT: 9 weekly, 1-hr group sessions.	CBT: 12 weekly, 1-hr group sessions	36 adults (MT: n = 21; CBT: n = 15) with alcohol and/or cocaine use disorders. 25 participants completed baseline assessment (MT: n = 18; CBT: n = 7). Of MT participants: Mage = 35.6 (SD = 10.4); 72.2% men; 55.6% White, 33.3% African American, and 11.1% Hispanic. Of CBT participants, Mage = 45.0 (SD = 13.5); 71.4% men; 85.7% White, and 14.3% Hispanic. 14 participants completed the interventions and were included in data analyses. There were no	Substance misuse was measured with substance use calendar. Mindfulness was measured with the FFMQ. Emotion was measured with the DES. Psychophysiological functions were measured in 1-hr lab session including neutral-relaxing and stress imagery conditions at	There were no significant differences in # of days of cocaine and alcohol use at posttx between participants in MT and CBT groups. MT participants had significantly lower levels of anxiety, anger, and fear at posttx compared to CBT participants. MT participants had significantly decreased sympathetic/vagal ratios compared to CBT participants at posttx. Participants in MT and CBT groups had significant improvements in mindfulness; however, the improvement in mindfulness did not significantly differ between MT and CBT	Small sample size. No information regarding tx fidelity assessment. No follow-up assessments posttx. Study had high attrition rates and did not use ITT analyses. The control condition had more tx sessions than MT.

	significant differences between tx and control groups in baseline demographic or outcome variables, except in the % of participants who had never married (28.6% for CBT group vs. 61.1% for MT group). There were no significant differences in baseline drug or alcohol use between tx completers and non-completers.	posttx assessment.	groups. Completion rates were 43.0% for MT group and 33.3% for CBT group. MT participants who initiated tx (n =18) attended 65% of sessions vs. CBT participants who initiated tx (n = 7) attended 34% of sessions.				
Brewer et al. (2011)	Baseline, posttx (4-wk), & 6-, 12-, & 17-wk post- tx initiation	MTS: 4-wk, twice-a-wk, 1.5-hr group sessions.	FFS: 4-wk, twice-a-wk, 1.5-hr group sessions	88 adults who smoked an average of 20 cigarettes/day were recruited; 87 adults (MT: n = 46; FFS: n = 41) were included in data analyses. Of MT participants, Mage = 46.5 (SD = 8.7); 65.9% men; 58.5% White, 36.6% Black, and 4.9% Hispanic. Of FFS participants, Mage=45.3 (SD = 11.4); 58.7% men; 41.3% White, 41.3% Black, and 15.2% Hispanic. There were no significant differences between MT and FFS groups in baseline demographic or outcome variables. There were no significant differences	Cigarette smoking was measured with the TLFB and Carbon Monoxide Breath Test. Mindfulness practice at home was self-reported by participants.	MT participants had a significantly greater reduction in cigarette use compared to FFS participants over the tx and follow-up periods. MT participants had a significantly greater one-wk point prevalence abstinence at 17-wk post intervention initiation compared to FFS participants. The amount of mindfulness practice at home was significantly inversely associated with cigarette use at posttx. The amount of practice of sitting meditation was significantly associated with one-wk point prevalence abstinence at 17-wk post intervention initiation. The use of informal mindfulness	No information regarding tx fidelity assessment.

			<p>between participants who initiated tx and did not initiate tx in baseline demographic characteristics or cigarette use.</p> <p>practice was significantly inversely correlated with the average # of cigarettes smoked at 4-wk and 6-wk follow-ups. MT participants who initiated tx ($n = 33$) attended an average of 6.7 ($SD = 1.7$) of 8 sessions vs. FFS participants who initiated tx ($n = 38$) attended an average of 6.2 ($SD = 2.2$) of 8 sessions.</p>			
Davis et al. (2013)	Baseline & 2-wk post-quit-day	<p>MTS: 6 weekly, 2-hr group sessions and a 7-hr Quit Day Retreat; 30-min guided meditation every day during the tx.</p> <p>ILS: combined FFS and Mayo Clinic's Nicotine Dependence Center program; matched to tx condition in time, duration, intensity, and exercises; 30-min walking (not mindful walking) every day during tx.</p>	<p>55 college students (MTS: $n = 30$; ILS: $n = 25$) who smoked ≥ 10 cigarettes per day. Of MTS participants, Mage = 21.7 ($SD = 2.4$); 70.0% men; 90.0% White. Of ILS participants, Mage = 22.2 ($SD = 2.7$); 72.0% men; 92.0% White. There were no significant differences between MTS and ILS groups in baseline demographic or outcome variables. There were no significant differences in baseline demographic variables or levels of cigarette/alcohol use between tx completers and non-completers; however, completers reported smoking significantly fewer</p>	<p>Cigarette smoking was measured with the TLFB and Carbon Monoxide Breath Test. Alcohol use was assessed with the TLFB. Mental distress was measured with the DTS. Stress was measured with the PSS. Mindfulness was measured with the FFMQ. Urge to smoke was assessed using one question rated on a 10-point scale.</p>	<p>MTS participants had a significantly higher 7-day point prevalence abstinence rate and a significantly greater # of days of smoking abstinence compared to ILS participants at 2-wk post-quit-day. MTS participants had decreases in # of drinks per wk from pre-to-post quit day, whereas ILS participants had increases in # of drinks per wk from pre-to-post quit day; however, changes in # of drinks per wk were not significantly different between MTS and ILS participants. # of drinks per wk at 2-wk post-quit-day was significantly negatively associated with relapse to smoking. Completion rates were 50% for the MTS group and 40% for the ILS group.</p>	<p>No follow-up assessments posttx. No information regarding tx fidelity assessment.</p>

cigarettes per day at baseline compared to non-completers (M = 11.9, SD = 3.0 vs. M = 15.3, SD = 7.9).

Davis, Goldberg, et al. (2014)	Baseline, 4- & 24-wk post-quit-day	MTS: one, 7-hr introductory session; 4 weekly, 3-hr group sessions; one, 7-hr Quit Day Retreat; and 4 weekly, 1.5-hr meditation groups along with Nicotine Replacement tx.	QL and 4-wk Nicotine Replacement tx	198 adults (MTS: n = 105; QL: n = 91) who smoked an average of ≥ 15 cigarettes/day were recruited; 118 adults (MTS: n = 59; QL: n = 59) initiated tx. Of all participants, Mage = 41.7 (SD = 13.3); 50.0% men; 77.0% White, and 11.7% African American. There were no significant differences between MTS and QL groups in baseline demographic or outcome variables. Of tx initiators, the MTS group had heavier smokers, more racial/ethnic minorities, and a larger proportion of participants with post-high school education (specific statistics were not provided). Attrition did not differ significantly between MTS and QL participants	Cigarette smoking was measured with the TLFB and Carbon Monoxide Breath Test. Emotion regulation was measured with the DERS. Attentional control was measured with the ACS. Mindfulness was measured with the FFMQ.	Of tx initiators (n = 118), MTS participants had a significantly higher 7-day point-prevalence abstinence rate and a significantly higher continuous abstinence rate at 4-wk post-quit-day compared to QL participants. MTS participants had a significantly higher continuous abstinence rate at 24-wk post-quit-day compared to QL participants. 45.8% and 38.7% of MTS participants were abstinent at 4-wk and 24-wk post-quit-day, whereas 20.6% and 25.4% of QL participants were abstinent at 4-wk and 24-wk post-quit-day. MTS participants had a significantly greater decrease in difficulty in emotion regulation, and significant increases in attentional control, non-judgement, and mindfulness at 24-wk post-quit-day assessment compared to QL participants. The # of days smoked post-quit-day was	No information regarding tx fidelity assessment. Attrition rates were high for 4-wk and 24-wk follow-up; however, ITT analyses were not used when analyzing time-by-group interactions in self-report measures.
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significantly inversely associated with attentional control, difficulty in emotion regulation, and mindfulness at 4-wk post-quit-day assessment. The # of mins of meditation practice at home per day was significantly positively associated with attentional control, difficulty in emotion regulation, and mindfulness states at 4-wk post-quit-day assessment among MTS participants. Completion rate for the MTS group was 74.6%.

Davis, Manley, et al. (2014)	Baseline, 4-, & 24-wk post-quit-day	MTS: 7 weekly, 2.5-hr group sessions and one, 6.5-hr Quit Day Retreat, and 2-wk Nicotine Replacement Therapy; 15-30 mins of meditation at home every day during tx.	FFS: matched to tx condition in time, duration, intensity, and exercises; QL and 2-wk Nicotine Replacement Therapy	175 low-income adults (MTS: n = 68; FFS: n = 67; QL: n = 40) who smoked an average of ≥ 15 cigarettes/day. 135 participants were randomized to MTS and FFS. Of MTS participants, Mage = 43.2 (SD = 12.1); 57.4% men; 85.3% White, 2.9% African American, 4.4% Hispanic, and 4.4% American Indian. Of FFS participants, Mage = 45.8 (SD = 13.4); 49.3% men; 88.1% White, 3.0% African American, 2.2% Hispanic, and 1.5% American Indian. Of QL participants, Mage =	Cigarette smoking was measured with TLFB and Carbon Monoxide Breath Test. Mindfulness was measured with the FFMQ. Urge to smoke was assessed using one question rated on a 10-point scale. Stress was measured with the PSS. Acceptance of negative experiences was	MTS and FFS participants had similar 7-day point prevalence abstinence rates at 4-wk post-quit-day assessment. MTS participants had nonsignificantly higher 7-day point prevalence abstinence rates compared to FFS participants at 24-wk post-quit-day. MTS participants had a significantly greater reduction in urges for smoking compared to FFS participants at 24-wk post-quit-day. Post-quit urge ratings were significantly associated with 7-day point prevalence abstinence rates at 4-wk and 24-wk post-quit-day assessments. MTS	No information regarding tx fidelity assessment. Attrition rates were high for 4- and 24-wk follow-up; however, ITT analyses were not used when analyzing time-by-group interactions in self-report measures. Participants' self-selected to be either randomized to MTS or FFS or
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de Dios et al. (2012)	Baseline, posttx (2-wk), & 1-, 2- & 3-mo post baseline assessments	MI + MM: 2-weekly, 45-min individual sessions	No active intervention; assessment only	34 adult women (MI + MM: n = 22; control condition: n = 12) who were Mj users. Of MI + MM participants, Mage = 22.7 (SD = 2.7); 45.5% White. Of participants in the control condition, Mage = 23.5 (SD = 3.3);	45.3 (SD = 11.9); 47.5% men; 45.0% White, 50% African American, 0% Hispanic, and 2.5% American Indian. There were no significant differences between MTS and FFS in baseline demographic or outcome variables. MTS/FFS and QL participants differed significantly in race, % of participants who completed high school (70.1% vs. 59.7% vs. 42.1%), and # of prior quit attempts (M = 9.9, SD = 19.9 vs. M = 10.4, SD = 20.6 vs. M = 4.6, SD = 5.3). Attrition was not significantly associated with any baseline variables and did not differ significantly between participants in the MTS, FFS, and QL conditions.	measured with the AAQ.	participants had significantly greater decreases in experiential avoidance and perceived stress, and a significantly greater increase in non-judgment, acting with awareness, non-reacting, and mindfulness at 24-wk post-quit-day assessment compared to FFS participants. Completion rates were 67.6% for the MTS group, 73.1% for the FFS group, and 57.5% for the QL group. MTS participants attended an average of 5.4 of 8 sessions vs. FFS participants attended an average of 5.2 of 8 sessions.	participants had significantly greater decreases in QL.
						Mj use was measured with urinalysis and the TLFB. Anxiety was measured with the PDSQ-GAD. Meditation practice at	MI + MM participants in the tx condition had significantly greater decreases in the # of days of Mj use over the past 30 days at 1-, 2-, and 3-mos follow-up assessments compared to participants in the control condition. Among MI + MM participants, participants	Small sample size. No active control condition.

58.3% White. There were no significant differences between MM and control groups in baseline demographic or outcome variables. Attrition was not significantly associated with participants' baseline demographic or Mj use characteristics and did not differ significantly between participants in the tx and control conditions.

home was assessed with the TLFB.

were 50% less likely to use Mj on days when they practiced meditation than when they didn't practice meditation. 100% of MI + MM participants attended the 1st session and 73% attended the 2nd session.

Garland et al. (2010)	Baseline, mid-tx, & posttx (10-wk)	MORE: 10 weekly, 2-hr group sessions. Participants were asked to practice mindfulness for 15 mins/day.	SG: 10 weekly, therapist-led social support groups based on the Matrix model IOP tx manual. Participants were asked to journal for 15 mins/day on support group topics.	53 adults (MORE: n = 27; SG: n = 26) with alcohol dependence, 37 participants completed tx. Of MORE participants, Mage = 39.9 (SD = 8.7); 81.5% men; 62.9% African American and 42.3% White. Of SG participants, Mage = 40.7 (SD = 10.2); 76.9% men; 57.7% African American and 42.3% White. There were no significant differences between MORE and SG groups or completers and non-completers in baseline demographic or outcome variables.	Craving was measured with the PACS. Mindfulness was measured with the FFMQ. Mental distress was measured with the BSL. Stress was measured with the PSS. Impairment in response inhibition to drinking behavior was measured with the IARIS. Thought suppression was measured with the WBSI.	MORE participants had significantly greater decreases in perceived stress, thought suppression, alcohol attentional bias at posttx compared to SG participants. MORE participants had significant pre-to-posttx decreases in perceived stress, psychiatric sx's, alcohol attentional bias, and significant pre-to-posttx improvement in physiological recovery from alcohol cues. Completion rates were 66.7% for MORE and 73.1% for SG. MORE participants completed an average of 8 (SD = 2.1) of 10 sessions, whereas SG participants completed an average of 7.3 (SD = 3.5) of 10 sessions.	Small sample size. No follow-up assessments post tx. Study had high attrition rates at posttx and did not use ITT analyses.
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Physiological and neuropsychological functions were measured with cue-reactivity protocol, dot probe task, and HR variability measurement.							
Garland, Manusov, et al. (2014)	Baseline, posttx (8-wk), & 3-mo follow-up	MORE: 8 weekly, 2-hr group sessions. Participants were asked to practice mindfulness for 15 mins/day.	SG: 8 weekly, 2-hr, therapist-led social support groups based on the Matrix model IOP tx manual. Participants were asked to journal for 15 mins/day on support group topics.	115 chronic pain patients (MORE: n = 57; SG: n = 58) who had taken prescription opioids for pain. Of MORE participants, Mage = 49.3 (SD = 13.9); 30.0% men; 63.0% White, 18% African American, 4% American Indian, and 12% did not respond; 72.0% met criteria for opioid use disorders. Of SG participants, Mage = 47.4 (SD = 13.6); 34.0% men; 67.0% White, 19% African American, 3% American Indian, and 7% did not respond; 72.0% met criteria for opioid use disorders. There were no significant differences between MORE and SG groups or completers and non-completers in	Prescription opioid misuse was measured with the COMM. Craving for prescription opioid was measured with a single item rated on a 10-point scale. Mindfulness was measured with the FFMQ. Pain was measured with the BPI. Coping with pain was measured with the CSQ-Pain Sensations. Coping was measured with the CERQ. Stress was	MORE participants had a significantly greater proportion of individuals who no longer met opioid use disorder criteria at posttx compared to SG participants. Participants in the MORE and SG conditions had a significant pre-to-posttx decrease in self-reported opioid misuse. MORE participants had significantly greater reductions in urges for opioids, pain severity, functional interference, sympathetic arousal sxs, and neurological sxs, and nonreactivity, and significantly greater increases in reinterpretation of pain sensations and cognitive reappraisal at posttx compared to SG participants. MORE participants had significantly greater reductions in pain	Relied on self-reported measures.

	baseline demographic or outcome variables.	measured with the C-SOSI.	severity and pain interference at 3-mos follow-up compared to SG participants.		
Garland, Froeliger, et al. (2014b). Secondary data analysis of Garland, Manusov, et al. (2014)	Baseline & posttx (8-wk) MORE: 8 weekly, 2-hr group sessions. Participants were asked to practice mindfulness for 15 mins/day. SG: 8 weekly, 2-hr, therapist-led social support groups based on the Matrix model IOP tx manual. Participants were asked to journal for 15 mins/day on support group topics.	69 participants (MORE: n = 20; SG: n = 49) who completed psychophysiological assessments at posttx in Garland et al. (2014a). Of MORE participants, Mage = 46.0 (SD = 13.6); 75% women. Of SG participants, Mage = 46.9 (SD = 14.4); 69% women. There were no significant differences in baseline demographic or outcome variables between MORE and SG participants.	Craving for prescription opioids was measured with a single item rated on a 10-point scale. Pain was measured with the BPI. Physiological and neuropsychological functions were measured with dot probe task and HR variability measurement MORE participants had significantly greater reductions in subjective opioid cue-reactivity on the dot probe task at posttx compared to SG participants. MORE participants had significantly greater enhancements in HR deceleration during attention to pleasure cues, and significantly greater increases in HR variability from rest during emotional attention to pleasure cues than SG participants. Effects of MORE on craving were mediated by enhanced reward responsiveness.	No follow-up assessments post tx.	
Garland et al. (2016)	Baseline & posttx (10-wk) MORE: 10 weekly, 2-hr group sessions. Participants were asked to practice mindfulness for 15 mins/day. CBT: 10 weekly, 2-hr group CBT sessions adapted from Seeking Safety program that addressed substance misuse and trauma-	180 adult men who were in a TC for substance misuse problems were recruited (MORE: n = 64; CBT: n = 64; TAU: n = 52). Of MORE participants, Mage = 37.7 (SD = 10.4); 40% White, 45% Black, and 14% others. Of CBT participants, Mage = 36.5 (SD = 11.2); 44%	Craving was measured with the PACS. Trauma history was assessed using 9 yes/no questions that asked participants' about their experiences with traumatic	MORE participants had a significantly greater reduction in craving compared to CBT participants at posttx. MORE participants had significant pre-to-posttx reductions in post-traumatic stress, depression and anxiety sxs, and negative affect; and significant pre-to-posttx increases in	Relied on self-reported measures. No follow-up assessments posttx.

related issues. Participants were asked to do daily homework. TAU: 10 wky, 2-hr program adapted from TC program, including participation in a therapeutic milieu, psychoeducation, client-centered, supportive-expressive group therapy, and coping skills groups.

White, 44% Black, and 12% others. Of TAU participants, Mage = 38.7 (SD = 9.8); 42% White, 44% Black, 14% others. There were no significant differences among participants in the 3 conditions or between study completers and non-completers in baseline demographic or outcome variables.

events. Stress was measured with the PCL-C. Mental distress was measured with the BSI. Mindfulness was measured with the FFMQ. Affect was measured with the PANAS.

positive affect and mindfulness. MORE participants had significantly greater reductions in post-traumatic stress and negative affect, and a significantly greater increase in mindfulness compared to CBT participants. MORE participants had significantly greater increases in positive affect and mindfulness compared to TAU participants. Changes in mindfulness were significantly negatively associated with changes in craving and PTSD sx's.

Himelstein et al. (2015)	Baseline & posttx (12-wk)	MM in addition to TAU: 12 weekly, 1.5-hr individual sessions	TAU: 12 weekly sessions of individual psychotherapy (40-65 mins sessions)	35 incarcerated male youth with substance misuse problems: Mage = 16.5; 70% Latino, 14% African American, 6% Caucasian, 5% Pacific Islander, and 5% mixed-ethnic.	Attitude toward drugs was measured with the ATD. Mindfulness was measured with the MAAS. Locus of control was measured with the PLCS.	Participants in both conditions had significant pre-to-posttx increases in self-esteem and decision-making skills. MM training in addition to TAU was significantly more effective in increasing participants' self-esteem and behavioral	Small sample size. Relied on self-report measures. No information regarding tx fidelity assessment. Independent t-tests used for outcome
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Decision-making skills was measured with the DMS. Self-esteem was measured with the RSES. Participants' behavioral regulation was observed and rated by detention camp staff.

regulation at posttx compared to TAU alone.

analyses did not account for repeated-measure effects and missing values at posttx assessment. No follow-up assessments post tx.

Hsu et al. (2013). Secondary data analysis of Bowen et al. (2009)	Baseline, posttx (8-wk), 2- & 4-mo follow-up assessments	MBRP as an adjunct to TAU: 8 weekly 2-hr group sessions.	TAU: standard outpatient aftercare groups: 1.5-hr group sessions, 1-2 times weekly	Same as Bowen et al. (2009)	Substance misuse was measured with the TLFB. Craving for substance was measured with the PACS. Mindfulness was measured with the FFMQ.	MBRP participants had a significantly greater decrease in # of days of substance use over the course of intervention and 4-mo follow-up compared to TAU participants. Participants in both conditions had a significant decrease in # of days of substance use over the course of intervention and 4-mo follow-up. However, these effects were not maintained at 4-mo follow-up. Distress tolerance moderated tx effects: MBRP participants with lower baseline distress tolerance showed a significantly greater decrease in # of days of substance use compared to TAU participants with lower baseline distress	Relied on self-report measures. No information regarding tx fidelity assessment.
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tolerance; however, the decrease was not maintained at the 4-mo follow-up.

Lee et al. (2011)	Baseline & posttx (10-wk)	Modified MBRP: 10 weekly, 1.5-hr group sessions	TAU: substance use education	24 incarcerated adult men in Taiwan (MBRP: n = 10; TAU: n = 14) who were currently abstinent from drug use. Of MBRP participants, Mage = 43.0 (SD = 5.6). Of TAU participants, Mage = 38.8 (SD = 7.9). There were no significant differences between MBRP and TAU groups in baseline demographic and outcome variables; however, MBRP participants had significantly less frequent drug use compared to TAU participants at baseline (M = 3.8, SD = 1.8 vs. M = 6.9, SD = 2.9).	Substance misuse was measured with the DUDIT. Self-efficacy to avoid drugs was measured with the DASES. Depression was measured with the BDI.	MBRP participants had a significantly greater increase in negative outcome expectancies of drug use assessed by DUDIT-negative aspect of drug use subscale compared to TAU participants at posttx. MBRP participants had significant pre-to-posttx changes in drug avoidance self-efficacy and positive aspect of drug use assessed by DUDIT.	Small sample size. Relied on self-report measures. No information on tx fidelity assessment. Study did not report attrition rates and whether ITT analyses were used. No follow-up assessments posttx.
Mermelstein & Garske (2014)	Alcohol use & mindfulness practice (only for mindfulness participants) was measured each wk. Cue	Brief mindfulness tx: 2 weekly sessions (a 28-min session providing guided instructions for MM practice and	Control group: participants did not engage in any comparable active intervention; but were given instructions	76 college students with binge drinking problems (Mindfulness, n = 38; Control, n = 38); Mage = 19.1 (SD = 1.2); 50% were men; 91% were White. Participants were blind to tx condition when signing up to the txs. There were no significant differences	Alcohol use was measured with the DDQ, RAPI, and TLFB; Urge for alcohol was measured with the AUQ. Self-efficacy to refuse drinking was measured	Participants in the mindfulness intervention group had significantly greater decreases in binge drinking episodes and negative consequences of alcohol use compared to control participants during the 4 wks after the initial intervention. Mindfulness intervention participants had	Relied on self-report measures for alcohol use/binge drinking. No information regarding tx fidelity assessment.

	exposure protocol was implemented after the 2 sessions (wk-1 & wk-2). Other measures were administered at baseline, after session 1, & at the wk-4 after session 1.	urge surfing exercise and a 25-min session on MM). Daily, 1-hr mindfulness practice over 5 wks.	to utilize any technique they would normally use to cope with alcohol-related urges during the cue exposure protocol.	between tx and control groups in baseline binge drinking, alcohol use, readiness to change, self-efficacy, and mindfulness. All participants completed assessments.	with the DRSEQ. Mindfulness was measured with the FFMQ. Mindfulness practice was self-rated by participants on a scale of 0 to 100.	significantly greater increases in self-efficacy to refrain from using alcohol and mindfulness compared to participants in the control group during the 4 wks after the initial intervention. Completion rate was 97% for mindfulness intervention. 82% had at least one mindfulness practice each wk and 97% had at least one practice during the 4-wk period.	
Murphy et al. (1986)	Once a day over a 16-wk period	Meditation exercise: 8-wks, 3 times-a-wk, individual sessions, and meditation practice twice-a-day over the 3 wks.	Running exercise: 8-wks, 3 times-a-wk, group sessions; Control: no active intervention	43 male college students (Meditation group: n = 14; Running group: n = 13; Control group: n = 16) who were heavy social drinkers. Of students in the meditation group, Mage = 25.0; of students in the running group, Mage = 24.9; of students in the control group, Mage = 24.5. There were no significant differences in baseline alcohol use of participants in meditation, running, and control groups.	Daily journal including type and amount of alcohol use, and amount of time spent drinking	Participants in the meditation group had significant reductions in alcohol consumption over the 8-wk intervention; however, the reductions in alcohol consumption of the meditation group were not significantly different from participants in the running or control groups. High meditation compliers (i.e., meditated ≥ 5.3 times per wk) reduced their alcohol consumption by 60% compared to 24% in low compliers (meditated ≤ 5.3 times per wk).	Small sample size. Relied on self-report measures. No information regarding tx fidelity assessment. Study did not report attrition rates, or whether ITT analyses were used.
Nakamura et al. (2015)	Baseline, mid-tx, & posttx (10-wk)	MBI: 10 wks, 20, 2-hr group sessions in	TAU: case management, individual, group, and	38 adult women (MBI: n = 18; TAU: n = 20) with substance misuse problems in a substance	Substance misuse was measured with the SIP.	MBI participants had a significantly greater reduction in craving at posttx compared to TAU	Small sample size. Relied on self-report measures. No

addition to TAU.	family tx, life skills classes, relapse prevention techniques, behavior management groups, and parenting classes.	abuse tx facility. Of MBI participants, Mage = 30.4 (SD = 8.3); 95.0% White. Of TAU participants, Mage = 34.7 (SD = 10.2); 100% White. There were no significant differences between MBI and TAU groups in baseline demographic or outcomes variables.	Craving for substance was measured with the PACS. Distress caused by traumatic event was measured with the IES-R. Depression was measured with the CES-D. Sleep was measured with the MOS-SS. Mindfulness was measured with the FFMQ. Self-compassion was measured with the SCS. Well-being was measured with the WHO-5.	participants. Participants in MBI and TAU conditions had significant pre-to-posttx reductions in their severity of alcohol and drug use; however, the reductions were not significantly different between MBI and TAU participants. MBI participants had significant pre-to-posttx decreases in impact of substance abuse-related traumatic events, depressive sxs, and sleeping problems, and significant pre-to-posttx increases in mindfulness, self-compassion, and well-being. Compared to TAU, MBI were significantly more effective in reducing impact of substance abuse-related traumatic events, and sleeping problems, and enhancing participants' mindfulness, self-compassion, and well-being at posttx. Completion rates were 70% for MBI group and 94.4% for TAU group.	information regarding tx fidelity assessment. No follow-up assessments posttx.		
Price et al. (2012)	Baseline, posttx (3-mo post-baseline), 6-mo & 9-mo follow-up assessments	MABT: 8 weekly, 1.5-hr individual sessions, in addition to TAU.	TAU: 3-5 wk inpatient program, 12-24 wk outpatient program, and 12-wk	46 adult women (MABT: n = 31; TAU: n = 15) with substance misuse problems who were enrolled in an outpatient program. Of MABT participants, Mage = 40; 94.0%	Substance misuse was measured with the TFBL, urinalysis, and breathalyzer. Reasons for relapse was	MABT participants had a significant higher % of abstinent days in the past 90 days at posttx, were significantly more likely to maintain abstinence, and were significantly less likely to have a relapse due to	Small sample size.

continuing care.

White. Of TAU participants, Mage = 38; 93.0% White. 63% reported sexual or physical trauma. 30% had comorbid eating disorder. There were no significant differences between MABT and TAU groups in baseline demographic or outcome variables.

measured with the RDQ. Distress was measured with the MSC, BSI, and PDS. Eating disorder was measured with the EDEQ. Stress and coping were measured with the PSS, PANAS, DES, and DERS. Body awareness was measured with the SBC and BIS. Mindfulness was measured with the FFMQ.

craving or social pressure compared to TAU participants at posttx, 6-, and 9-mo follow-ups. Compared to TAU participants, MABT participants had significantly lower levels of dissociation experiences at posttx, 6-, and 9-mo follow-up assessments; significantly lower levels of eating disorder, depression, and limited strategies at 6- and 9-mo follow-up assessments; significantly lower levels of anxiety and control difficulties at 6-mo follow-up; and significantly lower levels of perceived stress and less frequent physical sx's at 9-mo follow-up. Completion rates: 58% of participants completed at least 6 of 8 sessions; 52% completed all 8 sessions.

Ruscio et al. (2015)	Assessment on PDA immediately after each tx session; 1-baseline, 1- & 2-wk post baseline for assessment in the lab	Brief mindfulness practice implemented on PDA: 5 daily, 20-min guided meditation sessions.	Guided sham-meditation track on PDA: 5 daily, 20-min guided sessions.	44 participants (tx condition: n = 24; control condition, n = 21) who reported smoking ≥ 10 cigarettes per day: ages = 18-65; 50% men. There were no significant differences between tx and control groups in demographics, # of cigarettes/day, age when starting daily smoking. # of quit	Cigarette smoking was measured with participants' self-reports, CO levels, and salivary cotinine. Craving for cigarette was measured with a single item on a 7-point Likert-	Participants in the tx condition had a significantly greater reduction in # of cigarettes smoked per day over the 2-wk intervention compared to participants in the control condition. Participants in the tx condition had significantly greater reductions in craving immediately after meditation than their craving at other random time during the day.	Small sample size. Study had high attrition rates and ITT analyses were not used. No follow-up assessments posttx.
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attempts, or intention to quit at baseline. There were no significant differences in baseline demographics or levels of cigarette use between study completers and non-completers.	type scale. Affect was measured with the PANAS.	Participants in the tx condition had significantly lower levels of overall negative affect compared to participants in the control condition at 2-wks post baseline. Completion rate was 72.7% for both tx and control participants.					
Schuman-Olivier et al. (2014). Secondary data analysis of Brewer et al. (2011)	Baseline, posttx (4-wk), & 6-, 12-, & 17-wk follow-up assessments	MTS: 4-wks, twice-a-wk, 1.5-hr group sessions.	FFS: 4-wks, twice a wk, 1.5-hr group sessions.	Same as Brewer et al. (2011).	Cigarette smoking was measured with the TLFB. Mindfulness was measured with the FFMQ.	MTS participants smoked significantly fewer cigarettes per day at posttx and 12-wk follow-up, and had a significantly higher 7-day point prevalence abstinence rate at posttx compared to FFS participants. Non-judgment moderated the tx effects of smoking cessation at 12-wks follow-up: among participants with high levels of non-judgment, those in the MTS condition smoked significantly fewer cigarettes per day over the follow-up period compared to FFS participants; among participants in the MTS condition, those with high levels of non-judgment smoked significantly fewer cigarettes per day over the follow-up period compared to participants with low levels of non-judgment. MTS participants with high levels of non-judgment had the highest 7-day point	No information regarding tx fidelity assessment.

prevalence abstinence rate at 17-wk follow-up compared to other participants. MT participants who initiated tx (n = 33) attended an average of 6.7 (SD = 1.7) of 8 sessions vs. FFS participants who initiated tx (n = 38) attended an average of 6.2 (SD = 2.2) of 8 sessions.

Tang et al. (2013)	Baseline & posttx (2-wk)	IBMT: 30-min practice training every night for 10 consecutive nights.	RT: 30-min practice training every night for 10 consecutive nights.	60 college students including 27 cigarette smokers and 33 nonsmokers (IBMT: n = 33 including 15 smokers and 11 of them were men; RT: n = 27 including 12 smokers and 8 of them were men); Mage = 21.5 (SD = 3.1). There were no significant differences between tx and control groups in levels of cigarettes use and craving at baseline.	Cigarette smoking was measured with exhaled Carbon monoxide and the FTND. Craving was assessed with a 5-point Likert scale. Intention to smoke was measured with a 10-point scale. Brain functions associated with self-control was measured with brain scans.	IBMT participants had a significantly greater reduction in cigarette smoking at posttx compared to RT participants: IBMT participants had a reduction in smoking of 60%, whereas participants in the control condition had no reduction at posttx. IBMT participants had significantly increased activity at ACC/medial PFC and inferior frontal gyrus/ventrolateral PFC, compared to no significant changes among RT participants. Compared to RT participants, IBMT participants had significantly greater decreased activity at posterior cingulate cortex/precuneus and cerebellum. Results of brain scans suggested that improved self-control capacity in the IBMT group compared to RT group at posttx. Completion rates	Small sample size. No information regarding tx fidelity assessment. No follow-up assessments posttx (authors mentioned in Discussion that 5 smokers in IBMT were assessed at 2- and 4-wk follow-ups using CO monitor and FTND, and theses participants maintained reduced smoking).
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were 100% for both conditions.

