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Adventure Therapy for Young Adults with Substance Use Disorders: A Feasibility Study of Psychosocial Empowerment Outcomes

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Abstract

This study examined the feasibility and preliminary effectiveness of an adventure therapy (AT) intervention for young adults in outpatient Substance Use Disorders (SUD) recovery settings. This research sought to understand participants' experiences and evaluate the program's impact on critical psychological resources. Twelve young adults from a SUD recovery program in Greece participated in a four-day structured adventure therapy intervention involving sea kayaking, camping, and reflective processing. A quantitative approach utilized the Adventure Therapy Experience Scale (ATES 5.0) to assess program dimensions, while paired-samples t-tests compared pre- and post-intervention scores on the Rosenberg Self-Esteem Scale (RSES), and the General Self-Efficacy Scale (GSE). Quantitative results indicated high participant appraisal of interpersonal cohesion (M = 9.17) and the restorative role of nature (M = 8.85) in the group. Statistical analysis revealed significant improvements in both self-esteem ($p < .001$, $d = 0.96$) and general self-efficacy ($p < .05$, $d = 0.28$) after the intervention. The findings suggest that short-term AT interventions can effectively strengthen internal coping mechanisms and facilitate identity reconstruction. By providing mastery experiences within a supportive natural environment, AT serves as a potent complementary tool for enhancing resilience and preventing relapse during substance use recovery.

Indroduction

Substance Use Disorder (SUD) is a clinical classification of problematic use, with addiction serving as its most chronic manifestation. Characterized by compulsive use despite adverse outcomes, addiction is defined as a relapsing brain disorder involving persistent neurobiological alterations in reward and self-regulation systems (Koob & Volkow, 2016; Volkow & Blanco, 2023).

Neuroadaptations within dopaminergic pathways facilitate a transition from voluntary to compulsive behavior (Everitt et al., 2008; Robinson & Berridge, 2001). This progression is marked by a shift from positive reinforcement (pleasure-seeking) to negative reinforcement, where substance use primarily serves to alleviate withdrawal and negative emotionality (West & Brown, 2013). Consequently, cessation remains difficult even when the individual intends to stop.

Broadly, addiction encompasses both psychoactive substances and behavioral patterns, such as gambling and problematic Internet use (UNODC, 2023). Because SUD arises from the complex intersection of biological vulnerability, psychological mechanisms, and socio-environmental factors, effective intervention requires a comprehensive, integrative approach to prevention and treatment (Volkow & Blanco, 2023).

Addiction manifests in both physical and psychological dimensions. Physically, the body adapts to the presence of a substance, leading to increased tolerance and severe physiological dysfunction upon cessation. Psychologically, it is marked by intense cravings and a compulsive mental need to maintain the "high". These processes often trigger broader disturbances, including mood instability, diminished self-esteem, and a marked lack of impulse control (Julien et al., 2011). As addiction progresses, an

individual's daily life and behavior become increasingly centered on obtaining and using substances, resulting in a gradual withdrawal from social roles and productive activities (Reinarman, 2005). Ultimately, this shift leads to a profound redefinition of the self, where the individual's identity is reconstructed as an "addicted subject" within their social and cultural environment (Coonfield, 2007).

Addiction is a multifaceted phenomenon emerging from the complex interplay between genetic, personal, familial, and socio-environmental factors, often serving as a maladaptive mechanism to alleviate daily life stressors. The etiology of addiction involves a constellation of risk factors, including antisocial behavior, emotional disorders such as depression and post-traumatic stress, and personality traits such as high impulsivity and reward-seeking (Gorka et al., 2013; Perry & Carroll, 2008). On a systemic level, the breakdown of social cohesion, low socioeconomic status, and family dysfunction, combined with high substance availability, create an ecosystem conducive to addiction (Dingle et al., 2015).

