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Lay Beliefs about Self-Love in the Context of Alcohol and Other Drug Recovery: A Study of Social Media Posts

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Lay Beliefs about Self-Love in the Context of Alcohol and Other Drug Recovery: A Study of Social Media Posts

By

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Abstract

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Diseases of despair, often characterized as morbidity associated with feelings of hopelessness, have received public and scientific attention in recent years. One common disease of despair is *alcohol and other drug (AOD) misuse*. AOD misuse is pervasive and harmful to individual and societal well-being. Although many individuals do not participate in any formal treatment, many more people identify as being "in recovery" or otherwise having resolved a prior issue with AOD. Capturing these persons' recovery definitions (e.g., abstinence, process of growth) and experiences have proved challenging due to how people (do not) identify themselves in recovery. The utilization of different research recruitment methods and analyses may clarify this. Learning from individuals outside formal pathways of treatment and recovery may illuminate mechanisms for innovative practice methods that promote well-being, and observing recovery discourse in new ways may therefore elucidate ways to prevent AOD relapse and sustain recovery.

Interventions targeting emotion regulation and negative affect to alleviate hopelessness have been explored as mechanisms for facilitating treatment and preventing relapse. Many of these treatments seek to reduce emotional distress (i.e., negative affect). Relatively unexamined is the use of positive affect (i.e., positive emotions or positive feelings) in the AOD treatment and recovery literature. Studies of positive affect in the AOD treatment and recovery context have generally been conducted with very specific AOD groups (e.g., methamphetamine using men who have sex with men) and use small sample sizes. Additionally, this literature primarily discusses positive feelings related to buffering stress, acquiring resources (e.g., social connection), and reducing unhelpful health behaviors (e.g., AOD misuse) as concepts of positive affect. Yet, it overlooks a concept evoked by the public: *self-love*. Self-love is not clearly defined but seems to present a positive view of accepting oneself, signaling care for the self, and experiencing positive emotions and social connection. While the literature primarily uses the constructs of self-esteem and narcissism to operationalize self-love, laypersons may hold different beliefs about self-love and make different use of this concept.

Both self-love and AOD recovery are discussed extensively on social media platforms. As of December 2022, Instagram has almost 94 million posts with #selflove (Instagram, 2022) and has increased by an estimated 56 million posts since this project's inception in March of 2020. Recovery-related tags, like #sobriety, #12steps, and #AlcoholicsAnonymous, are also prevalent. Despite these topics' popularity, there is a dearth of research exploring these topics on social media. To capture the general public's views of self-love (i.e., lay beliefs), specifically how people make meaning of self-love and within an AOD recovery context, this study observes invocations of self-love in general and by people referencing AOD recovery on social media. Leveraging social media for the study of a positive affect-related concept contributes to the research by accessing a large sample size and a broad spectrum of recovery discourse.

Using #selflove social media posts from 2019, this mixed-methods dissertation aimed to uncover lay beliefs of self-love in a general and in an AOD recovery context in 188,114 and 902 posts, respectively. This was done through an iterative process of collecting, analyzing, and interpreting social media posts and then theorizing and validating their meaning. The dissertation employed topic modeling, a method that integrates machine learning and natural language processing, to identify topics of self-love in social media (i.e., Instagram and Twitter) posts that are also tagged with allusions to recovery. Probability densities and data mapping visualization were used to present clusters of self-love, and human labeling further delineated specific themes. Next, utilizing computational prediction modeling, annotations of allusions of recovery and self-love meanings were used to train an algorithm with the aim of accurately classifying the co-occurrence of self-love and AOD themes related to abstinence talk versus abstinence silence (i.e., no mention of abstinence in a post). Lastly, an algorithm was trained to predict AOD recovery content in social media posts.

Findings demonstrate that self-love on social media encompasses four primary categories: relationship to the self, wellness, self-care, and engagement with others. Within an AOD recovery and #selflove context, four categories emerged: process of growth, learning from the past, building new beginnings, and getting help. Both samples—#selflove generally and the AOD recovery subsample—contained numerous similarities within these topics, such as prioritizing the self, utilizing coping strategies, and a process of change. Key differences are that the AOD recovery subsample highlighted learning from the past while the self-love sample included self-promoting discourse (within the *engagement with others* category). Additionally, when narrowing the focus to the #selflove AOD recovery subsample to predict abstinence talk and abstinence silence, several paths of co-occurring self-love and AOD recovery were found. Abstinence talk was predicted by expressing positive emotions, taking responsibility, using recovery slogans and mentioning alcohol, and discussing alternatives to 12-steps programs without mentioning AOD substance and anger. Abstinence silence was predicted in discussions that mentioned alcohol in some capacity (e.g., past use) without referencing recovery slogans. Lastly, in a quest to predict AOD recovery content, this study was also able to develop an algorithm with 99% accuracy and an F1 score of .99 (which factors in precision and recall) to differentiate between AOD recovery content and non-AOD recovery content within #selflove. Words related to abstinence (e.g., sober), substance (e.g., alcohol, heroin), self-empowerment (e.g., commit, admit), and positive emotions (i.e., gratitude, inspiration) were found to be important in predicting AOD recovery content compared to non-recovery #selflove content. Based on these findings, layperson beliefs about self-love and within AOD recovery are

discussed more in depth in this dissertation's discussion chapter as a relationship with the self, well-being, and self-care.

By examining social media users' beliefs of self-love and within an AOD recovery context, there are multiple implications for practice and research. This line of research elucidated lay beliefs of self-love in an AOD recovery context and contributed to extant research by examining a positive affect-related concept with a large sample size. This research clarified existing self-love messaging, offered language to practitioners of how abstinence is discussed, and created an algorithm that could identify AOD recovery content for potential future study and participant recruitment. This work has a greater goal of building a future line of research to examine self-love as a mechanism to prevent AOD misuse and diseases of despair and facilitate behavioral health interventions in treatment and recovery. While this study is situated within AOD recovery, self-love may have broader implications for other behavioral health issues, such as depression and eating disorders.

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With appreciation and warmth,

Kelly L. Ziemer
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This six-chapter dissertation presents background, theory, three research questions with their corresponding analyses and results, and lastly a discussion. Chapter 1 discusses the social problem of alcohol and other drugs (AOD) misuse and a potential protective factor in the positive affect-related concept, self-love. Chapter 2 provides theory on the use of emotion research in AOD recovery and extant evidence about self-love and its discussion on social media. Chapter 3 examines the use of *unsupervised* machine learning, specifically a method likened to grounded theory known as topic modeling, to detect latent topics of self-love. #selflove posts on social media are analyzed to understand the general discourse of the self-love concept. It is compared to a subsample of #selflove posts within AOD recovery posts to identify differences between how self-love is discussed broadly and within the context of recovery. Chapter 4 explores the #selflove AOD recovery subsample and uses content analysis and manual annotation to examine associations between frequently discussed #selflove topics. Additionally, using *supervised* machine learning, a classification-informed decision tree is constructed to determine the most important co-occurring themes that are linked to self-love within AOD recovery to predict language that is related to mentions of abstinence. This informs practitioners about key abstinent concepts when discussing recovery outcomes with clients. Chapter 5 explores training an algorithm, a *supervised* machine learning methodology, to predict AOD recovery context within #selflove social media posts with the aim of identifying future research participants to expand AOD recovery knowledge. Chapter 6 details a general discussion of this study.

I. Background: AOD Misuse, Recovery, Positive Affect & Self-Love

Chapter 1 presents the social problem of AOD misuse and AOD recovery science. It offers a potential solution with self-love.

Alcohol and Other Drug (AOD) Misuse is a Problem

Diseases of despair, often characterized as morbidity associated with feelings of hopelessness (Goldman et al., 2018), have received public and scientific attention in recent years (Case & Deaton, 2017). Despair and its corresponding diseases have been attributed to economic, societal, and cultural factors, such as social policy and the labor market (e.g., Case & Deaton, 2017). Suicide, drug overdose, and alcohol-related liver disease (e.g., cirrhosis) are examples of diseases of despair. A key contributor to each of these diseases is substance abuse (White et al., 2020). Substance abuse, and generally diseases of despair, are impacted by affect-related experiences like social isolation, loneliness, and depression (e.g., Goldman et al., 2018; Holt-Lunstad, 2017). This paper explores how an affective mechanism, self-love, may alleviate despair-related behavior, specifically within the context of substance abuse and recovery.