Tuab et al. (1994)	Baseline 6-, 12-, & 18-mo post leaving the tx institution	TM: 7 group and individual sessions	BF: 20 daily, 1-hr sessions; NT: 5 daily 30-min sessions, 5 days a wk for 3 wks; RT: Alcohol Anonymous meetings and counseling services	250 adult men (TM: n = 35; BF: n = 24; NT: n = 28; RT: n = 31) with alcohol abuse problem were recruited: 80% African American. Of participants in TM group, Mage = 44.3. Of participants in BF group, Mage = 44.3. Of participants in NT group, Mage = 44.4. Of participants in RT group, Mage = 44.4.	Alcohol use was measured with social questionnaire including information about amount and pattern of drinking. Psychological state was measured with the PMS.	Participants in TM and BF groups had a significantly greater % of abstinent days compared to participants in RT group at 6-, 12-, and 18-mo follow-up assessments; however, there were no significant differences in % of abstinent days between TM and BF participants. Participants in TM and BF groups combined had a significantly greater % of participants who were completely abstinent at 6-, 12-, and 18-mo follow-ups compared to NT and RT participants combined. Participants in TM group had significant improvements on psychological states when they were discharged from the tx institution compared to baseline assessment. Completion rates were 100% for all tx conditions.	Relied on self-report measures. No information regarding tx fidelity assessment. Study had high attrition rates at follow-up assessments and ITT analyses were not used.
Witkiewitz & Bowen (2010). Secondary data analysis of	Baseline, posttx (8-wk), 2- & 4-mo follow-up assessments.	MBRP as an adjunct to TAU: 8 weekly, 2-hr group sessions.	TAU: standard outpatient aftercare groups designed to maintain abstinence	Same as Bowen et al. (2009)	Substance use was measured with the TLFB. Craving was measured with the PACS. Depression was	61.4% of MBRP participants and 60.9% of TAU participants were abstinent during the study. Participation in MBRP was significantly negatively associated with craving at 2-mo follow-up. Tx condition	Relied on self-report measures.

Bowen et al. (2009)	through a 12-step process-oriented format: 1.5-hr group sessions, 1-2 times wkly.	measured with the BDI.	moderated the mediating effects of craving. Craving partially mediated the relation between depressive sx's and substance use for TAU participants, but not for MBRP participants. MBRP participants were less likely to experience craving in response to depression, and the attenuated reactivity to depressed mood and reduced craving also predicted fewer days of substance use at 4-mo follow-up. Craving at 2-mo follow-up partially mediated the relationship between depressive sx's at posttx and substance use at 4-mo follow-up among TAU participants, not among MBRP participants.	
Witkiewitz, Bowen et al. (2013). Secondary data analysis of Bowen et al. (2009)	Baseline, posttx (8-wk), 2- & 4-mo follow-up assessments MBRP as an adjunct to standard outpatient aftercare: 8 weekly 2-hr group sessions. TAU: standard outpatient aftercare groups designed to maintain abstinence through a 12-step process-oriented format: 1.5-hr group sessions, 1-2 times wkly.	Craving was measured with the PACS. Mindfulness was measured with the FFMQ. Acceptance of negative experiences was measured with the AAQ.	MBRP participants had a significantly greater reduction in craving at 4-mo follow-up compared to TAU participants. The tx effect on craving was not maintained for MBRP participants post tx, whereas TAU participants had slight increases in craving at posttx. A latent factor representing acceptance, awareness, and nonjudgment mediated the effects of	Relied on self-report measures.

MBRP participation on craving at posttx.					
Witkiewit z, Greenfield, et al. (2013). Secondary data analysis of Witkiewit z, Warner, et al. (2014)	Baseline, mid-tx, posttx (8-wk), & 15-wk follow-up	Modified MBRP: 16, twice-a-wk, 50-min group sessions for 8 wks.	Relapse prevention tx (RP): matched MBRP in time, format, and group size.	70 adult women who had complete data on race/ethnicity in Witkiewitz et al. (2014). There were no significant differences in demographic variables between White and Non-white participants at baseline. There were no significant differences in baseline demographic and outcome variables between study completers and non-completers.	Substance misuse was measured with the TLFb and ASI.
				MBRP participants had significantly fewer drug use days over the 15-wk follow-up period compared to RP participants. Race/ethnicity moderated tx effects on drug use: Racial minority women in MBRP reported the lowest # of days of drug use at 15-wk follow-up compared to all other groups, while racial minority women in RP reported the highest # of days of drug use at 15-wk follow-up compared to other groups. MBRP participants had significantly lower levels of ASI-assessed addiction-related problems at 15-wk follow-up compared to RP participants. Race/ethnicity moderated the addiction-related problems: Racial minority women in MBRP had the lowest levels of addiction-related problems and medical problems at 15-wk follow-up compared to all other groups, while racial minority women in RP had the highest levels of addiction-related problems and medical problems at 15-wk follow-up.	Relied on self-report measures. No information regarding tx fidelity assessment.

Witkiewitz, Warner, et al. (2014)	Baseline, mid-tx, posttx (8-wk), & 15-wk follow-up	Modified MBRP: 16, twice-a-wk, 50-min group sessions for 8 wks.	Relapse prevention program (RP): matched MBRP in time, format, and group size.	105 adult women (MBRP: n = 55; RP: n = 50) who were referred by criminal-justice system to a residential addiction tx program. Of MBRP participants, Mage = 35.8 (SD = 9.5); 34.5% White, 12.7% African American, 7.3% Native American, and 40% unknown. Of RP participants, Mage = 32.4 (SD = 8.9); 51.0% White, 10.2% African American, 10.2% Native American, and 26.5% American. There were no significant differences between MBRP and RP groups in baseline demographics or outcome variables. Attrition was not significantly associated with any baseline demographic or substance use variables.	Substance misuse was measured with the TLFB, ASI, and SIP.	MBRP participants had significantly (96%) fewer drug use days over the 15-wk follow-up period compared to RP participants. MBRP participants had significantly lower (39%) levels of drug use-related consequences over the 15-wk follow-up period compared to RP participants. MBRP participants had significantly lower levels of ASI-assessed addiction-related legal and medical problems at the 15-wk follow-up compared to participants in the RP condition. Completion rates were 63.6% for MBRP group and 72% for RP group.	Relied on self-report measures. No information regarding tx fidelity assessment.
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Acronyms/Abbreviations: AAQ = Acceptance and Action Questionnaire; ACS = Attentional Control Scale; ASI = Addiction Severity Index; AUQ = Alcohol Urge Questionnaire; ATD = Attitude Toward Drugs; BDI = Beck Depression Inventory; BF = (EMG) Biofeedback; BIS = Body Investment Scale; BPI = Brief Pain Inventory; BSI = Brief Symptom Inventory; CES-D = Center for Epidemiologic Studies-Depression; CERQ = Cognitive Emotion Regulation Questionnaire; COMM = Current Opioid Misuse Measure; C-SOSI = Calgary Sxs of Stress Inventory; CSQ = Coping Strategies Questionnaire; DASES = Drug Avoidance Self-Efficacy Scale; DDQ = Daily Drinking Questionnaire; DES = Differential Emotion Scale; DES = Dissociation Experiences Scale; DERS = Difficulty in Emotion Regulation Scale; DMS = Decision-making Skills; DRSEQ = Drinking Refusal Self-Efficacy Questionnaire; DTS = Distress Tolerance Scale; DUDIT = Drug Use Identification Disorders Test-Extended; EDEQ = Eating Disorder Examination Questionnaire; FFS = Freedom from Smoking program; FTND = Fagerstrom Test for Nicotine Dependence; HR = heart rate; hr = hour; IARIS = Impaired Alcohol Response Inhibition Scale; IES-R = Impact of Event Scale-Revised; ILS = Interactive Learning Smokers program; IBMT = Integrative Body-Mind Training; IOP = Intensive Outpatient Program; ITT = intent-to-treat; LAP-R = Life Attitude Profile-Revised; LOT = Life Orientation Test; MAAS = Mindful Attention Awareness

Scale; MABT = Mindful Awareness in Body-Oriented Therapy; MBI = Mind-Body Intervention; MBRP = Mindfulness-Based Relapse Prevention; MI = Motivational interviewing; min = minute; Mj = Marijuana; MM = Mindfulness Meditation; mo = month; MORE = Mindfulness-Oriented Recovery Enhancement; MOS-SS = Medical Outcomes-Study Sleep Scale; MSC = Medical Sxs Checklist; MT = Mindfulness training; MTS = Mindfulness Training for Smoking Cessation; NT = Neurotherapy; PACS = Penn Alcohol Craving Scale; PANAS = Positive and Negative Affect Schedule; PDS = Post-Traumatic Stress Disorder Scale; PDSQ-GAD = Psychiatric Diagnostic Screening Questionnaire-Generalized Anxiety Disorder; PLCS = Prison Locus of Control Scale; PMS = Profile of Mood States; PSS = Perceived Stress Scale; PCL-C = PTSD Checklist-Civilian Version; PDA = Personal Digital Assistant; QL = (Tobacco) Quit Line; RAPI = Rutgers Alcohol Problem Index; RDQ = Reasons for Drinking Questionnaire; RP = relapse prevention; RSES = Rosenberg Self-Esteem Scale; RT = Relaxation Training; SAS = Spirituality Assessment Scale; SBC = Scale of Body Connection; SF-36 = SF-36 Health Survey Questionnaire; SIP = Short Inventory of Problems; SG = Support group; SCS = Self-Compassion Scale; sxs = symptoms; TAU = Treatment as usual; TC = Therapeutic Community; TM = Transcendental Meditation; TLFB = Timeline Followback; tx = treatment; WBSI = White Bear Suppression Inventory; WHO-5 = World Health Organization Well-Being Index; wk = week; yr = year; # = number; % = percent/percentage.

Effect Sizes of Mindfulness Treatment vis-a-vis Posttreatment Outcomes

Meta-analyses were conducted for RCTs that compared effects of mindfulness treatment to a control condition on posttreatment values of outcome variables, including severity of substance misuse, point-prevalence of abstinence, craving, stress, and mindfulness. Figure 1.2 illustrates the pooled Cohen's d s and associated 95% CIs of mindfulness treatment on levels of substance misuse at posttreatment compared to a control condition (i.e., TAU and alternative treatments). Six trials provided sufficient information (i.e., means, standard deviations, sample size per treatment and control conditions) to calculate effect sizes. The included studies used different measures to assess substance misuse, including number of days of substance use/binge drinking episodes ($n = 3$), the Short Inventory of Problem Alcohol/Drug Use ($n = 2$), and the Current Opioid Misuse Measure ($n = 1$). Cohen's d s were pooled for studies that used different measures. The Cohen's d s for studies using different measures were then pooled together to compute an average effect size. Results revealed a significant, small effect size ($d = -.28$, 95% CI $[-.54, -.03]$) on levels of substance misuse measured with the number of days of substance use/binge drinking episodes; a small effect size ($d = -.40$, 95% CI $[-.73, .07]$) on substance misuse measured with the Short Inventory of Problem Alcohol/Drug Use; and a significant medium effect size ($d = -.51$, 95% CI $[-.88, -.14]$) on opioid misuse measured with the Current Opioid Misuse Measure at posttreatment. Overall, the synthesized effect size was $-.33$ (95% CI $[-.88, -.14]$), suggesting that mindfulness treatment had a significant and small effect in reducing substance misuse at posttreatment compared to a control condition.

Figure 1.2. Forest plot displaying random effects meta-analysis for the effect of mindfulness treatment on substance misuse at posttreatment compared to a control condition.

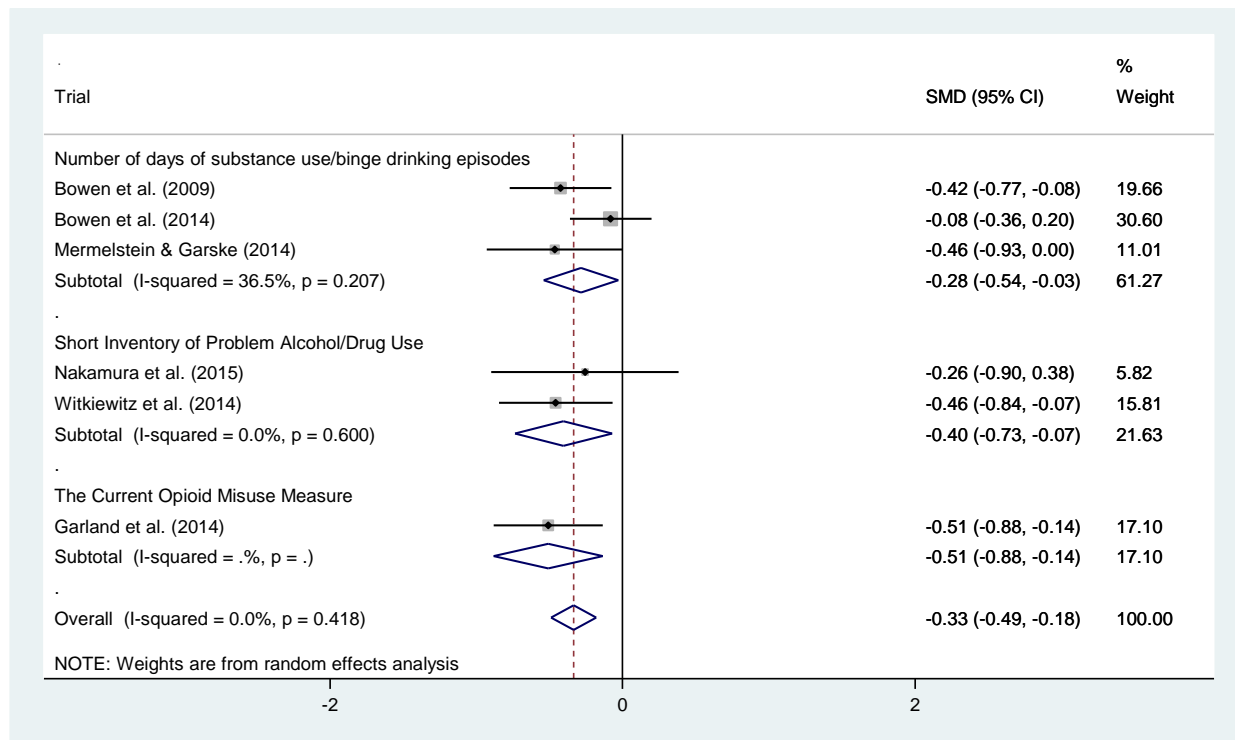


Figure 1.3 illustrates the pooled odds ratios and associated 95% CIs of mindfulness treatments on point-prevalence abstinence from cigarette smoking compared to an alternative treatment across 4 RCTs. The synthesized effect size was 1.76 (95% CI [.98, 3.15]), which suggests that participants who received mindfulness treatment were 76% more likely to achieve abstinence from cigarette smoking at posttreatment compared to their peers who received alternative treatments that were adapted from the American Lung Association's Freedom from Smoking program (American Lung Association, 2010) and the Mayo Clinic's Nicotine Dependence Center program (Boardman, Catley, Mayo, & Ahluwalia, 2005), and Tobacco Quit Line.

Figure 1.3. Forest plot displaying random effects meta-analysis for the effect of mindfulness treatment on abstinence from cigarette smoking at posttreatment compared to a control condition.

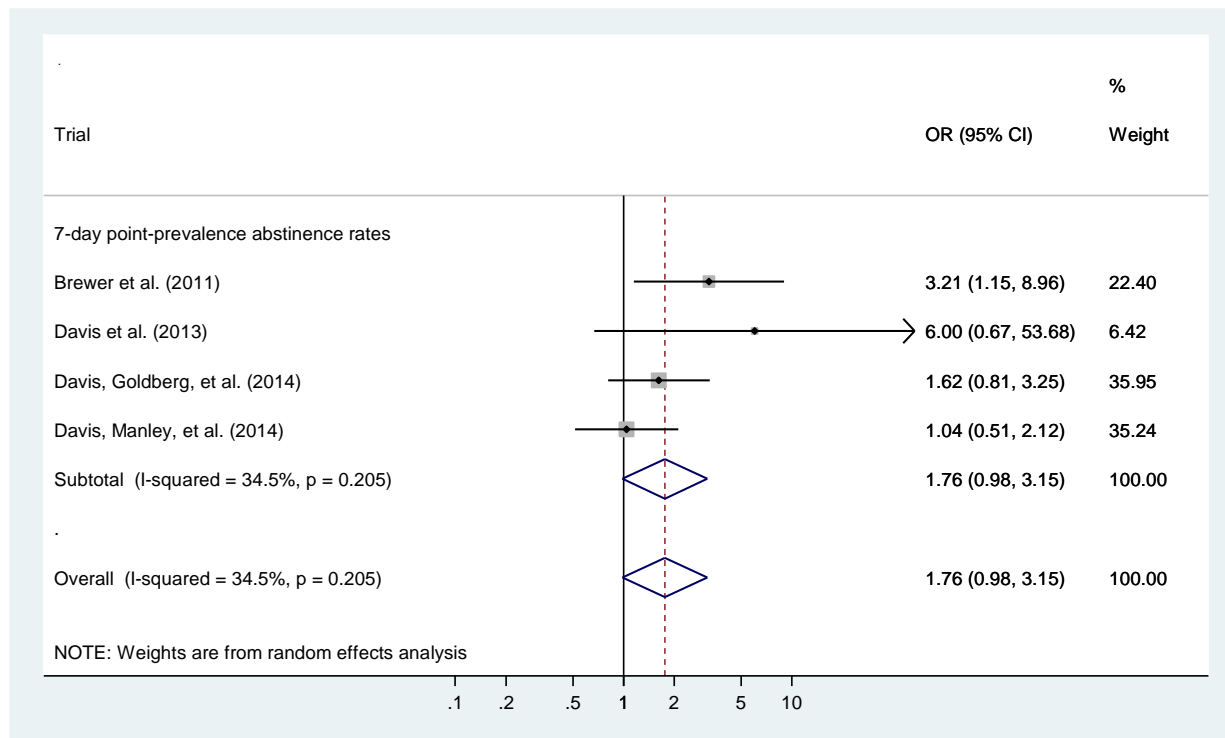


Figure 1.4 presents the pooled Cohen's *ds* and associated 95% CIs of 7 RCTs that provided adequate information to compute effect sizes on craving for substance at posttreatment. The included studies used two measures to assess craving, including the Penn Alcohol/Drug Craving Scale and a numeric rating scale. Specifically, the average effect size of mindfulness treatment on craving measured with the Penn Alcohol/Drug Craving was $-.65$ (95% CI $[-1.67, .37]$), and the effect size on craving measured using a numeric rating scale was $-.59$ (95% CI $[-.87, -.31]$). Overall, the synthesized effect size of mindfulness treatment on reducing craving was $-.63$ (95% CI $[-1.17, -.08]$), suggesting that mindfulness treatment had a significant medium effect on reducing craving at posttreatment compared to a control condition.

Figure 1.4. Forest plot displaying random effects meta-analysis for the effect of mindfulness treatment on craving at posttreatment compared to a control condition.

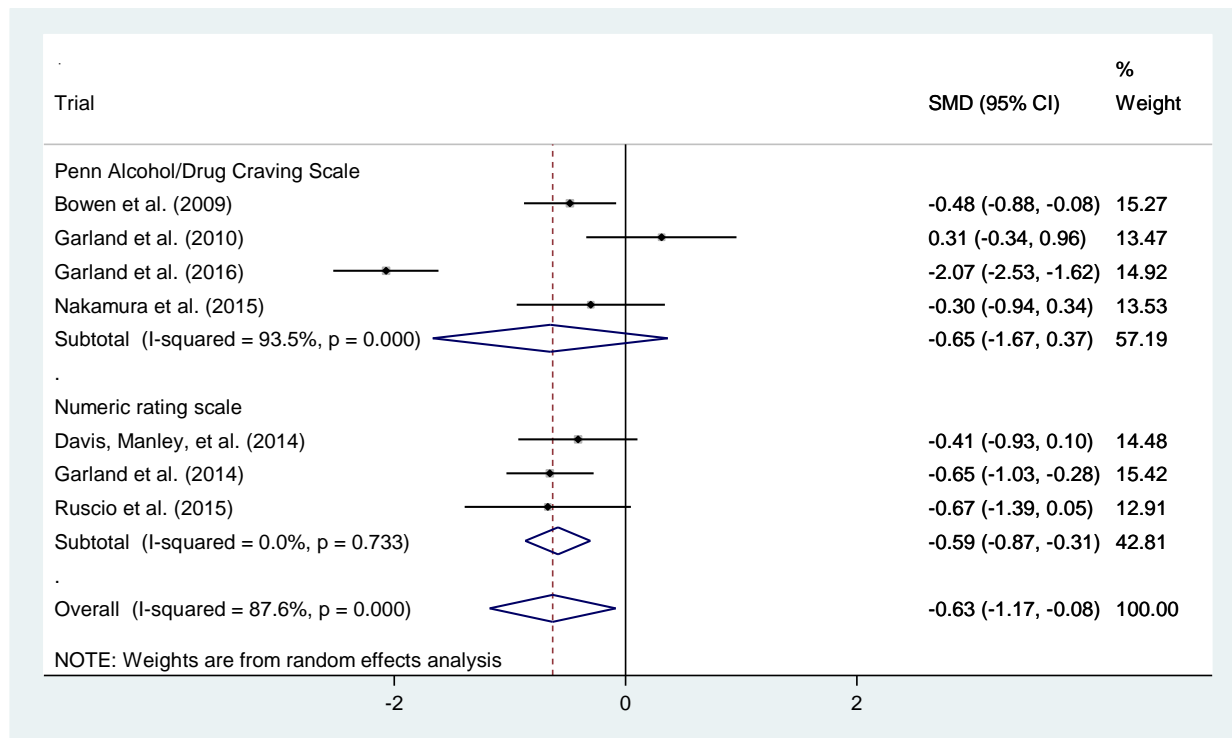


Figure 1.5 presents the pooled Cohen's d s and associated 95% CIs of 5 RCTs on reducing stress at posttreatment compared to a TAU or alternative treatments. Three studies used the Perceived Stress Scale to measure stress and had an average effect size of $-.46$ (95% CI $[-.81, -.11]$). One study assessed participants' stress using the PTSD CheckList-Civilian Version, and had an effect size of -3.77 (95% CI $[-4.38, -3.15]$). One study measured participants' stress using the Calgary Symptoms of Stress Scale and had an effect size of $-.41$ (95% CI $[-.60, -.22]$). Overall, the synthesized effect size of mindfulness treatment on reducing stress at posttreatment compared to a control condition was statistically significant and large ($d = -1.12$, 95% CI $[-2.24, -.01]$).

Figure 1.5. Forest plot displaying random effects meta-analysis for the effect of mindfulness treatment on stress at posttreatment compared to a control condition.

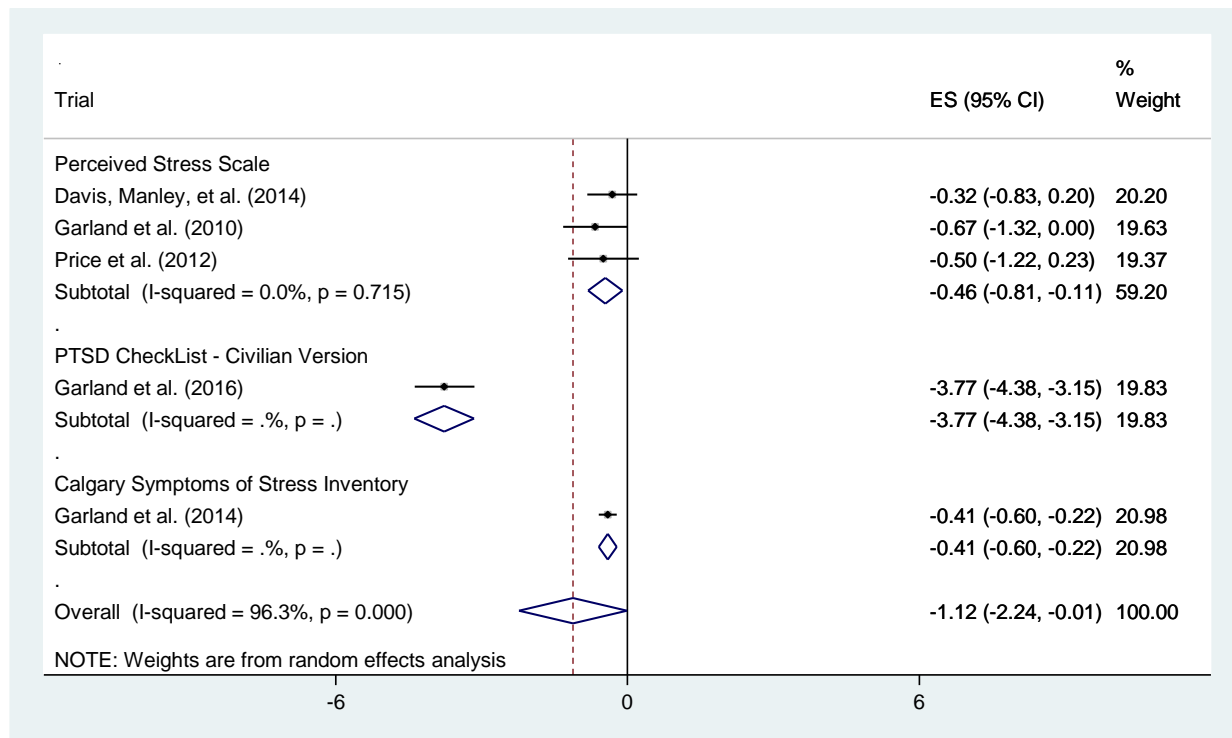


Figure 1.6 presents the pooled Cohen's *d*s and associated 95% CIs of 8 RCTs on enhancing mindfulness at posttreatment compared to TAU or alternative treatments. Mindfulness at posttreatment across the 8 RCTs was measured with the Five Facet Mindfulness Questionnaire. Results revealed a medium effect size ($d = .61$, 95% CI [-0.02, 1.24]) of mindfulness treatment on improving mindfulness at posttreatment, compared to a control condition. The effect size approaches the significance level at .05 ($p = .059$). Table 1.4 presents synthesized effect sizes of mindfulness treatment on each outcome variable assessed by different measures.

Figure 1.6. Forest plot displaying random effects meta-analysis for the effect of mindfulness treatment on mindfulness at posttreatment compared to a control condition.

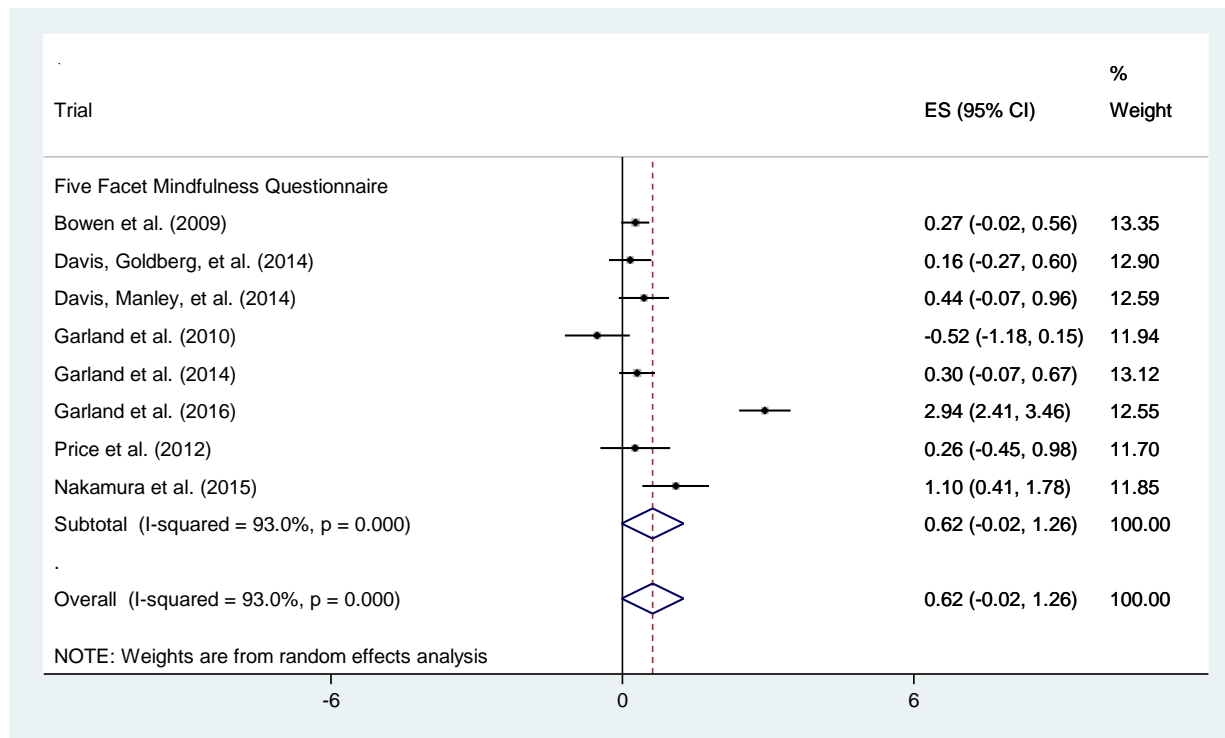


Table 1.4
Synthesized Effect Sizes of Mindfulness Treatment on Outcome Variables

Outcome Variable	N	Cohen's d/OR	95% CI	z	p	I ²
Substance use	6	-.33	[-.49, -.17]	4.10	.000	5.0%
# of days of substance use/binge-drinking episodes	3	-.28	[-.55, -.02]	2.08	.037	40.2%
Current Opioid Misuse Measure	1	-.51	[-.88, -.14]	2.67	.008	
Short Inventory of Problem Alcohol/Drug Use	2	-.40	[-.74, -.07]	2.38	.017	0%
Abstinence from cigarette smoking ^a	4	1.76	[.99, 3.15]	1.91	.056	34.5%
Craving	7	-.63	[-1.17, -.08]	2.26	.024	87.6%
Penn Alcohol/Drug Craving Scale	4	-.65	[-1.67, .37]	1.25	.21	93.5%
Numeric rating scale	3	-.59	[-.87, -.31]	4.09	.000	0%
Perceived stress	4	-1.12	[-2.24, -.01]	1.98	.048	96.3%
Perceived Stress Scale	3	-.46	[-.81, -.11]	2.54	.011	0%
PTSD Checklist – Civilian Version	1	-3.77	[-4.39, -3.16]	12.01	.000	
Calgary Sxs of Stress	1	-.41	[-.60, -.22]	4.29	.000	
Mindfulness states ^b	8	.61	[-.02, 1.24]	1.88	.059	91.9%

Note:

N: # of studies that were included in the meta-analysis.

*I*²: % of variation attributable to heterogeneity. A value of 0% indicates no observed heterogeneity, and larger % indicates increasing heterogeneity.

Sxs = Symptoms

a. Abstinence from cigarette smoking was measured using 7-day point-prevalence abstinence rates. The effect size was measured with pooled odds ratios.

b. Mindfulness was measured using the Five Facet Mindfulness Questionnaire in all 8 studies.

Discussion

This systematic review and meta-analysis examined 49 studies published by December 2015. The variety of studies and the use of meta-analysis allowed us to evaluate the therapeutic benefits of mindfulness treatment in diverse substance misusing client populations. A large number of treatment outcome studies has accrued suggesting that mindfulness treatment is a promising approach to treating substance misuse problems, preventing relapse, and enhancing psychosocial well-being. The promising effects of mindfulness treatment are supported by the consistency of positive findings across studies using different designs and evaluating different mindfulness treatment modalities in diverse populations with a variety of substance misuse problems. Further, results of meta-analyses revealed small-to-large effects of mindfulness treatment on reducing substance misuse, craving for substance misuse, and stress, and on increasing abstinence from cigarette smoking and mindfulness at posttreatment compared to alternative treatments (e.g., TAU, CBT, and support group).

