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The Compatibility of Mindfulness-Based Therapy and Adventure Therapy for Effectuating
Change in SUD Populations.

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Abstract

Mindfulness-based therapy causes neurological changes that reduce reactivity to drug cues through modulation of regional activation, functional connectivity, and gray matter concentration. These neural mechanisms of mindfulness translate to reduced reports of craving, increased psychological well-being, and the development of acceptance, awareness, non-judgment, and non-reactivity. All of which attribute to the effectiveness of mindfulness-based relapse prevention as a therapeutic treatment for Substance Use Disorder (SUD). Adventure therapy programs who provide psychological therapy in wilderness contexts should consider the integration of mindfulness-based therapy into their practice for the treatment of SUD.

Mindfulness-based therapy and adventure therapy approaches have many coinciding program qualities that provide a groundwork for incorporating the approaches into one another. Their utilization of group therapy, exercise, and time-intensive practice make them highly compatible. Additionally, their ability to supplement one another's limitations provides additional support for combining these practices. Both effective treatments for SUD, adventure therapy and mindfulness-based therapy may have even greater effects in preventing drug craving and relapse if these two approaches are combined. The neural mechanisms of mindfulness reduce reactivity to drug cues by psychological improvements in acceptance, awareness and non-judgement, which when applied in conjunction with the restorative effects of nature and adventure therapy will provide holistic, long-term recovery for clients with SUDs.

The Compatibility of Mindfulness-Based Therapy and Adventure Therapy for Effectuating Change in SUD Populations.

The neural changes that are fostered through mindfulness-based therapeutic training are indicative of substance abuse rehabilitation. The regional gray matter and functional connectivity changes within craving-related regions suggests that mindfulness-training induces long-term physiological modifications that reduce reactivity to drug cues. The effectiveness of mindfulness-based therapy in Substance Use Disorders (SUD) has been demonstrated through reduced drug craving and rate of relapse in mindfulness trained groups (Bowen et al., 2009; Witkiewitz & Bowen, 2010). Mindfulness-based therapy is a viable option for treatment of SUD, and thus should be considered as a treatment option in adventure therapy programs that treat clients combating SUD. Adventure therapy is therapeutic approach that utilizes wilderness settings to facilitate group psychotherapy. The principle components and limitations of mindfulness-based therapy and adventure therapy share commonalities and strengths where the other's weaknesses lie. For this reason, the addition of mindfulness-based components into adventure therapy should be considered as it may provide more effective treatment than either approach alone. Not only are these approaches compatible on a theoretical basis, but they also have had demonstrated interactions in adventure therapy programs that currently integrate mindfulness-based experiences. The strength of both mindfulness-based relapse prevention and adventure therapy in treating SUD as well as their fulfillment of one another's limitations may produce a compounding effect that promotes the most effective treatment of SUD in young adults.

What is Mindfulness?

Adapted from Buddhist tradition, current mindfulness practices take many different forms as they have expanded into the secular community and clinical field. The literature on mindfulness and its therapeutic effects has risen exponentially over the last three decades (Black, 2010). For the purpose of this paper, I will focus on mindfulness in its use of Mindfulness Based Stress Reduction (MBSR) and Mindfulness Based Relapse Prevention (MBRP). MBSR is a regulated treatment program that consists of eight weeks of mindfulness training with an emphasis on reducing stress (Kabat and Hanh, 2009). The training consists of group mindfulness activities such as introductory yoga, sitting meditation, and body scans. The Five Facet Mindfulness Questionnaire (FFMQ) is a clinical measure that breaks mindfulness into five components. The measure includes rating on participant's observation of internal and external stimuli, verbal description of stimuli, awareness of action, and practicing non-judging and non-reactivity to internal feelings (Baer et al., 2006). MBSR is conducted through eight, weekly group meetings of two and a half hours each with an additional full day of training on the sixth week. MBSR has produced effective therapeutic treatment for various psychological disorders. Due to the applicability of mindfulness practices to craving resistance, a specific program has been developed to propose mindfulness practice to addicts for substance use disorder (SUD) treatment. This approach is known as Mindfulness Based Relapse Prevention (MBRP).