Naming the Problem: AOD Misuse

Substance abuse is a broad term with specific clinical implications and lay connotations. Substance abuse and substance dependence, once classified as separate diagnoses, are now classified by the Diagnostic and Statistical Manual of Mental Disorders, 5th edition, as substance use disorder (SUD) (American Psychiatric Association, 2013). The criterion for SUD is exhibiting, in its mildest manifestation, at least two of eleven possible symptoms over a 12-month span, including: using a substance (i.e., alcohol, illicit drug, tobacco) to the extent of hazardous use (e.g., danger to self or another); impairment in social issues (e.g., relationship

conflict) and health; failure to meet responsibilities; and failed attempts to quit. Using a substance repeatedly, impulsively, and to the point of dependence is identified as an addiction (Grant & Chamberlain, 2016).

This pathology does not depict the breadth of this social problem. The harmful and dangerous activity of binge drinking, which would not necessarily categorize an individual as having an SUD or addiction, has serious individual and societal consequences (e.g., increased risk of youth developing more severe SUD into adulthood; Ryan et al., 2019) (Center for Behavioral Health Statistics and Quality (CBHSQ), 2016). Public health and public policy imperatives accordingly focus on (mis)use rather than solely addiction (Office of the Surgeon General, 2016). Thus, in this study, the term *alcohol and other drug (AOD) misuse* will be used to intentionally include a broad range of issues related to the (mis)use of these substances (Kelly et al., 2017). The reach and negative impact on individuals and society make AOD misuse a grave social problem.

The Scope of AOD Misuse

AOD misuse is pervasive and problematic. AODs are misused by people of all ages, genders, incomes, and races (Office of the Surgeon General, 2016). It is estimated that 164.8 million people, aged 12 and older (60% of the American population), used alcohol (~85%), tobacco (~36%), or an illicit drug (24%) (with cross-usage amongst the three possible) within the past month (SAMHSA, 2018). Trends in use vary with some studies reporting an increase in prevalence over time, while others present an overall decrease. AOD trends can be explained by variation of "who and to what extent" people misuse, as exemplified by an examination of reported trends in alcohol use across age groups and the extent of problematic drinking. Findings demonstrate decreases of heavy episodic drinking (i.e., binge drinking) amongst teenagers in recent years; however, alcohol remains the most frequently used substance by this age group (Johnston et al., 2020). Though trends decreased in recent years with this age group, concern remains due to an increased risk of youth developing an SUD, and severely, into adulthood (Ryan et al., 2019). Amongst adults whose drinking is not yet diagnosed as an SUD (i.e., DSM-IV; high-risk drinking, alcohol use), an increase is reported between the 12-month periods of 2001-2002 and 2012-2013 (Grant et al., 2017). Yet, compared to studies that report on adults' alcohol use disorder, a decrease is reported from 2002 to 2017 in every age category, except those 65 years and older (SAMHSA, 2019). Reasoning for its re-emergence as problematic is due to older adults' bodily sensitivity and risk of mixing alcohol with medication for physical ailments (Mattson et al., 2017). Thus, across the life course, misuse of alcohol fluctuates. For those who continue to mis(use), the risk of developing more serious conditions increases.

Heterogeneity across studies regarding *who* is (mis)using and *to what extent* they are (mis)using perpetuate incongruence in the overall picture of AOD trends. Several reasons highlight why the scope of alcohol misuse may be underreported and further emphasize why misuse is a problem worth examining. Examples include: studies reporting problematic drinking versus a DSM diagnosis (with further delineation of severity based on the DSM-IV diagnosis compared to the DSM-V diagnosis); agency funding the research and corresponding impact on their preferred subgroups of race and age (e.g., NIDA's Monitoring the Future survey focusing on grades 7-12 compared to SAMHSA's report from three separate datasets detailing older adults' usage); and historical policies and practices of reporting AOD use (e.g., prescription drug use, commonly characterized as an opioid, wasn't collected until 2015, SAMHSA, 2017; mortality rates do not consistently track alcohol misuse, NIAAA, 2020). Further undergirding

claims of AOD misuse underestimation, a 2020 National Institute on Alcohol Abuse and Alcoholism (NIAAA) report analyzing death certificates from 1999 to 2017 found that alcohol deaths in women increased by 85%. The report hypothesized several factors for this alarming increase: historically, death certificates have not monitored alcohol-related deaths but the rise in opioid mortality and its link to alcohol makes reporting more prevalent today; increased usage amongst aging baby boomers; and social acceptance of alcohol (compared to other substances) has prevented people from recognizing alcohol is the culprit (White et al., 2020). Despite the heterogeneity in estimates of the scope of AOD misuse, it is reasonable to conclude that this is an extensive problem that is not going away.

Consequences of AOD misuse.

AOD misuse is a widespread problem, with consequences for individuals and for society. Substance abuse is a key contributor to suicide, liver disease, and alcohol and drug poisoning: the top three causes of despair-related mortality (White et al., 2020). An estimated 70,000 people died from a drug overdose in 2017 (National Center for Health Statistics, 2018). Globally, alcohol remains a leading risk for health-related death (e.g., cancer) and disability, as measured in a study published in *The Lancet* examining 694 data sources of alcohol consumption across 195 locations spanning 1990-2016, gender, and ages 15-95 years old (Griswold et al., 2018).

Consequences affect not only individuals but also impact society. Societal consequences of AOD misuse are notable in allocation of government resources and spending with widespread reach to the labor market, healthcare, and legal system. AOD misuse is estimated to have cost $440 billion dollars in 2010 ($193b for illicit drug use and $249b for excessive drinking, of which 40% was allocated from taxpayer dollars) (National Drug Intelligence Center, 2011; Sacks et al., 2015). Expenditures included lost job productivity, healthcare and criminal justice services, and motor vehicle accidents. Signaling a priority to decrease these consequences, and specifically bolstering prevention and treatment for opioid use, government spending has increased in recent years (e.g., National Institutes of Health (NIH) HEAL initiative; Collins et al., 2018). Positive impacts on individual and societal consequences of AOD misuse are possible through undergoing treatment and sustaining recovery.

Gaps Persist in AOD Misuse Treatment and Recovery

Vast treatment options, some demonstrating effectiveness, for AOD misuse exist. However, only a small portion of people with AOD misuse receive these treatments (Office of the Surgeon General, 2016). The Substance Abuse and Mental Health Services Administration (SAMHSA; 2017) estimates that almost 1.4 million people receive formal substance use treatment each year. Evidence points to several barriers to obtaining formal treatment. Stigma, lack of affordability, competing job and childcare responsibilities are reasons for not seeking formal treatment (Center for Behavioral Health Statistics and Quality, 2016; Office of the Surgeon General, 2016; Marlatt & Witkiewitz, 2002). Traditional ways of providing treatment are leaving a large portion unserved. Few seek help through formal treatment, yet a significant number of people identify as being in recovery from AOD misuse (Kelly et al., 2017). To fill these gaps, novel approaches to treatment and recovery are needed (Krentzman, 2013; Office of the Surgeon General, 2016).

Non-traditional models of treatment may offer promise. The most frequently cited reason (41% of survey respondents, who met criteria for an SUD diagnosis and perceived needing treatment) for not seeking formal treatment was the respondent was not ready (CBHSQ, 2016).

Overestimating an ability to control the use and underestimating how severe the use is are reasons for not being ready (CBHSQ, 2016). Inconclusive from this survey but suggested elsewhere is that readiness may be more appealing with alternative routes to abstinence (e.g., Marlatt & Witkiewitz, 2002). Whereas traditional models of treatment deem success when abstinence is reached (e.g., Kober, 2013), non-traditional models aspire for a reduction in misuse to mitigate harm. Harm reduction models of substance abuse advocate for three overarching goals: reduce consequences with use; craft alternatives to zero-tolerance (i.e., zero consumption) that incorporate an individual's needs such as setting goals to eventually achieve abstinence or using AOD in moderation; and promote approaches that have low barriers to accessing prevention and treatment services (Marlatt & Witkiewitz, 2002).