A majority of studies in this systematic review suggest that mindfulness treatment was effective in reducing substance misuse and medical, psychological, relationship, and legal-related problems, and on increasing abstinence at posttreatment and follow-ups ranging from 2-weeks to 12-months posttreatment. RCTs suggest that MBRP combined with TAU outperformed TAU alone (e.g., Alterman et al., 2004; Bowen et al., 2009; 2014; Lee et al., 2011) and relapse prevention treatment (e.g., Bowen et al., 2014; Witkiewitz et al., 2014) in reducing substance

misuse at posttreatment and follow-ups. Mindfulness treatment for cigarette smoking based on MBSR was superior to alternative treatments adapted from the American Lung Association's Freedom from Smoking program (American Lung Association, 2010) and the Mayo Clinic's Nicotine Dependence Center program (Boardman et al., 2005), and Tobacco Quit Line in enhancing abstinence at follow-up periods ranging from 2- to 24-weeks post-quit day (Brewer et al., 2011; Davis et al., 2013; Davis, Goldberg, et al., 2014; Davis, Manley, et al., 2014). Further, MORE was significantly more effective than a support group based on the Matrix model IOP treatment and CBT (e.g., Garland et al., 2010; 2014; 2016) in populations with alcohol and prescription opioid misuse.

In addition, quasi-experimental studies suggest that VM courses plus TAU outperformed TAU alone (e.g., Bowen et al., 2006) in substance misusing populations involved in the criminal justice system; and mindfulness treatment combined with therapeutic community usual care outperformed TAU (e.g., Marcus et al., 2009) in people enrolled at a therapeutic community for substance misuse problems. These positive findings were supported by meta-analyses of RCTs that indicated small, though significant, effects of mindfulness treatment on severity of substance misuse and point-prevalence abstinence of cigarette smoking at posttreatment compared to a control condition.

Further, this systematic review concluded that mindfulness treatment could alter underlying risk mechanisms for addictive behaviors and relapse, particularly craving for substance use and stress-induced substance misuse behaviors. These findings are compelling given that craving and substance use as a palliative coping response for stress have been documented as predictors of relapse (Hartz, Frederik-Osborne, & Galloway, 2001; Tiffany & Conklin, 2000). Mindfulness treatment may reduce craving by facilitating people's

metacognitive awareness of their craving experience and the presence of urges, teaching people to disengage their attention from substance-related urges and distressing experiences that could trigger substance use and to reorient attention to health-promoting stimuli (e.g., breathing; Garland, 2014). Studies suggest that mindfulness training could reduce craving through cultivating awareness and acceptance of, and nonreactivity to, craving without engaging in addictive responses (Garland et al., 2014; Witkiewitz, Bowen, et al., 2013). The systematic review also found that mindfulness treatment was more effective in reducing stress (e.g., Davis et al., 2013; Garland et al., 2016), and might have reduced stress-induced substance misuse. Greater effects of mindfulness treatment compared to alternative treatments with regard to reducing craving and stress were also supported by the meta-analyses. Results of meta-analyses revealed significant, moderate-to-large effects of mindfulness treatment on craving and stress reduction at posttreatment compared to a control condition.

Moreover, some studies in this systematic review examined changes in brain functions, and neuropsychological and psychophysiological functions associated with substance misuse as a result of mindfulness treatment (Alfonso et al., 2011; Brewer et al., 2009; Garland et al., 2010; 2014b; Tang et al., 2013). Findings suggest that mindfulness treatment was associated with greater decreases in substance-related cue reactivity (Garland et al., 2014b), attentional-bias toward substance-related cues (Garland et al., 2010), and executive and decision-making deficits in people with substance misuse (Alfonso et al., 2011), enhancement in brain functions associated with self-control capacity in cigarette smokers (Tang et al., 2013), and enhancements in physiological recovery from stress and substance-related cues (Brewer et al., 2011; Garland et al., 2014b) relative to alternative treatments. Neurobiological findings suggest that mindfulness

treatment could modify brain and psychophysiological functions associated with addiction, and thereby reducing risk of relapse to substance misuse.

Since treatment adherence appears to be a critical issue in populations with substance misuse, this systematic review specifically examined treatment completion rates across studies. Findings suggest moderate-to-high treatment adherence (i.e., 40% - 100%) for mindfulness treatment in samples with a variety of substance misuse problems. Treatment completion rates for mindfulness treatment across studies were not significantly different from TAU or alternative treatments (e.g., CBT and support group). Moreover, the amount of mindfulness practice between sessions/at home was significantly positively associated with abstinence maintenance, and negatively associated with amount of substance use and likelihood of relapse (e.g., Brewer et al., 2011; de Dios et al., 2012; Zgierska et al., 2008).

Although a majority of studies in this systematic review reported positive findings regarding effects of mindfulness treatment, several methodological concerns across studies might have introduced biases to results and limited generalizability of findings. Specifically, many studies had small samples and limited statistical power to detect treatment effects. Further, methodological limitations such as nonprobability sampling, reliance on self-report measures, a lack of randomization to treatment conditions, and RCTs without using ITT analyses might have caused biased findings and limited generalizability. Although a few studies followed treatment participants for 12-month posttreatment, a majority of studies only assessed treatment outcomes at posttreatment or 3-month follow-up. Finally, although many mindfulness interventions evaluated across studies were manualized (e.g., MBRP), a dearth of information regarding treatment fidelity assessment might have affected reliability of findings.

Future research would benefit by addressing these methodological concerns. To establish empirical evidence for mindfulness treatment as an evidence-based intervention for substance misuse, larger and more rigorous RCTs are needed to evaluate the efficacy and effectiveness of manualized mindfulness treatments (e.g., MBRP and MORE) in diverse populations and when these treatments are implemented in multiple clinical settings. Detailed information is needed in future intervention studies regarding descriptions of treatment protocols/manuals, extent of adaptation/deviation from original treatment protocols/manuals, fidelity assessment, treatment adherence, randomization process, and statistical analyses that could minimize biases from missing data. Longer-term follow-up assessments and objective measures for substance use could strengthen study findings.

Moreover, many researchers have published conceptual models that elucidate treatment mechanisms of mindfulness treatment for substance misuse (Garland et al., 2014a; Marlatt & Chawla, 2007); however, few studies have verified treatment models using empirical data (e.g., Garland et al., 2014; Witkiewitz & Bowen, 2010; Witkiewitz, Bowen, et al., 2013). Future studies are needed to assess potential treatment mechanisms of mindfulness treatment using longitudinal and experimental designs.

Limitations and Conclusion

This systematic review and meta-analysis has several limitations. The systematic review limited the inclusion criteria only to studies published in English and in peer-reviewed journals. Moreover, synthesizing findings across studies that evaluated different modalities (e.g., group-based vs. individual therapy) and types of mindfulness treatment (e.g., Vipassana Meditation courses vs. MBRP) could have introduced bias to meta-analyses results due to the heterogeneity of included studies. Despite the limitations, this systematic-review suggests that mindfulness

treatment could be a promising intervention for substance misuse and relapse prevention. Preliminary evidence from the meta-analyses reveals small-to-large effects of mindfulness treatment vis-a-vis reducing severity of substance misuse, level of craving for psychoactive substances, and stress, and enhancing abstinence and mindfulness at posttreatment compared to alternative treatments. Findings from this systematic review and meta-analysis contribute to the evidence base for mindfulness treatment for substance misuse problems in diverse populations.

REFERENCES: PAPER I

- Ahir, D. C. (1999). *Vipassana: A universal Buddhist meditation technique*. New Delhi: Sri Satguru Publications.
- Alexander, C. N., Walton, K. G., Orme-Johnson, D. W., Goodman, R. S., & Pallone, N. (2003). *Transcendental meditation in criminal rehabilitation and crime prevention*. New York: Haworth Press.
- Alfonso, J. P., Caracuel, A., Delgado-Pastor, L. C., & Verdejo-García, A. (2011). Combined goal management training and mindfulness meditation improve executive functions and decision-making performance in abstinent polysubstance abusers. *Drug and Alcohol Dependence*, 117(1), 78-81. doi:10.1016/j.drugalcdep.2010.12.025
- Alterman, A. I., Koppenhaver, J. M., Mulholland, E., Ladden, L. J., & Baime, M. J. (2004). Pilot trial of effectiveness of mindfulness meditation for substance abuse patients. *Journal of Substance Use*, 9(6), 259-268. doi:10.1080/14659890410001711698
- Amaro, H., Spear, S., Vallejo, Z., Conron, K., & Black, D. S. (2014). Feasibility, acceptability, and preliminary outcomes of a mindfulness-based relapse prevention intervention for culturally-diverse, low-income women in substance use disorder treatment. *Substance Use & Misuse*, 49(5), 547-559. doi:10.3109/10826084.2013.852587
- American Lung Association (2010). *Freedom from smoking*. Retrieved from <http://lung.org/stop-smoking/how-to-quit/freedom-from-smoking>
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed., text rev.)*. Washington, DC: Author. doi:10.1176/appi.books.9780890423349
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. Arlington, VA: American Psychiatric Publishing. doi:10.1176/appi.books.9780890425596.744053
- Black, D. S. (2014). Mindfulness-based interventions: An antidote to suffering in the context of substance use, misuse, and addiction. *Substance Use & Misuse*, 49(5), 487-491. doi:10.3109/10826084.2014.860749
- Boardman, T., Catley, D., Mayo, M. S., & Ahluwalia, J. S. (2005). Self-efficacy and motivation to quit during participation in a smoking cessation program. *International Journal of Behavioral Medicine*, 12(4), 266-272. doi: 10.1207/s15327558ijbm1204_7
- Bootzin, R. R., & Stevens, S. J. (2005). Adolescents, substance abuse, and the treatment of insomnia and daytime sleepiness. *Clinical Psychology Review*, 25(5), 629-644. doi:10.1016/j.cpr.2005.04.007

- Bowen, S., Witkiewitz, K., Dillworth, T. M., Chawla, N., Simpson, T. L., Ostafin, B. D., ... & Marlatt, G. A. (2006). Mindfulness meditation and substance use in an incarcerated population. *Psychology of Addictive Behaviors*, 20(3), 343-347. doi:10.1016/j.cpr.2005.04.007
- Bowen, S., Witkiewitz, K., Dillworth, T. M., & Marlatt, G. A. (2007). The role of thought suppression in the relationship between mindfulness meditation and alcohol use. *Addictive Behaviors*, 32(10), 2324-2328. doi:10.1016/j.addbeh.2007.01.025
- Bowen, S., Chawla, N., Collins, S. E., Witkiewitz, K., Hsu, S., Grow, J., ... & Marlatt, A. (2009). Mindfulness-based relapse prevention for substance use disorders: A pilot efficacy trial. *Substance Abuse*, 30(4), 295-305. doi:10.1080/08897070903250084
- Bowen, S., & Chawla, N. (2011). *Mindfulness-based relapse prevention for addictive behaviors: A clinician's guide*. New York, NY: Guilford Press.
- Bowen, S., & Kurz, A. S. (2012). Between-session practice and therapeutic alliance as predictors of mindfulness after mindfulness-based relapse prevention. *Journal of Clinical Psychology*, 68(3), 236-245. doi:10.1002/jclp.20855
- Bowen, S., Witkiewitz, K., Clifasefi, S. L., Grow, J., Chawla, N., Hsu, S. H., ... & Larimer, M. E. (2014). Relative efficacy of mindfulness-based relapse prevention, standard relapse prevention, and treatment as usual for substance use disorders: A randomized clinical trial. *JAMA Psychiatry*, 71(5), 547-556. doi:10.1001/jamapsychiatry.2013.4546
- Bradburn, M. J., Deeks, J. J., & Altman, D. G. (1998). metan - an alternative meta-analysis command. *Stata Technical Bulletin*, 8(44), 4-15.
- Brewer, J. A., Sinha, R., Chen, J. A., Michalsen, R. N., Babuscio, T. A., Nich, C., ... & Rounsaville, B. J. (2009). Mindfulness training and stress reactivity in substance abuse: Results from a randomized, controlled stage I pilot study. *Substance Abuse*, 30(4), 306-317. doi:10.1080/08897070903250241
- Brewer, J. A., Mallik, S., Babuscio, T. A., Nich, C., Johnson, H. E., Deleone, C. M., ... & Rounsaville, B. J. (2011). Mindfulness training for smoking cessation: Results from a randomized controlled trial. *Drug and Alcohol Dependence*, 119(1), 72-80. doi:10.1016/j.drugalcdep.2011.05.027
- Britton, W. B., Bootzin, R. R., Cousins, J. C., Hasler, B. P., Peck, T., & Shapiro, S. L. (2010). The contribution of mindfulness practice to a multicomponent behavioral sleep intervention following substance abuse treatment in adolescents: A treatment-development study. *Substance Abuse*, 31(2), 86-97. doi:10.1080/08897071003641297
- Chen, K. W., Comerford, A., Shinnick, P., & Ziedonis, D. M. (2010). Introducing qigong meditation into residential addiction treatment: A pilot study where gender makes a

- difference. *The Journal of Alternative and Complementary Medicine*, 16(8), 875-882. doi:10.1089/acm.2009.0443
- Chiesa, A., & Serretti, A. (2014). Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Substance Use & Misuse*, 49(5), 492-512. doi:10.3109/10826084.2013.770027
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates Inc.
- Courbasson, C. M., Nishikawa, Y., & Shapira, L. B. (2010). Mindfulness-action based cognitive behavioral therapy for concurrent binge eating disorder and substance use disorders. *Eating Disorders*, 19(1), 17-33. doi:10.1080/10640266.2011.533603
- Dakwar, E., & Levin, F. R. (2013). Individual mindfulness-based psychotherapy for cannabis or cocaine dependence: A pilot feasibility trial. *The American Journal on Addictions*, 22(6), 521-526. doi:10.1111/j.1521-0391.2013.12036.x
- Davis, J. M., Fleming, M. F., Bonus, K. A., & Baker, T. B. (2007). A pilot study on mindfulness based stress reduction for smokers. *BMC Complementary and Alternative Medicine*, 7, 2. doi:10.1186/1472-6882-7-2
- Davis, J. M., Mills, D. M., Stankevitz, K. A., Manley, A. R., Majeskie, M. R., & Smith, S. S. (2013). Pilot randomized trial on mindfulness training for smokers in young adult binge drinkers. *BMC Complementary and Alternative Medicine*, 13(1), 215. doi:10.1186/1472-6882-13-215
- Davis, J. M., Goldberg, S. B., Anderson, M. C., Manley, A. R., Smith, S. S., & Baker, T. B. (2014). Randomized trial on mindfulness training for smokers targeted to a disadvantaged population. *Substance Use & Misuse*, 49(5), 571-585. doi:10.3109/10826084.2013.770025
- Davis, J. M., Manley, A. R., Goldberg, S. B., Smith, S. S., & Jorenby, D. E. (2014). Randomized trial comparing mindfulness training for smokers to a matched control. *Journal of Substance Abuse Treatment*, 47(3), 213-221. doi:10.1016/j.jsat.2014.04.005
- de Dios, M. A., Herman, D. S., Britton, W. B., Hagerty, C. E., Anderson, B. J., & Stein, M. D. (2012). Motivational and mindfulness intervention for young adult female marijuana users. *Journal of Substance Abuse Treatment*, 42(1), 56-64. doi:10.1016/j.jsat.2011.08.001
- Elwafi, H. M., Witkiewitz, K., Mallik, S., Thornhill IV, T. A., & Brewer, J. A. (2013). Mindfulness training for smoking cessation: Moderation of the relationship between craving and cigarette use. *Drug and Alcohol Dependence*, 130(1), 222-229. doi:10.1016/j.drugalcdep.2012.11.015

- Garland, E., Gaylord, S., & Park, J. (2009). The role of mindfulness in positive reappraisal. *Explore: The Journal of Science and Healing*, 5(1), 37-44. doi:10.1016/j.explore.2008.10.001
- Garland, E. L., Gaylord, S. A., Boettiger, C. A., & Howard, M. O. (2010). Mindfulness training modifies cognitive, affective, and physiological mechanisms implicated in alcohol dependence: Results of a randomized controlled pilot trial. *Journal of Psychoactive Drugs*, 82(2), 177-192. doi:10.1080/02791072.2010.10400690
- Garland, E. L. (2013). *Mindfulness oriented-recovery enhancement for addiction, stress, and pain*. Washington DC: NASW Press.
- Garland, E. L. (2014). Disrupting the downward spiral of chronic pain and opioid addiction with mindfulness-oriented recovery enhancement: A review of clinical outcomes and neurocognitive targets. *Journal of Pain & Palliative Care Pharmacotherapy*, 28(2), 122-129. doi:10.3109/15360288.2014.911791
- Garland, E. L., Froeliger, B., & Howard, M. O. (2014a). Mindfulness training targets neurocognitive mechanisms of addiction at the attention-appraisal-emotion interface. *Frontiers in Psychiatry*, 4, 1-15. doi:10.3389/fpsy.2013.00173
- Garland, E. L., Froeliger, B., & Howard, M. O. (2014b). Effects of Mindfulness-Oriented Recovery Enhancement on reward responsiveness and opioid cue-reactivity. *Psychopharmacology*, 231(16), 3229-3238. doi:10.1007/s00213-014-3504-7
- Garland, E. L., Manusov, E. G., Froeliger, B., Kelly, A., Williams, J. M., & Howard, M. O. (2014). Mindfulness-oriented recovery enhancement for chronic pain and prescription opioid misuse: Results from an early-stage randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 82(3), 448-459. doi:10.1037/a0035798
- Garland, E. L., Roberts-Lewis, A., Tronnier, C. D., Graves, R., & Kelley, K. (2016). Mindfulness-Oriented Recovery Enhancement versus CBT for co-occurring substance dependence, traumatic stress, and psychiatric disorders: Proximal outcomes from a pragmatic randomized trial. *Behaviour Research and Therapy* 77, 7-16. doi:10.1016/j.brat.2015.11.012
- Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F., Rowland-Seymour, A., Sharma, R., ... & Ranasinghe, P. D. (2014). Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. *JAMA Internal Medicine*, 174(3), 357-368. doi:10.1001/jamainternmed.2013.13018
- Grow, J. C., Collins, S. E., Harrop, E. N., & Marlatt, G. A. (2015). Enactment of home practice following mindfulness-based relapse prevention and its association with substance-use outcomes. *Addictive Behaviors*, 40, 16-20. doi:10.1016/j.addbeh.2014.07.030

- Harris, R., Bradburn, M., Deeks, J., Harbord, R., Altman, D., & Sterne, J. (2008). metan: fixed- and random-effects meta-analysis. *Stata Journal*, 8(1), 3-28.
- Hartz, D. T., Frederick-Osborne, S. L., & Galloway, G. P. (2001). Craving predicts use during treatment for methamphetamine dependence: A prospective, repeated-measures, within-subject analysis. *Drug and Alcohol Dependence*, 63(3), 269-276. doi:10.1016/S0376-8716(00)00217-9
- Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *British Medical Journal*, 327, 557-560. doi:10.1136/bmj.327.7414.557
- Himelstein, S. (2010). Mindfulness-based substance abuse treatment for incarcerated youth: A mixed method pilot study. *International Journal of Transpersonal Studies*, 30(1-2), 1-10.
- Himelstein, S., Saul, S., & Garcia-Romeu, A. (2015). Does mindfulness meditation increase effectiveness of substance abuse treatment with incarcerated youth? A pilot randomized controlled trial. *Mindfulness*, 6(6), 1472-1480. doi:10.1007/s12671-015-0431-6
- Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science*, 6(6), 537-559. doi:10.1177/1745691611419671
- Hsu, S. H., Collins, S. E., & Marlatt, G. A. (2013). Examining psychometric properties of distress tolerance and its moderation of mindfulness-based relapse prevention effects on alcohol and other drug use outcomes. *Addictive Behaviors*, 38(3), 1852-1858. doi:10.1016/j.addbeh.2012.11.002
- Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, 10(2), 144-156. doi:10.1093/clipsy/bpg016
- Kabat-Zinn, J., & Hanh, T. N. (2009). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. New York, NY: Dell Publishing.
- Katz, D., & Toner, B. (2013). A systematic review of gender differences in the effectiveness of mindfulness-based treatments for substance use disorders. *Mindfulness*, 4(4), 318-331. doi:10.1007/s12671-012-0132-3
- Lee, K. H., Bowen, S., & An-Fu, B. (2011). Psychosocial outcomes of mindfulness-based relapse prevention in incarcerated substance abusers in Taiwan: A preliminary study. *Journal of Substance Use*, 16(6), 476-483. doi:10.3109/14659891.2010.505999
- Liehr, P., Marcus, M. T., Carroll, D., Granmayeh, L. K., Cron, S. G., & Pennebaker, J. W. (2010). Linguistic analysis to assess the effect of a mindfulness intervention on self-

- change for adults in substance use recovery. *Substance Abuse*, 31(2), 79-85.
doi:10.1080/08897071003641271
- Maisto, S. A., Pollock, N. K., Cornelius, J. R., Lynch, K. G., & Martin, C. S. (2003). Alcohol relapse as a function of relapse definition in a clinical sample of adolescents. *Addictive Behaviors*, 28(3), 449-459. doi:10.1016/S0306-4603(01)00267-2
- Marcus, M. T., Fine M., & Kouzekanani, K. (2001). Mindfulness-based meditation in therapeutic community. *Journal of Substance Use*, 5, 305-311. doi:10.3109/14659890109059829
- Marcus, M. T., Schmitz, J., Moeller, G., Liehr, P., Cron, S. G., Swank, P., ... & Granmayeh, L. K. (2009). Mindfulness-based stress reduction in therapeutic community treatment: A stage 1 trial. *The American Journal of Drug and Alcohol Abuse*, 35(2), 103-108.
doi:10.1080/00952990902823079
- Marlatt, G. A., & Donovan, D. M. (Eds.). (2005). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York, NY: Guilford Press.
- Marlatt, G. A., & Chawla, N. (2007). Meditation and alcohol use. *Southern Medical Journal*, 100(4), 451-454. doi:10.1097/SMJ.0b013e3180381416
- Mermelstein, L. C., & Garske, J. P. (2014). A brief mindfulness intervention for college student binge drinkers: A pilot study. *Psychology of Addictive Behaviors*, 29(2), 259-269.
doi:10.1037/adb0000040
- Miller, W. R., Walters, S. T., & Bennett, M. E. (2001). How effective is alcoholism treatment in the United States? *Journal of Studies on Alcohol*, 62(2), 211-220.
doi:10.15288/jsa.2001.62.211
- Murphy, T. J., Pagano, R. R., & Marlatt, G. A. (1986). Lifestyle modification with heavy alcohol drinkers: Effects of aerobic exercise and meditation. *Addictive Behaviors*, 11(2), 175-186.
doi:10.1016/0306-4603(86)90043-2
- Nakamura, Y., Lipschitz, D. L., Kanarowski, E., McCormick, T., Sutherland, D., & Melow-Murchie, M. (2015). Investigating impacts of incorporating an adjuvant mind-body intervention method into treatment as usual at a community-based substance abuse treatment facility. *SAGE Open*, 5(1), 1-8. doi:10.1177/2158244015572489
- National Institute on Drug Abuse. (2015). *Trends & statistics*. Retrieved from <http://www.drugabuse.gov/related-topics/trends-statistics>
- Price, C. J., Wells, E. A., Donovan, D. M., & Rue, T. (2012). Mindful awareness in body-oriented therapy as an adjunct to women's substance use disorder treatment: A pilot feasibility study. *Journal of Substance Abuse Treatment*, 43(1), 94-107.
doi:10.1016/j.jsat.2011.09.016

- Rösner, S., Willutzki, R., & Zgierska, A. (2015). Mindfulness-based interventions for substance use disorders. *The Cochrane Library*. doi:10.1002/14651858.CD011723
- Ruscio, A. C., Muench, C., Brede, E., & Waters, A. J. (2015). Effect of brief mindfulness practice on self-reported affect, craving, and smoking: A pilot randomized controlled trial using ecological momentary assessment. *Nicotine & Tobacco Research*, 18(1), 64-73. doi:10.1093/ntr/ntv074.
- Schuman-Olivier, Z., Hoepfner, B. B., Evins, A. E., & Brewer, J. A. (2014). Finding the right match: Mindfulness training may potentiate the therapeutic effect of nonjudgment of inner experience on smoking cessation. *Substance Use & Misuse*, 49(5), 586-594. doi:10.3109/10826084.2014.850254
- Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2012). *Mindfulness-based cognitive therapy for depression*. New York, NY: Guilford Press.
- Simpson, T. L., Kaysen, D., Bowen, S., MacPherson, L. M., Chawla, N., Blume, A., ... & Larimer, M. (2007). PTSD symptoms, substance use, and Vipassana meditation among incarcerated individuals. *Journal of Traumatic Stress*, 20(3), 239-249. doi:10.1002/jts.20209
- Staiger, P. K., Dawe, S., Richardson, B., Hall, K., & Kambouropoulos, N. (2014). Modifying the risk associated with an impulsive temperament: A prospective study of drug dependence treatment. *Addictive Behaviors*, 39(11), 1676-1681. doi:10.1016/j.addbeh.2014.05.001
- StataCorp. (2011). *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP.
- Substance Abuse and Mental Health Services Administration. (2014). *Results from the 2013 national survey on drug use and health: Summary of national findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration.
- Tang, Y. Y., Tang, R., & Posner, M. I. (2013). Brief meditation training induces smoking reduction. *Proceedings of the National Academy of Sciences*, 110(34), 13971-13975. doi:10.1073/pnas.1311887110
- Tiffany, S. T., & Conklin, C. A. (2000). A cognitive processing model of alcohol craving and compulsive alcohol use. *Addiction*, 95(8s2), 145-153. doi:10.1046/j.1360-0443.95.8s2.3.x
- Tuab, E., Steiner, S. S., Weingarten, E., & Walton, K. G. (1994). Effectiveness of broad spectrum approaches to relapse prevention in severe alcoholism: A long-term, randomized, controlled trial of transcendental meditation, EMG biofeedback and electronic neurotherapy. *Alcoholism Treatment Quarterly*, 11(1-2), 187-220. doi:10.1300/J020v11n01_06
- United Nations Office of Drugs and Crime. (2015). *2015 World drug report finds drug use stable, access to drug & HIV treatment still low*. Retrieved from

<https://www.unodc.org/unodc/en/frontpage/2015/June/2015-world-drug-report-finds-drug-use-stable--access-to-drug-and-hiv-treatment-still-low.html>

- Ussher, M., Cropley, M., Playle, S., Mohidin, R., & West, R. (2009). Effect of isometric exercise and body scanning on cigarette cravings and withdrawal symptoms. *Addiction*, 104(7), 1251-1257. doi:10.1111/j.1360-0443.2009.02605.x
- Witkiewitz, K., & Masyn, K. E. (2008). Drinking trajectories following an initial lapse. *Psychology of Addictive Behaviors*, 22(2), 157-167. doi:10.1037/0893-164X.22.2.157
- Witkiewitz, K., & Bowen, S. (2010). Depression, craving, and substance use following a randomized trial of mindfulness-based relapse prevention. *Journal of Consulting and Clinical Psychology*, 78(3), 362-374. doi:10.1037/a0019172
- Witkiewitz, K., Bowen, S., Douglas, H., & Hsu, S. H. (2013). Mindfulness-based relapse prevention for substance craving. *Addictive Behaviors*, 38(2), 1563-1571. doi:10.1016/j.addbeh.2012.04.001
- Witkiewitz, K., Greenfield, B. L., & Bowen, S. (2013). Mindfulness-based relapse prevention with racial and ethnic minority women. *Addictive Behaviors*, 38(12), 2821-2824. doi:10.1016/j.addbeh.2013.08.018
- Witkiewitz, K., Warner, K., Sully, B., Barricks, A., Stauffer, C., Thompson, B. L., & Luoma, J. B. (2014). Randomized trial comparing mindfulness-based relapse prevention with relapse prevention for women offenders at a residential addiction treatment center. *Substance Use & Misuse*, 49(5), 536-546. doi:10.3109/10826084.2013.856922
- Witkiewitz, K., Bowen, S., Harrop, E. N., Douglas, H., Enkema, M., & Sedgwick, C. (2014). Mindfulness-based treatment to prevent addictive behavior relapse: Theoretical models and hypothesized mechanisms of change. *Substance Use & Misuse*, 49(5), 513-524. doi:10.3109/10826084.2014.891845
- Wupperman, P., Marlatt, G. A., Cunningham, A., Bowen, S., Berking, M., Mulvihill-Rivera, N., & Easton, C. (2012). Mindfulness and modification therapy for behavioral dysregulation: Results from a pilot study targeting alcohol use and aggression in women. *Journal of Clinical Psychology*, 68(1), 50-66. doi:10.1002/jclp.20830
- Zgierska, A., Rabago, D., Zuelsdorff, M., Coe, C., Miller, M., & Fleming, M. (2008). Mindfulness meditation for alcohol relapse prevention: A feasibility pilot study. *Journal of Addiction Medicine*, 2(3), 165-173. doi:10.1097/ADM.0b013e31816f8546
- Zgierska, A., Rabago, D., Chawla, N., Kushner, K., Koehler, R., & Marlatt, A. (2009). Mindfulness meditation for substance use disorders: A systematic review. *Substance Abuse*, 30(4), 266-294. doi:10.1080/08897070903250019

PAPER II

MINDFULNESS-ORIENTED RECOVERY ENHANCEMENT FOR VIDEO GAME ADDICTION IN U.S. EMERGING ADULTS: PREPARING TO CONDUCT A RANDOMIZED CONTROLLED TRIAL

Recent systematic reviews and meta-analyses support the efficacy of mindfulness treatments for substance use disorders. However, mindfulness treatments have not been used to treat persons with video game addiction. This report presents a theoretical justification for mindfulness treatment of video game addiction, describes an adapted 8-session, 16-hour mindfulness treatment program for video game addiction (i.e., Mindfulness-Oriented Recovery Enhancement [MORE]), and describes relevant training protocols, key variables, and measures included in the first randomized controlled trial (RCT) of a mindfulness treatment for video game addiction. Important methodological aspects of RCTs in this area including participant recruitment, screening and assessment, and randomization to treatment conditions are discussed. Mindfulness interventions are a promising approach to the treatment of persons with video game addiction. Our experience implementing the first RCT to evaluate a mindfulness treatment of video game addiction may be informative to other clinical investigators planning similar studies.

Introduction

Video game playing has become a major entertainment activity for people worldwide, and video games are ingrained in the culture of the younger generation (Entertainment Software Association [ESA], 2015). More than 150 million Americans play video games via computer, game consoles (e.g., SONY Play Station, Microsoft Xbox, and Nintendo Wii), and mobile devices (e.g., smartphones and tablet computers; ESA, 2015). Women represent a significant portion (33%) of video game players in the U.S. (ESA, 2015). The growth of video game development has significantly enhanced related business opportunities and created new avenues for social communication, recreation, and entertainment (ESA, 2015). However, a rapidly increasing number of empirical reports indicates that some people, particularly adolescents and young adults, are developing video game addiction (Kuss & Griffiths, 2012; Petry et al., 2014).

Video game addiction — defined as a pattern of excessive and pathological video game playing — is characterized by signs and symptoms similar to those of substance use and gambling disorders (Kuss & Griffiths, 2012; Petry et al., 2014). Signs and symptoms of video game addiction include a) a preoccupation with playing video games; b) a need to increase the amount of time spent playing video games in order to achieve the desired levels of excitement; c) psychological withdrawal symptoms (e.g., feeling restless, irritable, or sad) when attempting to reduce or stop playing video games; d) repeated unsuccessful attempts to stop or reduce gaming behavior; e) failure to engage in other hobbies or activities due to video game playing; f) playing video games to escape or relieve aversive moods; g) lying to others about the extent of video game playing; h) continued video game playing despite the negative consequences; and i) mental distress and impairments in social functioning (American Psychiatric Association [APA], 2013; Kuss & Griffiths, 2012; Petry et al., 2014).

Approximately 4% to 12% of “gamers” meet criteria for video game addiction (Kuss & Griffiths, 2012). Emerging adults with video game addiction often exhibit symptoms of impaired physical health (e.g., obesity, sleep disorders, and greater risk for seizures; Escobar-Chaves & Anderson, 2008; Ferrie, De Marco, Grünewald, Giannakodimos, & Panayiotopoulos, 1994; Smyth, 2007; Vandelandotte, Sugiyama, Gardiner, & Owen, 2009), impaired mental health (e.g., depression and social anxiety; Dong, Lu, Zhou, & Zhao, 2011; Lo, Wang, & Fang, 2005; Romer, Bagdasarov, & More, 2009), and behavioral problems (e.g., suicidal ideation and interpersonal violence; Bucktin, 2013; Grusser, Thalemann, & Griffiths, 2007; Kohn, 2002). Moreover, emerging adults with video game addiction often experience interpersonal problems, poor academic and employment performance, and financial debt (Beranuy, Carbonell, & Griffiths, 2013; Chappell, Eatough, Davies, & Griffiths, 2006; Jackson, von Eye, Witt, Zhao, & Fitzgerald, 2011).