Mindfulness Based Relapse Prevention includes practices specifically involved with rehabilitation of substance abuse. This adaptation of MBSR integrates theories of Mindfulness Based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2002) and general relapse prevention (MBRP; Bowen, Chawla, & Marlatt, 2010; Witkiewitz, Marlatt, & Walker, 2005). Thus, MBRP maintains the foundational components of mindfulness as outlined in the FFMQ,

while integrating cognitive behavioral therapy techniques and placing emphasis on each approach's components that relate to SUD. Just as with, MBSR, this treatment method consists of eight, weekly group meetings that focus on fostering attention for internal and external stimuli and acceptance of bodily states. This approach suggests that participants bring attention to and accept their cravings while practicing non-reactivity to their inner experience and acting with awareness. This paper will examine the effects of mindfulness through both the MBSR and MBRP approach and how they could collectively impact and increase the therapeutic effects of SUD treatment as noted in mindfulness practice it's and neural mechanisms of action.

Mindfulness Affects Craving-Related Cortical Areas

The neural modifications from mindfulness are vast and applicable across many psychological diseases (Hölzel et al., 2011b). Research specific to MBSR and MBRP show many cortical impacts of mindfulness training. The neural mechanisms of mindfulness as a whole are outlined further in the review by Hölzel et al. (2011b) and an in-depth review of the neurobiology of MBRP is discussed by (Witkiewitz, Lustyk, & Bowen, 2013b). Here we will discuss some key components of neurological change initiated by mindfulness training that demonstrate mechanisms for how mindfulness works in SUD treatment. Studies in healthy controls and addicted populations show changes in brain activity and brain morphology in regions associated with craving and drug relapse.

Changes in Functional Connectivity

Craving has been associated with many different brain regions. Specifically, craving-area activations were observed in the subgenual anterior cingulate cortex (sgACC), caudate, premotor cortex, ventral striatum, bilateral insula, and the ventral medial prefrontal cortex (VMPFC) in nicotine addicts who viewed an image of a cigarette (Westbrook et al., 2011). When participants

attended to the cigarette image in a mindful manner, they reported reduced craving and the activity within the VMPFC and sgACC returned to normal levels. Additionally, the functional connectivity was disrupted between sgACC and other craving-related regions, such as those listed previously. These craving areas are pertinent in attribution of value to stimuli, reward-related processing, cue-induced craving, and dependence. This suggests that mindfulness may decouple craving neurocircuitry leading to improved subjective craving experiences. These findings support the conclusion that mindfulness can offer biological relapse prevention leading to reduced reactivity to stimuli.

Additional research on largescale functional connectivity after MBSR training show increased functional connectivity within auditory/salience networks and medial visual networks of MBSR participants (Kilpatrick et al., 2011). Furthermore, enhanced connectivity between the auditory/salience network and the dorsomedial prefrontal cortex was found in MBSR participants suggesting greater attention and reflective awareness of auditory experience. Additionally, connections between the medial visual network and the sgACC cortex were anticorrelated suggesting greater inhibitory control. This demonstrates separation of the visual network from motor and control processing suggesting that MBSR participants have greater inhibitory control allowing them to focus attention to specific stimuli. Thus, inhibitory control may be strengthened when viewing drug-related stimuli and attentional control can assist in avoiding fixation and shifting attention. In conjunction, these intrinsic connections may indicate better self-referential processing and reflective awareness of sensory experiences in MBSR participants.