Harm reduction interventions have been implemented across substance type (e.g., illicit drugs, Dick et al., 2019; alcohol; Muckle et al., 2012) and various contexts (e.g., online, Dick et al., 2019; in homeless shelters, Muckle al., 2012). Studies have demonstrated at least equal effectiveness, when compared to abstinence approaches, in the reduction of AOD outcomes (e.g., consumption and consequences; Marlatt & Witkiewitz, 2002). An RCT of a web-based, self-guided cannabis treatment program found at the 6-week and 3-month follow-up, users had fewer cannabis symptoms and had used less cannabis in the past month as compared to the control group (Rooke et al., 2013). While systematic reviews of specific harm reduction interventions show preliminary benefits in having at least one positive outcome of reducing use and harm, there is an opportunity to improve the quality of studies (e.g., Dick et al., 2019). Furthermore, harm reduction may call into question the definition of recovery. The field will benefit from further exploration of how people speak about recovery.

"In Recovery": A Common Term with Various Definitions

Similar to substance misuse, the term "in recovery" has a variety of definitions (Office of the Surgeon General, 2016; White, 2007). In medical terms, recovery refers to someone regaining health after an illness (White, 2007) involving diagnosis, treatment, and rehabilitation (Kaskutas et al., 2014). The term can be as broad as the remediation of a mental health condition (Barbic et al., 2018) or improved quality of life and respect for others (The Betty Ford Institute Consensus Panel, 2007). "Recovery" also varies amongst recovery communities (e.g., Alcoholics Anonymous), and some have adopted recovery "ways of living" (W., 1939), addressing not just the biological, but also psychological and spiritual well-being. Heterogenous reporting of recovery outcomes reflect these differences. Three examples are: first, a spectrum of recovery depicted with abstinence, abstinence decreasing over time (i.e., serial recovery; White, 2007), abstinence decreasing frequency and severity (i.e., moderate recovery, White, 2007), or no abstinence at all (i.e., harm-reduction models; e.g., Kaskutas et al., 2014; Kober, 2013; White, 2007); second, variation in quantity and duration of usage (e.g., drinks per day, days abstinent in the last 90 days; Kelly et al., 2017); and third, self-identified length of time in recovery leaving the term open for interpretation (e.g., Kaskutas et al., 2014). Questions of—what are the goals of recovery, by whose determination are the goals achieved, and for how long the goals are sustained—present challenges in coming to a shared understanding of what it means to be a person treated for and recovering from AOD misuse.

Part of this challenge originates with differing opinions of the desired outcome. Some uses of recovery imply the successful treatment of a substance use disorder, though other uses of recovery imply it is naturally resolved (i.e., self-resolved with unassisted means; White, 2007). Some recovery models do not emphasize a need for abstinence (e.g., White, 2007) and others

equate recovery with automatically inferring abstinence (Reif, 2019). Popularity is growing in the "sober curious" movement emphasizing an intrigue with one's relationship to alcohol and pondering what life would be like without it (Williams, 2019). Sober curiosity advocates for mindful use, calls out "problem drinking," and recognizes that people can have a problem with AOD misuse (e.g., frequent hangovers) without ever "hitting rock bottom" (Williams, 2019). To my knowledge, no empirical findings of sober curiosity have been documented. Historically AOD treatment and recovery literature has focused on abstinence, and abstinence has been the socially acceptable, de-stigmatized path of being "in recovery." With the emergence of harm reduction and sober curiosity, there is an opportunity to gather evidence about dialogue in these different contexts. Examining how people discuss self-love within an abstinence context (i.e., abstinence talk) and a non-abstinence context (i.e., abstinence silence) could be a good place to start.

Another challenge lies within the distinction of where treatment ends and recovery begins. The beginning of recovery can be entangled with remission (i.e., the point at which the condition ended) but being in treatment or remission do not necessitate recovery (Kelly et al., 2017). Others delineate an AOD problem using a timeline with three differentiated periods of detoxification, recovery, and relapse prevention (e.g., Kober, 2013). The NIAAA define recovery from alcohol use disorder (AUD) as including both remission from AUD and cessation from heavy drinking. This definition clearly does not emphasize abstinence but rather highlights that being "recovered" is a process of growth where impairments of decrease and well-being improve over a sustained amount of time (NIAAA, n.d.). Still others reject the systematized models of pathology (e.g., intertwined with medicine, mental health, and criminal justice) and embrace solution-focused wellness, intentionally silent on the relationship between recovery and the presence of disease. While 62% agreed to wanting to quit alcohol and drugs, in interviews with postpartum women in treatment for opioid disorder, the most highly endorsed recovery goals were being a better spouse/partner and improving their finances, both at 87.5% endorsement (Shadowen et al., 2022). Despite these differences in the conceptualization of recovery, one commonality they share is the aim of surpassing a reduction in symptoms to obtain positive life changes.

There is an opportunity to further explore what recovery means. A consistent definition of "recovery" has been sought by scholars in recent years and prompted scholars to formalize a new discipline termed recovery science (Ashford et al., 2019; Brown & Ashford, 2019). The recently formed Recovery Science Research Collaborative (RSRC) has crafted a definition of recovery as "an individualized, intentional, dynamic, and relational process involving sustained efforts to improve wellness" (Ashford et al., 2019, p.183). The stance made here serves to a) conceptualize and operationalize recovery for the advancement of recovery science and b) encourage awareness that recovery may occur outside of the traditional systems which have historically disempowered and stigmatized those seeking assistance. The term "in recovery" is broad and dependent on the individual and embedded systems. Further studies can contribute to the literature by observing recovery discourse.

Efforts have been made to clarify the definition and bolster scientific recovery evidence. One such initiative sought to clarify the ubiquitous, yet opaque term "recovery" by seeking participants from various recovery pathways with the aim of defining tangible elements of a recovery definition (Kaskutas et al., 2014). Participants from an online survey of ~9,300 participants identifying as "in recovery" were recruited from heterogenous recovery pathways (e.g., faith-based recovery, recovery alumni networks, Craigslist, 12-step programs, non-

abstinent programs (i.e., medically assisted)). Factor analysis suggested four dimensions of recovery (comprised of 37 indicators): abstinence, essentials of recovery (e.g., being honest with oneself, handling negative feelings), spirituality (e.g., showing gratitude, giving back), and enriched recovery (e.g., taking care of others, being of service, improved self-esteem; Kaskutas et al., 2014). This initial attempt to universalize the term has implications for future development of a recovery measure, service utilization and the structuring of recovery systems of care, and the de-stigmatization of recovery through spotlighting personal and social experiences within recovery (Kaskutas et al., 2014; White, 2007). Elucidation of components of recovery and innovative mechanisms of treatment and recovery need to be examined.

Prevalence, Pathways, and Profile of "In Recovery"

The prevalence of people in recovery is relatively unknown. Two studies with nationally representative samples examined recovery prevalence: one identifying abstinence after an SUD diagnosis and the other recovery from AOD misuse. Captured from almost 9,000 adults in the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions, past year status of those reporting an SUD was: abstinence (14.2%), asymptomatic use (i.e., used though did not meet DSM-V criteria except for craving, 36.9%), partial remission (10.9%), and persistent/recurrent SUD (38.1%) (McCabe et al., 2018). This study was cross-sectional and only assessed a 12-month period of recovery. In another cross-sectional design, though with almost 40,000 survey respondents, approximately 63.4% "used to have a problem with drugs or alcohol but no longer do" (Kelly et al., 2017). The majority were male, ages 25-49, white, and working as a paid employee. This equates to a prevalence of 9.1% (of an estimated 22.5 million Americans). Interestingly, those who indicated no longer having an AOD problem were more than those who reported "being in recovery" (46%). This discrepancy suggests that resolving an AOD issue may not lead someone to self-identify as being in recovery. Several challenges are highlighted in this study: probability sampling, lack of longitudinal data, and an open-ended interpretation of "problem" with AOD. There is an opportunity to further explore recovery discourse and highlight perspectives that have yet to be captured in empirical research (Kelly, Abry, et al., 2018).