The erosion of an individual's psychological resources is central to the maintenance of addictive behavior. The literature indicates that individuals struggling with SUD often present with low self-esteem and a diminished sense of self-efficacy, frequently feeling incapable of managing cravings or stressful conditions without substances. This negative self-image and perceived inadequacy make the person particularly vulnerable to relapse when effective coping responses are lacking (Marlatt & Donovan, 2005).

The Role of Self-Efficacy and Self-Esteem in SUD Recovery

Self-efficacy refers to an individual's belief in their capacity to organize and execute actions required to manage prospective situations and achieve goals (Bandura, 1997). This construct reflects perceived rather than actual competence, influencing human agency by shaping choices, effort, and persistence in the face of obstacles (Bandura, 1997; Maddux, 1995). Individuals with high self-efficacy engage more readily with challenging tasks and sustain effort despite setbacks (Bandura & Adams, 1977), whereas those with low self-efficacy often avoid perceived threats to their coping capacity, interpret obstacles as personal deficiencies, and withdraw prematurely from difficult tasks (Maddux, 1995). Social cognitive theory posits that self-efficacy develops primarily through mastery experiences, supported by vicarious learning, social persuasion, and the interpretation of physiological and emotional states (Bandura, 1997). Accumulated successes enhance resilience, enabling individuals to approach future challenges with greater confidence.

Self-esteem is defined as an individual's subjective evaluation of their worth, ranging from positive to negative, and strongly influences emotional well-being (Baumeister et al., 2003; Snyder & Lopez, 2002). Low self-esteem constitutes a vulnerability factor that impairs stress processing and the interpretation of social feedback (Sowislo & Orth, 2013). For marginalized populations, structural inequities exacerbate these effects, creating compounded disadvantages (Lereya et al., 2024). Reinforcing self-esteem is

therefore integral to promoting social integration, stress management, and behavioral change, forming a key component of recovery interventions (Corrigan & Rao, 2012; Bandura, 1997).

Recent evidence highlights self-efficacy and self-esteem as critical determinants of substance use disorder prevention and treatment (Chavarria et al., 2012). Addiction is often maintained by negative self-perceptions, with low self-efficacy and self-esteem undermining motivation and the cognitive strategies necessary to inhibit addictive impulses (West & Brown, 2013; Zeigler-Hill & Wallace, 2012). Higher self-efficacy correlates with greater abstinence, reduced relapse, and improved management of anxiety-induced thoughts (Alavi, 2011; Chavarria et al., 2012). Despite these findings, practical application in clinical settings remains constrained by limited empirical evidence (Chavarria et al., 2012).

Contemporary interventions, including behavioral therapies and experiential approaches, target the reconstruction of self-perception by fostering mastery experiences and coping skills (Jhanjee, 2014; West & Brown, 2013). Adventure therapy and similar experiential models provide immersive environments where psychological support and hands-on learning promote personal development, identity restructuring, and the reinforcement of internal coping mechanisms (Bowen et al., 2016; Díaz-Martínez et al., 2024; Russell et al., 2017). By integrating self-efficacy and self-esteem enhancement into treatment design, such approaches strengthen protective psychosocial resources and facilitate long-term recovery from SUD.

Adventure therapy

Adventure Therapy (AT) is a contemporary, experiential therapeutic approach grounded in ecotherapy and ecopsychology, utilizing structured activities in natural environments to promote mental health, personal development, and life skills acquisition. Defined as the prescriptive use of adventure-based experiences by trained professionals to facilitate therapeutic change across cognitive, emotional, and behavioral domains, AT differs from traditional psychotherapy by incorporating elements of real or perceived risk, which activate deeper psychological processes and enhance engagement, responsibility, and motivation (Gass et al., 2012; Fletcher & Hinkle, 2002). Its foundational principles—active participation, intrinsic motivation, direct experience of consequences, emotional reflection, and transfer of learning to real-life contexts—position participants as active agents of change, fostering self-awareness and personal transformation (Gass et al., 2012).