The growing U.S. and global prevalence of video game addiction coupled with evidence describing related adverse outcomes support the pressing need for interventions with emerging adults that can interrupt their video game addiction and prevent this problem behavior from progressing to more severe psychosocial dysfunction. Prior studies suggest that pharmacological therapies may be effective in treating video game addiction among adolescents (Atmaca, 2007; Han et al., 2009; Han, Hwang, & Renshaw, 2010; Han & Renshaw, 2012; Satter & Ramaswamy, 2014). However, pharmacological therapies often bear significant costs and side effects, and may relieve symptoms temporarily but seldom address underlying causes. The effects of psychotherapies (i.e., cognitive-behavioral therapy and family therapy) have been examined among Korean youth with video game addiction (Han, Kim, Lee, & Renshaw, 2012; Kim, Han, & Renshaw, 2012). Findings of these studies suggest that psychotherapies may be beneficial in

treating video game addiction; however, further research is needed to document psychotherapeutic treatment efficacy among different populations.

Mindfulness treatments have been found to be effective in reducing substance misuse and pathological gambling (e.g., Chiesa & Serretti, 2014; Toneatto, Pillai, & Courtice, 2014; Zgierska et al., 2009). Mindfulness practices could raise awareness of the automatic processes of substance seeking and using, thereby enabling an interruption of the cycle by using learned positive coping strategies (Garland, Froeliger, & Howard, 2014). Further, mindfulness practices (e.g., meditation and mindful breathing) could enhance intentional self-regulation of attention by facilitating increased attention to present-moment experience and “letting go” of cognitive fixations on thoughts and desires (Garland, Roberts-Lewis, Kelley, Tronnier, & Hanley, 2014). The enhancement of attentional regulation could lead to improved positive coping with difficult emotions, unwanted thoughts, and craving for a substance (Garland, Froeliger, et al., 2014; Garland, 2014). In addition, mindfulness practices (e.g., mindful reappraisal) have been associated with reduced symptoms of distress by fostering the development of a non-judgmental attitude toward distress and an ability to accept distressing experiences, which in turn, could reduce stress-induced substance use (Chiesa & Serretti, 2014; Garland, Froeliger, et al., 2014).

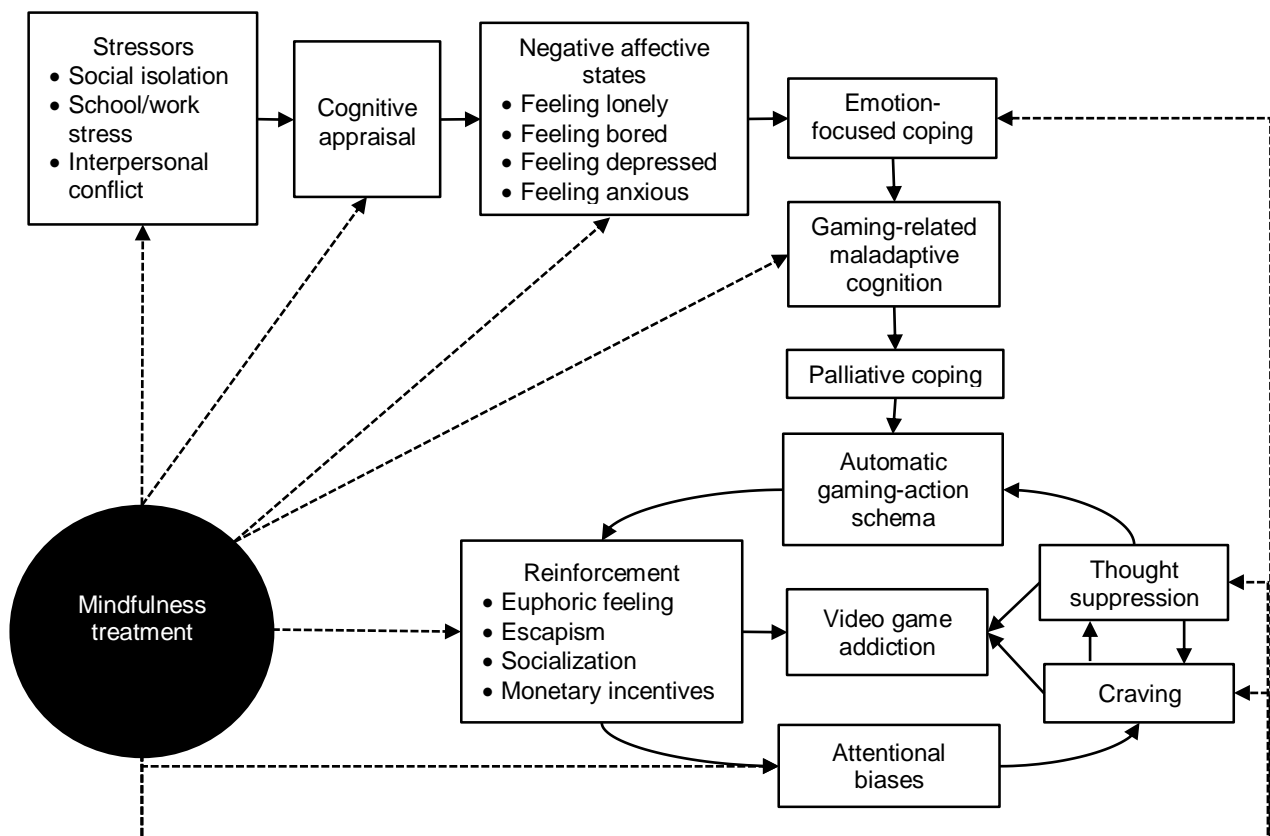
I hypothesized that mindfulness treatments might be a promising intervention for video game addiction because video game addiction shares risk mechanisms similar to those for substance use disorder that may be malleable to mindfulness interventions that target these factors, including stress management, maladaptive cognitions, and cognitive skills such as cognitive reappraisal and decentering attention toward addiction-related stimuli (e.g., Astin, 1997; Garland, Boettiger, & Howard, 2011; Garland, Gaylord, & Fredrickson, 2011; Garland, Boettiger, Gaylord, Chanon, & Howard, 2012; Garland, Froeliger, et al., 2014; Garland, Roberts-

Lewis, et al., 2014; Grossman, Niemann, Schmidt, & Walach, 2004; Jha, Krompinger, & Baime, 2007; Ochsner & Gross, 2005). Similar to substance use disorder, research has documented that video game playing may be a palliative coping mechanism and social outlet for many emerging adults (Hilgard, Engelhardt, & Bartholow, 2013; Yee, 2006). Thus, emerging adults may play video games extensively to escape from daily obligations, cope with stress and negative emotions, and expand their social networks (Cole & Griffiths, 2007; Hilgard et al., 2013). Recurrent extensive video game playing, when used as a primary and/or exclusive coping strategy for negative affective states and maladaptive cognitions evoked by stress, establishes automatic gaming action schema in response to stress, and leads to addiction marked by loss of control via the rewarding effects of video game playing (e.g., Hetzel-Riggin & Pritchard, 2011; Ko, Liu, Yen, Chen, & Lin, 2013; Kuss, Louws, & Wiers, 2012; Koepp et al., 1998; LaRose & Eastin, 2004; Peng & Liu, 2010; Velezmoro, Lacefield, & Roberti, 2010; Yee, 2006).

As illustrated in Figure 2.1, mindfulness treatments target underlying risk mechanisms of video game addiction. These mechanisms involve positive feedback loops between stress, cognitive appraisal and reappraisal, emotion regulation, maladaptive cognitions and coping, and implicit cognition (i.e., the loops between automatic gaming action schema, attentional bias toward gaming-related cues, craving, and thought suppression; e.g., Davis, 2001; Decker & Gay, 2011; Hetzel-Riggin & Pritchard, 2011; Hilgard et al., 2013; Kuss et al., 2012; Ko et al., 2013; Koepp et al., 1998; LaRose & Eastin, 2004; van Holst et al., 2012; Velezmoro et al., 2010; Yuan et al., 2011; Yee, 2006). Mindfulness treatments may ameliorate video game addiction through several pathways. They may a) enhance stress management through the practice of meditation and positive cognitive reappraisal skills, thereby reducing stress-related video game playing; b) attenuate negative affective states and video gaming-related maladaptive cognitions by

improving mindful reappraisal skills and emotion regulation, thereby reducing motivation to engage in video game playing as escapism and/or mood alteration; c) enhance attention to triggers and the presence of urges, enabling a more skillful deployment of coping strategies; d) facilitate disengagement of attention from gaming-related cues to allow for focus on neutral or health-promoting stimuli, thereby reducing the risk of craving; e) provide an effective alternative to suppressing unpleasant emotions, urges, and thoughts that trigger video game playing through mindful exposure that can help participants become desensitized to experiences that were previously distressing; and f) increase the sense of reward from other pleasant events in place of playing video games. Therefore, mindfulness treatments hold promise as an effective means for treating video game addiction and enhancing psychosocial well-being.

Figure 2.1. Theoretical model of mindfulness treatment's effects on video game addiction.



To that end, I adapted Mindfulness-Oriented Recovery Enhancement (MORE), an evidence-based manualized treatment for substance misuse and co-occurring mental distress (Garland, 2013; Garland, Gaylord, Boettiger, & Howard, 2010; Garland, Manusov, et al., 2014; Garland, Roberts-Lewis, Tronnier, Graves, & Kelly, 2016), and pilot tested it for video game addiction among U.S. emerging adults using a randomized controlled trial (RCT) design. Given that the adapted intervention was a novel treatment for video game addiction, it was important to assess the feasibility of adapting MORE for video game addiction and to conduct a pilot RCT that tested the effects of the adapted MORE treatment. In addition, no prior study had examined sampling and recruitment issues for treatment studies with emerging adults who were identified as having video game addiction. It was important to assess the feasibility of the screening, recruitment, and treatment protocol with emerging adults who volunteered to participate in intervention studies for video game addiction without parental (or other external) mandates.

In this paper, I describe the development of a protocol for RCT that adapted and tested MORE treatment for video game addiction among U.S. emerging adults. The study's primary aim was to determine the feasibility of developing a RCT comparing effects of the adapted MORE to a support group (SG) in reducing the severity of video game addiction among emerging adults. In addition, this paper describes the process and results of sampling, screening, and recruitment for the proposed RCT. A secondary aim was to determine the feasibility of recruiting emerging adults with video game addiction for a psychotherapeutic treatment.

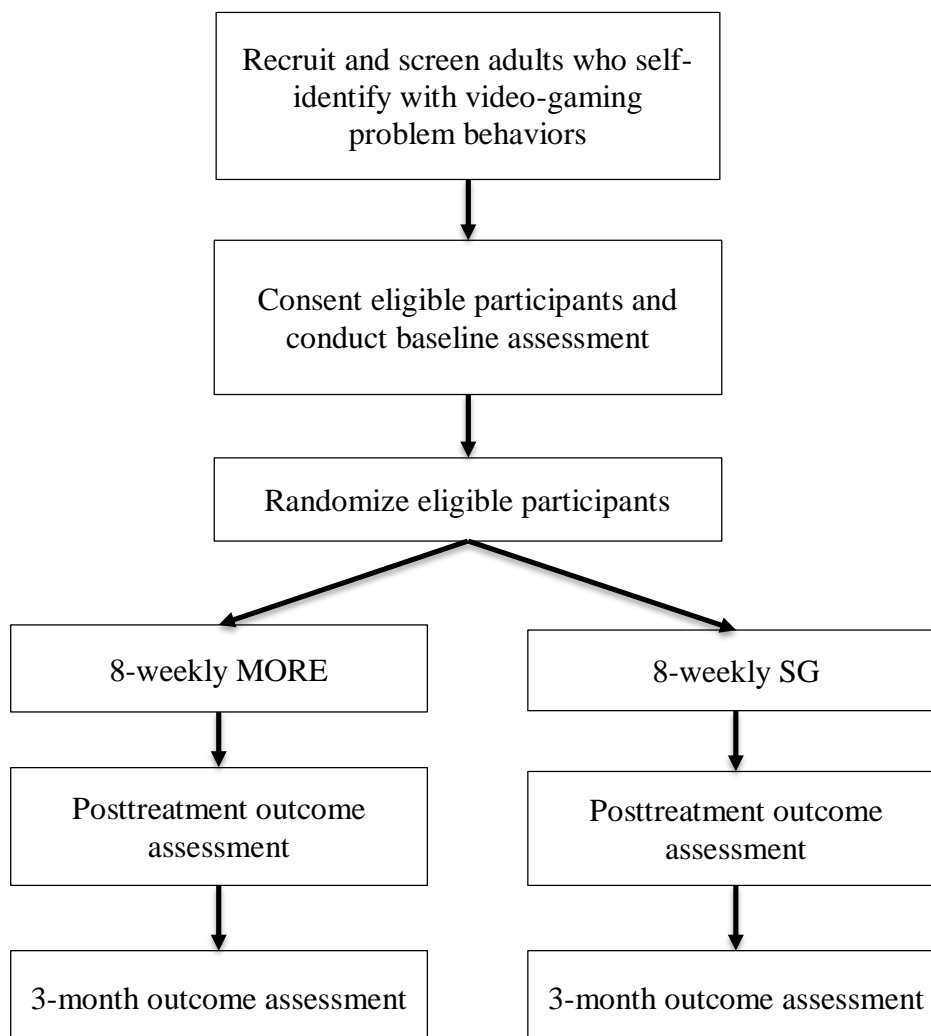
Methods and Design of the Randomized Controlled Trial

Research Hypotheses and Study Design

The aims of the RCT were to determine the feasibility, and effects of the adapted MORE for emerging adults with video game addiction. I hypothesized that both MORE and SG

participants would demonstrate significant decreases in the severity of their video game addiction. I also hypothesized that participants who received MORE would demonstrate significantly greater decreases in severity of their video game addiction, maladaptive cognitions and coping, and craving for video game playing compared to SG participants.

Figure 2.2. Design and participant flow of Mindfulness-Oriented Recovery Enhancement (MORE) randomized controlled trial.



To test these hypotheses, a longitudinal pretest-posttest control group design with three data collection points (i.e., pretreatment, posttreatment, 3-month follow-up) was used. Figure 2.2

illustrates the overall study design. The project involved the following steps: 1) participant recruitment; 2) a pretreatment session to obtain study consent and pretreatment assessment (i.e., survey questionnaire administered); 3) randomization following the pretreatment session for all successfully recruited participants; 4) 8-weekly sessions of the MORE and SG interventions; 5) posttreatment assessment (i.e., survey questionnaire and semi-structured in-depth individual interviews with participants) following completion of MORE and SG; and 6) 3-month follow-up assessment (i.e., survey questionnaire). Study procedures and consent forms were reviewed and approved by the Institutional Review Board of the University of North Carolina at Chapel Hill.

Treatment Condition

The protocol for the treatment condition was adapted from the Mindfulness-Oriented Recovery Enhancement (MORE) treatment manual developed by Eric L. Garland, Ph.D. (Garland, 2013). MORE combines mindfulness-based cognitive therapy with group discussion and skill practice that specifically address substance misuse and co-occurring mental distress (Garland et al., 2010; 2016; Garland, Manusov et al., 2014). The research team, in concert with a licensed Master's-level social worker with extensive experience in delivering mindfulness therapy, modified the MORE treatment manual vis-a-vis its psychoeducation, mindfulness practice, and topics for group discussion content in order to emphasize symptoms and prescriptions concerning video game addiction. Modification of the MORE treatment manual included: 1) replacing the substance use-related terms and phrases (e.g., "alcohol/drug use") with video gaming-related terms and phrases (e.g., "problematic gaming behaviors"); 2) modifying and adding topics and case scenarios for group discussion that reflect signs and symptoms of pathological video gaming behaviors; 3) modifying instructions for mindfulness exercises to reflect contexts pertaining to video game addiction; and 4) combining sessions and content to

reduce the original 10-week intervention to an 8-session treatment. In so doing, the modified psychoeducation, mindfulness practice, and group discussion topics specifically address maladaptive cognitions, escape-oriented coping styles, and interpersonal conflicts associated with pathological gaming behaviors (Hilgard et al., 2013; Yee, 2006).

The modified MORE treatment consisted of 8-weekly, 2-hour group sessions. The MORE group was led by a licensed Master's-level social worker who was trained in delivering MORE and had experience in leading MORE groups for individuals with substance use disorders. The content of the adapted MORE program for each session is described below.

Session 1. Participants are provided with an overview of the MORE treatment program, including an agenda and treatment goals. Participants engage in psychoeducation and group discussion with respect to important concepts including video game addiction, neurocognitive changes associated with video game addiction, automaticity in addiction, and the concept of mindfulness. Participants are then led through a brief practice of mindful breathing that helps them to raise awareness of themselves in the moment. Beginning in session 1, participants are asked to practice mindfulness techniques that are taught each session and to be mindful of their daily activities at home. They are also asked to keep a daily log to record the amount of time they spend on mindfulness practice and video game playing. They are then encouraged to discuss their experiences with regard to home practice, as well as awareness of triggers and automatic habits during the next session.

Session 2. Participants are guided through a mindful breathing exercise at the beginning and end of each session starting with session 2. The length of the mindful breathing exercise gradually increases from 5 minutes to 20 minutes each session. Participants are introduced to the concept of maladaptive cognitions and engage in group discussion regarding their own

experiences with maladaptive cognitions related to pathological gaming behaviors. Participants are then introduced to mindful reappraisal and practice mindful reappraisal as a coping skill for negative affective states and difficult emotions.

Session 3. Participants are introduced to the concept of attentional re-orienting and engage in group discussion vis-a-vis shifting focus as a means of coping with negative emotions, unwanted thoughts, and urges for video game playing. Participants are then introduced to the concept of mindful savoring, and guided through a mindful savoring practice that facilitates their savoring of natural pleasure and increases their sense of reward from pleasant events (e.g., watching a sunset) other than playing video games.

Session 4. Participants engage in a group discussion focusing on the nature of craving, and share their experiences of craving for video game playing. Participants are then guided through the “Chocolate Exercise” which explains how mindfulness can be used to break down experience (e.g., the experience of craving) into sensorial, affective, and cognitive subcomponents. Participants are then taught to practice mindful ways of coping with craving for playing video games.

Session 5. Participants engage in a group discussion about their experience with stress as a trigger for pathological gaming behaviors. Participants are then guided through an imaginal stress exposure and relaxation response exercise that explains the difference between reacting versus responding to stress. Further, participants are led through a lengthy scan of somatic sensations to raise their awareness of the effects of stress on the body.

Session 6. Participants are introduced to the concepts of attachment, aversion, and thought suppression, and engage in group discussion regarding the relationship between thought suppression, craving, and automatic gaming behaviors. Participants are then guided through two

exercises, the thought suppression exercise and acceptance of gaming-related thoughts and craving exercise, which facilitate their acceptance of unwanted thoughts and ability to disengage from undesired thoughts and craving.

Session 7. Participants engage in group discussion about interpersonal relationships (e.g., interactions with friends, family, coworkers, and people they meet on the Internet when playing online games) as triggers of video game playing. Participants are then guided through the loving-kindness meditation exercise and practice a mindful way of coping with stress due to relationships and interpersonal interactions.

Session 8. Participants are introduced to the difference between interdependence and dependence, and guided through a meditation on interdependence. Participants then review their progress, acknowledge where they are at this point in their personal practices, and cultivate resources for continued practice.

Control Condition

I selected a support group (SG) facilitated by a licensed Master's-level social worker as the control condition. SG matched the MORE intervention with respect to the length (i.e., 8-weekly sessions) and duration (i.e., 2-hours) of sessions. The SG facilitator had experience in leading SGs for individuals with addictions and psychiatric distress and was not trained in MORE. SG was selected as the control condition because it allowed for the control of components including group discussion, a group facilitator, and a structure similar to MORE without therapeutic components related to mindfulness practice, cognitive or behaviorally-based treatment, and motivational interviewing skills.

The research team, in concert with two licensed Master's-level social workers with extensive experience in delivering SGs designed the SG sessions. The SG sessions focused on

specific topics and involved open group discussions about participants' experiences with, or reactions to, each topic. Session topics included a) an overview of video game addiction and pathological video gaming behaviors, b) thoughts and feelings related to pathological video game playing, c) experiences of craving for video game playing and possible triggers, d) identity and video game playing, e) video game playing to cope with stress, f) interpersonal relationships and video game playing, g) positive and alternative coping strategies, and h) review of the group experience. During each group session, the facilitator raised topics for discussion, used reflective listening techniques, and elicited interactions of group members without providing didactic information, behavioral prescriptions, or advice. If participants asked the group facilitator a question about how to manage their video gaming behaviors, the facilitator redirected the question to the group and urged participants to share their own experiences and solutions with one another.

Training of Group Facilitators on Characteristics of Video Games and “Gamers”

To increase group facilitators' competencies in understanding participants' experiences with video games and gaming behaviors, the research team provided MORE and SG facilitators with a one-hour training on video games and “gamers.” During the training session, group facilitators were introduced to the concepts of video games and “gamers,” characteristics of different video game platforms, users' experiences with different types of video games, sociodemographic information regarding “gamers,” and commonly used terms and phrases among “gamers.” The brief training was conducted on the Internet using online conferencing technology. A researcher in the area of video game marketing prepared the training content and delivered the training. Appendix presents The training slides.

Fidelity Control

To enhance fidelity, all sessions of the MORE and SG interventions were videotaped and reviewed by the research team to identify and address fidelity issues. Further, clinical supervision was provided weekly to ensure group facilitators were implementing MORE and SG as intended; thus, implementation difficulties were addressed in a timely fashion. In addition, MORE and SG group facilitators completed a checklist after each session that evaluated their fidelity to the respective treatment protocols.

Variables and Measures

DSM-5 Criteria for Internet Gaming Disorder (DSM-5 criteria). DSM-5 criteria consist of nine questions that assess whether or not (yes or no) an individual evidences signs or symptoms of a) a preoccupation with Internet gaming; b) a need to increase the amount of time spent on Internet gaming in order to achieve the desired level of excitement; c) psychological withdrawal symptoms (e.g., feeling restless, irritable, or sad when attempting to reduce or stop Internet gaming); d) repeated unsuccessful attempts to stop or reduce Internet gaming; e) failure to engage in other hobbies or activities due to Internet gaming; f) playing video games on the Internet to escape or relieve negative moods; g) lying to others about the extent of Internet gaming; h) continued video game playing on the Internet despite negative consequences; and i) mental distress and impairments in social functioning due to Internet gaming (APA, 2013). In order to assess participants' video game addiction (including playing video games online and offline), I adapted DSM-5 criteria to assess signs and symptoms associated with video game playing rather than solely Internet gaming by replacing the phrases "Internet gaming" or "Internet games" with "gaming" or "games" in each item. The adapted DSM-5 criteria for video game addiction had an internal consistency of .93 in a sample of Dutch youth (Lemmens,

Valkenburg, & Gentile, 2015). In this RCT, a person who met ≥ 5 adapted DSM-5 criteria was diagnosed with video game addiction; and a person who met 3 or 4 adapted DSM-5 criteria met the cutoff for “subthreshold video game addiction.”

Video Game Addiction Scale (VGAS). The VGAS consists of 21 items rated on a 5-point Likert-type scale, with a response format ranging from 1 (never) to 5 (very often), and measures the level of video game addiction (Lemmens, Valkenburg, & Peter, 2009). The VGAS is based on DSM-IV-TR criteria for substance dependence and assesses signs and symptoms of video game addiction, including salience, tolerance, mood modification, relapse, withdrawal, conflict with other people due to gaming, and physical and psychosocial problems due to excessive gaming. Higher scores indicate greater levels of video game addiction. Previous studies reported that the VGAS had internal consistency reliabilities of .94 (Lemmens et al., 2009) among Dutch young adults.

Online Cognition Scale (OCS). The OCS measures maladaptive cognitions associated with Internet activities. The OCS is a 36-item, 7-point Likert-type scale, with a response format ranging from 1 (not true) to 7 (very true), that assesses individuals’ cognitions related to their Internet use, including feelings of loneliness and depression, diminished impulse control, preferring socialization on the Internet to socialization in the real-world, and distraction. Higher scores indicate higher levels of maladaptive cognitions related to Internet use. Previous studies reported that the OCS had internal consistency reliabilities of .85 and .94 in two college student samples (Davis, Flett, & Besser, 2002; Jia & Jia, 2009). In addition, the OCS score was significantly positively correlated with the extent to which students engaged in online gaming (Jia & Jia, 2009). In this study, I modified the OCS to measure maladaptive cognitions related to

video game playing by replacing the phrases “Internet” and “Internet use” with “video games” and “playing video games” in each OCS item.

Perceived Stress Scale (PSS). The PSS includes 12 items rated on a 5-point Likert-type scale, with response options ranging from 0 (never) to 4 (very often). The PSS measures the degree to which participants find their lives unpredictable, uncontrollable, and overwhelming in the past month (Wickrama et al., 2013). Higher scores indicate greater levels of perceived stress (Wickrama et al., 2013). Previous studies reported that the PSS had internal consistency reliabilities of $> .84$ and a test-retest reliability of $.85$ in samples of university students (Cohen et al., 1983; Myers et al., 2012).

Brief Symptom Inventory-18 (BSI-18). The BSI-18 is an 18-item version of the Symptom Checklist-90-R that measures psychiatric distress symptoms (Derogatis, 2000). Participants reported the extent to which they were distressed by each of 18 symptoms (e.g., “nervousness or shakiness inside” and “feeling no interest in things”) on a 5-point Likert Scale, with response options ranging from 1 (not at all) to 5 (extremely). A previous study reported that the BSI-18 had an internal consistency reliability of $.85$ (Derogatis & Melisaratos, 1983).

Cognitive Emotion Regulation Questionnaire (CERQ). The CERQ is a multidimensional questionnaire that identifies the extent to which cognitive strategies are employed for coping with negative life events, including self-blame, acceptance, rumination, positive refocusing, refocusing on planning, positive reappraisal, putting into perspective, catastrophizing, and blaming others (Garnefski, Kraaij, & Spinhoven, 2001). The CERQ consists of 9 subscales with 36 items rated on a 5-point Likert-type scale, with response options ranging from 1 (almost never) to 5 (almost always). Higher scores on a subscale indicate that a specific cognitive strategy is used more frequently (Garnefski et al., 2001). The CERQ subscales had

internal consistency reliabilities between .75 and .87 in a general adult population sample (Garnefski & Kraaij, 2007).

Five Facet Mindfulness Questionnaire (FFMQ). The FFMQ measures participants' self-reported mindfulness, including nonreactivity to inner experience, observing and attending to experiences, describing and discriminating emotional experiences, nonjudging of experience, and acting with awareness (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The FFMQ consists of 39 items rated on a 5-point Likert-type scale, with response options ranging from 1 (never/very rarely true) to 5 (very often/always true). Higher scores indicate greater levels of mindfulness. Internal consistency reliabilities of the FFMQ in samples of meditators and non-meditators ranged from .72 to .93 (Baer et al., 2006, 2008; Christopher, Neuser, Michael, & Baitmangalkar, 2012). The FFMQ had good internal consistency reliabilities for the five subscales ranging from .75 (nonreactivity subscale) to .91 (describing subscale) in a sample of university students who were not meditators (Baer et al., 2008).

Visual Analog Scale (VAS). VAS ("How much do you want to play video games right now?") anchored on a 10-point (1 = *not at all*, 10 = *extremely*) was used to measure the level of participants' craving for video game playing. This item assessed participants' current desire for video game playing as a proxy for craving, due to the possibility that asking participants directly about craving might elicit defensive responding or denial. The VAS has been documented as an efficient and sensitive tool that measures craving for cocaine and cigarette smoking (Lee, Brown, Perantie, & Bobadilla, 2002; Wewers, Rachfal, & Ahijevych, 1990).

Semi-structured in-depth individual interview guidance. The acceptability and feasibility of MORE was examined using semi-structured in-depth individual interviews. Interview guidance included open-ended questions, such as "what did you like about the group?"

“How does the time, location, setting, and duration of group sessions work for you?” “How have you changed as a result of the treatment?”

Data Collection and Analysis

A questionnaire including all outcome measures was administered to participants at the pretreatment interview. The same questionnaire comprised of all outcome measures was administered to participants at posttreatment and 3-month follow-up (see Table 2.1 for the list of outcome measures in the questionnaire). To enhance response rates to the survey questionnaire at posttreatment and 3-month follow-up, participants could choose to complete the questionnaire online or in a face-to-face format. An email including the link to the online survey was distributed to participants who prefer completing the questionnaire online at posttreatment and 3-month follow-up. To assess treatment acceptability and feasibility, in-depth individual interviews with participants who participated in MORE were conducted and audiotaped during the two weeks following completion of all sessions.

Table 2.1

Instruments Used to Measure Primary and Secondary Outcomes at Pretreatment, Posttreatment, and 3-Month Follow-up Assessments

Variable	Measure	Time pt.
Primary Outcome Variable		
Video game addiction	DSM-5 criteria for video game addiction	T1, 2, 3*
	Video Game Addiction Scale	T1, 2, 3
Secondary Outcome Variables		
Gaming-related maladaptive cognitions	Online Cognition Scale	T1, 2, 3
Craving for video gaming	Visual Analog Scale	T1, 2, 3
Perceived stress	Perceived Stress Scale	T1, 2, 3
Psychiatric distress	Brief Symptom Inventory- 18	T1, 2, 3
Cognitive coping	Cognitive Emotion Regulation Questionnaire	T1, 2, 3

Note: * T1, 2, 3 refers to pretreatment, posttreatment, and 3-month follow-up assessments.

Preliminary analyses consisting of descriptive and bivariate tests were conducted on sociodemographic and outcome variables to describe sample characteristics and examine the adequacy of randomization. Analysis of covariance (ANCOVA) was used to test the hypotheses that participants who received MORE had significantly greater decreases in signs and symptoms of video game addiction, craving for video game playing, gaming-related maladaptive cognitions, perceived stress, and psychiatric distress, and significantly greater increases in positive coping and mindfulness. Intent-to-treat analyses were conducted to statistically account for all participants regardless of whether the assigned treatment was fully received. Audiotapes of individual interviews were transcribed verbatim, and an open-coding strategy was used to generate themes relevant to the acceptability, feasibility, and effects of MORE.

Participants and Recruitment

Sample size. Given that our RCT was a pilot study, I recruited a sample of 30 participants ($n = 15$ per condition). A sample this size would allow us to identify moderate-to-large effects and to estimate effect sizes for a larger RCT I plan to conduct in the future.

Participation eligibility. Participants eligible for study inclusion met the following criteria: 1) were at least age 18; 2) met ≥ 3 DSM-5 criteria for video game addiction; 3) were not receiving mental health services elsewhere at the time of recruitment; 4) did not meet DSM-5 criteria for schizophrenia or bipolar disorder; and 5) were not suicidal or homicidal.

Recruitment strategy and eligibility screening. A purposive sampling strategy was used for recruitment. An e-mail with study information was distributed to all students enrolled at, and all employees who work at, a large Southeastern public university through the University

LISTSERV. A brief survey questionnaire for recruitment and initial eligibility screening was developed using Qualtrics (Qualtrics, 2015), and the link to the online screening questionnaire was included in the recruitment email. The screening questionnaire included nine diagnostic questions for video game addiction (i.e., the adapted DSM-5 criteria), four open-ended questions asking about respondents' patterns of video gaming behaviors, and one question asking about respondents' willingness to participate in a treatment program for video game addiction.

Respondents who were interested in study participation were also asked to leave their name and contact information for the research team to schedule baseline interviews. Potential participants who 1) responded to the recruitment email by completing the online screening questionnaire, 2) met ≥ 3 DSM-5 criteria for video game addiction, and 3) expressed willingness to participate in the treatment program were contacted via email or phone for further screening, consent, and pretreatment assessment.

Consent, enrollment, and randomization. The research team scheduled individual interviews with prospective participants at a mutually convenient time to explain the study, further screen for their eligibility, obtain informed consent, and complete pretreatment assessment. A brief psychosocial assessment was conducted to ensure that potential participants met other study eligibility criteria. After providing informed consent, participants were asked to complete a paper-and-pencil questionnaire.