Very limited research exists on whether the pathway to recovery is moderated by the substance (mis)used. 12-steps programs (primarily Alcoholics Anonymous) and abstinence are often synonymous with alcohol just as medication-assisted treatment and harm reduction is with drugs, particularly opioids. When comparing remission across multiple SUD diagnoses, those with alcohol use disorder reported more stressful life events than those with other SUDs. Most recovery studies more broadly discuss alcohol use than another substance (e.g., cannabis, McCabe et al., 2018), though this may be attributed to a sampling bias (e.g., funding priorities, recruitment strategies). Past opioid and other drug users were found to have lower recovery capital (i.e., resources like social support and employment, e.g., Casey & Deaton, 2015) compared to past alcohol and cannabis users early in recovery. Recovery capital reached similar levels across substances recovered from around the third year of problem resolution (Kelly, Greene, & Bergman, 2018). It is unclear whether recovery experiences vary depending on the substance used though exploring this factor is warranted.

Tentatively understood is that there are a variety of pathways through which people access or achieve recovery. In some cases, a particular pathway is associated with remission outcome (abstinence vs non-abstinence). Common pathways include inpatient/outpatient services, anti-craving medication (i.e., medication-assisted treatment; MAT), or mutual help

groups such as Alcoholics Anonymous (AA). 12-step programs, such as AA, have proven to be more effective in increasing abstinence, even when compared to therapies such as Cognitive Behavioral Therapy (Kelly et al., 2020). For those who prefer alternatives (e.g., more secular, such as SMART Recovery) to the ubiquitous AA, longitudinal findings assessed after 12 months of program attendance demonstrated no differences, when compared to 12-step programs, in their effectiveness for maintaining lifetime abstinence from alcohol use disorder (Zemore et al., 2018). Though various recovery pathways have demonstrated effectiveness in maintaining sobriety, amongst those who identified as previously having an AOD problem, almost one-third of them sought recovery through unassisted means (Kelly et al., 2017; Mellor et al., 2019).

Unassisted entails not undergoing informal and formal treatment; these folks are referred to as natural recoverers (Sobell et al., 2000) and self-changers (Kaskutas & Ritter, 2015). When asked the reason for recovering, 17/40 said it was due to health-related consequences, the most common response, followed by negative personal effects and finances (Sobell et al., 2000). Natural recoverers may abstain from use or they may favor moderation (Sobell et al., 2000; von Greiff & Skogen, 2021), though it is commonly hypothesized that those who naturally recovered had low problem severity. In contrast, literature also points to high-problem severity users who "matured out" and shifted into moderate use from late adolescence to early adulthood (Lee, Chassin, & Villalta, 2013). This theory posits transitional life events (e.g., getting married, parenthood; Dawson, 2006) as a motivation that drives behavior change (Lee, Chassin, & Villalta, 2013). Additionally, online technologies (e.g., Bergman et al., 2018) and online support groups (e.g., Moore et al., 2011) are examples of these means. Online spaces where recovery discourse occurs are worth exploring. Using various terms and search criteria to cover the broad spectrum of recovery definitions is possible online.

Embracing new recruitment methods.

It is clear that there remains much to be explored in recovery science. Understanding *what* recovery actually is creates opportunities to identify abstinence (vs. harm reduction) and pathways (treatment, mutual help, informal resolution). Refining how researchers receive this information from participants is becoming more important. Recruitment and collection methods have historically focused on treatment centers, mutual help groups, and word-of-mouth. Given the treatment gap, it is beneficial to recruit participants outside of treatment centers. Additionally, research has recently demonstrated that the scientific community, through these pathways, is also likely missing a sample of folks who do not identify with recovery, despite resolving a former substance use problem who no longer identify as using a substance (i.e., natural recoverers; Sobell et al., 2000). Part of the problem is how researchers have pre-defined recovery in the way they ask participants about their experiences, and thus, there is concern that there is a wider issue of an underestimation of substance use prevalence (Cunningham & Godhino, 2021). Straying from methods that involve surveys and interviews and capturing how participants naturally and unprompted self-identify may offer promise; researchers have even begun to recruit participants based on their posted content online (e.g., Sinnenberg et al., 2017). Emergent literature explores the willingness for those in treatment and recovery to embrace technology as intervention sites (e.g., Ashford et al., 2018) and to discuss their recovery experiences on social media (e.g., TikTok; Russell et al., 2021). This is an untapped resource that could be beneficial to the field.

A Mechanism of AOD Misuse: Emotional Distress and Emotion Regulation

Evidence, though sparse, of recovery-related psychological and social characteristics of an individual point to a profile of recovery experiences. In a cross-sectional sample of about 2,000 people identifying as "in recovery," moderate to high levels of self-reported happiness, self-esteem, quality of life, and recovery capital were found (Kelly, Greene, & Bergman, 2018). Distress was low in this sample. However, time in recovery, operationalized as years and months since resolving their problem, did play a factor in exhibiting psychological recovery characteristics. Data spliced into two groups, those in the first 5 years of recovery and those with up to 40 years of recovery, demonstrated that happiness and self-esteem decreased in the first year of recovery, though steeply increased within the first 5 years of recovery and gradually maintained up to 40 years of recovery. Additionally, enjoying life was central to 91% of those in recovery for an SUD (Kaskutas et al., 2014). Exploring a novel approach of bolstering positive experiences in treatment and recovery may hold potential for sustaining recovery.

Emotions, also discussed in literature as affect or colloquially as feelings, are paramount to the human experience. Scholars assert two ends of the emotional spectrum - human flourishing and human suffering (e.g., Nussbaum, 2003). Emotions interact with thoughts, physiology, and behaviors. Hope and despair occupy ends of this spectrum and arise when there are expectations about meeting (or not) a specific goal (Nesse, 1999). Depression, a manifestation of despair, results when one perceives (e.g., cognition, thoughts) lacking options in a goal that has not been achieved. Experiencing depression is theorized to induce intolerability thus propelling a (behavior) change (Nesse, 1999). Health behaviors, such as AOD misuse and relapse, are influenced by negative emotions.

Affect (i.e., the propensity to experience negative and positive emotions and their corresponding events, e.g., activity enjoyment), specifically *negative affect*, has been linked to craving (i.e., inability to soothe the negative affect) and relapse (i.e., behavior), though the associations are mixed (Zemore, 2018). Emotional distress, conceptualized broadly as experiencing more negative emotions (e.g., sadness, shame and at times anxiety, depression) than positive emotions (Kang et al., 2019), is one mechanism of AOD misuse (e.g., Sinha et al., 2009). Negative emotions, and specifically negative affect is a mechanism found to impact AOD health behaviors.

Several opportunities abound in the AOD misuse and affect literature to clarify this link. First, there is a dearth of research delineating between distinct negative emotions making it difficult to pinpoint specific affect mechanisms (Williams & Evans, 2014). Few studies, with the following two studies as exceptions, exist that examine specific negative emotions. A daily diary study of 70 self-identified problem drinkers, between-subject analysis found that shame predicted solitary drinking (but not social drinking nor total drinking) and within-subject analysis found that daily shame predicted consuming more alcohol that evening (Luoma et al., 2018). Another negative emotion, sadness (i.e., irrevocable loss experiences, like a loved one, job), more than other negative emotions, predicted both tobacco use and relapse 10 and 20 years later in a study of over 10,000 participants (Dorison et al., 2019). Additionally, and paramount to this study, is that studies have historically focused on negative affect and rarely examined positive affect (e.g., Kang et al., 2019; Kober, 2013). Furthermore, just as there is a need to study specific negative emotions, there is also a need to explore positive affect's role in AOD misuse with a narrow lens.