Experiential learning theory provides a central theoretical framework for AT, conceptualizing learning as a cyclical process of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 2014). Participants engage in physically and emotionally demanding activities, reflect on these experiences, extract meaning, and apply newly acquired skills to future situations. This cyclical learning process enhances self-awareness, facilitates internalization of adaptive cognitive and behavioral patterns, and promotes sustainable behavioral change (Neill, 2003; Richards et al., 2011). The integration of challenge, reflection, and application generates “teachable moments” that enable participants to re-evaluate limiting beliefs and develop adaptive coping strategies.

The natural environment serves as an active co-therapist in AT, providing a multisensory immersive context that reduces stress, promotes psychological restoration, and enhances emotional regulation (Shanahan et al., 2019; Soga & Gaston, 2016; Sonntag-Öström et al., 2015; Yang et al., 2023). Nature balances challenge with support, introducing unpredictability and controlled uncertainty to foster resilience, while simultaneously offering a restorative backdrop for introspection (Miles, 1987; Kuo, 2015). Furthermore, nature encourages connection to self, others, and the broader ecosystem, an important factor for individuals experiencing social isolation, with positive implications for well-being and social integration (Jordan & Hinds, 2016).

AT intentionally incorporates perceived or actual risk as a therapeutic mechanism, using controlled exposure to elicit eustress—a positive, motivating stress that encourages participants to confront personal limitations and develop mastery, competence, and self-efficacy (Priest & Gass, 2017; Selye, 1976; Nelson & Simmons, 2003; Neill, 2003). The principle of "challenge by choice" allows participants to self-regulate engagement, supporting autonomy, intrinsic motivation, and safety, particularly in populations with trauma histories (Priest & Gass, 2017).

Facilitators in AT integrate clinical expertise with technical competence, ensuring physical and psychological safety while facilitating meaningful therapeutic experiences (Tucker & Norton, 2013). Alongside technical skills such as risk management and navigation, therapists employ cognitive-behavioral, Gestalt, and narrative approaches to support reflection and meaning-making (Gass et al., 2012). Debriefing sessions are critical for processing experiences, deriving insights, and integrating learning into daily life. The therapeutic relationship emphasizes collaboration, with the therapist as guide rather than authority, enhancing engagement and intervention efficacy (Gass & Gillis, 2010).

AT interventions encompass structured activities designed to achieve therapeutic goals, including cooperative tasks for teamwork, trust-building exercises, initiative challenges for problem-solving and leadership, and high-adventure activities to build resilience and confidence (Priest & Gass, 2017). Programs are tailored to participant needs, with activity intensity progressing to provide achievable challenges and maximize outcomes (Becker, 2010; Gass et al., 2012).

Empirical evidence supports AT's effectiveness across populations and contexts (Cavanaugh et al., 2025). Meta-analytic findings indicate significant improvements in psychological, behavioral, emotional, and interpersonal outcomes, with effects sustained over time (Bowen & Neill, 2013). Key benefits include increased self-esteem, self-efficacy, emotional regulation, and social skills, largely driven by mastery experiences that reinforce confidence and adaptive behavior (Bandura, 1997; Goldenberg et al., 2005; Russell et al., 2017).

AT has garnered attention as a complementary intervention in substance use disorder (SUD) treatment, targeting domains such as emotional regulation, self-efficacy, and social functioning (Díaz-Martínez et al., 2024). Evidence demonstrates its capacity to enhance coping, reduce negative affect, and foster achievement and purpose in recovery populations (Bettmann et al., 2013; Panagiotounis et al., 2020; Russell, 2007). Its action-oriented, nonverbal nature suits individuals resistant to conventional therapies,

while group-based formats promote social support and accountability essential for sustaining recovery (Fletcher & Hinkle, 2002; Gillis & Simpson, 1991).

By situating participants in real-world challenges, AT enables the translation of therapeutic insights into practical skills. Individuals recognize behavioral patterns, experiment with new coping strategies, and transfer learning beyond the therapeutic setting, reinforcing sustainable personal and social development (Russell et al., 2017).