Gray Matter Changes in the Cortex

MBSR participants also have shown increases in gray matter concentration within the hippocampus, posterior cingulate cortex, temporo-parietal junction, and the cerebellum (Hölzel et al., 2011a). These regions are involved in learning, memory, self-referential processing, perspective, and emotional regulation (Hölzel et al., 2011a). Hippocampal gray matter concentration may indicate enhanced regulation of emotion responding (Hölzel et al., 2011a). Additionally, the hippocampus' role in memory formation and habit learning suggests that it may help reduce reactivity to drug cues through a bottom-up approach (Witkiewitz et al., 2013b). The posterior parietal cortex is utilized for processing stimuli in relation to oneself. Thus, increased gray matter in this region may impact the association of drug cues with the individual's own autonomy. Increases in gray matter volume in the temporo-parietal junction may be indicative of reduced reactivity to drug cues as result of interoception, or a knowledge of what is going on inside one's body (Witkiewitz et al., 2013b). Coincidentally, the temporo-parietal junction, hippocampus, and posterior cingulate cortex form a brain network that allows for self-projection in which individual's can project themselves in future states. This could be helpful in envisioning long-term reward of abstinence in the presence of drug-related cues (Hölzel et al., 2011a). Additionally, although initial associations with the cerebellum focus on motor coordination, the cerebellum is also involved in the coordination and regulation of emotional and cognitive states (Hölzel et al., 2011a). Gray matter increases in this region may lead to enhanced control of emotional and cognitive responses to drug-related stimuli and enhance mood and psychological functioning overall. Overall, mindfulness training induces increases in cortical gray matter within the posterior cingulate cortex, temporo-parietal junction, hippocampus, as well as the cerebellum, which may translate to enhanced emotional regulation, self-projection, and reduced reactivity to drug cues.

Gray Matter Changes in Brain Stem

In addition to cortical changes, gray matter increases have been identified in the brainstem (Hölzel et al., 2011a; Lazar, 2014). Particularly in regions associated with the locus coeruleus, nucleus raphe pontis, pontine tegmentum, and the sensory trigeminal nucleus (Hölzel et al., 2011a; Lazar, 2014). These brain stem areas are areas involved in the synthesis and release of norepinephrine and serotonin, neurotransmitters involved in the regulation of mood and arousal (Lazar, 2014). Gray matter change within the raphe nuclei suggest an alteration in serotonin synthesis and release and thus, the regulation of sleep, appetite, mood, and conditioned fear. The locus coeruleus is the principal site for synthesis and release of norepinephrine a neurotransmitter involved in autonomy and perception of personal control (Lazar, 2014). Interestingly, increases in gray matter concentration within the brain stem are positively correlated with psychological well-being as measured by self-acceptance, positive relations with others, environmental mastery, autonomy, purpose in life, and personal growth (Lazar, 2014). Morphological change within the brain stem may initiate the subjective well-being and internal control of the MBSR participants. For example, the increase in gray matter in the locus coeruleus may relate to the increase in autonomy and environmental mastery allowing for MBSR participants to have greater regulation over the effects of environmental stimuli and their personal authority (Lazar, 2014). These alterations in gray matter concentration not only suggest that morphological brain changes may positively alter psychological well-being, but also that MBSR may induce lasting changes that will persist post treatment (Hölzel et al., 2011a).

Implications of Neural Mechanisms of Mindfulness on SUD

Mindfulness training produces observable morphological changes that may assist in reduced reactivity to drug cues as well as modify the subjective experience of craving and

perceived psychological well-being. Mindfulness trainees reduced activity within the sgACC, VMPFC, and their connections with craving-related cortical areas suggest that mindfulness disrupts the habituated pathways that cause drug-craving and promotes control over response and reduced reactivity to drug cues. This is supported by the finding that gray matter is increased within craving-related cortical areas such as the PCC, TPJ, and ACC as well as the fundamental neural pathways involved in craving circuitry and neurotransmitter synthesis and release. The neural mechanisms of mindfulness produce both biological and psychological change that makes participants experience lower levels of craving and improved psychological well-being and may reduce rates of relapse.

MBRP is an Effective Treatment Program for SUD

The neural mechanisms of mindfulness training may drive the psychological expression of acceptance, non-judgmental thought, and non-reactivity. The emphasis on these factors in MBRP contribute to reduced drug craving and relapse. The efficacy of MBRP treatment is evident in research comparing effectiveness of MBRP treatment to treatment-as usual (TAU) and general relapse prevention programs. Addicts who undergo MBRP have decreased craving scores throughout and after treatment compared to addicts undergoing TAU, the general 12-step relapse prevention program (Bowen et al., 2009; Witkiewitz & Bowen, 2010; Witkiewitz, Bowen, Douglas, & Hsu, 2013a). Mindfulness training caused participants to have increased acceptance, non-judgmental thought, and acting with awareness (Witkiewitz et al., 2013a). These mechanisms allow addicts to be non-judgmental of their drug craving and be able to accept and sit with their feelings without necessarily acting on them. This is demonstrated when at two and four months post-treatment, participants in the TAU group had correlations between their depressive states and their cravings and relapse whereas MBRP participants had less cravings