More Evidence Needed in Emotions-Focused Treatment

Emotion regulation literature leads us to understand *how* emotions are related to AOD misuse behaviors. Emotion regulation is defined as either emotional functioning or as adaptive (e.g., acceptance) and maladaptive (e.g., avoidance) strategies to increase, maintain, and decrease feelings (Sloan et al., 2017). Models of addictive behavior demonstrate that negative emotions and AOD use are bidirectionally related (e.g., Kang et al., 2019; Kober, 2013; Sinha et al., 2009; Sliedrecht et al., 2019; Williams & Evans, 2014). Bidirectionality operates when: someone feels down and uses a substance to feel better (i.e., colloquially understood as numbing long term problems with short term euphoria or "high"); in contrast, using a substance eventually leads to feeling down. Emotion regulation could manifest in the following way: negative emotion leads to craving AOD, the individual is overwhelmed, cannot manage the craving, and uses AOD; comparatively, negative emotion leads to craving, the individual self-soothes with acceptance, and thereby does not use AOD (Kober, 2013).

Emotions serve a function to motivate behavior change and the (in)ability to regulate them is linked to (un)helpful AOD-related behaviors. Emotion dysregulation mediated the relationship between negative affect and risky substance use behaviors amongst 46 SUD patients at a Veteran's Administration hospital (Weiss et al., 2015). Additionally, in a sample of 331 university students, difficulty regulating positive emotions is associated with greater AOD misuse, though effects were small (Weiss et al., 2018). Targeting increased emotion self-regulation (e.g., acceptance)-as well as self-identity, coping skills (e.g., mindfulness), self-esteem, emotions induction-suggest emotion-related mechanisms for treatment intervention (e.g., McHugh et al., 2010; McHugh et al., 2013; Otto et al., 2007; Roos & Witkiewitz, 2017).

Examples of these mechanisms are found in treatment: Cognitive Behavioral Therapy (CBT), Dialectical Behavioral Therapy (DBT), Acceptance Commitment Therapy (ACT), and mindfulness treatment (e.g., Mindfulness-Based Relapse Prevention (MBRP) and Mindfulness Oriented Recovery Enhancement; Li et al., 2017; e.g., Kober, 2013; Sloan et al., 2017). All are widely known therapies for substance use demonstrating small to large effect sizes in decreasing emotional dysregulation (e.g., craving), reduction of emotional distress, improved abstinence, and relapse (e.g., Kober, 2013; Li et al., 2017; Sancho et al., 2018). One systematic review of 67 emotion regulation studies of transdiagnostic diagnoses—of which SUD with depression or anxiety treatment was included—found decreased SUD symptoms, decreased emotion dysregulation (i.e., avoidance), and achieved abstinence following treatment (Sloan et al., 2017). An opportunity frequently appearing in the literature that this study aims to shed light on: treatments have historically targeted negative affect only (e.g., Kober, 2013), yet it is advised to include positive affect in AOD misuse and recovery studies and interventions (e.g., Roos, & Witkiewitz, 2017).

Examining a Gap: Positive Affect in Treatment.

Terminating treatment with solely behavior changes (e.g., abstinence) is not advised and scholars call for the bolstering of pleasure in treatment and recovery for improved well-being (e.g., Boden et al., 2016; Kaskutas et al., 2014; Miller & Miller, 2009). One such mechanism is positive affect (i.e., positive subjective experiences, of which emotions are an example; Watson & Naragon, 2009). Positive affect has been more widely examined for other conditions (e.g., depression; Krentzman, 2013), however, literature is scant when considering positive affect as an AOD protective factor, induced in treatment, or critical to recovery. In a correlational study of almost 500 participants who completed a cross-sectional survey online, self-compassion was

lower for those deemed high-risk for developing an SUD compared to low-risk participants (Phelps et al, 2018) offering preliminary evidence that feelings of care amidst suffering could be a protective factor. When considered within treatment interventions, positive affect has been linked to better substance use outcomes (e.g., lower frequency of use in the past 30 days, Carrico et al., 2013; decreased opioid use following 8-week treatment; Garland et al., 2017) independent of negative emotions. However, in the scant body of literature, the samples were small (i.e., 88, 55) and highly specified (e.g., methamphetamine-using men; Carrico et al., 2013; mindfulness-based intervention for opioid use; Garland et al., 2017). One study was cross-sectional (Carrico et al., 2013) while the other measured positive affect over an 8-week intervention compared to a control group (Garland et al., 2017). Further research examining positive affect in AOD recovery is needed and with larger sample sizes.

Extant evidence theorizes positive affect as an outcome rather than a mechanism in AOD treatment. Seven studies (of 30) in a meta-analysis examined substance use interventions' effect on positive emotions. Meta-analyses findings from these interventions (i.e., those that targeted emotion regulation and used mindfulness) reported a non-significant effect of positive emotions, though authors caution the interpretation due to the small sample (Kang et al., 2019). Though much of the affect literature in treatment has targeted negative emotions, findings from these few studies suggest that strengthening positive affect could be beneficial to substance use outcomes.

Positive Affect in Recovery.

Positive affect research in recovery literature is almost non-existent, though preliminary evidence supports further exploration. Those in recovery, however, see a need to manage negative feelings and bolster positive ones. When surveying those in recovery, 90% and 87% of survey respondents said, “handling negative feelings without using drugs and alcohol like I used to” and “being grateful,” respectively, were within their definitions of recovery (Kaskutas et al., 2014). In a study of 531 participants online, recruited from three recovery-support social network websites, in-the-moment happiness for those in recovery was achieved after completing five positive psychology tasks (e.g., savoring the present moment; Hoeppner et al., 2019). Findings are preliminary, and clarity about sustaining recovery, such as length of time in recovery or relapse rates, were not included in the study. In a longitudinal study of 12-step groups of 647 participants meeting criteria for AUD compared to alternatives, greater positive affect at 6-months was associated with the same time period’s commitment to sobriety, which mediated greater alcohol abstinence at 12 months (Zemore, 2018). Before treatment and recovery interventions targeting emotion regulation with positive affect can be developed, more needs to be understood about these concepts in the AOD misuse and recovery contexts and with larger sample sizes.

Conceptualization of Self-Love

Self-love, love directed at the self, may be a promising utility of positive affect in AOD recovery. Do people see self-love as positive or negative? How is it actually used? Is it a resource? Exploring self-love through one of its root words—love—and extant self-love literature aim to clarify these questions and more.

From Love to Self-Love

To understand the concept of self-love, it is helpful to first examine the root of this concept - love (Fredrickson, 2016; hooks, 2000). Different definitions of love exist, largely predicated upon the definer’s field of study. Love has been written about extensively in

relationship science, developmental science, and more recently, emotion science (Fredrickson, 2016). Relationship scientists define love in the context of romantic relationships, suggesting love is an "investment in the well-being of the other, for his or her own sake" (Hegi & Bergner, 2010, p. 621). Developmental scientists situate their work in infants and their primary caregivers, where love is experienced as the biological and behavioral synchronicity between the two, culminating in attachment (e.g., Feldman, 2007; Harlow & Harlow, 1966). Some emotion scientists align with this view stating that love is "the surge of feeling experienced when one perceives another acting as a reliable and trustworthy caregiver, and submits passively and fully to being the recipient of this care" (Shiota et al., 2006, p.64). Categorizing love as an emotion is still disputed by emotion researchers, despite commonly held layperson beliefs (Shaver et al., 1996). Ultimately, consensus on a singular definition of love has not yet been reached.

There are various definitions about what love truly is, attributed in part to love's specific meanings (e.g., romantic love vs. sexual desire, Cowen & Keltner, 2017; attachment love vs. nurturant love; Shiota et al., 2011). Fredrickson (2016) reconceptualized love by defining it as "a pleasant and momentary experience of connection with another person (or persons)" (p. 848) and theorizes a bigger love umbrella system. The framework, known as positivity resonance, consists of multiple components: (1) pays homage to the aforementioned relationship and developmental scientific literature by including mutual care and biological and physiological synchronicity (i.e., *resonance*) with the other; and (2) adds *positive* emotions that are experienced between people, culminating into a supreme emotional experience of love (Fredrickson, 2016). Positivity resonance is therefore a shared connection with another while experiencing care and positive emotions; altogether, this is an affective experience of the broader concept of love.