Despite the growing interest in AT, evidence regarding its impact on psychological constructs such as self-efficacy and self-esteem remains limited, with most available data derived from small-scale or uncontrolled studies. The primary aim of this study was to examine the therapeutic effects of an adventure therapy intervention on young adults who were already participating in SUD recovery programs. This study focused on the potential of a four-day adventure therapy program to enhance participants' self-efficacy and self-esteem. Participants were expected to experience positive personal benefits, particularly in terms of social connection, emotional processing, and personal growth. The intervention was also designed to be feasible and acceptable, with high levels of satisfaction and engagement anticipated in the program structure and activities. This pilot study aims to provide preliminary evidence to inform the design of larger, controlled adventure therapy interventions for individuals in substance use recovery, bridging both theoretical understanding and practical application.

H1

Participation in the adventure therapy program is expected to be associated with positive changes in psychosocial outcomes, including increased self-efficacy and self-esteem.

H2

Participants are anticipated to report positive subjective experiences and personal benefits, particularly in relation to social connections, emotional processing, and personal growth.

Methodology

Participants

The study involved 12 young adults (M = 25.08, SD = 3.78) enrolled in the Diaplus outpatient addiction recovery program in Corfu, Greece. Participants were selected based on therapeutic engagement, adherence to program protocols, cooperative disposition, and sufficient physical capacity for outdoor and physically demanding activities. The sample exhibited a pronounced gender imbalance (91.7% male), consistent with global epidemiological trends indicating higher substance use prevalence among men (UNODC, 2023). The mean treatment duration of 2.33 years (SD = 1.30) reflects a relatively stable and therapeutically mature cohort.

Eligibility required good physical health, and voluntary willingness to participate in an adventure therapy intervention. Prior to engagement, participants received comprehensive information regarding study objectives, procedures, data confidentiality, and anonymity. Written informed consent was obtained from all participants, who were explicitly informed of their right to withdraw at any point without any negative consequences. This rigorous selection and ethical protocol ensured both the safety of participants and the integrity of the intervention evaluation.

Design

This study, conducted within the framework of the European Change-Up/Erasmus+ Sport project, examined the feasibility and preliminary effectiveness of adventure therapy (AT) as a complementary approach for young adults with a history of substance use disorder. The program received formal approval from the Board of the therapeutic program “Diaplus,” adhering to established ethical and deontological standards. It was explicitly designed according to experiential learning principles and psychosocial empowerment, aiming to restore participants’ relationships with themselves, their peers, and the natural environment.

Each day was structured around specific objectives and sequential activities, forming a therapeutic trajectory that progressed from establishing safety and trust to managing challenges and assuming responsibility for personal choices. Activities included collaborative problem-solving, physically engaging exercises of varying intensity, orientation tasks, and guided reflection, providing opportunities for personal growth and internal processing. The primary aim was to assess whether a four-day adventure experience could positively influence psychosocial outcomes such as self-efficacy and self-esteem, which are critical for sustained abstinence, relapse prevention, and social reintegration (Bandura, 1997; Gass et al., 2012). The intervention also targeted the translation of experiential learning into daily life through practical coping and interpersonal skill acquisition.

The program took place at Isos, Corfu, chosen for its natural environment conducive to reflection and physical engagement. Activities adhered to core AT principles emphasizing active participation, challenge, cooperation, and emotional-physical engagement. Specific tasks included tent-based camp setup, group problem-solving exercises, meal preparation, and sea kayaking, the central activity designed to strengthen autonomy, competence, and personal empowerment. The facilitator team comprised professionals with expertise in substance use treatment, AT methodology, and outdoor sports facilitation, ensuring safety and therapeutic alignment. Preparatory meetings and liaison with participants’ therapists supported individualized planning and responsiveness to emerging needs (Walsh & Russell, 2010).