and remained abstinent regardless of depression state. MBRP breaks the habitual connection between negative emotional states and craving tendencies giving participants volition over their actions (Witkiewitz & Bowen, 2010). In addition to reduced craving, MBRP reduces the rate of drug and heavy drinking relapse compared to other treatments. While treatment-as-usual, relapse prevention, and MBRP all reduce relapse in drug and alcohol abuse, MBRP participants reported fewer days of relapse than the TAU group at a 4-month follow-up and fewer than TAU and relapse prevention groups at a 12-month follow-up (Bowen et al., 2009; Witkiewitz & Bowen, 2010). While other treatments promote initial change, it is relatively short-term, and MBRP stands alone as the most-effective, long-term, prevention of relapse.

The neural mechanisms of mindfulness training promote a shift from reactivity to intentionality. Increased prevalence of acceptance, nonjudgmental thought, and non-reactivity are examples of the psychological components that may be manifested by neural change which contribute to reduced craving and relapse. MBRP offers a therapeutic treatment that is both effective initially and promotes long-term recovery. Not only is MBRP an effective therapy for SUD on its own, but many of its core components hinge on those that are critical in adventure therapy as well making these two therapeutic options incredibly compatible.

To understand how mindfulness practice and adventure therapy may interact, it is important to first understand the foundation of adventure therapy, where its strengths lie, and where its limitations lie.

What is Adventure Therapy?

Adventure therapy is an evolving therapeutic treatment based from the framework of the Outward Bound model. The main difference between adventure therapy and wilderness-expedition programs, like Outward Bound, is the stringent licensure and emphasis on therapeutic

treatment. Today, an adventure therapy program is licensed under the Outdoor Behavioral Healthcare Industry Council and Association for Experiential Education. Adventure therapy programs employ licensed therapists that work with clients to develop individualized treatment programs and routinely track progress throughout the duration of treatment (Davis-Berman & Berman, 1994). During this time, the psychologists often maintain contact with the participants guardians and update them on treatment progress and treatment plans (Gass & Russell, 2012). Post-treatment, psychologists remain involved in after-care treatment and assurance of continued psychological development (Gass & Russell, 2012). Additionally, the staff that is in the field with the participants 24/7 must be qualified professionals (Gass & Russell, 2012). Admissions of clients to these programs is selective and designed for the health and safety of participants and staff as well as for the most effective treatment for the client (Davis-Berman & Berman, 1994).

Though there are some technical guidelines for all adventure therapy programs, there are factors on which program models differ. For example, clients can be accepted into either a rolling admissions or fixed date program. Rolling admissions programs admit new clients based on availability and release clients once appropriate recovery has been achieved. Fixed duration programs have a set number of days that clients are enrolled, and all clients start and end the program together. Additionally, programs can either operate on a base-camp or expedition-based model (Crisp, 1997). In a base-camp model, the program has an established home-base and day-treks and leave from and return to there. In an expedition-based model, programs have a moving camp that is broken down, moved, and reset daily.

Though, there is some leniency on program design there are still key components that are conserved across all adventure therapy programs. For example, all programs include a nature and/or outdoor adventure component (Gass & Russell, 2012). For example, many programs

implement experiences while backpacking through rural backcountry and participants engage in daily camp responsibilities such as preparing meals and setting up camps as well as hiking multiple miles each day and engaging in group therapy exercises. Reflective experiences are an integral part of the curriculum, among others, that promotes interpersonal growth (Kimball & Bacon, 1993). Additionally, all programs are conducted in a group setting (Crisp, 1997). Programs typically have 9 clients per group and 3 professional guides on a daily basis. Licensed mental health practitioners join the group on a weekly basis to conduct evaluations, suggest treatment plans, and conduct group psychotherapy sessions (Russell, Hendee, & Phillips-Miller, 2000). Some programs have therapists on staff with the guides at all times rather than meeting on a weekly basis although this is less common (Russell et al., 2000). Some of the principle components of adventure therapy include the utilization of nature as a therapeutic setting, extensive time in that therapeutic setting, and group setting and psychotherapy. These very principles are entwined in the foundation of MBRP.