Upon completion of pretreatment interviews with all prospective participants, enrolled participants were randomized to the MORE or SG conditions. To eliminate experimenter bias in group assignment, randomization was performed by a research team member who did not participate in the recruitment and baseline interview. A matched pairs design was used for randomization to ensure an equal numbers of participants in each study condition (Shadish,

Cook, & Campbell, 2002). In addition, a matched pairs design allowed us to control for gender and the level of video game addiction at pretreatment when participants were assigned to the MORE or SG conditions. Participants were grouped into pairs based on their gender and number of DSM-5 criteria for video game addiction. Within each pair, participants were randomly assigned to one of the study interventions by the selected research team member flipping a coin. To minimize differences in participants' treatment expectancies, the experimental interventions (i.e., MORE and SG) were described to participants as two group-based interventions that have not been evaluated in previous studies of video game addiction. The intent was to prevent participants from knowing which intervention the research team believed was more likely to improve symptoms.

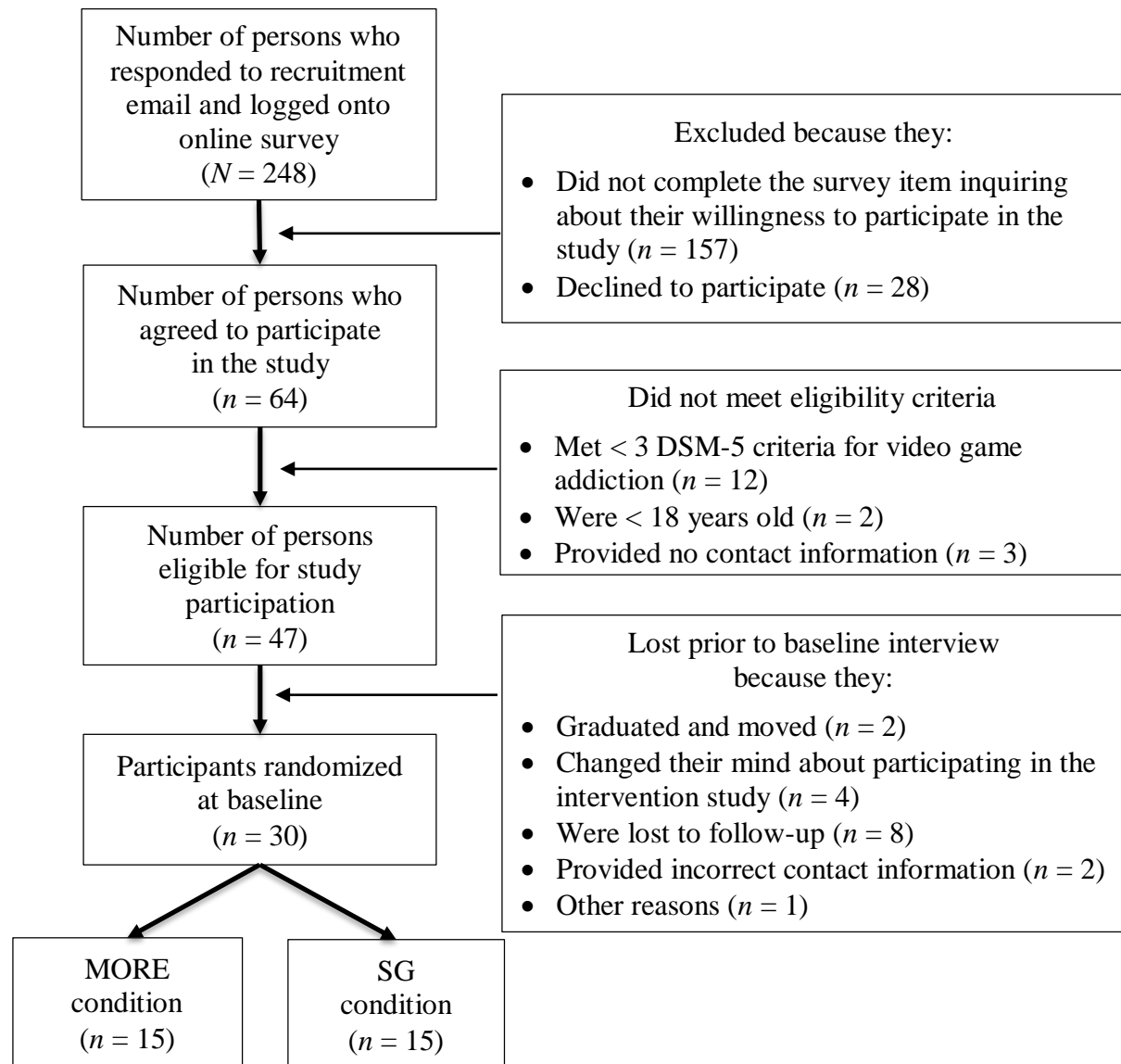
Results of Recruitment

Recruitment Process

The recruitment email including the online screening questionnaire was distributed via the university LISTSERV to over 10,000 undergraduate and graduate students enrolled at, as well as employees who work at, a large public university in the southeastern United States once a week between May and September, 2015. A total of 248 people responded to the recruitment email by logging onto the online screening questionnaire (the link to the questionnaire was embedded in the recruitment email) during the recruitment period (i.e., over 4 months). Among people who logged onto the online screening questionnaire, 47 agreed to participate in the study, were eligible for study participation, and were contacted to schedule a baseline interview via email or phone. Individual interviews at pretreatment were conducted by a research team member with prospective participants during the first three weeks of Fall semester, 2015. Thirty prospective participants completed pretreatment assessments and were randomized to MORE or

SG. Figure 2.3 presents the study consolidated standards of reporting trials (CONSORT) diagram (Rennie, 2001), illustrating the process of recruitment and randomization for this study.

Figure 2.3. CONSORT diagram for sampling and recruitment protocol for Mindfulness-Oriented Recovery Enhancement (MORE) randomized controlled trial.



Characteristics of Respondents to the Online Screening Questionnaire

A total of 248 people responded to the recruitment email by logging onto the online screening questionnaire. Among people who logged onto the online screening questionnaire,

64.1% ($n = 159$) responded to at least one question. Table 2.2 presents participants' self-reported video gaming behaviors and indicated willingness to participate in a treatment program for video game addiction.

Table 2.2

Characteristics of Video Gaming Behaviors among Individuals Who Responded to the Online Recruitment and Study Eligibility Screening Questionnaire ($N = 159$)

Variable	<i>N</i> (%)	<i>M</i> (<i>SD</i>)	Range
DSM-5 Criteria for Video Game Addiction	158 (99.4%)*	3.4 (2.7)	0-9
DSM-5 Criteria ≤ 2	65 (41.1%)		
DSM-5 Criteria = 3 or 4	32 (20.3%)		
DSM-5 Criteria ≥ 5	61 (38.6%)		
Number of hours spent gaming per week	108 (67.9%)*	17.7 (18.0)	0 – 126 hrs
Number of days played games per week	90 (56.6%)*	5.1 (1.2)	0 – 7 hrs
Number of hours spent gaming during the longest gaming session	85 (53.4%)*	6.1 (6.5)	.17 – 50 hrs
Platform	100 (62.9%)*		
Mobile devices only	8 (8.0%)		
Consoles and computers only	79 (79.0%)		
Mobile devices, consoles, and computers	13 (13.0%)		
Playing game offline vs. online	100 (62.9%)*		
Offline only	32 (32.0%)		
Online only	37 (37.0%)		
Offline and online	31 (31.0%)		
Genre of games played the most	99 (62.3%)*		
Puzzle/logic/casual	17 (17.2%)		
Fantasy role play games	15 (15.2%)		
Shooting action	14 (14.1%)		
Multiplayer online battle arena	12 (12.1%)		
Simulation and sports	10 (10.1%)		
Fighting	2 (2.0%)		
Played multiple genres of games	29 (29.3%)		
Respondents' willingness to participate in a treatment program for video game addiction	92 (57.9%)*		
Yes	64 (69.6%)		
No	28 (30.4%)		

Note: * Indicates the number and percentage of the 159 respondents who answered specific survey items.

Respondents reported their current patterns of video gaming behavior with respect to the amount of time (i.e., hours) they spent playing video games per week, number of days they played video games per week, and amount of time they spent gaming during their longest session

of play. The amount of time respondents reported they had spent playing video games per week ranged from 0 to 126 hours, with an average of 17.7 hours ($SD = 18.0$). The average number of days respondents reported they had played video games per week was 5 days ($SD = 1.2$). The longest period of time respondents reported they had spent playing video games in one continuous session ranged from 10 minutes to 50 hours, with an average of 6.1 hours ($SD = 6.5$).

Further, respondents reported the characteristics of their gaming behaviors, including titles and/or genres of video games they had played the most, and their preferred platforms to play video games. More than 17% (17.2%, $n = 17$) reported they played puzzle or casual games (e.g., *Candy Crush Saga*) the most, 15.2 % ($n = 15$) reported they played fantasy role play games (RPG, e.g., *Dark Souls*) the most, 14.1% of respondents ($n = 14$) reported they played shooting action games (e.g., *Call of Duty*) the most, 12.1% ($n = 12$) reported they played multiplayer online battle arena games (MOBA, e.g., *League of Legend* and *World of Warcraft*) the most, 10.1% ($n = 10$) reported they played simulation and sports games (e.g., *Sims*, *NBA*) the most, 2.0% ($n = 2$) reported they played fighting games (e.g., *Smash Brothers*) the most, and the rest 29.3% ($n = 29$) reported play of multiple genres. The platforms that respondents reported they played video games on varied, including mobile devices (e.g., smartphones and tablet computers), consoles (e.g., Play Station and Xbox), and computer. A majority of respondents (68%, $n = 68$) reported they played video games on the Internet.

A total of 157 respondents endorsed at least one item on the DSM-5 criteria for video game addiction. On average, respondents met 3.4 ($SD = 2.7$) of the DSM-5 criteria. Nearly 40% (38.9%, $n = 61$) of respondents met five or more DSM-5 criteria, and therefore met criteria for video game addiction. Another 20.4 % ($n = 32$) met three or four DSM-5 criteria, reflecting the suggested cut off for subthreshold video game addiction. Table 2.3 reports endorsement rates for

each criterion of the modified DSM-5 criteria for video game addiction. Approximately, 63.1 % ($n = 99$) of respondents reported they had felt preoccupied with video game playing, 44.0% ($n = 69$) reported the development of tolerance, and 33.8% ($n = 53$) reported they had experienced psychological withdrawal symptoms when they could not access video games. In addition, 68.4% ($n = 80$) of respondents reported they had played video games to escape or relieve a negative mood, and 22.4% ($n = 26$) reported they had jeopardized or lost a significant relationship, job, or educational/career opportunity due to their pathological gaming behaviors.

Table 2.3

Endorsement Rates for Each of the DSM-5 Diagnostic Criteria for Video Game Addiction ($N = 157$)

DSM-5 Internet Gaming Disorder Criteria	Yes <i>N</i> (%)	No <i>N</i> (%)
1. Do you frequently think about previous gaming activity or anticipate playing the next game to the extent that you are preoccupied with gaming? Has video gaming become the dominant activity in your daily life?	99 (63.1%)	58 (36.9%)
2. Do you feel the need to spend increasing amounts of time engaged in video gaming?	69 (44.0%)	88 (56.1%)
3. Have you repeatedly made unsuccessful efforts to control, cut back, or stop your participation in video games?	53 (33.8%)	104 (66.2%)
4. Do you feel irritable, anxious, or sad when video game is taken away from you or when you cannot access games?	64 (46.4%)	74 (53.6%)
5. Have you lost interest in previous hobbies or entertainment as a result of, and with the exception of, video games?	52 (37.7%)	86 (62.3%)
6. Do you continue excessive use of video games despite knowledge of psychosocial problems caused by game playing?	57 (41.3%)	81 (58.7%)
7. Have you lied to family members, therapists, or others regarding the amount of gaming you are engaging in?	35 (25.4%)	103 (74.6%)
8. Do you use video games to escape or relieve a negative mood (e.g., feelings of helplessness, sadness, guilt, anxiety)?	80 (68.4%)	37 (31.6%)
9. Have you jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in video games?	26 (22.4%)	90 (77.6%)

Finally, 92 respondents answered the question that asked about their willingness to participate in a treatment study for video game addiction. Among the 92 respondents, 69.6% ($n = 64$) responded “yes,” versus 30.4 % ($n = 28$) who responded “no.” Independent t-tests were performed to test differences in characteristics of video gaming behaviors and the level of video game addiction between respondents who responded “yes” to treatment participation compared to people who responded “no.” No significant differences were found across variables related to characteristics of video gaming behaviors between people who responded “yes” to treatment participation and people who responded “no,” including amount of time respondents spent playing video games per week ($t(87) = -.29, p = .77$), number of days that respondents played video games per week ($t(87) = .71, p = .48$), and amount of time respondents spent on gaming during their longest session of play ($t(87) = .85, p = .40$). By contrast, people responding “yes” to treatment participation met statistically significantly more DSM-5 criteria for video game addiction compared to those who responded “no” ($t(89) = 3.04, p = .003$).

Further, independent t-tests were performed to test differences in characteristics of video gaming behaviors and the level of video game addiction between people who responded to the question that asked about their willingness to participate in a treatment study and people who did not respond to this question. Results revealed no statistically significant differences between people who responded to the question asking about their willingness to participate in a treatment study and people who did not respond to this question in characteristics of video gaming behaviors (i.e., amount of time respondents spent on playing video games per week, number of days respondents played video games per week, and amount of time respondents spent on gaming during their longest session of play) and number of DSM-5 criteria they met for video game addiction.

Discussion

Video game addiction is increasingly prevalent worldwide and has been identified as a major public health concern in East Asia (Kuss & Griffiths, 2012). The American Psychiatric Association has emphasized the need for research in this area (APA, 2013). However, evidence-based interventions for video game addiction have not been established. Consequently, this RCT study tested the feasibility and effects of a mindfulness treatment for young adults who suffer from video game addiction. To our knowledge, this study is the first RCT to assess effects of a mindfulness treatment for video game addiction. In addition, this paper reported the feasibility of recruiting emerging adults with video game addiction for a group-based treatment from a large public university using recruitment emails and an online screening questionnaire.

First, it was feasible to adapt the MORE treatment manual for video game addiction. Due to a lack of manualized interventions for video game addiction, adaptation of the MORE treatment manual for this newly identified behavioral addiction was a challenge. I collaborated with scholars from different disciplines for the treatment manual adaptation, including the developer of MORE, a clinical social worker with extensive experience in leading MORE groups for individuals with substance use disorders, experts in the area of addictions, and researchers in the areas of video game behavior and marketing. The multi-disciplinary collaboration increased the quality of the treatment manual adaptation. Specifically, the consultation provided by the developer of MORE ensured fidelity of the modified manual. Further, the consultation provided by the researcher in the area of video game behaviors and marketing ensured that the modified terms and phrases, topics for group discussion, and instruction in mindfulness practices targeted the right population.

Further, given that many therapists and social workers do not have specific experience in working with individuals who suffer from video game addiction, it was beneficial to provide a brief training for the therapists/group facilitators regarding characteristics of video gaming behaviors. Such training could provide therapists/group facilitators with necessary knowledge and information about video games, gaming behaviors, and characteristics of “gamers.” The brief training increased the cultural competency of the therapists/group facilitators to work with participants in this study. The therapists/group facilitators felt more capable of understanding participants’ personal experiences, thoughts, and motivations related to their video game playing, enabling them to provide more accurate and effective feedback during the MORE and SG sessions. The brief training on characteristics of video gaming behaviors for therapists/group facilitators also appeared to enhance the therapeutic rapport between group facilitators and participants, which might have increased participants’ motivation to complete the treatment program and improved treatment outcomes (Joe, Simpson, Dansereau, & Rowan-Szal, 2001).

Instruments selected to measure treatment outcomes proved to be feasible. All participants who completed baseline interviews completed the comprehensive questionnaire that included all study measures in a timely fashion (i.e., 30 to 40 minutes) with minimal assistance. One participant had difficulty in understanding certain questionnaire items that asked about experiences related to specific feelings, emotions, and mindfulness because English was his second language. This participant needed the interviewer to explain what the items inquired about. It took more than an hour for this specific participant to complete the survey questionnaire. Few participants found the questionnaire excessively lengthy, although some items in the questionnaire appeared to be repetitive. Specifically, some items on the VGAS and

OCS asking about respondents' thoughts and cognitions while playing video games were worded in similar ways.

Finally, it was feasible to recruit young university students and employees for a group-based treatment for video game addiction using recruitment emails and the university LISTSERV. A total of 248 people responded to the recruitment email by logging onto the online screening questionnaire over four months. Further, it was feasible and effective to use an online questionnaire to screen for participation eligibility among respondents who showed interests in participating in the intervention study. Combining the online screening questionnaire with the recruitment email could be cost-effective and increase prospective participants' response rates to eligibility screening. Among the 248 people who logged onto the online screening questionnaire, more than 90 responded to the question that asked about their willingness to participate in the intervention study and completed items assessing video game addiction.

Despite the feasibility of the recruitment strategy, reaching the target sample size ($N = 40$) was challenging. I did not anticipate the difficulties faced in achieving our targeted sample size by the time MORE and SG started. I expected to easily reach enrollment goals given that 64 people agreed to participate in the study and 47 met participation eligibility. However, I experienced a high attrition rate prior to completion of baseline interviews. More than one-third of prospective eligible participants ($n = 17$) did not complete baseline interviews and therefore were not enrolled in the study. I lost contact with eight prospective participants. These prospective participants stopped responding to emails or phone calls from the research team after the initial contact to schedule baseline interviews. In addition, six prospective participants changed their minds and withdrew from the study prior to baseline interviews because they graduated and moved during the summer, or they no longer wanted to commit to attending an 8-

week treatment program. I think the long period of time between when the prospective participants agreed to participate in the study and the scheduled baseline interviews could have contributed to the high attrition rate prior to baseline interview. Some people might underestimate their school workload for the coming semester (when the intervention study was conducted) at the time they agreed to participate in the study (during the summer). However, they decided to discontinue their participation at the time of baseline interviews (beginning of the new semester) because they were aware of the heavy workload and time conflicts between school/work and the schedule for intervention groups.

Conclusion

In sum, this RCT was the first attempt to examine a mindfulness treatment for video game addiction and associated psychosocial problems. This report supports the feasibility of developing a rigorous RCT that adapts an evidence-based, manualized mindfulness treatment for video game addiction, and tests its effects compared to SG. This paper describes the process and possible challenges with respect to treatment manual adaptation, recruitment and eligibility screening using Internet-based technologies, outcome measures, and statistical approaches. The results of this report contribute to future studies undertaking rigorous RCTs to evaluate mindfulness treatments for Internet-related pathological behaviors, including video game addiction. Findings regarding treatment outcomes of this RCT will be presented in future reports upon completion of the study. Findings from this study could fill the gap in evidence-based interventions for video game addiction. In addition, I expect findings will contribute to knowledge of mindfulness treatment for addictions.

REFERENCES: PAPER II

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
doi:10.1176/appi.books.9780890425596.744053
- Astin, J. A. (1997). Stress reduction through mindfulness meditation. *Psychotherapy and Psychosomatics*, 66(2), 97-106. doi:10.1159/000289116
- Atmaca, M. (2007). A case of problematic internet use successfully treated with an SSRI-antipsychotic combination. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 31, 961-962.
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27-45.
doi:10.1177/1073191105283504
- Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., ... & Williams, J. M. G. (2008). Construct validity of the Five Facet Mindfulness Questionnaire in meditating and nonmeditating samples. *Assessment*, 15(3), 329-342.
doi:10.1177/1073191107313003
- Beranuy, M., Carbonell, X., & Griffiths, M. D. (2013). A qualitative analysis of online gaming addicts in treatment. *International Journal of Mental Health and Addiction*, 11(2), 149-161. doi:10.1007/s11469-012-9405-2
- Bucktin, C. (2013). *Washington Navy Yard gunman Aaron Alexis heard "voices in head" after playing violent video games up to 18 hours a day*. Retrieved from <http://www.mirror.co.uk/news/world-news/washington-navy-yard-gunman-aaron-2280976>
- Chappell, D., Eatough, V., Davies, M. N., & Griffiths, M. (2006). EverQuest—It's just a computer game right? An interpretative phenomenological analysis of online gaming addiction. *International Journal of Mental Health and Addiction*, 4(3), 205-216.
doi:10.1007/s11469-006-9028-6
- Chiesa, A., & Serretti, A. (2014). Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Substance Use & Misuse*, 49(5), 492-512. doi:10.3109/10826084.2013.770027
- Christopher, M. S., Neuser, N. J., Michael, P. G., & Baitmangalkar, A. (2012). Exploring the psychometric properties of the Five Facet Mindfulness Questionnaire. *Mindfulness*, 3(2), 124-131. doi:10.1007/s12671-011-0086-x
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385-396. doi:10.2307/2136404

- Cole, H., & Griffiths, M. D. (2007). Social interactions in massively multiplayer online role-playing gamers. *CyberPsychology & Behavior*, 10(4), 575-583. doi:10.1089/cpb.2007.9988
- Davis, R. A., Flett, G. L., & Besser, A. (2002). Validation of a new scale for measuring problematic Internet use: Implications for pre-employment screening. *CyberPsychology & Behavior*, 5, 331-345. doi:10.1089/109493102760275581
- Decker, S. A., & Gay, J. N. (2011). Cognitive-bias toward gaming-related words and disinhibition in World of Warcraft gamers. *Computers in Human Behavior*, 27(2), 798-810. doi:10.1016/j.chb.2010.11.005
- Derogatis, L. R. (2000). *BSI-18: Administration, scoring, and procedures manual*. Minneapolis, MN: National Computer Systems.
- Derogatis, L. R., & Melisaratos, N. (1983). The Brief Symptom Inventory: An introductory report. *Psychological Medicine*, 13(3), 595-605. doi:10.1017/S0033291700048017
- Dong, G. G., Lu, Q., Zhou, H., & Zhao, X. (2011). Precursor or sequela: Pathological disorders in people with Internet addiction disorder. *PLOS ONE*, 6, e14703. doi:10.1371/journal.pone.0014703
- Entertainment Software Association. (2015). *Essential facts about the computer and video game industry*. Retrieved from <http://www.theesa.com/wp-content/uploads/2015/04/ESA-Essential-Facts-2015.pdf>
- Escobar-Chaves, S. L., & Anderson, C. A. (2008). Media and risky behaviors. *The Future of Children*, 18(1), 147-180. doi:10.1353/foc.0.0007
- Ferrie, C. D., De Marco, P., Grünewald, R. A., Giannakodimos, S., & Panayiotopoulos, C. P. (1994). Video game induced seizures. *Journal of Neurology, Neurosurgery & Psychiatry*, 57(8), 925-931. doi:10.1136/jnnp.57.8.925
- Garland, E. L., Gaylord, S. A., Boettiger, C. A., & Howard, M. O. (2010). Mindfulness training modifies cognitive, affective, and physiological mechanisms implicated in alcohol dependence: Results of a randomized controlled pilot trial. *Journal of Psychoactive Drugs*, 42(2), 177-192. doi:10.1080/02791072.2010.10400690
- Garland, E. L., Boettiger, C. A., & Howard, M. O. (2011). Targeting cognitive-affective risk mechanisms in stress-precipitated alcohol dependence: An integrated, biopsychosocial model of automaticity, allostasis, and addiction. *Medical Hypotheses*, 76(5), 745-754. doi:10.1016/j.mehy.2011.02.014
- Garland, E. L., Gaylord, S. A., & Fredrickson, B. L. (2011). Positive reappraisal mediates the stress-reductive effects of mindfulness: An upward spiral process. *Mindfulness*, 2(1), 59-67. doi:10.1007/s12671-011-0043-8

- Garland, E. L., Boettiger, C. A., Gaylord, S., Chanon, V. W., & Howard, M. O. (2012). Mindfulness is inversely associated with alcohol attentional bias among recovering alcohol-dependent adults. *Cognitive Therapy and Research*, 36(5), 441-450. doi:10.1007/s10608-011-9378-7
- Garland, E. L. (2013). *Mindfulness oriented-recovery enhancement for addiction, stress, and pain*. Washington DC: NASW Press.
- Garland, E. L. (2014). Disrupting the downward spiral of chronic pain and opioid addiction with mindfulness-oriented recovery enhancement: A review of clinical outcomes and neurocognitive targets. *Journal of Pain and Palliative Care Pharmacotherapy*, 28(2), 122-129. doi:10.3109/15360288.2014.911791
- Garland, E. L., Froeliger, B., & Howard, M. O. (2014). Mindfulness training targets neurocognitive mechanisms of addiction at the attention-appraisal-emotion interface. *Frontiers in Psychiatry*, 4, 1-15. doi:10.3389/fpsyt.2013.00173
- Garland, E. L., Manusov, E. G., Froeliger, B., Kelly, A., Williams, J. M., & Howard, M. O. (2014). Mindfulness-oriented recovery enhancement for chronic pain and prescription opioid misuse: Results from an early-stage randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 82(3), 448-459. doi:10.1037/a0035798
- Garland, E. L., Roberts-Lewis, A., Kelley, K., Tronnier, C., & Hanley, A. (2014). Cognitive and affective mechanisms linking trait mindfulness to craving among individuals in addiction recovery. *Substance Use & Misuse*, 49(5), 525-535. doi:10.3109/10826084.2014.850309
- Garland, E. L., Roberts-Lewis, A., Tronnier, C. D., Graves, R., & Kelley, K. (2016). Mindfulness-Oriented Recovery Enhancement versus CBT for co-occurring substance dependence, traumatic stress, and psychiatric disorders: Proximal outcomes from a pragmatic randomized trial. *Behaviour Research and Therapy*, 77, 7-16. doi:10.1016/j.brat.2015.11.012
- Garnefski, N., Kraaij, V., & Spinhoven, P. (2001). Negative life events, cognitive emotion regulation and emotional problems. *Personality and Individual Differences*, 30(8), 1311-1327. doi:10.1016/S0191-8869(00)00113-6
- Garnefski, N., & Kraaij, V. (2007). The Cognitive Emotion Regulation Questionnaire. *European Journal of Psychological Assessment*, 23(3), 141-149. doi:10.1027/1015-5759.23.3.141
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, 57(1), 35-43. doi:10.1016/S0022-3999(03)00573-7
- Grüsser, S. M., Thalemann, R., & Griffiths, M. D. (2007). Excessive computer game playing: Evidence for addiction and aggression? *CyberPsychology & Behavior*, 10(2), 290-292. doi:10.1089/cpb.2006.9956

- Han, D. H., Lee, Y. S., Na, C., Ahn, J. Y., Chung, U. S., Daniels, M. A., ... & Renshaw, P. F. (2009). The effect of methylphenidate on Internet video game play in children with attention-deficit/hyperactivity disorder. *Comprehensive Psychiatry*, 50, 251-256. doi:10.1016/j.comppsy.2008.08.011
- Han, D. H., Hwang, J. W., & Renshaw, P. F. (2010). Bupropion sustained release treatment decreases craving for video games and cue-induced brain activity in patients with internet video game addiction. *Experimental and Clinical Psychopharmacology*, 18, 297-304. doi:10.1037/a0020023
- Han, D. H., Kim, S. M., Lee, Y. S., & Renshaw, P. F. (2012). The effect of family therapy on the changes in the severity of on-line game play and brain activity in adolescents with on-line game addiction. *Psychiatry Research: Neuroimaging*, 202, 126-131. doi:10.1016/j.psychres.2012.02.011
- Han, D. H., & Renshaw, P. F. (2012). Bupropion in the treatment of problematic online game play in patients with major depressive disorder. *Journal of Psychopharmacology*, 26(5), 689-696. doi:10.1177/0269881111400647
- Hetzel-Riggin, M. D., & Pritchard, J. R. (2011). Predicting problematic Internet use in men and women: The contributions of psychological distress, coping style, and body esteem. *Cyberpsychology, Behavior, and Social Networking*, 14, 519-525. doi:10.1089/cyber.2010.0314
- Hilgard, J., Engelhardt, C. R., & Bartholow, B. D. (2013). Individual differences in motives, preferences, and pathology in video games: The gaming attitudes, motives, and experiences scales (GAMES). *Frontiers in Psychology*, 4, 608. doi:10.3389/fpsyg.2013.00608
- Jackson, L. A., von Eye, A., Witt, E. A., Zhao, Y., & Fitzgerald, H. E. (2011). A longitudinal study of the effects of Internet use and videogame playing on academic performance and the roles of gender, race and income in these relationships. *Computers in Human Behavior*, 27(1), 228-239. doi:10.1016/j.chb.2010.08.001
- Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, & Behavioral Neuroscience*, 7(2), 109-119. doi:10.3758/CABN.7.2.109
- Jia, R., & Jia, H. H. (2009). Factorial validity of problematic Internet use scales. *Computers in Human Behavior*, 25(6), 1335-1342. doi:10.1016/j.chb.2009.06.004
- Joe, G. W., Simpson, D. D., Dansereau, D. F., & Rowan-Szal, G. A. (2001). Relationships between counseling rapport and drug abuse treatment outcomes. *Psychiatric Services*, 52(9), 1223-1229. doi:10.1176/appi.ps.52.9.1223

- Kim, S. M., Han, D. H., Lee, Y. S., & Renshaw, P. F. (2012). Combined cognitive-behavioral therapy and bupropion for the treatment of problematic on-line game play in adolescents with major depressive disorder. *Computers in Human Behavior*, 28, 1954-1959. doi:10.1016/j.chb.2012.05.015
- Ko, C. H., Liu, G. C., Yen, C. F., Chen, C. S., & Lin, W. C. (2013). The brain activations for both cue-induced gaming urge and smoking craving among subjects comorbid with Internet gaming addiction and nicotine dependence. *Journal of Psychiatric Research*, 47, 486-493. doi:10.1016/j.jpsychires.2012.11.008
- Koepp, M. J., Gunn, R. N., Lawrence, A. D., Cunningham, V. J., Dagher, A., Jones, T., ... & Grasby, P. M. (1998). Evidence for striatal dopamine release during a video game. *Nature*, 393, 266-268. doi:10.1038/30498
- Kohn, D. (2002). *Addicted: Suicide over Everquest? Was he obsessed?* Retrieved from <http://www.cbsnews.com/news/addicted-suicide-over-everquest/>
- Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction*, 10, 278-296. doi:10.1007/s11469-011-9318-5
- Kuss, D. J., Louws, J., & Wiers, R. W. (2012). Online gaming addiction? Motives predict addictive play behavior in massively multiplayer online role-playing games. *Cyberpsychology, Behavior, and Social Networking*, 15(9), 480-485. doi:10.1089/cyber.2012.0034
- LaRose, R., & Eastin, M. S. (2004). A social cognitive theory of Internet uses and gratifications: Toward a new model of media attendance. *Journal of Broadcasting & Electronic Media*, 48, 358-377. doi:10.1207/s15506878jobem4803_2
- Lee, J. W., Brown, E. S., Perantie, D. C., & Bobadilla, L. (2002). A comparison of single-item Visual Analog Scales with a multiitem Likert-type scale for assessment of cocaine craving in persons with bipolar disorder. *Addictive Disorders & Their Treatment*, 1(4), 140-142.
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, 12(1), 77-95. doi:10.1080/15213260802669458
- Lemmens, J. S., Valkenburg, P. M., & Gentile, D. A. (2015). The Internet Gaming Disorder Scale. *Psychological Assessment*. doi:10.1037/pas0000062
- Lo, S. K., Wang, C. C., & Fang, W. (2005). Physical interpersonal relationships and social anxiety among online game players. *Cyberpsychology & Behavior*, 8, 15-20. doi:10.1089/cpb.2005.8.15

- Myers, S. B., Sweeney, A. C., Popick, V., Wesley, K., Bordfeld, A., & Fingerhut, R. (2012). Self-care practices and perceived stress levels among psychology graduate students. *Training and Education in Professional Psychology*, 6(1), 55-66. doi:10.1037/a0026534
- Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences*, 9(5), 242-249. doi:10.1016/j.tics.2005.03.010
- Peng, W., & Liu, M. (2010). Online gaming dependency: A preliminary study in China. *CyberPsychology, Behavior, and Social Networking*, 13(3), 329-333. doi:10.1089/cyber.2009.0082
- Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H. J., Möble, T., ... & O'Brien, C. P. (2014). An international consensus for assessing Internet Gaming Disorder using the new DSM-5 approach. *Addiction*, 109(9), 1399-1406. doi:10.1111/add.12457
- Qualtrics. (2015). Qualtrics. Utah: Provo. <http://www.qualtrics.com>
- Rennie, D. (2001). CONSORT revised—improving the reporting of randomized trials. *Jama*, 285(15), 2006-2007. doi:10.1001/jama.285.15.2006
- Romer, D., Bagdasarov, Z., & More, E. (2013). Older versus newer media and the well-being of United States youth: Results from a national longitudinal panel. *Journal of Adolescent Health*, 52, 613-619. doi:10.1016/j.jadohealth.2012.11.012
- Sattar, P., & Ramaswamy, S. (2004). Internet gaming addiction. *Canadian Journal of Psychiatry*, 49, 869-870.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston, MA: Houghton Mifflin.
- Smyth, J. M. (2007). Beyond self-selection in video game play: An experimental examination of the consequences of massively multiplayer online role-playing game play. *CyberPsychology & Behavior*, 10(5), 717-721. doi:10.1089/cpb.2007.9963
- Toneatto, T., Pillai, S., & Courtice, E. L. (2014). Mindfulness-enhanced cognitive behavior therapy for problem gambling: A controlled pilot study. *International Journal of Mental Health and Addiction*, 12(2), 197-205. doi:10.1007/s11469-014-9481-6
- Vandelanotte, C., Sugiyama, T., Gardiner, P., & Owen, N. (2009). Associations of leisure-time Internet and computer use with overweight and obesity, physical activity and sedentary behaviors: Cross-sectional study. *Journal of Medical Internet Research*, 11, e28. doi:10.2196/jmir.1084; 10.2196/jmir.1084
- van Holst, R. J., Lemmens, J. S., Valkenburg, P. M., Peter, J., Veltman, D. J., & Goudriaan, A. E. (2012). Attentional bias and disinhibition toward gaming cues are related to problem

- gaming in male adolescents. *Journal of Adolescent Health*, 50(6), 541-554.
doi:10.1016/j.jadohealth.2011.07.006
- Velezmoro, R., Lacefield, K., & Roberti, J. W. (2010). Perceived stress, sensation seeking, and college students' abuse of the Internet. *Computers in Human Behavior*, 26, 1526-1530.
doi:10.1016/j.chb.2010.05.020
- Wewers, M. E., Rachfal, C., & Ahijevych, K. (1990). A psychometric evaluation of a visual analogue scale of craving for cigarettes. *Western Journal of Nursing Research*, 12(5), 672-681.
- Wickrama, K. A. S., Ralston, P. A., O'Neal, C. W., Ilich, J. Z., Harris, C. M., Coccia, C., ... & Lemacks, J. (2013). Linking life dissatisfaction to health behaviors of older African Americans through psychological competency and vulnerability. *Research on Aging*, 35(5), 591-611. doi:10.1177/0164027512449473
- Yee, N. (2006). Motivations for play in online games. *CyberPsychology & Behavior*, 9(6), 772-775. doi:10.1089/cpb.2006.9.772
- Yuan, K., Qin, W., Wang, G., Zeng, F., Zhao, L., Yang, X., ... & Tian, J. (2011). Microstructure abnormalities in adolescents with internet addiction disorder. *PLOS ONE*, 6(6), e20708. doi:10.1371/journal.pone.0020708
- Zgierska, A., Rabago, D., Chawla, N., Kushner, K., Koehler, R., & Marlatt, A. (2009). Mindfulness meditation for substance use disorders: A systematic review. *Substance Abuse*, 30(4), 266-294. doi:10.1080/08897070903250019

PAPER III

MINDFULNESS-ORIENTED RECOVERY ENHANCEMENT FOR VIDEO GAME ADDICTION IN U.S. EMERGING ADULTS: AN EARLY-STAGE RANDOMIZED CONTROLLED TRIAL

Empirical studies have identified increasing rates of video game addiction and associated adverse consequences in emerging adults. However, there are no evidence-based interventions for video game addiction. This study evaluated Mindfulness-Oriented Recovery Enhancement (MORE) treatment of video game addiction. Thirty adults ($M_{age} = 25.0$, $SD = 5.4$) with video game addiction were randomized to 8 weeks of group-based MORE or 8 weeks of a support group (SG) intervention. Outcomes included the number of DSM-5 criteria participants met for video game addiction, craving for video game playing, video gaming-related maladaptive cognitions, perceived stress, coping, and mindfulness. Measures were administered at pre-and posttreatment using standardized self-report instruments. Analysis of covariance (ANCOVA) and intent-to-treat analyses were used. Compared to SG participants, MORE participants had significantly greater reductions in the number of DSM-5 video game addiction criteria they met, in craving for video game playing, and in negative feelings related to video game playing, and a significantly greater increase in positive coping at posttreatment. MORE is a promising treatment approach for video game addiction.