The daily program structure progressively supported psychosocial development. Day 1 focused on safety, icebreaker exercises, and shared responsibilities to foster trust and autonomy. Day 2 emphasized paired sea kayaking and cooperative tasks, enhancing social cohesion and a sense of belonging. Day 3 introduced progressively challenging kayaking exercises under a “challenge by choice” framework,

promoting mastery, reflective processing, and coping strategies. Day 4 integrated learning, articulated personal goals, and facilitated skill transfer to daily contexts. A closing ceremony reinforced identity consolidation, social belonging, and internalization of experiences, supporting sustained psychosocial benefits (Harper et al., 2015; Norton et al., 2014).

Overall, the intervention combined structured outdoor activities, experiential challenges, and reflective processes within a coastal environment to create a supportive, immersive therapeutic setting. Careful activity sequencing aligned with participant needs and evidence-based AT frameworks, promoting psychosocial empowerment and resilience among individuals recovering from substance use disorders.

Measures

Data were collected at pre- and post-intervention using standardized, validated instruments to assess short-term psychosocial outcomes.

The Adventure Therapy Experience Scale (ATES 5.0; Russell & Gillis, 2017) was administered exclusively at post-test to capture participants' subjective experiences of the intervention. The instrument comprises 24 items, including 22 closed-ended questions and 2 open-ended responses. Items are rated on a 10-point Likert scale (1 = strongly disagree to 10 = strongly agree), allowing for a nuanced assessment of experiential outcomes. Two of the closed-ended items examine the perceived alignment between therapeutic goals and participation in adventure-based activities, while the remaining 20 items are organized into five subscales reflecting core dimensions of the adventure therapy experience: (a) Interpersonal (4 items), (b) Intrapersonal (4 items), (c) Reflection (4 items), (d) Connection with Nature (4 items), and (e) Challenge (4 items). For the purposes of the present study, only these five subscales were included in the analysis. The scale demonstrated acceptable internal consistency (Cronbach's $\alpha = .75$), supporting its reliability in capturing short-term experiential outcomes.

General self-efficacy was measured using the 10-item General Self-Efficacy Scale (GSE; Schwarzer & Jerusalem, 2013), rated on a 4-point Likert scale, with higher scores reflecting stronger perceived capacity to manage challenges. Reliability was acceptable at both time points ($\alpha > .71$).

Self-esteem was assessed with the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965), validated in Greek populations (Galanou et al., 2014). The 10-item scale, rated on a 4-point Likert-type scale, captures global self-worth through positively and negatively worded items and demonstrated consistent reliability across assessments ($\alpha > .72$).

Results

Table 1 presents the mean scores and standard deviations of ATES 5.0 for each dimension.

Table 1
Means and SD on the Adventure Therapy Experience Scale

Variable	N	M	S.D	Min	Max
Interpersonal	12	9.17	0.86	7.5	10
Intrapersonal	12	6.88	1.10	5.75	9.75
Reflection	12	7.83	0.93	6.75	9.5
Nature	12	8.85	1.19	6.75	10
Challenge	12	6.63	1.48	3.75	8.75

Table 1. Means and SD on the Adventure Therapy Experience Scale

The adventure therapy program yielded largely positive outcomes for participants in recovery from substance use disorders. The Interpersonal dimension received the highest mean score (M = 9.17, SD = 0.86), indicating strong group cohesion, trust, and supportive social relationships, essential for establishing a safe therapeutic environment. The Nature dimension was also highly rated (M = 8.85, SD = 1.19), highlighting the role of engagement with natural settings in fostering emotional regulation, present-moment awareness, and psychological wellbeing.

Reflection scores (M = 7.83, SD = 0.93) suggest participants were able to process experiences, engage in self-examination, and consider personal attitudes and behaviors, demonstrating effective facilitation of experiential learning. The Intrapersonal dimension (M = 6.88, SD = 1.10) was moderately positive, reflecting potential challenges in emotional expression or management of personal psychosocial difficulties. The Challenge dimension (M = 6.63, SD = 1.48) showed the greatest variability, reflecting differences in individual perceptions of effort, readiness, and risk.