Mindfulness and Adventure Therapy Compatibility

Importance of Wilderness

A key component of adventure therapy is wilderness. Connection to nature itself, increases psychological and social well-being and mindfulness (Howell, Dopko, Passmore, & Buro, 2011; Wolsko & Lindberg, 2013). Furthermore, this connection also leads to increased awareness (Howell et al., 2011), and decreased stress and mental fatigue (Russell & Farnum, 2004). The notion of “being away” from stressful everyday stimuli and engaging in “soft fascination” with wilderness environments facilitates psychological restoration (Russell & Farnum, 2004). Additionally, participation in appreciative outdoor recreation, such as backpacking, increases connectedness with nature, and subsequently, psychological well-being

and mindfulness (Wolsko & Lindberg, 2013). The independent mindfulness components are not studied in conjunction with outdoor recreation and nature connectedness. However, simply connecting with nature increases awareness, but does not increase non-judgmental acceptance (Howell et al., 2011). Thus, the combination of appreciative outdoor recreation and nature connectedness serve as critical components of AT that are already beginning to lay a foundation to enhance mindfulness and its foundational principles such as awareness (Howell et al., 2011; Wolsko & Lindberg, 2013). Intentionally implementing mindfulness training into adventure therapy treatment plans may be the extra factor that promotes increased non-judgment and acceptance, and thus decreased craving and drug relapse. As noted by Witkiewitz et al. (2013a), the presence of acceptance, awareness, and non-judgmental outlook work together to effectuate change rather than one over the other. This suggests that incorporating mindfulness training will emphasize additional components necessary for recovery from SUD while building from and being supplemented by the natural effects of nature and outdoor recreation in enhancing mindful acceptance and psychological and social well-being. Not only do these programs directly interact within nature, but the nature of them and their strengths and limitations make them and incredibly powerful duo.

Coinciding Program Qualities and Limitation Mitigation

Adventure therapy is designed to support MBRP. The overlap/coordination of group therapy, exercise, and a time intensive approach strengthens the ability to meld programs and might strengthen or enhance the therapeutic effectiveness of these factors. Furthermore, the mitigation of limitations is the most compelling support for incorporating mindfulness-based therapy in adventure therapy. The routine implementation, continuation of practice, and long-term effects of mindfulness-based therapy that could occur once implemented within an

adventure therapy context that provides clients with efficient, effective recovery that can translate back to an urban environment and give them control over their own mental health.

Adventure therapy and MBRP programming share multiple qualities. MBRP is conducted in a group setting and includes gentle exercise. A limitation in MBRP studies is whether the effects are due solely to mindfulness or if the activity and group therapy have an effect. Adventure therapy maintains those core components of MBRP allowing for a seamless transition between programming. In fact, the group adventure component of adventure therapy is one of the most influential factors in initiating psychosocial improvement (Russell, Gillis, & Kivlighan, 2017). By having similar program qualities, the effectiveness of mindfulness may have greater potential to carry over into the adventure therapy context. Thus, rehabilitation of participants with SUD may be possible through the application of an MBRP approach within adventure therapy.

Additionally, MBRP is a relatively time intensive program. This is a necessary component of treatment as time spent in treatment negatively correlates with craving (Witkiewitz et al., 2013a). However, due to the intensive time commitment, some of the training is required as “homework”. This is a limitation in research of mindfulness therapy as it can’t be ensured that participants complete the required lesson plans. However, adventure therapy naturally allows this time to strengthen mindfulness skills. When out in the backcountry, there is nothing, but time. Adventure therapy is one of the most applicable scenarios for time-intensive treatments. Given that the entirety of the program is focused on therapy, productive treatment, and 24/7 immersion, the perfect scenario for incorporating mindfulness-based therapy is provided. Additionally, mindfulness therapy is ideal for rolling admission or fixed-date programs due to the reductions in

craving observed mid-treatment as well as the correlation of treatment hours with craving reduction.