Introduction

Video game addiction is a recurrent and compulsive pattern of video game playing. Games may be played on computers, game consoles such as SONY Play Station and Microsoft Xbox, and mobile devices such as smartphones and tablet computers online and offline. Video game addiction is characterized by signs and symptoms similar to substance use and gambling disorders (Petry et al., 2014). Internet Gaming Disorder (a subtype of video game addiction) is included in Section 3 of the DSM-5 (American Psychiatric Association [APA], 2013). People who meet DSM-5 criteria for Internet Gaming Disorder may evidence signs and symptoms including a) a preoccupation with playing video games on the Internet; b) a need to increase the amount of time they engage in Internet gaming in order to achieve the desired level of excitement; c) psychological withdrawal symptoms (e.g., feeling restless, irritable, or sad when attempting to reduce or stop playing video games on the Internet); d) repeated unsuccessful attempts to stop or reduce Internet gaming; e) failure to engage in other hobbies or activities due to Internet gaming; f) playing video games on the Internet to escape or relieve negative moods; g) lying to others about the extent of Internet gaming; h) continued video game playing on the Internet despite negative consequences; and i) mental distress and impairments in social functioning (APA, 2013; Petry et al., 2014).

Approximately 81% of adults 18 to 29 years old in the U.S. play video games (Lenhart, Jones, & Macgill, 2008). Video game addiction is recognized as a serious problem for 4% to 12% of adolescents and adults who play video games (Kuss & Griffiths, 2012). Video games are inexpensive and easy to access for many young people in the U.S. (U.S. Pew Internet & American Life Project, 2012), and are ingrained in the culture of the younger generation (Entertainment Software Association [ESA], 2015). Further, college-aged adults have significant

unstructured time with little monitoring by school and parents that allows them to play video games intensively (Li, Garland, & Howard, 2014). In addition, video game playing may be a palliative coping mechanism that facilitates escape from daily obligations and serves as a social outlet (Hilgard, Engelhardt, & Bartholow, 2013). Thus, young adults may play video games intensively to cope with stress and negative affect. In addition, college-aged adults may experience diminished family and community support after leaving home for the first time (Li et al., 2014). Playing video games on the Internet with other people also enables young adults to expand their social networks (Cole & Griffiths, 2007).

Young adults addicted to video game playing may experience a) impaired physical health, such as being overweight or obese due to lack of physical activity, sleep disorders, and heightened risk for seizures (Ferrie, De Marco, Grunewald, Giannakodimos, & Panayiotopoulos, 1994; Smyth, 2007; Vandelandotte, Sugiyama, Gardiner, & Owen, 2009); b) psychiatric comorbidity, including depressive and somatic symptoms, social anxiety, and attention-deficit-hyperactivity-disorder (ADHD; Dong, Lu, Zhou, & Zhao, 2011; Lo, Wang, & Fang, 2005; Romer, Bagdasarov, & More, 2009); c) behavioral problems, including substance misuse (Yen, Ko, Yen, Chen, & Chen, 2009), driving while playing video games (Li, O'Brien, Snyder, & Howard, 2015), suicidal ideation (Kohn, 2002), and hostility and violence (Bucktin, 2013; Grusser, Thalemann, & Griffiths, 2007; Kim, Namkoong, Ku, & Kim, 2008); d) loss of relationships and employment (Chappell, Eatough, Davies, & Griffiths, 2006; Jackson, von Eye, Witt, Zhao, & Fitzgerald, 2011); and e) financial debt (Beranuy, Carbonell, & Griffiths, 2013). Although it is possible that young adults addicted to video game playing could benefit from interventions to forestall development of these deleterious effects, no evidence-based treatment has been established for video game addiction.

Mindfulness interventions are effective in treating substance use and gambling disorders (e.g., Chiesa & Serretti, 2014; Toneatto, Pillai, & Courtice, 2014; Zgierska et al., 2009). However, mindfulness interventions have not been evaluated with regard to their efficacy in treating video game addiction. I adapted Mindfulness-Oriented Recovery Enhancement (MORE), an evidence-based manualized treatment for addiction and co-occurring mental distress (Garland, 2013; Garland, Gaylord, Boettiger, & Howard, 2010; Garland, et al., 2014; Garland, Robert-Lewis, Tronnier, Graves, & Kelly, 2016), and pilot tested the adapted MORE treatment for video game addiction with U.S. emerging adults using a randomized controlled trial (RCT) design. Garland et al. (2010; 2014; 2016) conducted three RCTs that evaluated the efficacy of MORE with U.S. adults with a variety of substance use disorders, and demonstrated that MORE was more effective in reducing substance misuse and modifying underlying risk mechanisms of addictive behaviors, including decreases in perceived stress and psychological distress, and enhancement in affective and emotional regulation compared to cognitive-behavioral therapy (CBT), an active support group (SG), and treatment as usual.

MORE integrates mindfulness training, cognitive reappraisal skills, and savoring into a therapeutic approach that is designed to modify maladaptive coping with stress and mental distress, thought suppression, and autonomic stress responses underlying addictive behaviors (Garland, Froeliger, & Howard, 2014a). We hypothesized that the intervention components of MORE (i.e., mindfulness training, cognitive reappraisal skills, and savoring) target underlying risk mechanisms of video game addiction. Figure 2.1 presents the theoretical model of video game addiction that was described in paper II.

Mindfulness training may lead to reductions in stress (Garland et al., 2016) and emotional distress (Grossman, Niemann, Schmidt, & Walach, 2004; Hofmann, Sawyer, Witt, & Oh, 2010),

thereby reducing video game playing as a response to stress and negative affective states. Moreover, mindfulness training produces beneficial effects on addiction-related factors, such as craving, attentional bias, and autonomic cue-reactivity (Garland et al., 2010; Garland, 2014; Garland, Froeliger, & Howard, 2014b). Attentional-bias toward video gaming-related cues and stimuli was observed among people with video game addiction (e.g., Decker & Gay, 2011; van Holst et al., 2012). Similarly, cognitive reappraisal training decreases negative emotions and downregulates stress physiology (Ochsner & Gross, 2005; Garland, Gaylord, & Fredrickson, 2011), thereby reducing an individual's motivation to engage in video game playing as escapism and mood modification. Additionally, savoring pleasant events upregulates positive affect, reduces anhedonia, and increases the sense of reward from pleasant events other than playing video games (Garland et al., 2010; 2016).

This study evaluated the effects of MORE, compared to a SG, in reducing signs and symptoms of video game addiction at posttreatment. The study used an active control condition to control for nonspecific therapeutic factors such as social interaction and peer support. We hypothesized that both MORE and SG participants would demonstrate a significant decrease in their signs and symptoms of video game addiction at posttreatment. Further, we hypothesized that compared to SG participants, MORE participants would demonstrate significantly greater decreases in their signs and symptoms of video game addiction, gaming-related maladaptive cognitions, craving for video game playing, perceived stress, and psychiatric distress, as well as significantly greater increases in positive cognitive coping and mindfulness at posttreatment.

Methods

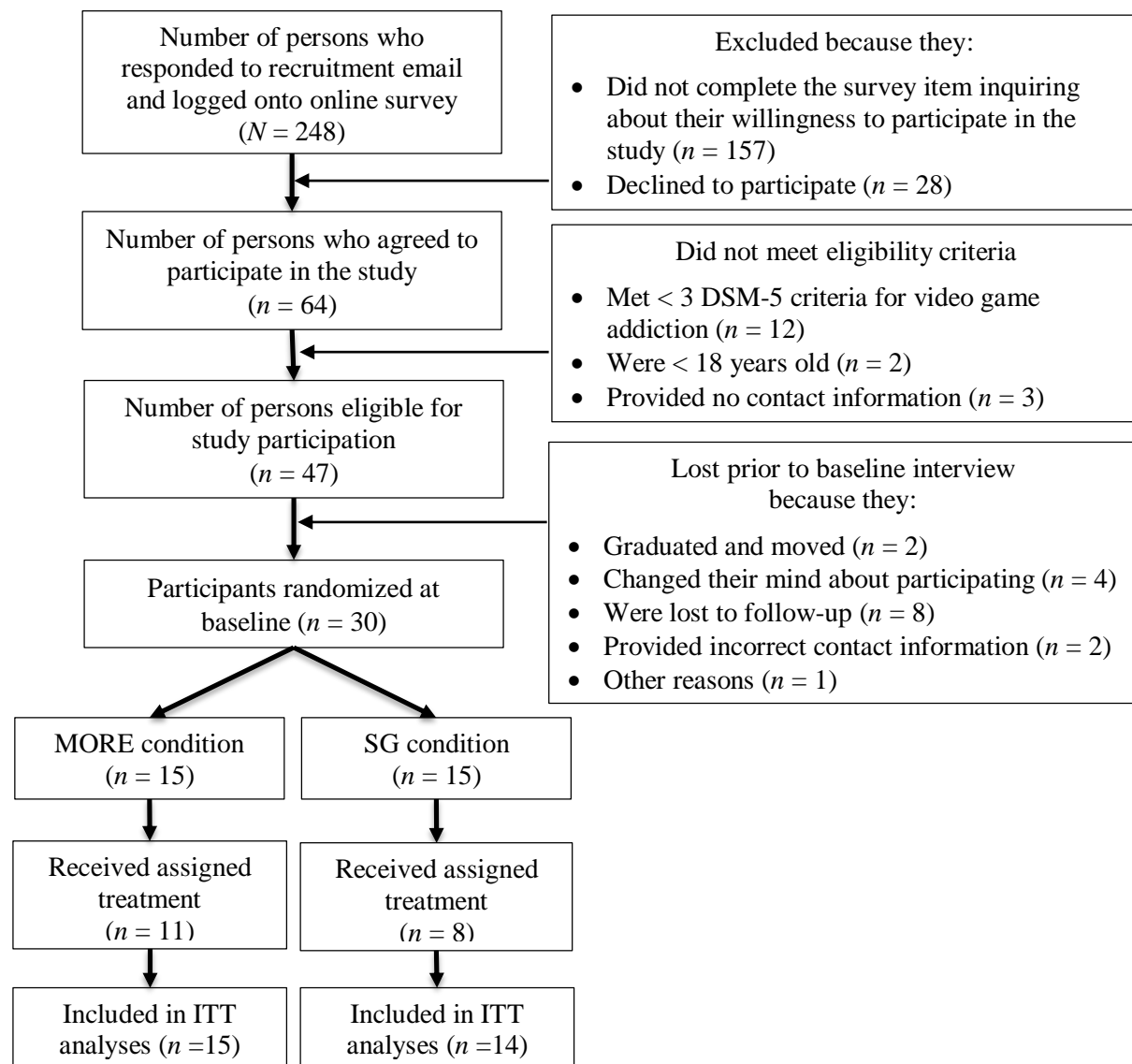
Participants

The study sample consisted of young adults who met proposed DSM-5 diagnostic criteria for video game addiction (i.e., ≥ 5 DSM-5 criteria) or who evidenced subthreshold video game addiction (i.e., 3 or 4 DSM-5 criteria), and who volunteered to participate in an 8-week, group treatment program. Participants were eligible for this study if they 1) were 18 or older; 2) met ≥ 3 DSM-5 criteria for video game addiction; 3) were not receiving mental health services elsewhere at the time of recruitment; 4) did not meet DSM-5 criteria for schizophrenia or bipolar disorder; and 5) were not suicidal or homicidal.

Students who were enrolled at, and employees who worked at, a large public university in the Southeast United States were recruited. A recruitment email was distributed via the university LISTSERV to over 10,000 undergraduate and graduate students, and university employees once a week between May and September, 2015. A brief questionnaire for initial eligibility screening was developed using Qualtrics (Qualtrics, 2015), and the link to the online screening questionnaire was embedded in the recruitment email. The screening questionnaire included nine questions about DSM-5 criteria assessing video game addiction, four open-ended questions asking about respondents' patterns of video gaming behaviors, and one question asking about respondents' willingness to participate in a treatment program for video game addiction. Potential participants who 1) responded to the recruitment email by completing the online screening questionnaire, 2) met ≥ 3 DSM-5 criteria for video game addiction, and 3) expressed willingness to participate in the treatment program, were scheduled for individual interviews to further assess if they met study eligibility criteria.

Over the course of 4 months, 248 people responded to the recruitment email by logging onto the online screening questionnaire (the link to the questionnaire was embedded in the recruitment email). Thirty were eligible for study participation, provided informed consent, and were randomly assigned to MORE or SG intervention. Of the 30 participants, 29 completed pre- and posttreatment assessments and were included in intent-to-treat (ITT) analyses. Figure 3.1 presents the CONSORT flowchart (Rennie, 2001).

Figure 3.1. CONSORT diagram for sampling and recruitment protocol for Mindfulness-Oriented Recovery Enhancement randomized controlled trial (ITT: intent-to-treat).



Procedures

Following a preliminary screening for eligibility using the online screening questionnaire, I scheduled individual interviews with potential participants to explain the study, further screen for study eligibility, and obtain informed consent. After providing informed consent, participants completed a paper-and-pencil questionnaire that included all outcome and sociodemographic measures.

After completing baseline interviews with all prospective participants, enrolled participants were randomized to MORE or SG conditions. To eliminate experimenter bias in group assignment, randomization was performed by a research team member who did not participate in the recruitment and baseline interview. A matched pairs design was used for randomization to ensure an equal number of participants in each study condition (Shadish, Cook, & Campbell, 2002). Moreover, a matched pairs design allowed us to control for gender and level of video game addiction at baseline when participants were assigned to MORE and SG conditions. Participants were grouped into pairs based on their gender and number of DSM-5 criteria for video game addiction they met at pretreatment assessment. Within each pair, participants were randomly assigned to one of the study conditions by the selected research team member flipping a coin. To minimize differences in participants' treatment expectancies, the experimental interventions (i.e., MORE and SG) were described to participants as two group-based interventions that have not previously been examined with regard to their ability to help persons with video game addiction. The intent was to prevent participants from knowing which intervention the research team hypothesized was more likely to improve symptoms.

Following completion of the MORE and SG interventions, participants completed a questionnaire including the same outcome measures that were administered at pretreatment.

Participants completed the posttreatment assessment via pencil-and-paper format ($n = 1$) or online survey ($n = 28$). An email including a link to the online survey was distributed to participants who preferred completing the posttreatment assessment online. Study procedures and consent forms were reviewed and approved by the Institutional Review Board of the University of North Carolina at Chapel Hill.

Treatment condition. The protocol for the treatment condition was adapted from Mindfulness-Oriented Recovery Enhancement (MORE), a manualized treatment that combines mindfulness-based cognitive therapy with group discussion and skill practice that specifically addresses addictions and co-occurring mental distress (Garland, 2013). MORE was modified to address symptoms of video game addiction by the research team. The modified sessions involved 1) gaining awareness of video game addiction, and automaticity and coping habits; 2) learning positive coping strategies with negative affective states through the practice of mindful reappraisal; 3) refocusing attention away from video game-related triggers and life stressors to savoring pleasant experiences through the practice of re-orienting and mindful savoring; 4) increasing awareness of craving and learning positive strategies to cope with craving; 5) enhancing stress management through the practice of mindful relaxation and stress reduction; 6) promoting acceptance of, rather than suppression of, unwanted thoughts and distressing experiences; 7) decreasing stress from interpersonal relationships through the practice of loving-kindness meditation; and 8) developing a mindful recovery plan (see paper II for a detailed description of each MORE session).

MORE treatment consisted of 8-weekly, 2-hour group sessions. Two MORE treatment groups were conducted on campus between September and November, 2015. Each group included 7 to 8 participants. MORE groups were led by a licensed Master's-level social worker

who was trained in delivering MORE and had intensive experience in leading MORE groups for individuals with substance use disorders. In addition to attending each group session, participants were asked to practice mindfulness breathing and body scan exercises at home guided by a MP3 audio file developed by Dr. Eric L. Garland (i.e., the developer of MORE). Participants were also asked to log the amount of time they spent on mindfulness practice and video game playing daily. Daily logs were examined by group facilitators and discussed during group sessions.

Control condition. A SG facilitated by a licensed Master's-level social worker was the control condition. The SG condition matched the MORE condition with respect to frequency (i.e., 8-weekly sessions) and duration (i.e., 2-hours) of sessions. Two SG were conducted on campus between September and November, 2015. Each group included 7 to 8 individuals. The group facilitator of the SG had intensive experience in leading SGs for individuals with substance misuse problems and was not trained in MORE. SG was selected as the control condition because it allowed for control of components including group discussion, a group facilitator, and a structure similar to the MORE treatment without therapeutic components related to mindfulness practice, cognitive or behaviorally-based treatment, and motivational interviewing skills.

SG sessions focused on specific pre-designated topics and involved open group discussions about participants' experiences with, or reactions to, each topic. Session topics included 1) an overview of video game addiction, 2) thoughts and feelings related to pathological video game playing, 3) experiences of craving for video game playing and possible triggers, 4) identity and video game playing, 5) playing video games to cope with stress, 6) interpersonal relationships and video game playing, 7) positive and alternative coping strategies, and 8) review of the group experience. During each session, the group facilitator raised topics for discussion,

used reflective listening techniques, and elicited interactions of group members without providing didactic information, behavioral prescriptions, or other advice. If participants asked the group facilitator a direct question about how to manage their video gaming behaviors, the group facilitator redirected the question to the group and urged participants to share their own experiences and solutions with one another.

To enhance fidelity, all MORE and SG sessions were videotaped and reviewed by the research team the following day to monitor therapist adherence to the MORE and SG treatment protocols via a fidelity checklist. In addition, facilitators of the MORE and SG conditions completed the same checklist after each session and evaluated their fidelity to the respective treatment protocols. Clinical supervision was provided by Dr. Eric L. Garland (i.e., the developer of MORE) when deviations were noted or questions were raised. Any deviations or questions raised by group facilitators were discussed during clinical supervision and corrected by facilitators in the following group sessions. No major deviations (e.g., proscribed behaviors) were noted in the MORE and SG conditions.

Variables and Measures

Video game addiction. Video game addiction was assessed using DSM-5 criteria for Internet Gaming Disorder. DSM-5 criteria consist of nine questions that assess whether (yes or no) an individual evidences signs and symptoms of a) preoccupation, b) tolerance, c) withdrawal symptoms, d) repeated unsuccessful attempts to reduce or stop playing Internet games, e) continued Internet game playing despite negative consequences, f) loss of other hobbies and interests due to Internet game playing, g) use of Internet games to cope with negative feelings and moods, h) lying to others about the extent of his or her Internet game usage, and i) impairment of psychosocial functioning due to Internet video gaming behaviors (APA, 2013).

Individuals answering “yes” to 5 or more questions met criteria for Internet Gaming Disorder (APA, 2013). DSM-5 criteria effectively discriminate individuals with current Internet Gaming Disorder from individuals remitted from Internet Gaming Disorder (Ko et al., 2014). To assess participants’ video game addiction (including playing video games online and offline), I adapted DSM-5 criteria to measure signs and symptoms of video game playing rather than solely Internet gaming by replacing the phrases “Internet gaming” or “Internet games” with “video gaming” or “video games” in each item. A recent study of video game addiction among Dutch youth and adults reported that the modified DSM-5 criteria for video game addiction had an internal consistency of .93. The number of modified DSM-5 criteria participants met was significantly positively associated with time spent playing video games, and level of loneliness and aggression; and significantly negatively associated with measures of prosocial behavior and life satisfaction (Lemmens, Valkenburg, & Gentile, 2015).

Video game addiction was also measured using the Video Game Addiction Scale (VGAS). The VGAS consists of 21 items rated on a 5-point Likert-type scale, with a response format ranging from 1 (never) to 5 (very often) (Lemmens, Valkenburg, & Peter, 2009). The VGAS is based on DSM-IV-TR criteria for substance dependence and assesses signs and symptoms of video game addiction, including salience, tolerance, mood modification, relapse, withdrawal, conflict with other people due to gaming, and physical and psychosocial problems due to excessive video game playing. A higher score indicates greater severity of video game addiction. Previous studies reported that the VGAS had internal consistency reliabilities of .94 (Lemmens et al., 2009) among Dutch youth. We used modified DSM-5 video gaming criteria and the VGAS to strengthen the validity of our results through data triangulation.

Video gaming-related maladaptive cognitions. Video gaming-related maladaptive cognitions (e.g., “I am only loved by others in the video games.”) were measured with the Online Cognition Scale (OCS). The OCS was originally developed to measure maladaptive cognitions associated with Internet activities (Davis, Flett, & Besser, 2002). The OCS is a 36-item, 7-point Likert-type scale, with a response format ranging from 1 (not true) to 7 (very true). The OCS includes four subscales that assess individuals’ cognitions related to their Internet use, including feelings of loneliness and depression, diminished impulse control, preferring socialization on the Internet to socialization in the real-world, and distraction. A higher score indicates a higher level of maladaptive cognitions related to Internet use (Davis et al., 2002). Previous studies reported that the OCS had internal consistency reliability of .94 among college student sample (Davis et al., 2002). Internal consistency reliabilities for the four subscales ranged from .77 (loneliness/depression) to .87 (social comfort). In addition, OCS scores were significantly positively correlated with the extent to which students engaged in online gaming (Jia & Jia, 2009). In this study, we adapted the OCS to measure maladaptive cognitions related to video game playing by replacing the phrases “Internet” and “Internet use” with “video games” and “playing video games” in each OCS item.

Craving for video game playing. The level of craving for video game playing was measured with a Visual Analog Scale (VAS) anchored on a 10-point scale (1 = *not at all*, 10 = *extremely*). The VAS has demonstrated construct and concurrent validity as a measure of craving for tobacco and cocaine (Lee, Brown, Perantie, & Bobadilla, 2002; Wewers, Rachfal, & Ahijevych, 1990), and was adapted to assess level of craving for video game playing.

Stress. Stress was measured with the 12-item Perceived Stress Scale (PSS). PSS items were rated on a 5-point Likert-type scale, with response options ranging from 0 (never) to 4

(very often). The PSS measures the degree to which participants find their lives unpredictable, uncontrollable, and overwhelming in the past month (Wickrama et al., 2013). A higher score indicates a greater level of perceived stress (Wickrama et al., 2013). Previous studies reported that the PSS had internal consistency reliabilities of $> .80$ and a test-retest reliability of $.85$ among samples of university students (Cohen et al., 1983; Myers et al., 2012).

Psychiatric distress. Psychiatric distress was measured with the 18-item Brief Symptom Inventory (BSI-18; Derogatis, 2000). Participants reported the extent to which they were distressed by each of 18 affective symptoms (e.g., “nervousness or shakiness inside” and “feeling no interest in things”) in the past week on a 5-point Likert Scale, with response options ranging from 1 (not at all) to 5 (extremely). Previous studies reported that the BSI-18 had internal consistency reliabilities of $.85$, and test-retest reliabilities of $.91$ (Derogatis & Melisaratos, 1983).

Cognitive coping. Use of cognitive coping strategies for coping with negative affective states and emotion regulation was measured with the Cognitive Emotion Regulation Questionnaire (CERQ). The CERQ is a multidimensional questionnaire that identifies the extent to which different cognitive strategies are employed to cope with negative life events, including 1) self-blame, 2) acceptance, 3) rumination, 4) positive refocusing, 5) refocusing on planning, 6) positive reappraisal, 7) putting into perspective, 8) catastrophizing, and 9) blaming others (Garnefski, Kraaij, & Spinhoven, 2001). The CERQ consists of 9 subscales with 36 items rated on a 5-point Likert-type scale, with response options ranging from 1 (almost never) to 5 (almost always). Subscale scores are obtained by summing up the scores of items belonging to the particular subscale. A higher subscale score indicates that a specific cognitive strategy is used more frequently (Garnefski et al., 2001). The CERQ subscales had an internal consistency reliability of $.87$ in a general adult population sample (Garnefski & Kraaij, 2007); and the CERQ

score was significantly positively correlated with the depression and anxiety subscales of the Symptom Checklist-90-R (Garnefski & Kraaij, 2007).

Mindfulness. Mindfulness was measured using the Five Facet Mindfulness Questionnaire (FFMQ). The FFMQ measures five aspects of mindfulness, including 1) nonreactivity to inner experience, 2) observing and attending to experiences, 3) describing and discriminating emotional experiences, 4) nonjudging of experience, and 5) acting with awareness (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The FFMQ consists of 39 items rated on a 5-point Likert-type scale, with response options ranging from 1 (never/very rarely true) to 5 (very often/always true). A higher total score indicates a greater level of mindfulness. The scores of individual subscales are obtained by summing up the scores of items belonging to the particular subscale. A higher subscale score indicates a higher level of a specific aspect of mindfulness. Internal consistency reliabilities of the FFMQ in samples of meditators and non-meditators ranged from .72 to .93 (Baer et al., 2006, 2008; Christopher, Neuser, Michael, & Baitmangalkar, 2012). Specifically, the FFMQ had good internal consistency reliabilities for the five subscales ranging from .75 (nonreactivity subscale) to .91 (describing subscale) in a sample of university students who were not meditators; the FFMQ score was significantly positively correlated with meditation experience and significantly negatively correlated with psychological symptoms (Baer et al., 2008).

Data Analyses

Descriptive analyses were performed on all sociodemographic and outcome variables to describe the sample characteristics and participants' levels of video game addiction and secondary outcomes (e.g., perceived stress, mindfulness) at pretreatment assessment. Bivariate tests (i.e., independent t-tests and chi-square tests) were conducted on sociodemographic and

outcome variables to examine the adequacy of randomization. Intent-to-treat (ITT) analyses were used for outcome assessments. ITT analyses include every participant who was randomized according to initial treatment assignment and intend to avoid any misleading artifacts associated with non-random attrition of participants from the study (Gupta, 2011). Estimates of treatment effects are generally conservative using ITT analyses (Gupta, 2011). In this study, ITT analyses were conducted to statistically account for all participants who completed both pre-and posttreatment assessment regardless of whether the assigned treatment was fully received. Twenty-nine participants completed pre-and posttreatment assessments and included in outcome analyses; and one person in the control condition was lost to posttreatment assessment and excluded from outcome analyses.

Pairwise t-tests were conducted on all outcome variables to explore pre-to-posttreatment changes in scores on standardized measures for video game addiction and secondary outcomes (i.e., video gaming-related maladaptive cognitions, craving for video game playing, perceived stress, psychiatric distress, use of positive cognitive coping strategies, and mindfulness) as a result of MORE and SG, respectively. Within-group effect sizes were computed using Hedges' *g* (i.e., standardized mean differences between pre-and posttreatment values on outcome variables). Compared to Cohen's *d*, Hedges' *g* allows a correction for bias due to a small sample size (Hedges, 1981). The magnitude of Hedges' *g* was interpreted using Cohen's description of .20 as small, .50 as medium, and .80 as large (Cohen, 1988).

Analysis of covariance (ANCOVA) was used to test the hypotheses that participants who received the MORE treatment had significantly greater reductions in DSM-5 signs and symptoms of video game addiction, craving for video game playing, gaming-related maladaptive cognitions, perceived stress, psychiatric distress, and significantly greater enhancements in

positive cognitive coping and mindfulness at posttreatment, compared to SG participants. In ANCOVA models, posttreatment values of outcome variables were regressed on treatment assignment (MORE [coded as 1] vs. SG [coded as 0]) controlling for pretreatment values of outcome variables. Controlling for pretreatment values of outcome variables ensured that comparisons of posttreatment outcomes between treatment and control conditions were independent of baseline differences on pretreatment values of outcomes and allowed a test for net treatment effects of MORE compared to SG (Frisson & Pocock, 1992). Moreover, all ANCOVA models used participants' age and age at which they first recognized having a problem with excessive video game playing as covariates, because independent t-tests indicated statistically significant group differences in these variables at pretreatment. Effect sizes of MORE vs. SG on treatment outcomes were computed using Hedges' *g* (i.e., standardized mean differences between treatment and control conditions on outcome variables at posttreatment). All models were evaluated using two-tailed tests, and the statistical significance level was set at .05. Stata 14.0 was employed for data analyses (StataCorp, 2015).