Quantitative analyses further supported the intervention's efficacy. Self-esteem increased from pre-test (M = 2.47, SD = 0.20) to post-test (M = 3.31, SD = 0.22), and general self-efficacy rose from 2.91 (SD = 0.22) to 3.12 (SD = 0.34). Paired-samples t-tests confirmed statistically significant improvements, with large effects for self-esteem ($t(11) = -7.461$, $p < .001$, Cohen's $d = 0.96$) and small-to-moderate effects for general self-efficacy ($t(11) = -2.803$, $p < .05$, Cohen's $d = 0.28$).

Overall, the findings indicate that short-term adventure therapy can enhance psychosocial functioning, particularly self-esteem, while fostering social cohesion, reflective capacity, and nature-based wellbeing. Variation in intrapersonal and challenge-related outcomes suggests that individualized approaches may further optimize benefits. These results provide preliminary empirical support for adventure therapy as a structured, immersive intervention to promote resilience and psychosocial empowerment among young adults in substance use recovery.

Table 2. Means and SD on RSES and GSE

Table 2
Means and SD on RSES and GSE

Variable	Time points	N	Mean	SD
RSES	Pretest	12	2.47	0.20
RSES	Posttest	12	3.31	0.22
GSE	Pretest	12	2.91	0.22
GSE	Posttest	12	3.12	0.34

Table 3. T-Tests and Effect sizes.

Table 3
T-Tests and Effect sizes.

Variables	t	df	*p*	*d*
RSES	-7.461	11	.001	0.96
GSE	-2.803	11	.017	0.28

Discussion

This study demonstrates that a well-structured, targeted AT intervention can serve as a potent catalyst for psychosocial empowerment among young adults participating in SUD recovery programs. Beyond recreational engagement, AT—when implemented systematically—facilitates meaningful personal growth, reflective insight, and the development of critical psychosocial skills. Key elements underpinning these outcomes include a stable and supportive interpersonal environment, active engagement with a natural setting, structured reflection opportunities, and carefully calibrated challenges that promote progressive mastery without overwhelming participants. Collectively, these components create a therapeutic ecosystem that supports personal insight and practical skill acquisition, aligning with broader recovery objectives (Buckley & Brough, 2017).

Consistent with the first hypothesis, participation in the four-day AT intervention was associated with statistically significant improvements in psychosocial outcomes. Participants reported enhanced confidence in managing uncertainty, a greater capacity to generate and apply adaptive coping strategies under pressure, and a more stable sense of self-worth. Improvements in self-esteem were relatively uniform across participants, suggesting that the group-based and experiential nature of AT fosters shared processes of positive self-reappraisal and social affirmation. These outcomes align with the theoretical premises of mastery experiences within social cognitive theory, whereby successful engagement in progressively challenging tasks strengthens perceived competence and supports adaptive behavioral persistence (Bandura, 1997). Recent empirical studies corroborate the role of experiential and nature-based interventions in enhancing self-concept and psychological resilience

through mechanisms of embodied learning, social connectedness, and perceived accomplishment (Mutz & Müller, 2016; Allan & McKenna, 2019; Mygind et al., 2019; Coventry et al., 2021).

The rapid emergence of these improvements within a four-day intervention, however, necessitates cautious interpretation. Some effects may reflect transient “adventure high” responses—acute mood and self-perception elevations driven by physiological arousal, novelty, and emotionally salient experiences in the natural environment. Neurobiologically, these effects are likely mediated by increased dopaminergic and endorphin activity, coupled with reductions in stress-related biomarkers, temporarily enhancing affect and perceived competence (Ewert et al., 2020; Buckley et al., 2019). This may account for the comparatively larger effect on self-esteem relative to self-efficacy, as the former is more sensitive to immediate affective and social reinforcement, whereas the latter reflects more stable beliefs that require repeated validation. Additional moderators include intervention intensity and challenge level (e.g., sea kayaking under variable conditions versus low-intensity hiking) and the quality of facilitation and therapeutic alliance, both critical to experiential and group-based outcomes (Bowen & Neill, 2013; Norton et al., 2014; Gass et al., 2020).