Drawing comparisons from love provides context to how self-love may be defined and operate. First, consensus across the aforementioned literatures presumes that love occurs within the context of the 'other'. Love occurs within an individual yet the other is "the object" of the emotion or behavior of love. Applied to self-love, the self could be the "object," and there may be the ability to direct love to the self. Second, preliminary, correlational evidence supports positivity resonance's association with greater flourishing mental health and lower symptoms of depression, loneliness, and illness (Major et al., 2018). This indicates that this broader love framework may impact symptoms that are related to AOD misuse. *Therefore, perhaps there is a greater self-love umbrella - mutual care and investment in the self, awareness to self, and the experience of a range of positive emotions.* Evidence for its psychological and physical benefits could have impacts on AOD misuse and recovery though a research line needs to be developed to explore this. Relevant to this study, positivity resonance and this broader conceptualization of love offer a framework to consider self-love, of which meanings of this concept first need to be clarified.

Additional Self-Love Conceptualization Needed

Scholars posit that love and self-love's respective fluid definitions heighten their mystification, elusiveness, and desire to obtain it (e.g., Fredrickson, 2016; hooks, 2000). Like love, self-love is also not well understood. Drawing on Fromm's (1963) self-love conceptualization of "care, respect, responsibility and knowledge" (p.24), hooks (2000) adds that self-love is actions, such as care, respect, responsibility, knowledge, trust, and commitment. Citing hooks' definition of self-love, an ethnographic content analysis of 56 YouTube vlogs (i.e., video blogs) of Black adolescent girls discussing their hair (i.e., a contextualized symbol of inferiority compared to the dominant standard of beauty, natural hair) found self-love themes of

self-confidence, self-care, and self-acceptance (Phelps-Ward & Laura, 2016). The only study of its kind, to this author's knowledge, from a master's thesis of 566 Chinese university students, self-love was conceptualized as self-esteem, unconditional self-acceptance, and self-realization (Zhou, 2016). These findings are preliminary evidence of a bigger self-love umbrella system that: one, views self-love in a positive manner, and two, constructs self-love as several views of the self.

Other literature begs for clarity. Though a variety of discourse communities have theorized about self-love, the concept is entangled with related self-love constructs and historical connotations. When mentioned in the research literature, self-love is either not defined or studies cite other concepts when operationalizing self-love (e.g., self-compassion, Fredrickson, 2013). Rather, self-love is often operationalized as self-esteem and narcissism (Campbell & Baumeister, 2003) supporting a rigid self-love dichotomy of either a positive connotation or negative connotation of the self. While this definitional obscurity exists, scholars - including those within the social work field - are calling for further examination of this concept (Ross, 2022).

Positive Connotations of the Self.

More commonly, a variety of positive meanings can be ascribed to self-love: self-esteem (i.e., "subjective evaluation of…worth as a person", Orth & Robbins, p. 381; positive self-evaluation; Campbell et al., 2002), self-acceptance (i.e., awareness and understanding of your strengths and limitations, e.g., Brown, 2010), and self-compassion (i.e., an attitude towards oneself of kindness, shared humanity, and mindfulness amidst suffering, Neff, 2003a). Often these "self-" terms are used together further complicating delineation. In a theoretical paper modeling the mechanisms of dance-movement therapy to ease chronic pain, authors explain self-love as connecting to the self through self-care and self-compassion to reach acceptance and validation of thoughts and emotions (Shim et al., 2019).

Alternatively, some of these concepts have a richer evidence base supporting their distinction (e.g., self-compassion versus self-esteem; Neff, 2003b). Although the concept of self-compassion is related to the concepts of self-esteem, self-acceptance, self-worth, narcissism, and selfishness, self-compassion is a distinct, measurable concept (i.e., Self-Compassion Scale, Neff, 2003). Self-compassion is theorized to act by transforming negative affect into positive affect by lessening self-criticism and self-judgment (Neff, 2003a) and is inversely related to undesired behavioral health outcomes (e.g., substance use, depression, stress, anxiety) (Brooks et al., 2012; Bluth & Blanton, 2014; Keng et al., 2012). Not only does self-compassion demonstrate benefits for the self by accepting our own flaws, but it also leads to accepting others' flaws (Zhang et al., 2019). Self-compassion is theorized as similar to self-esteem with evidence showing the two are moderately correlated yet believed to differ in that self-compassion has fewer drawbacks (Neff, 2003b). Gilbert and Irons (2005) posit that self-compassion provides a buffer for setbacks by triggering the self-soothing system, while self-esteem's emphasis on competence and evaluation of the self (at times with judgment), cannot support emotional resilience (Neff, 2003b; Neff, 2011).

Similarly, in Irvani's (2008) dissertation *Authentic Self-Love,* self-esteem is differentiated from self-love because of the former's conditional acceptance of the self, mired in flaws and failures. Crocker and Park (2004) assert that self-esteem facilitates striving for worth to validate successes and avoid failures making for a costly pursuit. Others have written that self-love is akin to "true" self-esteem (e.g., Deci & Ryan, 1995; Neff, 2011), meaning a stable feeling of self-worth that is not contingent on standards of excellence. This viewpoint has been generally

overlooked by the self-esteem's vast and diverse body of literature. What is evident is that self-compassion, self-acceptance, and self-esteem's differentiation from self-love is not yet clear or empirically based.

Negative Connotations of the Self.

Self-love also has several negative connotations. With origins in Greek mythology and Calvinism, respectively, related words are: narcissism (i.e., egotism, feelings of superiority, a sense of entitlement, and craving for approval; Bushman & Baumeister, 1998) or selfishness (Conn, 1998; Fromm, 1965). In fact, scholars have explained narcissism across three spectrums of self-love originating from philosophy: (1) self-enhancement (i.e., worthiness while ignoring one's failures), (2) self-preservation (i.e., required for survival), and (3) self-maximization (i.e., taking one of two forms - "good people" who maximize noble deeds for others or "wicked people" who seek hedonism while ignoring others' needs) (Thomaes & Brummelman, 2016). Though the second definition has a neutral connotation, the other two terms negatively connote self-love and purport views of superiority and lack of care for others, which are emblematic of narcissism. Some studies have demonstrated the weakly to moderately correlated nature of narcissism and self-esteem, both attributed to liking the self, but differentially framed as undesirable and desirable to interpersonal relationships, respectively (Brummelman et al., 2016; Campbell et al., 2002).

A single, clinical case study (Martens, 2011) provides preliminary evidence that self-esteem, narcissism, and self-love are theorized as different concepts. In treating a person for narcissistic personality disorder, "real self-love" (i.e., a differentiation from narcissistic, excessive self-love) is explained as a complex system of needs to 1) buffer self-esteem from the external world (e.g., unempathetic parents) and 2) develop strategies of authenticity and self-awareness. Via the therapeutic process, the client was able to cultivate (positive) self-love and connect more with others. In sum, definitions of self-love in scholarly work paint self-love in a negative light or are enmeshed with other constructs of positive self-views. However, self-love is discussed in lay discourses (and supported with one study) with positive connotation and as a distinct construct from those aforementioned.

Gaps exist in AOD recovery science, such as positive affect discourse and discussions of sustaining well-being. Self-love could prove to be promising though it has largely been examined empirically from a dichotomous perspective: positive and negative in the form of self-esteem and narcissism, respectively. Capturing more vast experiences of recovery and self-love utilizing new data collection sites and methods could expand knowledge within both bodies of literature.

II. Lay Beliefs of Self-Love & Within an AOD Context and Online

Chapter 2 provides background on lay beliefs, posits potential self-love lay theories, and situates self-love within AOD recovery and on social media.