Results

Descriptive Results

Table 3.1 presents participants' sociodemographic information and their responses to pretreatment measures. The average age of the sample ($N = 30$) was 25 ($SD = 5.4$), with a range of 18 to 35. A majority of the sample (80%, $n = 24$) was men, 16.7% ($n = 5$) were women, and 3.3% ($n = 1$) identified as neither male nor female. More than half of the sample (53.3%, $n = 16$) identified as White, whereas 30.0% ($n = 9$) were Asian, 6.7% ($n = 2$) were African American, 3.3% ($n = 1$) were Hispanic, and 6.7% ($n = 2$) identified as other. Approximately 36.6% ($n = 11$) of the sample were undergraduates, 46.7% ($n = 14$) were graduate students, and 16.7% ($n = 5$)

were university employees. Students represented 16 academic majors (e.g., chemistry, computer science, and business) in the university.

Table 3.1
Sample Characteristics and Participants' Responses on Pretreatment Measures

	Overall Sample (<i>N</i> = 30)	MORE (<i>n</i> = 15)	SG (<i>n</i> = 15)
Age: <i>M</i> (<i>SD</i>)	25.0 (5.4)	22.2 (3.8) *	27.8 (5.5) *
Gender: % (<i>N</i>)			
Male	80% (24)	93.3% (14)	66.7% (10)
Female	16.7% (5)	6.7% (1)	26.7% (4)
Other*	3.3% (1)	0% (0)	6.7% (1)
Race: % (<i>N</i>)			
White	53.3% (16)	53.3% (8)	53.3% (8)
African American	6.7% (2)	6.7% (1)	6.7% (1)
Asian	30.0% (9)	26.7% (4)	33.3% (5)
Hispanic	3.3% (1)	6.7% (1)	0% (0)
Other *	6.7% (2)	6.7% (1)	6.7% (1)
School/work: % (<i>N</i>)			
Undergraduate students	36.7% (11)	53.3% (8)	20.0% (3)
Graduate students	46.7% (14)	40.0% (6)	53.3% (8)
Work	16.7% (5)	6.7% (1)	26.7% (4)
Age at which participants first started to play video games: <i>M</i> (<i>SD</i>)	10.7 (5.6)	9.7 (3.3)	11.8 (7.2)
Age at which participants first recognized having a problem with excessive video game playing: <i>M</i> (<i>SD</i>)	19.8 (5.6)	17.1 (4.2) *	22.6 (5.7) *
DSM-5 Criteria for Video Gaming Disorder: <i>M</i> (<i>SD</i>)	5.7 (1.9)	6.0 (1.8)	5.4 (2.0)
Video Game Addiction Scale: <i>M</i> (<i>SD</i>)	62.7 (12.6)	63.3 (13.2)	62.0 (12.5)
Online Cognition Scale: <i>M</i> (<i>SD</i>)	136.2 (34.5)	139.5 (30.4)	132.9 (30.1)
OCS-Diminished Impulse Control	39.3 (10.8)	41.0 (10.1)	37.6 (11.5)
OCS-Distraction	33.8 (8.0)	35.2 (5.1)	32.3 (10.1)
OCS-Preferring Socialization in the Video Games to Socialization in the Real-World	44.3 (14.6)	43.3 (13.2)	45.3 (16.2)
OCS-Feelings of Loneliness/Depression	18.8 (7.0)	20.0 (7.2)	17.7 (6.8)
Visual Analog Scale Assessing Craving: <i>M</i> (<i>SD</i>)	5.2 (2.3)	5.4 (2.4)	4.9 (2.2)
Perceived Stress Scale-12 item: <i>M</i> (<i>SD</i>)	26.3 (5.7)	25.1 (6.0)	27.5 (5.3)
Brief Symptom Inventory-18 item: <i>M</i> (<i>SD</i>)	32.5 (9.6)	32.4 (2.5)	32.7 (9.8)
Cognitive Emotion Regulation Questionnaire (CERQ): <i>M</i> (<i>SD</i>)			
CERQ-Self Blame	14.0 (3.0)	14.7 (2.3)	13.3 (3.4)
CERQ-Acceptance	14.4 (3.1)	15.5 (2.4)	13.8 (3.6)
CERQ-Rumination	14.0 (3.7)	14.7 (3.2)	13.4 (4.2)
CERQ-Positive Refocusing	12.4 (4.7)	12.2 (4.9)	12.7 (4.7)
CERQ-Refocusing on Planning	15.6 (2.8)	15.8 (2.7)	15.4 (3.0)
CERQ-Positive Reappraisal	14.9 (3.3)	15.4 (3.8)	14.3 (2.9)
CERQ-Putting into Perspective	14.4 (3.5)	14.1 (4.0)	14.5 (3.1)
CERQ-Catastrophizing	9.4 (3.6)	9.5 (3.2)	9.4 (4.0)
CERQ-Blame Others	10.2 (3.8)	10.8 (3.6)	9.6 (4.0)

Five Facet Mindfulness Questionnaire (FFMQ): <i>M (SD)</i>	118.6 (14.9)	121.6 (14.6)	115.6 (15.1)
FFMQ-Nonreactivity	21.4 (4.7)	22.5 (4.6)	20.4 (4.7)
FFMQ-Observing	24.3 (5.4)	25.3 (5.9)	23.3 (4.8)
FFMQ-Awareness	23.0 (5.7)	23.5 (1.4)	22.5 (6.3)
FFMQ-Describing	24.2 (7.3)	25.2 (7.0)	23.2 (7.7)
FFMQ-Nonjudgement	25.7 (6.9)	25.1 (6.2)	26.2 (7.7)

Note: DSM-5 Criteria, VGAS, OCS, & VAS: higher scores indicate more severe video game addiction-related signs and symptoms

PSS & BSI: higher scores indicate higher levels of stress and mental distress, respectively

CERQ: the higher the subscale score, the more frequently a specific cognitive strategy is used

FFMQ: higher scores indicate higher levels of mindfulness; the higher the subscale score, the higher the level of a specific aspect of mindfulness

* $p < .05$

* Other: one participant identified as neither male nor female

The age at which participants reported they first started to play video games ranged from 4 to 29, with an average age of 11 ($SD = 5.6$). The age at which participants reported they first thought they had a problem with excessive video game playing ranged from 10 to 33, with an average age of problem onset of 20 ($SD = 5.6$). Approximately 76.6% ($n = 23$) of participants met ≥ 5 DSM-5 criteria for video gaming disorder (i.e., the diagnostic threshold for video game addiction). Another 23.4% ($n = 7$) of participants met 3 or 4 DSM-5 criteria for subthreshold video game addiction. On average, participants met 6 ($SD = 1.9$) DSM-5 criteria for video game addiction. Results of bivariate tests (i.e., independent t-tests and chi-square tests) showed that participants in the MORE group did not differ significantly from their SG counterparts across sociodemographic or outcome variables at pretreatment except for age and age at which they first recognized having a problem with excessive video game playing ($p < .05$). These variables were controlled for in subsequent analyses.

Primary Outcome: Video Game Addiction

Table 3.2 presents pre-to-posttreatment changes in outcomes for participants in the MORE and SG conditions, respectively. Results of pairwise t-tests showed that MORE ($t(14) = 9.38, p < .001$, Hedges' $g = 2.16$) and SG ($t(13) = 2.23, p = .04$, Hedges' $g = .87$) significantly

reduced the number of DSM-5 criteria participants met for video game addiction over the 8-week interventions. Moreover, MORE ($t(14) = 5.18, p < .001$, Hedges' $g = 1.29$) and SG ($t(13) = 3.86, p < .01$, Hedges' $g = 1.09$) significantly reduced participants' Video Game Addiction Scale (VGAS) scores over the 8-week treatment period. In both cases, effect sizes were larger for MORE than SG.

Table 3.3 presents the results of ANCOVA models for all outcome variables. All ANCOVA models regressed posttreatment values of each outcome variable on treatment assignment (MORE [coded as 1] vs. SG [coded as 0]), and included the pretreatment values of outcome variable, participants' age, and age at which they first recognized having a problem with excessive video game playing as covariates. Results revealed a statistically significant effect of treatment assignment (MORE vs. SG) on the number of DSM-5 criteria for video game addiction participants met at posttreatment ($\beta = -2.91, SE = .87, p = .003$, Hedges' $g = .80$), with MORE participants meeting fewer DSM-5 criteria at posttreatment compared to SG participants. That is, results indicated that participants in MORE had a significantly greater reduction in signs and symptoms of video game addiction at posttreatment than SG participants controlling for the pretreatment number of DSM-5 video game addiction criteria they met, participants' age, and age at which they first recognized having a problem with excessive video game playing. No between-group differences were observed in VGAS scores.

Secondary Outcomes

Video gaming-related maladaptive cognitions. Results of pairwise t-tests showed that MORE significantly reduced participants' video gaming-related maladaptive cognitions measured with Online Cognition Scale (OCS; $t(14) = 3.69, p = .002$, Hedges' $g = .93$), OCS-Diminished Impulse Control subscale scores ($t(14) = 3.38, p = .005$, Hedges' $g = .95$), OCS-

Distraction subscale scores ($t(14) = 2.19, p = .046$, Hedges' $g = .77$), and OCS-Feelings of Loneliness and Depression subscale scores ($t(14) = 4.25, p = .001$, Hedges' $g = 1.01$) at posttreatment. The ANCOVA analysis of the OCS-Feelings of Loneliness and Depression subscale revealed a statistically significant effects of treatment assignment (MORE vs. SG) ($\beta = -7.11, SE = 2.31, p = .005$, Hedges' $g = .38$). MORE participants showed lower levels of negative feelings (e.g., loneliness and depression) related to their video game playing than SG participants at posttreatment. No other between-group differences were observed in scores on the OCS and other OCS subscales.

Craving for video game playing. Results of the ANCOVA analysis of scores on the Visual Analog Scale (VAS) measuring craving for video game playing indicated a statistically significant effect of treatment assignment (MORE vs. SG) on craving for video game playing ($\beta = -1.80, SE = .78, p = .03$, Hedges' $g = .42$). MORE participants showed lower levels of craving for video game playing at posttreatment compared to SG participants.

Positive cognitive coping. The ANCOVA analysis of the Cognitive Emotional Regulation Questionnaire (CERQ) - Putting into Perspective subscale revealed a statistically significant effect of treatment assignment (MORE vs. SG) ($\beta = 4.32, SE = 1.38, p = .005$, Hedges' $g = .61$). MORE participants showed higher levels of using a specific positive coping strategy (i.e., downgrading the importance of negative experiences) than did SG participants at posttreatment. No other between-group differences were observed in the remaining CERQ subscales scores.

Nonreactivity to undesired thoughts and emotions. The ANCOVA analysis of the Five Facet Mindfulness Questionnaire (FFMQ) - Nonreactivity subscale revealed a statistical trend of effect of treatment assignment (MORE vs. SG) ($\beta = 3.27, SE = 1.82, p = .08$, Hedges' $g = .36$).

MORE participants showed higher levels of nonreactivity to unwanted thoughts and emotions at posttreatment compared to SG participants. ANCOVA analyses of other FFMQ subscales and the total FFMQ score did not reveal any significant between-group differences at posttreatment ($p > .10$).

Other secondary outcomes. Results of pairwise t-tests indicated that MORE participants had significant pre-to-posttreatment reductions in perceived stress assessed with the Perceived Stress Scale (PSS; ($t(14) = 2.27, p = .04$, Hedges' $g = .59$). However, ANCOVA analyses comparing the PSS and BSI-18 scores at posttreatment of MORE and SG participants did not find any significant between-group differences in perceived stress ($\beta = -2.88, SE = 2.79, p = .31$, Hedges' $g = -.12$), or mental distress stress ($\beta = -.27, SE = 6.63, p = .97$, Hedges' $g = .30$) at posttreatment.

Table 3.2
Outcomes as a Function of Treatment and Time of Measurement: Intention-to-Treat Analyses

Outcome	MORE ($n = 15$)			SG ($n = 14$)		
	Pre	Post	p -value	Pre	Post	p -value
DSM-5 Criteria for Video Gaming Disorder	6.00 (1.81)	2.07 (1.83)	<.001	5.29 (1.98)	3.64 (1.98)	.04
Video Game Addiction Scale (VGAS)	63.33 (13.18)	44.40 (15.25)	<.001	61.79 (12.96)	47.93 (12.65)	.002
Online Cognition Scale (OCS)	139.53 (30.39)	110.07 (31.10)	.002	130.93 (39.72)	115.93 (10.47)	.05
OCS-Diminished Impulse Control	41.00 (10.13)	31.60 (9.03)	.005	37.29 (11.83)	33.00 (11.3)	.22
OCS-Distraction	35.20 (5.07)	29.53 (8.69)	.046	32.00 (10.37)	29.07 (10.1)	.13
OCS-Preferring Socialization in the Video Games to Socialization in the Real-World	43.33 (13.23)	37.53 (13.50)	.055	44.50 (16.45)	40.07 (4.18)	.048
OCS-Feelings of Loneliness/Depression	20.00 (7.22)	13.33 (5.52)	<.001	17.14 (6.70)	15.79 (6.93)	.27
Visual Analog Scale Assessing Craving (VAS)	5.40 (2.41)	4.87 (1.19)	.45	4.79 (2.19)	5.64 (2.27)	.30
Perceived Stress Scale-12 item (PSS)	25.13 (5.97)	21.13 (7.21)	.04	27.43 (5.47)	20.36 (4.86)	.005
Brief Symptom Inventory-18 item (BSI)	32.40 (9.85)	30.07 (13.77)	.57	32.21 (9.98)	34.57 (15.52)	.60

Cognitive Emotion Regulation Questionnaire
(CERQ)

CERQ-Self Blame	14.67 (2.32)	13.93 (4.27)	.48	13.07 (3.41)	11.64 (3.52)	.23
CERQ-Acceptance	15.00 (2.39)	13.27 (2.15)	.004	13.86 (3.78)	11.71 (3.34)	.13
CERQ-Rumination	14.67 (3.24)	13.80 (3.43)	.48	13.50 (4.29)	10.29 (4.21)	.06
CERQ-Positive Refocusing	12.20 (4.92)	11.93 (3.08)	.85	12.93 (4.76)	12.79 (3.96)	.92
CERQ-Refocusing on Planning	15.80 (2.70)	16.60 (2.32)	.27	15.57 (3.08)	15.21 (3.19)	.78
CERQ-Positive Reappraisal	15.40 (3.78)	16.07 (3.39)	.37	14.50 (2.90)	15.00 (3.62)	.73
CERQ-Putting into Perspective	14.13 (3.96)	15.67 (2.94)	.13	14.79 (2.94)	13.50 (3.96)	.23
CERQ-Catastrophizing	9.47 (3.20)	10.00 (4.29)	.62	9.00 (3.88)	8.14 (3.46)	.39
CERQ-Blame Others	10.80 (3.65)	9.60 (2.80)	.16	9.57 (4.18)	9.57 (4.67)	1.0
Five Facet Mindfulness Questionnaire (FFMQ)	121.60 (14.58)	119.80 (14.10)	.68	116.57 (15.21)	121.29 (12.19)	.38
FFMQ-Nonreactivity	22.46 (4.56)	21.13 (3.56)	.25	20.64 (4.83)	19.71 (4.14)	.60
FFMQ-Observing	25.33 (5.90)	24.93 (6.55)	.73	23.36 (4.99)	24.64 (4.20)	.27
FFMQ-Awareness	23.47 (5.34)	24.13 (4.03)	.57	22.57 (6.49)	24.21 (4.53)	.27
FFMQ-Describing	25.20 (6.97)	24.60 (6.70)	.55	23.57 (7.82)	25.50 (4.15)	.40
FFMQ-Nonjudgement	25.13 (6.23)	25.00 (5.92)	.94	26.42 (7.99)	27.21 (7.08)	.54

Note: Data are given as *M (SD)*

DSM-5 Criteria, VGAS, OCS, & VAS: higher scores indicate more severe video game addiction-related signs and symptoms

PSS & BSI: higher scores indicate higher levels of stress and mental distress, respectively

CERQ: the higher the subscale score, the more frequently a specific cognitive strategy is used

FFMQ: higher scores indicate higher levels of mindfulness; the higher the subscale score, the higher the level of specific aspect of mindfulness

Table 3.3 *Predictors of Posttreatment Outcomes Controlling for Pretreatment Assessment Scores, Age, and Age at Which Participants First Recognized They Had a Problem with Video Game Playing*

Outcome Variable	Coefficient (S.E.)				
	MORE vs. SG assignment	Pretreatment assessment scores	Age	Age participants first recognized they had problems with video game playing	Intercept
DSM-5 Criteria for Video Gaming Disorder	-2.91 (0.87)**	.26 (.20)	-.22 (.12)	.09 (.10)*	6.82 (2.81)*
Video Game Addiction Scale	1.87 (6.00)	.73 (.23)**	.56 (.85)	.23 (.70)	-20.28 (29.19)
Online Cognition Scale (OCS)	-18.00 (14.47)	.60 (.21)*	-.81 (1.81)	.06 (1.69)	65.59 (62.03)
OCS-Diminished Impulse Control	-6.48 (4.85)	.19 (.21)	-.26 (.63)	-.29 (.56)	40.92 (18.77)*
OCS-Distraction	-1.19 (4.15)	.55 (.23)*	.32 (.55)	-.21 (.46)	7.86 (17.01)
OCS-Preferring Socialization in the Video Games to Socialization in the Real-World	-2.10 (4.89)	.77 (.15)***	-.19 (.61)	.23 (.56)	6.33 (17.27)
OCS-Feelings of Loneliness/Depression	-7.11 (2.31)**	.47 (.17)*	-.57 (.29)+	.16 (.28)	21.12 (9.43)*
Visual Analog Scale Assessing Craving	-1.80 (0.78)*	-.11 (.14)	-.07 (.10)	-.04 (.09)	9.48 (2.38)**
Perceived Stress Scale-12 item	-2.88 (2.79)	.27 (.19)	-.77 (.36)*	.28 (.31)	29.35 (9.33)**
Brief Symptom Inventory-18 item	-2.27 (6.63)	.31 (.26)	-.52 (.87)	1.04 (.74)	13.55 (21.00)
Cognitive Emotion Regulation Questionnaire (CERQ)					
CERQ-Self Blame	.74 (1.80)	.46 (.25)+	-.21 (.24)	.21 (.20)	7.67 (6.31)
CERQ-Acceptance	.17 (1.02)	.47 (.14)**	-.01 (.13)	.01 (.12)	6.23 (3.55)+
CERQ-Rumination	-.59 (1.51)	.01 (.16)	-.63 (.20)**	.11 (.17)	26.17 (4.70)***
CERQ-Positive Refocusing	-.41 (1.64)	.27 (.14)+	.16 (.22)	-.04 (.18)	6.30 (4.99)
CERQ-Refocusing on Planning	.94 (1.14)	.26 (.16)	.07 (.15)	-.03 (.13)	10.38 (3.59)**
CERQ-Positive Reappraisal	1.51 (1.44)	.30 (.17)	.34 (.19)+	-.14 (.15)	4.83 (3.74)
CERQ-Putting into Perspective	4.32 (1.38)**	.50 (.16)**	.22 (.18)	.14 (.15)	-2.92 (4.46)
CERQ-Catastrophizing	1.27 (1.67)	.54 (.19)**	.27 (.22)	-.32 (.19)	2.97 (5.20)
CERQ-Blame Others	-.62 (1.42)	.59 (.17)**	.22 (.20)	-.16 (.18)*	1.69 (4.31)
Five Facet Mindfulness Questionnaire (FFMQ)	1.70 (6.88)	.18 (.20)	.79 (.90)	-.32 (.76)	83.95 (27.35)**
FFMQ-Nonreactivity	3.27 (1.82)+	.18 (.16)	.15 (.23)	.06 (.18)	9.44 (4.63)+
FFMQ-Observing	-1.31 (1.93)	.72 (.14)***	-.21 (.25)	.12 (.22)	10.55 (6.37)
FFMQ-Awareness	-.57 (1.88)	.37 (.14)*	-.14 (.24)	.16 (.22)	16.17 (5.30)**
FFMQ-Describing	.61 (2.27)	.46 (.12)**	.54 (.30)+	-.32 (.25)	5.75 (7.20)
FFMQ-Nonjudgement	-.94 (2.69)	.49 (.16)**	.25 (.35)	-.11 (.30)	9.95 (8.66)

Note: + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ for the regression coefficients

DSM-5 Criteria, VGAS, OCS, & VAS: higher scores indicate more severe video game addiction-related signs and symptoms; PSS & BSI: higher scores indicate higher levels of stress and mental distress, respectively; CERQ: the higher the subscale score, the more frequently a specific cognitive strategy is used; FFMQ: higher scores indicate higher levels of mindfulness; the higher the subscale score, the higher the level of a specific aspect of mindfulness

Discussion

This RCT was the first attempt to adapt and evaluate a manualized mindfulness intervention (i.e., MORE) to treat video game addiction among emerging adults. The 8-week MORE treatment was effective in reducing signs and symptoms of video game addiction. Results also suggested that MORE might address cognitive mechanisms implicated in automatic video gaming behaviors as responses to stress and negative affective states. MORE participants had a significantly greater reduction in signs and symptoms of video game addiction over the 8-week intervention compared to SG participants. Moreover, compared to SG participants, MORE participants had significantly greater reductions in craving for video game playing and negative feelings (e.g., loneliness and depression) related to video game playing, and a significantly greater increase in positive cognitive coping.

Although MORE and SG interventions significantly reduced signs and symptoms of video game addiction over the 8-week interventions, MORE reduced signs and symptoms of video game addiction to a significantly greater degree compared to SG, with a large effect size. Our findings suggest that MORE is a promising approach to treating video game addiction. MORE treatment might cultivate participants' metacognitive awareness of urges and automatic habits of video game playing, thereby enabling an interruption of the cycle by using learned positive coping strategies (e.g., urge surfing and mindful breathing techniques). In addition to alleviating signs and symptoms of video game addiction, MORE appeared to effectively target underlying risk factors for video game addiction, including craving for video game playing, thought suppression, lack of positive cognitive coping strategies, video gaming-related maladaptive cognitions, and perceived stress.

This study assessed participants' changes in craving for video game playing as a result of MORE treatment. Compared to SG, MORE participants had a significantly greater decrease in craving for video game playing at the end of the 8-week intervention with a moderate effect size. MORE treatment might reduce craving for video game playing by enhancing participants' attention to triggers and the presence of urges, and teaching skills to cope with craving through mindfulness practice. Specifically, mindfulness training could facilitate participants' metacognitive awareness of their craving experience through the practice of mindfulness to deconstruct the experience into sensorial, affective, and cognitive subcomponents (Garland et al., 2014a). Once participants became aware of urges for video game playing, they could pause, step back, and not react to the urge using learned mindfulness techniques and let the urge pass by. MORE may have taught participants to disengage their attention from gaming-related urges and to reorient their attention to the sensation of breathing or other health-promoting stimuli using techniques such as mindful breathing and body scan exercises (Garland, 2014). Previous studies have documented mechanisms by which mindfulness training reduced craving for addictive behaviors through cultivating awareness and acceptance of, and nonreactivity to craving without engaging in addictive responses (Garland, 2014; Garland et al., 2014; 2016; Witkiewitz, Bowen, Douglas, & Hsu, 2013). We did not have adequate statistical power to further assess potential treatment mechanisms in this study. Future studies should examine the temporally-ordered and causal relationships among mindfulness practice, craving for video game playing, and enhancement of awareness and acceptance of craving, and nonreactivity to craving.

We found that MORE reduced participants' craving for video game playing; however, SG actually increased participants' craving for video game playing over the course of the intervention. Possible explanations are that SG raised participants' awareness of the process of

craving without providing any therapy to help them cope with craving. Specifically, SG increased participants' attention to their urges for video game playing, and factors that might trigger their urges for video game playing (e.g., stress from work/school work, negative emotions, and interpersonal conflicts) through group discussion. Increased attention to triggers and the presence of urges might have intensified participants' craving for video game playing (Tiffany & Conklin, 2000). Consequently, participants' craving for video game playing might be even stronger when they have tried to resist or suppress an overwhelming compulsion to play video games (Garland et al., 2011; Tiffany & Conklin, 2000).

This study found that MORE increased participants' positive cognitive coping measured with the Cognitive Emotion Regulation Questionnaire (CERQ)-Putting into Perspective subscale to a significantly greater degree at posttreatment compared to SG. This finding suggests that MORE was effective in helping participants employ positive cognitive coping by devaluing the importance of negative experiences. A previous study showed that MORE significantly increased participants' CERQ-Positive Reappraisal scores to a greater degree compared to SG (Garland, Manusov, et al., 2014). We did not observe significant between-group differences at posttreatment on other CERQ subscales. Studies are needed to explore effects of MORE on improving cognitive reappraisal when treating video game addiction.

Improvements in positive cognitive coping could lead to better regulation of emotions and video gaming-related maladaptive cognitions. In this study, we found that MORE significantly reduced participants' feelings of loneliness and depression related to their video game playing to a greater level compared to SG. Video gaming-related maladaptive cognitions refer to false and irrational beliefs about oneself in the video games (e.g., "I am worthless in the real world, but people think I am awesome in the video games"), and people may cope with such

maladaptive cognitions by engaging in video game playing (Hilgard et al., 2013; Kuss, Louws, & Wiers, 2012; Peng & Liu, 2010). Video games could facilitate possibilities for competition allowing players to challenge and dominate others, and achievement by advancing in the game (e.g., progressing via leveling up), acquiring admiration and reputation, and obtaining financial profit (King, Delfabbro, & Griffiths, 2010; Wood, Griffiths, Chappell, & Davies, 2004). These game structural characters allow players to achieve empowerment, mastery, control, recognition, and completion, and escape from negative emotions and feelings when playing video games (Hilgard et al., 2013; Kuss et al., 2012; Yee, 2006). These perceived outcome expectancies of video game playing (e.g., escapism and feeling of achievement) result in and reinforce video gaming-related maladaptive cognitions, and motivate players to engage in problematic gaming behaviors (Wood et al., 2004). Therefore, a decrease in maladaptive cognitions could attenuate participants' motivations to play video games as a palliative coping strategy for stressful events and negative affective states.

Limitations and Conclusion

Study limitations include the small sample size and single site location of the RCT. Although a small sample may be appropriate for a pilot test, the sample size limited statistical power to detect significant changes in some secondary outcomes (e.g., mindfulness and psychiatric distress) among participants. Further, participants were recruited from one university. The single study site may limit generalizability of findings to other emerging adult populations. Future studies are needed to replicate findings with larger samples from different settings.

Also, use of self-report measures of signs and symptoms of video game addiction, and craving for video game playing could limit the validity of study results. Different from substance use that could be assessed using biological measures (e.g., urinalysis and breathalyzer), self-

report measures are the only type of assessment that can be used for problematic video gaming behaviors. However, collateral information from clinical interviews and standardized measurements may strengthen the validity of results regarding treatment outcomes. Future studies should explore participants' perspectives regarding treatment outcomes using qualitative interviews. Participants' self-reflections and qualitative responses regarding their own perceived changes as a result of MORE can help to contextualize current findings. Additionally, in this study, the observed clinical outcomes were measured immediately after 8-week interventions. The duration of therapeutic benefits is unclear and needs to be explored with follow-up assessments. To that end, we plan to collect assessment data at 3-month follow-up to explore the duration of treatment outcomes.

Although only one participant in SG was lost to posttreatment assessment, a substantial number of participants did not complete treatment. The time demands required by study participation, time conflicts between study participation and work/school events, and low incentives for study participation (\$10 for each 2-hour group session) compared to incentives provided by similar studies on campus might have precluded high completion rates. Future studies need to explore strategies to improve intervention adherence among young adults who are not mandated to treatment for video game addiction. Incorporating motivational interviewing components in the MORE treatment program may enhance participants' treatment adherence (Rubak, Sandbæk, Lauritzen, & Christensen, 2005).

Finally, we used ITT analyses to minimize potential biases due to non-random attrition from the study. However, one person in the control condition was lost to posttreatment assessment and excluded from the outcome evaluation. Gupta (2011) suggested that "a better application of the ITT approach is possible if complete outcome data are available for all

randomized subjects” (p.111). Thus, excluding the case that was lost to posttreatment assessment might have introduced bias to our findings regarding outperformance of MORE than SG.

Despite limitations, this RCT was the first attempt to adapt and evaluate a mindfulness intervention for emerging adults who suffer from video game addiction and associated psychosocial problems. This study indicated that MORE was more effective in reducing signs and symptoms of video game addiction, and enhancing positive cognitive coping compared to a SG of emerging adults. Findings from this early-stage RCT demonstrated feasibility and effects of MORE as a treatment for video game addiction. Results also provide an important source of information to guide a larger RCT.