Enhancements in self-efficacy align with its established role as a central mechanism in SUD recovery, particularly regarding coping with high-risk situations and relapse prevention (Hendershot et al., 2011). Within AT, improved self-efficacy likely reflects participants’ engagement in problem-solving under real or perceived risk conditions, reinforcing beliefs in their capacity to manage future challenges. The small-to-moderate magnitude of change is theoretically consistent, as self-efficacy typically develops through repeated, contextually varied mastery experiences and reflective processes (Kolb, 1984; Morris, 2020). Short-term interventions may initiate but not fully consolidate efficacy beliefs, a pattern corroborated by longitudinal studies emphasizing the need for sustained engagement and iterative skill application to achieve durable improvements (Kelly et al., 2020).

The therapeutic trajectory—progressing from safety and trust establishment to controlled challenge management—appears to have facilitated psychosocial gains. Structured exposure to progressively demanding tasks provided opportunities for eustress, activating focused attention, emotional regulation, and adaptive problem-solving. While some participants leveraged controlled stress as a growth stimulus, others required task recalibration to maintain engagement without overwhelm. Integration of the natural setting, challenge, and reflective processing enabled reframing of beliefs and experiences, enhancing self-concept and perceived competence.

Aligned with the second hypothesis, participants reported highly positive subjective experiences, particularly regarding social connection, emotional processing, and personal growth. The intervention fostered a cohesive micro-community in which mutual recognition, collaborative problem-solving, and shared achievement reinforced a shift from identifying as individuals with SUD histories to perceiving themselves as capable, contributing group members (Best et al., 2016). These experiences mirror established mechanisms in group psychotherapy, including social cohesion, collective efficacy, and identity reconstruction (Yalom, 2005), underscoring AT’s value in promoting prosocial engagement.

Multiple interrelated mechanisms explain AT's contribution to psychosocial improvement. First, the natural environment acts as a regulatory context, reducing cognitive load, lowering stress, and fostering mindfulness, thereby facilitating decision-making and emotional stability (Berger & McLeod, 2006; Burls, 2007). Second, controlled exposure to challenges generates eustress and mastery experiences, strengthening perceived competence and resilience (Bandura, 1997; Gass et al., 2012). Third, group cohesion provides recognition, feedback, and role responsibilities, supporting identity shifts from passive substance users to capable, contributing members, reducing relapse risk (Best et al., 2016). Finally, structured reflection consolidates learning, linking action with personal patterns, values, and future choices, thereby supporting the transfer of skills to real-life contexts (Ewert et al., 2012; Kolb, 2014). Collectively, these mechanisms account for observed increases in self-efficacy and self-esteem and highlight AT's multifaceted value as a psychosocial intervention.

Practical Implications

The findings offer actionable guidance for optimizing adventure therapy (AT) programs for individuals recovering from substance use disorders (SUD). High-quality interpersonal climates can be cultivated through explicit group agreements, safety protocols, and targeted trust-building exercises. The natural environment should be leveraged intentionally, employing grounding practices, mindfulness walks, and silent observation to enhance emotional regulation and present-moment awareness. Reflection sessions benefit from structured prompts, encouraging participants to extract meaning from experiences and translate insights to daily life. The variability in participants' perceptions of challenge highlights the need for flexible activity design, graded risk, and alternative roles to ensure mastery experiences without excessive stress (Priest & Gass, 2017). Activities incorporating controlled risk, such as kayaking and outdoor living, create spaces of "productive destabilization," demanding engagement while remaining safe enough to reinforce self-regulation, internalized success, and adaptive coping, thereby supporting recovery goals. Goal-directed engagement combined with ongoing assessment of perceived challenge and achievement enhances therapeutic adherence and long-term motivation for behavioral change (Ryan & Deci, 2000; Fleming, 2018).