Lay theories are commonly studied in psychology and are defined as mental frameworks for describing cause-and-effect based on personal assumptions, beliefs, or idiosyncrasies about the self and world (e.g., a lay theory of happiness: if I am optimistic, then I'll be happy; Furnham & Cheng, 2000). Beliefs from laypersons offer nomological principles on related concepts that are believed to "just be so." They recognize that peoples' lived experiences are vastly different, originate from observation, and aim to capture personal meaning; they form a causal structure but are untested (Furnham & Cheng, 2000, Molden & Dweck, 2006; Ong et al., 2015). While theories from scientists are empirically tested, lay theories are still viewed as important to scientific inquiry because they guide behavior and produce conceptions about a phenomenon (Natividade et al., 2022). An example of a self-love lay belief that speaks to prioritizing the self in relation to another is: "you have to love yourself before you can love someone else." While this study does not test the validity of this belief, it seeks to identify additional self-love lay beliefs.

Three Potential Self-Love Lay Beliefs

While empirical research on self-love is sparse, self-love research has rarely examined lay beliefs about self-love. Several potential layperson beliefs of self-love are posited below: taking action to care for myself; experiencing positive emotions; and connecting with others.

Self-Love Means Taking Actions to Care for Myself

One existing lay belief is that self-love is a process of actions to care for the self. The term self-care is used interchangeably with self-love and confused for being one-in-the-same, yet they are not. While psychotherapy scholarly literature is void of self-love (Irvani, 2008), psychologists have theorized about self-love as acts of caring for the self: setting boundaries, protecting yourself, practicing good self-care, acting on what you need rather than on what you want, becoming mindful, forgiving yourself, and loving intentionally (Khoshaba, 2012). In regard to self-love, these are intentioned acts of care.

A critique of self-care, and more broadly self-love, is that acts of care embody capitalistic pursuits of services and commodities (i.e., massages, pedicures) and has come to be associated with furthering a neoliberal agenda (Wiens & MacDonald, 2021). At times, these services may be obtained by someone who is not fairly paid for their labor (yet in demand by the market) while the consumer is benefitting in the name of "care." In this way, care is self(ishly) focused. Additionally, sociology and feminist scholars caution that loving ourselves has become co-opted by advertising dollars and furthers the patriarchy (Gill & Elias, 2014). Campaigns that push accepting and empowering ourselves through care products (e.g., lipstick; "confidence is the new sexy") emphasize that there must be something inherently wrong in the first place ultimately leading consumers (i.e., typically women) to internalize defects and thus buy more products to "fix" themselves (Gill & Orgad, 2015). Critiques implore responsibility be held by structural actors rather than deflecting onto the individual in the notion of self-improvement. This former viewpoint of self-love is prevalent amongst activist communities.

Activists, who at times intersect with identities of black, feminist, and/or queer, delineate self-love from other perspectives as a political, radical act of anti-oppression. Lorde and Sanchez

(2017) write "caring for myself is not an act of indulgence; it is self-preservation. And that is an act of political warfare" (p.130). Taylor (2018) situates self-love within the body, an idea evolved from the widely criticized body positivity movement (i.e., "fat acceptance" with the goal of accepting one's body just as it is; Gillon, 2019). The purpose is to make a grander statement about not just an individual but society as a whole. Taylor views self-love as a radical call to transform "a hierarchy of bodies" away from the ranking of bodies that equates to (un)deservingness of social policies' protection to policies that support all peoples' worthiness.

Self-love may comprise the aforementioned self-worth and self-care, in addition to self-awareness. A conceptual model of positive body image designed for eating disorder recovery somewhat reflects Taylor's belief: self-love is depicted as self-care, body acceptance, and body love (i.e., "an inner attunement of the inner aspects of self (e.g., thoughts, emotions);" Cook-Cottone, 2016, p.6). The latter component suggests love for the (external and internal) body by being aware of (internal) thoughts and emotions. However, the model has not yet been tested, and concepts were not expanded. This may suggest that awareness of the body, in terms of thoughts and emotions may be a component of self-love.

Drawing from these perspectives and revisiting Fredrickson's framework, a bigger self-love umbrella system may contain self-awareness, self-acceptance, self-care, and self-worth. These concepts inform a lay belief that self-love could be positively caring for oneself with awareness, acceptance, respect, and worthiness.

Self-Love Means Experiencing Positive Emotions

One lay belief may be that experiencing self-love also involves experiencing positive emotions. Contrasting traditional theories of emotions, and debated for the past 50 years, emotion scientists recently demonstrated with over 200,000 self-report data of more than 2,000 videos that subjective experiences of emotion exist within a continuous gradient of emotion categories (rather than the historically conceived six distinct emotions; Cowen & Keltner, 2017). Furthermore, multiple emotions can be elicited from a single event or stimuli (Cowen et al., 2019). The aforementioned taxonomy of emotions can be elucidated by research on love. Love is theorized as a phenomenon with experiences of additional positive emotions combined into one: awe, hope, serenity, gratitude, amusement, interest, pride, and inspiration (Fredrickson, 2009). In a study of 202 participants randomly assigned to loving-kindness meditation (i.e., LKM, a technique to elicit feelings of love and kindness to the self and others) or waitlist control, love and other positive emotions increased during 9 weeks of LKM training and two weeks after the training (Fredrickson et al., 2008). However, although LKM directs participants to send love to the self, no study specifically measured increased loving feelings of the self. This could be due to the critique that emotion studies in general historically focused on negative emotions, and when studying positive emotions, only one or two positive emotions were included in the design (Shiota et al., 2011). Examination of co-occurring positive emotional experiences, and within the context of self-love, is warranted.

Self-Love Means Connecting with Others

One lay belief may be that self-love leads to social connection. Self-love may be more than an act of individual responsibility but is performed with the intent of inherently connecting with others (i.e., someone loves themselves, they act loving towards others) (Taylor, 2018). Certainly, the common adage-written widely in self-help, therapeutic communities, social psychology, philosophy, and religious studies is that the ability to love others begins with loving

ourselves may support this (Branden, 1994; Conn, 1998). Yet in a literature review of "does loving the self lead to loving others?", operationalized as either self-esteem or narcissism, self-esteem is largely unrelated to the quality of one's relationships, and narcissism can be harmful to them (Campbell & Baumeister, 2003). The dichotomous construction in this review leaves an opportunity to explore additional meanings of self-love, echoes a call by the authors that more self-love empirically based theories are needed, and leaves the possibility that a different conceptualization of self-love may lead to social connection.

Preliminary evidence supports the link between love (not self-love) and social connection. In a study of 93 participants randomly assigned to an LKM or a control group (Hutcherson et al., 2008), those in the LKM group, as compared to the control group, experienced increased explicit positivity (i.e., feelings of connection, similarity, and positivity) towards strangers. However, changes in explicit positivity were not found towards the self nor close others. This suggests that the *who* (e.g., stranger vs. close friend) involved in the connection matters. Additionally, in a study of 173 randomly assigned adolescents (Thomaes et al., 2012), those who reflected on their value affirmations (i.e., not specifically self-love but rather skills and traits of one's core identity) in two separate 15-minutes writing exercises had more feelings (e.g., love, gratitude) and behaviors of prosociality at the six-week follow-up, as compared to those in the control group. In other words, positive views of the self were associated with more positive feelings and more social connection.

Though empirical studies provide some evidence of love's association with positive emotions and connection with others, it is unknown if directing love towards oneself has this effect. Studies assess for love (aforementioned studies), either using single item questions (e.g., Hutcherson et al., 2008) or with validated scales (e.g., modified Differential Emotions Scale (mDES); Fredrickson et al., 2003; Fredrickson et al., 2008). Yet, they do not specify if love is directed to the self or the other. Implicit evaluations of positivity towards the self were marginally found after completing LKM, but differentiation of the positivity was not conducted, and explicit evaluation and positive feelings (e.g., calm, love, and happiness) towards the self did not account for the implicit effects (Hutcherson et al., 2008). Thus, these points further motivate a subsequent step to conceptualize self-love.

The scholarly interrogation of the concept and utility of self-love, as informed from the aforementioned definitions, has been minimal. Observing lay beliefs provides a landscape for exploring behaviors. When experiencing self-love, it could be theorized that the act of self-love evokes positive views of the self, positive emotions, and social connections. When drawing from an AOD recovery context, evidence may emerge how self-love could be beneficially used in interventions to prevent and treat AOD issues and sustain recovery. For purposes of this study, I define self-love as a positive view of accepting oneself comprising a larger self-love umbrella, signaling care for the self, experiencing positive emotions, and connecting with others.