REFERENCES: PAPER III

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
doi:10.1176/appi.books.9780890425596.744053
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27-45.
doi:10.1177/1073191105283504
- Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., ... & Williams, J. M. G. (2008). Construct validity of the Five Facet Mindfulness Questionnaire in meditating and nonmeditating samples. *Assessment*, 15(3), 329-342.
doi:10.1177/1073191107313003
- Beranuy, M., Carbonell, X., & Griffiths, M. D. (2013). A qualitative analysis of online gaming addicts in treatment. *International Journal of Mental Health and Addiction*, 11(2), 149-161. doi:10.1007/s11469-012-9405-2
- Bucktin, C. (2013). *Washington Navy Yard gunman Aaron Alexis heard "voices in head" after playing violent video games up to 18 hours a day*. Retrieved from <http://www.mirror.co.uk/news/world-news/washington-navy-yard-gunman-aaron-2280976>
- Chappell, D., Eatough, V., Davies, M. N., & Griffiths, M. (2006). EverQuest—It's just a computer game right? An interpretative phenomenological analysis of online gaming addiction. *International Journal of Mental Health and Addiction*, 4(3), 205-216.
doi:10.1007/s11469-006-9028-6
- Chiesa, A., & Serretti, A. (2014). Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Substance Use & Misuse*, 49(5), 492-512. doi:10.3109/10826084.2013.770027
- Christopher, M. S., Neuser, N. J., Michael, P. G., & Baitmangalkar, A. (2012). Exploring the psychometric properties of the Five Facet Mindfulness Questionnaire. *Mindfulness*, 3(2), 124-131. doi:10.1007/s12671-011-0086-x
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385-396. doi:10.2307/2136404
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale: Lawrence Erlbaum Associates Inc.
- Cole, H., & Griffiths, M. D. (2007). Social interactions in massively multiplayer online role-playing gamers. *CyberPsychology & Behavior*, 10(4), 575-583.
doi:10.1089/cpb.2007.9988

- Davis, R. A., Flett, G. L., & Besser, A. (2002). Validation of a new scale for measuring problematic Internet use: Implications for pre-employment screening. *CyberPsychology & Behavior*, 5, 331-345. doi:10.1089/109493102760275581
- Decker, S. A., & Gay, J. N. (2011). Cognitive-bias toward gaming-related words and disinhibition in World of Warcraft gamers. *Computers in Human Behavior*, 27(2), 798-810. doi:10.1016/j.chb.2010.11.005
- Derogatis, L. R. (2000). *BSI-18: Administration, scoring, and procedures manual*. Minneapolis, MN: National Computer Systems.
- Derogatis, L. R., & Melisaratos, N. (1983). The Brief Symptom Inventory: An introductory report. *Psychological Medicine*, 13(3), 595-605. doi:10.1017/S0033291700048017
- Dong, G. G., Lu, Q., Zhou, H., & Zhao, X. (2011). Precursor or sequela: Pathological disorders in people with Internet addiction disorder. *PLOS ONE*, 6, e14703. doi:10.1371/journal.pone.0014703
- Ferrie, C. D., De Marco, P., Grunewald, R. A., Giannakodimos, S., & Panayiotopoulos, C. P. (1994). Video game induced seizures. *Journal of Neurology, Neurosurgery & Psychiatry*, 57(8), 925-931. doi:10.1136/jnnp.57.8.925
- Frison, L., & Pocock, S. J. (1992). Repeated measures in clinical trials: Analysis using mean summary statistics and its implications for design. *Statistics in Medicine*, 11, 1685-1704. doi:10.1002/sim.4780111304
- Garland, E. L., Gaylord, S. A., Boettiger, C. A., & Howard, M. O. (2010). Mindfulness training modifies cognitive, affective, and physiological mechanisms implicated in alcohol dependence: Results of a randomized controlled pilot trial. *Journal of Psychoactive Drugs*, 42(2), 177-192. doi:10.1080/02791072.2010.10400690
- Garland, E. L., Gaylord, S. A., & Fredrickson, B. L. (2011). Positive reappraisal mediates the stress-reductive effects of mindfulness: An upward spiral process. *Mindfulness*, 2(1), 59-67. doi:10.1007/s12671-011-0043-8
- Garland, E. L. (2013). *Mindfulness oriented-recovery enhancement for addiction, stress, and pain*. Washington DC: NASW Press.
- Garland, E. L. (2014). Disrupting the downward spiral of chronic pain and opioid addiction with mindfulness-oriented recovery enhancement: A review of clinical outcomes and neurocognitive targets. *Journal of Pain and Palliative Care Pharmacotherapy*, 28(2), 122-129. doi:10.3109/15360288.2014.911791
- Garland, E. L., Froeliger, B., & Howard, M. O. (2014a). Mindfulness training targets neurocognitive mechanisms of addiction at the attention-appraisal-emotion interface. *Frontiers in Psychiatry*, 4, 1-15. doi:10.3389/fpsyt.2013.00173

- Garland, E. L., Froeliger, B., & Howard, M. O. (2014b). Effects of Mindfulness-Oriented Recovery Enhancement on reward responsiveness and opioid cue-reactivity. *Psychopharmacology*, 231(16), 3229-3238. doi:10.1007/s00213-014-3504-7
- Garland, E. L., Manusov, E. G., Froeliger, B., Kelly, A., Williams, J. M., & Howard, M. O. (2014). Mindfulness-oriented recovery enhancement for chronic pain and prescription opioid misuse: Results from an early-stage randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 82(3), 448-459. doi:10.1037/a0035798
- Garland, E. L., Roberts-Lewis, A., Tronnier, C. D., Graves, R., & Kelley, K. (2016). Mindfulness-Oriented Recovery Enhancement versus CBT for co-occurring substance dependence, traumatic stress, and psychiatric disorders: Proximal outcomes from a pragmatic randomized trial. *Behaviour Research and Therapy*, 77, 7-16. doi:10.1016/j.brat.2015.11.012
- Garnefski, N., Kraaij, V., & Spinhoven, P. (2001). Negative life events, cognitive emotion regulation and emotional problems. *Personality and Individual Differences*, 30(8), 1311-1327. doi:10.1016/S0191-8869(00)00113-6
- Garnefski, N., & Kraaij, V. (2007). The cognitive emotion regulation questionnaire. *European Journal of Psychological Assessment*, 23(3), 141-149. doi:10.1027/1015-5759.23.3.141
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, 57(1), 35-43. doi:10.1016/S0022-3999(03)00573-7
- Grüsser, S. M., Thalemann, R., & Griffiths, M. D. (2006). Excessive computer game playing: Evidence for addiction and aggression? *CyberPsychology & Behavior*, 10(2), 290-292. doi:10.1089/cpb.2006.9956
- Gupta, S. K. (2011). Intention-to-treat concept: A review. *Perspectives in Clinical Research*, 2(3), 109-112. doi:10.4103/2229-3485.83221
- Hedges, L. V. (1981). Distribution theory for Glass's estimator of effect size and related estimators. *Journal of Educational and Behavioral Statistics*, 6(2), 107-128. doi:10.3102/10769986006002107
- Hilgar, J., Engelhardt, C. R., & Bartholow, B. D. (2013). Individual differences in motives, preferences, and pathology in video games: The gaming attitudes, motives, and experiences scales (GAMES). *Frontiers in Psychology*, 4, 608. doi:10.3389/fpsyg.2013.00608
- Hofmann, S. G., Sawyer, A. T., Witt, A. A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, 78(2), 169-183. doi:10.1037/a0018555

- Jackson, L. A., von Eye, A., Witt, E. A., Zhao, Y., & Fitzgerald, H. E. (2011). A longitudinal study of the effects of Internet use and videogame playing on academic performance and the roles of gender, race and income in these relationships. *Computers in Human Behavior*, 27(1), 228-239. doi:10.1016/j.chb.2010.08.001
- Jia, R., & Jia, H. H. (2009). Factorial validity of problematic Internet use scales. *Computers in Human Behavior*, 25(6), 1335-1342. doi:10.1016/j.chb.2009.06.004
- Kim, E. J., Namkoong, K., Ku, T., & Kim, S. J. (2008). The relationship between online game addiction and aggression, self-control and narcissistic personality traits. *European Psychiatry*, 23(3), 212-218. doi:10.1016/j.eurpsy.2007.10.010
- King, D., Delfabbro, P., & Griffiths, M. (2010). Video game structural characteristics: A new psychological taxonomy. *International Journal of Mental Health and Addiction*, 8(1), 90-106. doi:10.1007/s11469-009-9206-4
- Ko, C. H., Yen, J. Y., Chen, S. H., Wang, P. W., Chen, C. S., & Yen, C. F. (2014). Evaluation of the diagnostic criteria of Internet gaming disorder in the DSM-5 among young adults in Taiwan. *Journal of Psychiatric Research*, 53, 103-110. doi:10.1016/j.jpsychires.2014.02.008
- Kohn, D. (2002). *Addicted: Suicide over Everquest? Was he obsessed?* Retrieved from <http://www.cbsnews.com/news/addicted-suicide-over-everquest/>
- Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction*, 10, 278-296. doi:10.1007/s11469-011-9318-5
- Kuss, D. J., Louws, J., & Wiers, R. W. (2012). Online gaming addiction? Motives predict addictive play behavior in massively multiplayer online role-playing games. *Cyberpsychology, Behavior, and Social Networking*, 15(9), 480-485. doi:10.1089/cyber.2012.0034
- Lee, J. W., Brown, E. S., Perantie, D. C., & Bobadilla, L. (2002). A comparison of single-item visual analog scales with a multiitem Likert-type scale for assessment of cocaine craving in persons with bipolar disorder. *Addictive Disorders & Their Treatment*, 1(4), 140-142.
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, 12(1), 77-95. doi:10.1080/15213260802669458
- Lemmens, J. S., Valkenburg, P. M., & Gentile, D. A. (2015). The Internet Gaming Disorder Scale. *Psychological Assessment*, 27(2), 567-582. doi:10.1037/pas0000062
- Lenhart, A., Jones, S., & Macgill, A. R. (2008). *Pew Internet project data memo*. Retrieved from http://pewInternet.org/~media/Files/Reports/2008/PIP_Adult_gaming_memo.pdf.pdf

- Li, W., Garland, E. L., & Howard, M. O. (2014). Family factors in Internet addiction among Chinese youth: A systematic review of English- and Chinese- language studies. *Computers in Human Behavior*, 31, 393-411. doi:10.1016/j.chb.2013.11.004
- Li, W., O'Brien, J. E., Snyder, S. E., & Howard, M. O. (2015). Diagnostic criteria for Internet addiction/problematic Internet use among U.S. university students: A mixed-methods evaluation. *PLOS ONE*, 11(1), e0145981. doi:10.1371/journal.pone.0145981
- Lo, S. K., Wang, C. C., & Fang, W. (2005). Physical interpersonal relationships and social anxiety among online game players. *Cyberpsychology & Behavior*, 8, 15-20. doi:10.1089/cpb.2005.8.15
- Myers, S. B., Sweeney, A. C., Popick, V., Wesley, K., Bordfeld, A., & Fingerhut, R. (2012). Self-care practices and perceived stress levels among psychology graduate students. *Training and Education in Professional Psychology*, 6(1), 55-66. doi:10.1037/a0026534
- Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences*, 9(5), 242-249. doi:10.1016/j.tics.2005.03.010
- Peng, W., & Liu, M. (2010). Online gaming dependency: A preliminary study in China. *CyberPsychology, Behavior, and Social Networking*, 13(3), 329-333. doi:10.1089/cyber.2009.0082
- Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H. J., Möble, T., ... & O'Brien, C. P. (2014). An international consensus for assessing Internet Gaming Disorder using the new DSM-5 approach. *Addiction*, 109(9), 1399-1406. doi:10.1111/add.12457
- Qualtrics. (2015). Qualtrics. Utah: Provo. <http://www.qualtrics.com>
- Rennie, D. (2001). CONSORT revised—improving the reporting of randomized trials. *Jama*, 285(15), 2006-2007. doi:10.1001/jama.285.15.2006
- Romer, D., Bagdasarov, Z., & More, E. (2013). Older versus newer media and the well-being of United States youth: Results from a national longitudinal panel. *Journal of Adolescent Health*, 52, 613-619. doi:10.1016/j.jadohealth.2012.11.012
- Rubak, S., Sandbæk, A., Lauritzen, T., & Christensen, B. (2005). Motivational interviewing: A systematic review and meta-analysis. *British Journal of General Practice*, 55, 305-312.
- Sattar, P., & Ramaswamy, S. (2004). Internet gaming addiction. *Canadian Journal of Psychiatry*, 49, 869-870.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston, MA: Houghton Mifflin.

- Smyth, J. M. (2007). Beyond self-selection in video game play: An experimental examination of the consequences of massively multiplayer online role-playing game play. *CyberPsychology & Behavior*, 10(5), 717-721. doi:10.1089/cpb.2007.9963
- StataCorp. (2015). *Stata statistical software: Release 14*. College Station, TX: StataCorp LP.
- Tiffany, S. T., & Conklin, C. A. (2000). A cognitive processing model of alcohol craving and compulsive alcohol use. *Addiction*, 95(8s2), 145-153. doi:10.1046/j.1360-0443.95.8s2.3.x
- Toneatto, T., Pillai, S., & Courtice, E. L. (2014). Mindfulness-enhanced cognitive behavior therapy for problem gambling: A controlled pilot study. *International Journal of Mental Health and Addiction*, 12(2), 197-205. doi:10.1007/s11469-014-9481-6
- U.S. Pew Research Center, Pew Internet & American Life Project. (2012). *College students and technology*. Retrieved from <http://www.pewInternet.org/Reports/2011/College-students-and-technology.aspx>
- Vandelanotte, C., Sugiyama, T., Gardiner, P., & Owen, N. (2009). Associations of leisure-time Internet and computer use with overweight and obesity, physical activity and sedentary behaviors: Cross-sectional study. *Journal of Medical Internet Research*, 11, e28. doi:10.2196/jmir.1084; 10.2196/jmir.1084
- van Holst, R. J., Lemmens, J. S., Valkenburg, P. M., Peter, J., Veltman, D. J., & Goudriaan, A. E. (2012). Attentional bias and disinhibition toward gaming cues are related to problem gaming in male adolescents. *Journal of Adolescent Health*, 50(6), 541-54. doi:10.1016/j.jadohealth.2011.07.006
- Wewers, M. E., Rachfal, C., & Ahijevych, K. (1990). A psychometric evaluation of a visual analogue scale of craving for cigarettes. *Western Journal of Nursing Research*, 12(5), 672-681.
- Wickrama, K. A. S., Ralston, P. A., O'Neal, C. W., Ilich, J. Z., Harris, C. M., Coccia, C., ... & Lemacks, J. (2013). Linking life dissatisfaction to health behaviors of older African Americans through psychological competency and vulnerability. *Research on Aging*, 35(5), 591-611. doi:10.1177/0164027512449473
- Witkiewitz, K., Bowen, S., Douglas, H., & Hsu, S. H. (2013). Mindfulness-based relapse prevention for substance craving. *Addictive Behaviors*, 38(2), 1563-1571. doi:10.1016/j.addbeh.2012.04.001
- Wood, R. T., Griffiths, M. D., Chappell, D., & Davies, M. N. (2004). The structural characteristics of video games: A psycho-structural analysis. *CyberPsychology & Behavior*, 7(1), 1-10. doi:10.1089/109493104322820057
- Yee, N. (2006). Motivations for play in online games. *CyberPsychology & Behavior*, 9(6), 772-775. doi:10.1089/cpb.2006.9.772

- Yen, J., Ko, C., Yen, C., Chen, C., & Chen, C. (2009). The association between harmful alcohol use and Internet addiction among college students: Comparison of personality. *Psychiatry and Clinical Neuroscience*, 63, 218-224. doi:10.1111/j.1440-1819.2009.01943.x
- Zgierska, A., Rabago, D., Chawla, N., Kushner, K., Koehler, R., & Marlatt, A. (2009). Mindfulness meditation for substance use disorders: A systematic review. *Substance Abuse*, 30(4), 266-294. doi:10.1080/08897070903250019

SUMMARY

This three-paper dissertation includes two studies. The first study is a systematic-review and meta-analysis of 49 investigations evaluating effects of mindfulness treatment for substance misuse. The second study is a randomized controlled trial (RCT) evaluating an adapted mindfulness treatment (i.e., Mindfulness-Oriented Recovery Enhancement [MORE]) for video game addiction in emerging adults. This dissertation fills important gaps by 1) conducting meta-analyses to estimate effects of mindfulness treatment for substance misuse compared to alternative treatments; and 2) adapting an evidence-based mindfulness treatment for use in treating video game addiction and evaluating the adapted mindfulness treatment for emerging adults with video game addiction using a RCT design.

To my knowledge, no prior published meta-analyses have examined the efficacy of mindfulness treatment for substance misuse. Moreover, no systematic reviews have examined studies evaluating mindfulness treatment for substance misuse published since 2012 (Chiesa & Alessandro, 2014; Katz, & Toner, 2013; Zgierska et al., 2009). To address these gaps, I conducted a systematic review and meta-analysis as part of my dissertation. This review is innovative because it evaluates studies of mindfulness treatment for substance misuse published between 2012 and 2015 and includes the first meta-analysis of RCTs comparing effects of mindfulness treatment for substance misuse to alternative treatments. The systematic review provides detailed information on substantive findings and methodological characteristics of each reviewed study, and supports positive effects of mindfulness treatment for substance misuse in diverse populations. Meta-analytic results reveal significant small-to-large effect sizes of

mindfulness treatment vis-a-vis reducing substance misuse, level of craving for psychoactive substances, and stress, and increasing abstinence from cigarette smoking and mindfulness at posttreatment compared to alternative treatments. Findings provide support for future studies that evaluate effects of mindfulness treatment for other forms of addictions, including video game addiction.

Video game addiction is increasingly prevalent worldwide in emerging adults, and emerging adults with video game addiction evidence severe negative consequences (Kuss & Griffiths, 2012; Petry et al., 2014). Although it is possible that emerging adults with video game addiction could benefit from effective interventions to forestall development of deleterious consequences, no evidence-based interventions for video game addiction have been established. This dissertation is innovative because it is the first RCT to adapt and evaluate a mindfulness treatment (i.e., MORE) for video game addiction. The second and third papers report the early-stage RCT that pilot tested MORE for video game addiction in emerging adults.

The second paper describes the process of adapting MORE for use in treating video game addiction, and the study protocol for the RCT that evaluated the adapted MORE treatment, including sampling, recruitment, and eligibility screening procedures. This manuscript discusses the challenges of treatment manual adaptation, treatment outcome assessment and evaluation, and recruitment and eligibility screening using Internet-based technologies. Findings demonstrate the feasibility of conducting a RCT to evaluate a mindfulness treatment for video game addiction. Findings also highlight the prevalence and characteristics of video game addiction in one population of emerging adults. These findings are informative to future studies undertaking rigorous RCTs to evaluate interventions for Internet-related pathological behaviors, including video game addiction.

The third paper reports the results of the RCT evaluating effects of MORE in treating emerging adults with video game addiction compared to a support group (SG). Results reveal that both MORE and SG significantly reduced signs and symptoms of video game addiction, video gaming-related maladaptive cognitions, and perceived stress. However, compared to SG, MORE was more effective in reducing signs and symptoms of video game addiction, levels of negative feelings related to video game playing, and intensity of craving for video game playing, and in increasing positive cognitive coping at posttreatment. Findings suggest that MORE is a promising approach to treating video game addiction and modifying underlying risk factors contributing to video game addiction.

Strengths of this dissertation should be understood in light of certain limitations. First, in the meta-analysis, effects of mindfulness treatment vis-à-vis reducing severity of substance misuse, craving for substances, and stress, and on increasing abstinence and mindfulness were synthesized across studies evaluating different types of mindfulness treatments (e.g., Vipassana Meditation courses vs. Mindfulness-Based Relapse Prevention [MBRP]). In addition, meta-analyses were conducted to compare effects of mindfulness treatment to different alternative treatments (e.g., treatment as usual, cognitive-behavioral therapy [CBT], and support group). To explore effects of mindfulness treatment for substance misuse more fully given the substantial differences in different types (e.g., Vipassana Meditation courses vs. MBRP) and modalities of mindfulness treatment (e.g., individual therapy vs. group-based treatment), future studies should conduct subgroup meta-analyses to compare the effects of the same type of mindfulness treatment to the same type of alternative treatment (e.g., MBRP vs. CBT).

Moreover, the second paper presents a comprehensive conceptual model that elucidates treatment mechanisms of mindfulness intervention for video game addiction and serves as a

theoretical justification for the RCT. It is the first conceptual model that integrates empirical evidence with regard to risk factors for video game addiction in emerging adults to mechanisms of mindfulness treatment. This model indicates risk chains of video game addiction that are especially malleable to mindfulness treatment. However, the RCT does not have adequate statistical power to further assess potential treatment mechanisms. Future studies using larger sample sizes are needed to investigate whether the effects of MORE on video game addiction are mediated by changes in maladaptive cognitions and coping, thought suppression, and attentional-bias toward video game-related cues. Such findings may advance research regarding the etiology of video game addiction, and guide future studies applying mindfulness treatment to different populations with video game addiction.

Finally, the RCT had a small sample ($N = 30$) and all participants were recruited from one setting. Although a small sample may be appropriate for a pilot test, the sample size limited statistical power to detect significant changes in some secondary outcomes (e.g., mindfulness and psychiatric distress) among participants. Additionally, small samples from single setting may limit generalizability of findings to other emerging adult populations. Future RCTs are needed to replicate findings from this early-stage RCT with larger samples in diverse settings.

Given that meta-analysis and intervention evaluation provide important contributions to evidence-based practice, this dissertation has several implications for clinical practice. First, findings of this systematic review and meta-analysis highlight the importance of implementing mindfulness interventions to treat substance misuse and prevent relapse. Mindfulness treatment could be an empowering and complementary approach in reducing addictions, psychiatric distress and pain, and enhancing abstinence from substance misuse, stress management, and positive coping with pain and psychiatric distress.

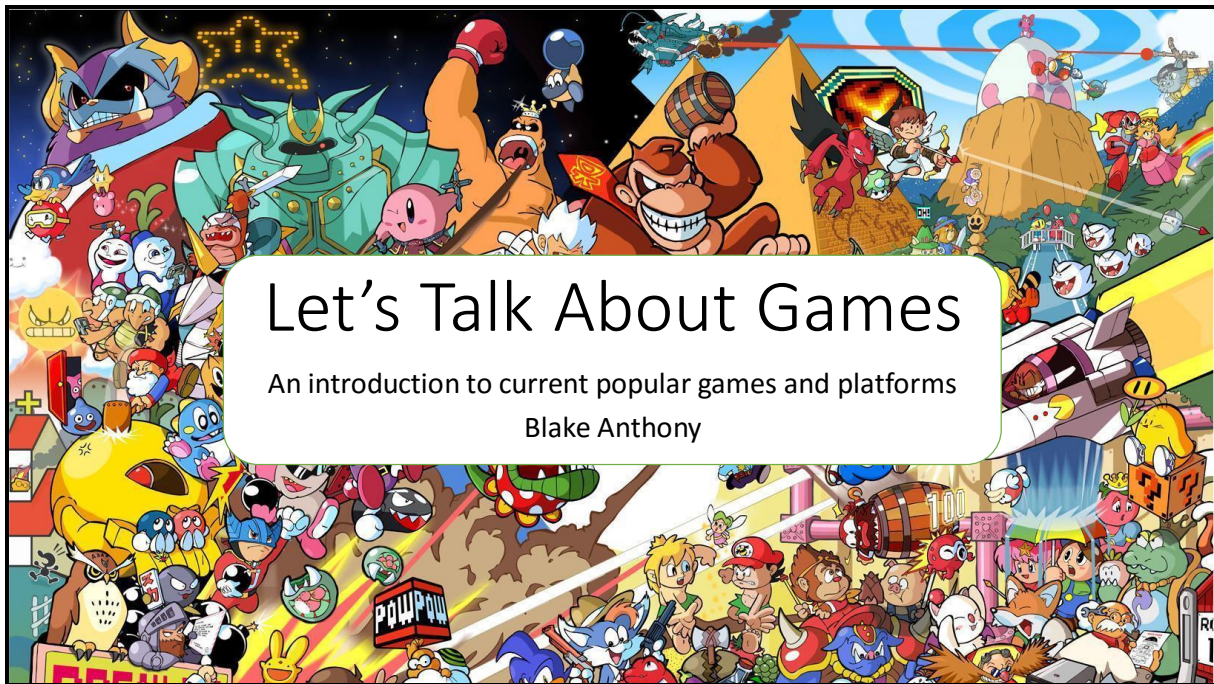
Second, findings of the RCT highlight the need for practitioners to assess and treat video game addiction when working with emerging adults, particularly when clients demonstrate signs and symptoms of video game addiction or psychosocial dysfunction associated with problematic video game playing. MORE may be a promising approach to treat emerging adults who suffer from video game addiction. Emerging adults may also benefit from practicing mindfulness exercises (e.g., meditation and breathing exercises) that help them better cope with thoughts and experiences associated with their problem video gaming behaviors, such as urges and triggers for video game playing (e.g., stress, negative affect, and interpersonal conflict).

Overall, this dissertation addresses the increasing problem of video game addiction in emerging adults, and the need to develop and test effective treatments for emerging adults who suffer from video game addiction. Results of the systematic review, meta-analyses, and early-stage RCT support the effectiveness of mindfulness treatment for substance misuse and video game addiction. Thus, mindfulness treatment should be further evaluated and implemented to treat a variety of addictions in diverse populations. Findings of this dissertation contribute to the evidence base of mindfulness treatment for addictions, and should be of value to health care professionals, mental health practitioners, addiction therapists, and policy makers.

REFERENCES: SUMMARY

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
doi:10.1176/appi.books.9780890425596.744053
- Chiesa, A., & Serretti, A. (2014). Are mindfulness-based interventions effective for substance use disorders? A systematic review of the evidence. *Substance Use & Misuse*, 49(5), 492-512. doi:10.3109/10826084.2013.770027
- Katz, D., & Toner, B. (2013). A systematic review of gender differences in the effectiveness of mindfulness-based treatments for substance use disorders. *Mindfulness*, 4(4), 318-331. doi:10.1007/s12671-012-0132-3
- Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction*, 10, 278-296. doi:10.1007/s11469-011-9318-5
- Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H. J., Möble, T., ... & O'Brien, C. P. (2014). An international consensus for assessing Internet Gaming Disorder using the new DSM-5 approach. *Addiction*, (109)9, 1399-1406. doi:10.1111/add.12457
- Zgierska, A., Rabago, D., Chawla, N., Kushner, K., Koehler, R., & Marlatt, A. (2009). Mindfulness meditation for substance use disorders: A systematic review. *Substance Abuse*, 30(4), 266-294. doi:10.1080/08897070903250019

**APPENDIX: TRAINING MATERIAL FOR GROUP FACILITATORS REGARDING
CHARACTERISTICS OF VIDEO GAMES AND “GAMERS”**



“Gaming”

var Gaming;

Define Gaming=

[“Computer Games”, “Video Games”, “Phone Games”];

Definition of “Games”

Prof. Ian Bogost defines video or computer games as:

“spaces governed by computational rules which can be explored through play” which allow for “simulations that express messages in ways that narratives cannot.”

Any media that player interaction (i.e. perceived agency) is made possible by computation.

Platforms

CONSOLE

- Connected to TV
- Physical media based (Disc, Carts, etc)
- Lower Game Cost
 - USED/NEW
- Proprietary
- Controller/Joystick
- “Typical Gamer”
- ~\$400

COMPUTER

- Desktop/Laptop
 - Win/Mac/Linux
- Download based
 - Various “app store”
- Games work across computers/OS versions
- Mouse/Keyboard
- “Hard Core”
- ~\$1,200

TABLET/MOBILE

- Tablet/Phone
 - iOS/Kindle/Android
- Download based
- Games work across “platform account”
- Touch controls
- “Casual”
- ~\$300

CONSOLES



Popular Console Platforms

Nintendo

- Nintendo Entertainment System (NES) - 1983
- Super Nintendo (SNES)
- Nintendo 64 (N64)
- GameCube (NGC)
- Wii
- **Wii U - 2012**



Sony Computer Entertainment

- PlayStation (PSX) -1995
- Playstation 2 (PS2)
- Playstation 3 (PS3)
- **Playstation 4 (PS4) – 2013**

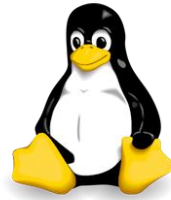


Microsoft

- XBOX -2001
- XBOX 360 (360)
- **XBOX ONE (XBONE) - 2013**



COMPUTER PLATFORMS



PC Game Platforms

STEAM

- Digital Download
- “Every Game”
- Most popular platform
- Account based
- Platform agnostic
 - Runs on Win/Mac/Linux



Proprietary

- Game specific store
- Website direct download
- Required to play certain games
- Referred to as “Client”
- Browser Game

OS Software Store

- Curated software offered by operating system
 - Apple App Store
 - Microsoft Store
 - Chrome Store
 - Google Play
 - Amazon
 - Amazon Direct

Tablet/Mobile

Apple

- iPad/iPhone
- Most Popular Gaming and Mobile Platform

Google

- Android/Android derived (Samsung, HTC, Motorola, LG, Sony, Huawei, ZTE, Alcatel, etc)
- Focuses on increasing diversity among users and applications/games by having a platform that is relatively more accessible to people from different ethnic and socio-economic backgrounds.

Amazon

- Amazon Fire, Fire HD, Kindle
- Derived from Google Android
- Acts a digital store front and media platform for Amazon products, including downloadable games, software, books, and music.

DIFFERENT TYPES OF VIDEO GAMES



FPS – First Person Shooter (Ego Shooter)

Played through the “eyes” of the character controlled by the player. These games usually have two different modes of play.

1. Play alone for the story or “Campaign”
2. Play competitively against other people online or in the same room “Multiplayer”

Games are usually violent, power fantasies that revolve around “shooting guns.” Popular titles usually contain military or science fiction themes.

Call of Duty (CoD)

Genre defining title of the modern first person shooter game.

Call of Duty has yearly releases.

Gameplay Features:

- Themes of near future technology
- 2 teams of 6 shoot guns at each other. You get more points to upgrade your “gear” or guns/armor the more you play/kill opposing team. The more upgrades make it easier to “kill” other players.
- Tracking “score” via ratio of kills versus deaths. Players are encouraged to kill more people than to be killed by others.
- Biggest media annual media event, earning more money than any movie ever released.
- Multiplayer is the biggest focus
- Games that are part of the Call of Duty series:
 - Black ops (CoD:BO)
 - Modern Warfare (CoD:MW)
 - Ghosts
 - Advanced Warfare (CoD:AW)
- Available on Xbox, PlayStation, Wii, Windows, Mac

MOBA – Multiplayer Online Battle Arena

- This is a relatively new type of game made popular by the modification of the game Warcraft 3 “Defender of the Ancients” or DOTA. Hence, this genre is often referred to as “DOTA-like”
- Involves teams of players controlling characters who then escort “soldiers” from one side of an isometric map to the other. Players must defend their “soldiers” from the other players characters who are trying to destroy them. The more soldiers that are successfully escorts, the more damage the team inflicts to the opposing teams “home base.” The first team to destroy the other home base wins.

League of Legends

- Also referred to as “LoL” or “league”
- Currently the most popular competitive game in the world.
- More people watch League of Legends on Twitch.tv or other video game broadcasting website than any other major TV event, including the Superbowl.
- Players pick from a roster of hundreds of characters or “champions” to control. (selection rotates).
- Players must pay money to pick a specific character or buy aesthetic upgrades to make their characters “distinct” or to show “skill.”
- Windows only

MMO (MMORPG)

- Any game that consists of hundreds or thousands of players playing concurrently in a game.
 - This includes fantasy role playing games, where players from all over the world control characters, accomplishing in game tasks to earn gold, items, or experience points (XP) to make their character stronger/have more abilities.
 - MMOs can also include TPS or “Third person shooters” where players are able to see the character they are controlling. The game play is similar to Call of Duty, where the goal is to shoot other characters to get stronger. Instead the “camera” of the game is not from the perspective of the controlled character, but from a “virtual camera” located behind the controlled character (see keyterms)

World of Warcraft (WoW)

- Players pay \$10 a month to play as a virtual character of various fantasy tropes.
- Core gameplay includes accomplishing quests to gain in game items to decorate their in game character (avatar) or gain new abilities (e.g. more powerful spells).
- Campaigns provide a story to give context to the game world.
- WoW provides many “social activities” in game to give the players a feeling of a meta-game or a “game within a game.”
- Available on Windows/Mac

Fighting

- A genre made popular by the arcade game “Street Fighter II”
- 2-4 players each control a character to punch, kick, and do special attacks to “knock out” the other player controlled characters.
- Games or “matches” are usually played locally at tournaments, arcades, and in people’s homes due to the negative impact of latency caused by slow or inconsistent internet speeds. Though online play has become more popular as internet speeds improve.
- Requires extensive memorization of moves and quick thinking.
- The Fighting Game Community (FGC) is an active and vocal group that commands the discourse of this genre (how to play, which games are “worth playing seriously,” etc).

Super Smash Brothers

- Players control characters made popular by Nintendo.
- 4-8 players can play together on the same TV or over the internet
- Players must “knock” other players out of the level by hitting or “smashing” them.
- Appeals to the young and old because it lets them play as their favorite Nintendo or other video game characters, including Super Mario, Sonic the Hedgehog, Link from Legend of Zelda, and Donkey Kong.
- Is sometimes looked down on by “serious” players in the fighting game community.
- Availability: Nintendo Wii U

Role Playing Games (CRPG & JRPG)

- Focuses on telling a story, usually in a fantasy setting. Players usually control a character or a party of characters.
- As players play, they earn in-game money to buy items for their character to make them stronger, as well as XP to level up their abilities and strength.
- Role Playing Games (RPG) have two distinct categories.
- Japanese and Western or “Computer” style.
- The difference between these two sub-genres is mostly gameplay and story focus. Japanese RPG stories usually feature a set of character that tell the player a story. Western RPG allow players to create their own character and story with multiple endings and results based on how the player plays the game.
- Gameplay is often turn-based in JRPGs while combat in CRPG is often “cool-down” based, where actions are entered in real time.
- RPGs are responsible for the gameplay element of “leveling up” “loot drops” “grinding” etc.
 - These elements can now be found in most games in different genres, including sports, puzzle, FPS, and fighting games.

Simulation

- Simulation games emulate a certain situation that requires strategy, resource management, and creative response to unanticipated situations.
- Feature many different themes and gameplay types.
- Are popular in Europe and mostly played with a keyboard and mouse on personal computers.
- More and more titles are being adapted to touch interface of mobile/tablet devices.

Games that can be considered “simulation” type games include:

- Sports Games
- Farming
- City Building
- Dating or Erotic Games
- Car Racing
- Military Strategy
- Space Exploration

Simulation type games

- City Building
 - Cities XL
- Military Campaign
 - Total War
- Professional Sports
 - Football Manager (soccer)
 - Fifa (soccer)
 - Madden (american football)
- Farming
 - Farmville

Notes on Demographics

- 60% of all college-age students play at least an hour of video games a week.
- Research shows that both men and women play videos games in an equal proportion, and play the same games.
 - Recent studies show that the proportion of women who play “violent games” or games traditionally considered to have a largely male audience is much higher than assumed by marketing and general public.
- One interesting difference is that a large proportion of young women who do actively play online, do not use “voice chat” to communicate with players.
 - Please read this article for more information:
<http://www.pewinternet.org/2015/08/06/teens-technology-and-friendships/>

- F2P – Free to Play
- P2W – Pay to Win
- PVP – Player versus Player (competitive)
- PVE – Player versus Enemy (single player)
- Deathmatch– Everyone is trying to kill everyone else
- Team Deathmatch – two teams trying to kill each other
- Co-op – Cooperate with other players
- Grind – Play to earn XP not to enjoy gameplay/story
- Loot or Gear – in-game items to use to enhance gameplay
- Drop Rate – The frequency of getting loot or gear in a game
- Lag/latency- reduced fidelity of movement due to slow internet connection
- Griefing (Trolling) – Playing online with others with the sole purpose of making other people not have fun playing.
- Twitch.tv (twitch) – An online video platform that shows live broadcasts of people playing video games. Similar to YouTube.
- KD Ratio – Ratio of kills to player deaths, indicates your skill at FPS games
- Open world – A game that does not have “levels” or “stages” but can be explored around seamlessly
- Platformer – Classic games like Mario

See more terms:

https://en.wikipedia.org/wiki/Category:Video_game_terminology

Q&A