Limitations

Despite promising outcomes, several limitations constrain interpretation. The small sample size limits statistical power and generalizability, while the absence of a control group prevents causal inferences. Selection bias is present, as participants were already engaged in treatment and relatively stable, limiting applicability to individuals in early or acute recovery stages. All participants had over two years of treatment experience, further restricting transferability to early-stage recovery populations. Gender imbalance reduces representativeness and precludes gender-specific analyses. Context specificity—conducted within a single site—may limit ecological transferability across cultural, geographic, or programmatic contexts. Short intervention duration precludes assessment of long-term effects, maintenance of gains, or relapse outcomes, and the absence of follow-up data limits conclusions on

sustainability. Field conditions, including weather variability, physical fatigue, and logistical constraints, may have influenced engagement and responses. Additionally, a potential Hawthorne effect cannot be excluded, as participant behavior may have been altered by novelty and observation.

Recommendations for Future Research

Future research should build on these preliminary findings using rigorous, comprehensive designs. Randomized controlled trials (RCTs) with larger, more diverse samples are essential to establish causal relationships and generalizability. Active control groups, such as structured physical activity programs without adventure elements, would allow isolation of AT's unique contributions. Stratified sampling considering gender, recovery stage, trauma history, and baseline psychosocial functioning would facilitate identification of differential effects and development of targeted interventions. Longitudinal designs with extended follow-up are crucial to evaluate sustainability of outcomes, including relapse prevention, maintenance of self-efficacy, and psychosocial adjustment. Mixed-methods approaches combining quantitative measures with systematic qualitative analyses would provide nuanced insights into participants' lived experiences and mechanisms of change. Standardized intervention protocols—including manuals, facilitator training frameworks, and graded challenge guidelines—would improve replicability, enable cross-study comparisons, and facilitate integration of AT into formal treatment and policy frameworks. Collectively, these steps would strengthen the evidence base for AT in SUD recovery.

Integration with Existing Literature

The findings align with existing literature on AT and nature-based interventions, reinforcing their impact on self-perception, resilience, and broader psychosocial functioning (Bowen & Neill, 2013; Norton et al., 2014; Russell et al., 2017). Improvements in self-efficacy and self-esteem are consistent with prior evidence that structured AT programs enhance core psychological resources among individuals in recovery (Panagiotounis et al., 2020). Similarly, short-term AT interventions have been shown to produce measurable gains in self-concept and capacity for behavioral change (Panagiotounis et al., 2020).

Nature immersion and "green exercise" are associated with reductions in stress and depressive symptoms, alongside enhanced attention, mood, and mindfulness (Linke & Ussher, 2015; Ambra, 2007; Sonntag-Öström et al., 2015). At the interpersonal level, collaborative engagement, problem-solving, and mutual support are critical for identity reconstruction and sustained therapeutic involvement (Yalom, 2005; Bettmann et al., 2016). Mastery experiences and active participation in challenging but achievable tasks foster competence, responsibility, and agency, which are protective factors in SUD recovery and support relapse prevention (Bandura, 1997; Kadden & Litt, 2011; Panagiotounis et al., 2020). By integrating psychological, social, and environmental elements, AT operates as a coherent intervention addressing multiple determinants of recovery.

Conclusion

In conclusion, this study provides evidence that AT is a structured, theory-informed, and clinically applicable intervention capable of enhancing psychosocial outcomes among young adults in SUD

recovery. Participants demonstrated measurable increases in self-efficacy and self-esteem, alongside strengthened social bonds, emotional processing, and personal growth. AT facilitates these outcomes through environmental immersion, graded challenge, group cohesion, and structured reflection, producing mastery experiences and supporting sustainable behavioral change. While further research with rigorous designs is needed, the current findings suggest that AT can play a central role in comprehensive recovery programs, supporting psychosocial restoration, relapse prevention, and development of a resilient, capable self. By offering real-life experiences of competence and group belonging, AT transforms abstinence from a demanding exercise of self-control into a practical, attainable, and enduring life choice, providing a pathway for recovery, reintegration, and the restoration of hope.

Declarations

Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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