Furthermore, as noted before, continuation of mindfulness practice post-treatment resulted in abstinence in experimental groups. The average duration a client spends in adventure therapy is 45 days thus incorporating mindfulness as a daily or even weekly regimen assists in establishing routine practice for the participants. By performing this habitual therapy and perceiving the psychological benefits, especially those escalated by practice in nature and alongside outdoor recreation, participants may engage in their own after-care treatment to a greater extent than after MBRP alone (Bowen et al., 2009).

Over half (54% - 88%) of MBRP participants continue mindful therapeutic practice post-treatment (Bowen et al., 2009; Bowen et al., 2014). The positive correlation of continued self-treatment with sustained reduction in cravings and relapse suggest that MBRP therapy promotes continued self-treatment and that the self-supplied after-care is effective in continuing SUD recovery (Bowen et al., 2009). This supplements major limitations of adventure therapy. Adventure therapy can be extremely costly ranging from \$15,000-\$25,000 depending on length, and post-treatment, 50% of participants may be admitted to after-care treatment at a continued cost (K.C. Russell personal communication June 6, 2018). The initial cost alone makes adventure therapy inaccessible to many populations and the fact that there is not full recovery post-treatment means that continued treatment must be paid for out of pocket. MBRP provides a mechanism for participants to take volition over their own mental health. MBRP induces not only a shift to psychological awareness and control of bodily states and reactions, but also a long-term biological shift to disconnect craving related cortical areas and reduce reactivity to drug cues. This provides cost-effective aftercare. Additionally, the questioning of adventure

therapy as having long-term efficacy and translation of therapeutic progress back to “real-world” scenarios is mitigated by MBRP. The original implementation of MBRP within urban environments and mindfulness’ positive correlation with nature connectedness, psychological well-being, and outdoor recreation suggest that it could be an effective therapy in both urban and wilderness environments. Thus, incorporating mindfulness therapy into adventure therapy ease the transition from therapeutic environments and could create more effective and long-lasting changes than either alone. The time-intensive aspects that promote developing routine paired alongside the ability for effective and independent after-care, provide a solid mechanism for transitioning adventure therapy back into an urban environment in a cost-effective and independent manner.

Observed Outcomes of Mindfulness in Adventure therapy

Recent research on adventure therapy programs implementing mindful therapeutic components demonstrate the feasibility and effectiveness of merging these two programs as well as documented features of how they interact. For example, Shunda is an adventure-based SUD program for young adult males that operates in Calgary, Alberta, Canada and incorporates the use of mindfulness-based experiences (MBEs). The MBEs are typically 1-5-day adventure trips in which participants engage in a range of outdoor recreation activities and incorporate intentional mindfulness practice before, during, and after the trip. On average, a client will participate in one MBE a week for the course of treatment. Current research on Shunda’s effectiveness and the components that drive it provide support for the compatibility and effectiveness of incorporating mindful practice into adventure therapy for treatment of SUD.

Clients of Shunda who entered with more frequent drug use had lower total mindfulness scores (Chapman et al., 2018). There was a specific detriment in acting with awareness

(Chapman et al., 2018). However, at treatment completion frequency of drug use at intake was not correlated with mindfulness score (Chapman et al., 2018). This suggests that the initial lack of awareness and mindfulness was mitigated through the Shunda treatment process which may be due in part to the use of mindfulness-based experiences. Furthermore, in a qualitative analysis, awareness (coded as a combination of non-reactivity and acceptance) was one of the most referenced components in patient recollection of treatment (Russell et al., 2016). Patients recall identifying negative thoughts and feelings and being able to recognize and change them in the moment (Russell et al., 2016). This demonstrates the applicability of mindfulness training in a nature and adventure-based context being translated back to real-world scenarios and treatment-related outcomes. Clients are able to use their mindfulness therapy to directly relate it to cravings and psychological well-being.

Additionally, throughout treatment, increased mindfulness is correlated with improved psychosocial functioning and reductions in subjective distress (Russell et al., 2017; Russell, Gillis, & Heppner, 2016). Weeks where participants were more mindful, had greater improvement (Russell et al., 2017). Specifically, non-judging and non-reactivity components contributed significantly to decline of depression, anxiety, and stress (Russell et al., 2017; Russell, Gillis, & Heppner, 2016). Similar findings were obtained in Base-Camp, a program similar to Shunda, which focuses on SUD treatment for adolescents through the use of adventure therapy and MBEs. Clients of Base-Camp had increased mindfulness scores from pre to post treatment and increased mindfulness was predictive of improved Intrapersonal Distress and Interpersonal Relations on measures of psychosocial functioning (Russell, Gillis, Law, & Couillard, 2018). This demonstrates that mindfulness therapy in conjunction with adventure therapy is an effective treatment for at-risk populations. Furthermore, it emphasizes the

improvement of acting with awareness, non-judging, and non-reactivity which were demonstrated to be key components of recovering from SUD.

Additionally, the combination of increased mindfulness and perception of the experience as helpful lead to the greatest predictor of improvement between clients (Russell et al., 2017). This suggests that incorporating mindful programming and directly relating the experience to treatment goals, such as MBRP implementation into SUD specific treatment, may provide the most effective treatment within an adventure therapy program. This is exemplified, as mentioned above, by the participant-report of craving and negative thought identification and reframing (Russell et al., 2016). Their subjective experience of having personal volition over their thoughts that directly effects their actions and improves their treatment outcomes encourages this component of perceiving the mindful therapy as helpful.

Participating in an adventure therapy program with incorporated MBEs lead to increased mindfulness, and specifically awareness, nonjudging, and nonreactivity which correlated with overall improved treatment outcome and specifically subjective distress. These statistical findings function concordantly with self-reported application of learned mindfulness to treatment outcomes and regulation of negative thought and craving to support these programs. Taken together, these findings support the integration of mindfulness-based therapy with adventure-therapy to provide effective treatment for SUD populations.

Conclusion

Mindfulness training reduces activity within and between craving-related cortical areas and the neurotransmitters involved with them as well as increases gray matter in regulatory brain regions. These neural changes translate into reduced reactivity to drug cues and an observable

behavioral shift toward reduced cravings and drug relapse, thus proving itself an effective therapeutic treatment for substance use disorders. SUDs are a commonly treated psychological disorder within adventure therapy. Although the foundational components of nature and group settings assist in recovery, strengths of mindfulness training can effectively fill the gaps in adventure therapy to provide the most effective treatment for young adults combating substance dependency. By increasing non-judgmental acceptance of actions, MBRP supplements the natural development of awareness acquired through an adventure therapy program to provide holistic skills to effectively recover from SUD. Adventure therapy provides a space to develop routine mindfulness practice which promotes abstinence and offers an independent and effective after-care approach while mitigating cost and promoting self-health and self-dependency. In conclusion, neural mechanisms of mindfulness reduce reactivity to drug cues by psychological improvements in acceptance, awareness and non-judgement, which when applied in conjunction with the restorative effects of nature and adventure therapy will provide holistic, long-term recovery for clients with SUDs.

Future Research

The current implementation of mindfulness programming into adventure therapy provides the prime opportunity to study the effectiveness of combining these treatments. Future research should assess the effectiveness of adventure therapy programs implementing mindfulness-based experiences and additionally monitor the components of mindfulness that are associated with change in treatment progress and psychological well-being. It should be noted whether independent factors correlate with progress, some factors are dependent on each other, or if mindfulness practice as a whole, and all of its components are necessary for therapeutic progress. A longitudinal study in which treatment progress, timeline, mindfulness factors, and

adventure therapy factors are studied should also be included. The best validity would include assessing the same adventure therapy program for a year before and one year following implementation of MBE or MBRP-like programs into their curriculum. A classic MBRP, AT, and TAU therapy group should be used for comparison. Follow-ups on cravings and relapse at four, six, and twelve months post-treatment would also help determine the long-term applicability. All in all, mindfulness effects are already seen in adventure therapy programs and are beginning to be implemented more intentionally providing grand opportunity to explore the effectiveness of these two practices, what drives their compatibility, and if the results persist long-term.

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