Self-Love and Related Constructs in Recovery Literature

Now that a review of the self-love literature has been presented, it is paramount to explore *how* it is discussed and used in the context of AOD recovery. Yet, it is known that the emphasis on the importance of self-love for recovery is consistent with a common slogan from Alcoholics Anonymous (AA): "Let us love you until you can learn to love yourself" (1939). This may inform several lay beliefs. First, and echoing Fredrickson's positivity resonance, self-love may result from connection and love from others. Additionally, connecting to a form of spirituality is common in recovery communities (e.g., Higher Power; Kaskutas et al., 2003), and

one study noted that a participant stated that knowing God's love allowed her to love herself (Rodrigues, 2014). Thus, connection from others and a spiritual belief may be associated with self-love.

Second, alluded to in the aforementioned theorizing is that self-love can originate out of hardship and may be a difficult task. Self-help authors and psychotherapists have written widely about the importance of self-love within a deficit context: for healing imperfections (e.g., Brown, 2010) and codependency (deemed the "self-love deficit disorder"; Rosenberg, 2016). Recovery is emblematic of a similar context - one where deficit (i.e., known as defects in 12-step literature) and hardship warrant discourse in self-love. Women for Sobriety, an alternative mutual help group to AA, emphasizes the new process and importance of loving oneself in their 13 New Life Acceptance Statements: "Love can change the course of my world. Caring is all-important" and "All love given returns. I am learning to know that I am loved" (Women for Sobriety, n.d.). These recovery groups suggest that self-love-in the form of care, positive emotions, and connection with another or spirituality, possibly within or without hardship-could be empirically observed in recovery.

Applications of *self-love*, and related constructs, have appeared in the addiction recovery literature. The NIAAA (2020) recently incorporated self-care in their recovery definition by situating it within well-being, which also included engagement with community, concern for others, personal growth, and happiness. Perhaps all these concepts could simply be summarized as self-love? Though self-love is evidenced in recovery literature, it is rarely defined. In a qualitative analysis of 12 women in early drug and alcohol recovery, participants delineate self-forgiveness and self-compassion as a path towards open heartedness and self-love (Rodrigues, 2014). While participants mentioned having self-kindness (i.e., a component of self-compassion), they spoke of it in the context of self-love and recognized self-accountability and self-love as keys to staying sober. However, no definition of self-love was provided. Rather, other terms like self-acceptance (i.e., embracing all of self to transcend negative messages; Payne, 2010) and self-forgiveness (i.e., release difficult feelings due to a past transgression; McGaffin et al., 2013) are more pervasive. Both terms allude to self-compassion due to their origins in negative stimuli—including ruminating thoughts, past events, and difficult emotions like shame and guilt—and inducing a need for care amidst hardship. Self-compassion in a recovery context makes sense given that recovery came about through one's suffering, historical patterns, and ways of life that may reappear (i.e., be triggered) during recovery. Assessing for self-compassion within a self-love and AOD recovery sample aims to further extrapolate these two concepts.

Additionally, self-esteem has also been found to be important for recovery. Using a cross-sectional sample spanning more than 40 years of recovery, it is estimated that self-esteem (i.e., *I have high self esteem*, scored not very true to very true) declines within the first several months of recovery, then increases in the subsequent years; first rapidly in the first five years of recovery with continued growth through 40 years (Kelly, Greene, & Bergman, 2018). Self-liking, self-competence, and self-confidence were found to be constructs of self-esteem present in a sample in recovery (Ferrari et al., 2012). It is not clear though where self-love may also be situated in these terms. Thus, different constructs—like self-esteem, self-acceptance, self-forgiveness, self-compassion—are themes within recovery that may be part of a larger self-love umbrella. Examining a self-love and AOD recovery context where these terms have the potential to co-occur could highlight fine-tuned meanings of their use.

In summary, AOD recovery alludes to the importance of self-love and suggests self-love, though difficult at first, can be obtained with the help of others. Self-love is discussed: in a variety of related constructs within AOD recovery; operationalized as self-esteem and narcissism; implicitly theorized as care of the self and associations with positive emotions and connection to others in layperson discourse. Yet, a clear conceptualization of its positive connotation is lacking. To discern these similarities and differences, self-love will be observed within an AOD recovery context on social media, a hub for these topics and appropriate for observing lay beliefs.

Social Media: A Platform for Recovery and Self-Love Discourse

Social media (i.e., social networking sites, e.g., Facebook, Instagram, Twitter), a medium intentioned to engage people with specific content, has become a space where recovery is discussed (e.g., Bergman et al., 2017; Bliuc et al., 2017). Social media usage is pervasive with more than two-thirds of Americans using one or more social media platforms (Pew Research Center, 2019). The most frequent users of social media are those within the 18-29 year old range (90%) followed by 30-49 years olds (82%). Women utilize social media slightly more than men, and those with an income of $50,000 or more (>78%) and a college degree (79%) use social media more than those with income less than $50,000 (68-70%) or without a college degree (64%). There is overlap in the demographics between the ages of people who use social media and those who identify as being in recovery.

AOD Recovery Online

Technology is a source for people to access recovery-related information (Ashford et al., 2018). Social media offers a platform for people in recovery by serving as a medium for creating and sharing narratives of the self, including the forms of self-expression, storytelling, and self-disclosure (e.g., Andalibi et al., 2017; Lee et al., 2015). Several reasons offer insight into: Why might someone share their recovery stories?; and why would they do this on social media?

Particularly when done within a context of an emotional experience, sharing resembles narrative therapy. Nussbaum (2003) found narratives helpful because:

> "The understanding of any single emotion is incomplete unless its narrative history is grasped and studied for the light it sheds on the present response. This already suggests a central role for the arts in human self-understanding: for narrative artworks of various kinds (whether musical or visual or literary) give us information about these emotion-histories that we could not easily get otherwise" (p.236).

Charged emotional events are the primary target of narrative therapy, and one tool used is re-writing a script (i.e., processing an emotional experience through writing to get to a different outcome). Writing about emotional experiences in recovery is aligned with two core components of narrative therapy-creating an alternative story tied to AOD use and continuing to strengthen that new story into recovery (Singer et al., 2013). Recovery, and especially the new emotional and identity experiences of a person in recovery, is the alternative story, which can continue to be strengthened when sharing their narrative. Writing captions on social media posts may mirror the same tool and offer a platform to construct and further this new story. Additionally, social support and computer-mediated communication theory posits that writing thoughts related to one's health creates distance between a person and their problems. This can be helpful to find

communities online, particularly if the health content is stigmatized (e.g., AOD use; Wright & Bell, 2003).

Claiming one's experience and identity on social media may have its benefits. One study of heterosexual, White women participating in body positivity on Instagram found that posting selfies, which represented non-normative ideals of beauty, allowed the participants to own their self-representation. Women felt more empowered to depict their own narrative external to societal pressures (Cwynar-Horta, 2016). Other studies have shown, though mostly correlational, a preference on social media of self-disclosing (Lee, Noh, et al., 2013) compared to self-comparing or lurking (i.e., not engaging with likes or comments). Studies have demonstrated that disclosing information (e.g., fully revealing oneself, discussing feelings) garners intrinsic motivation, even hitting dopamine reward centers in the brain (Tamir & Mitchell, 2012). Furthermore, on social media, self-disclosure is associated with well-being only when mediated by social support. This suggests sharing about oneself is related to an individual's perception of connecting with others (Lee, Noh, et al., 2013). Other studies have documented the link between post exposure to behavior; for example, online exposure to a positive experience in AOD treatment or recovery was positively associated with another's intention to seek their own AOD treatment/recovery (Russell et al., 2022).

People in recovery have reasons to post online and recovery discourse is prevalent on social media (e.g., D'Agostino et al., 2017; Russell et al., 2021). Users engage on social media by posting with a hashtag (e.g., #recovery or #sober; i.e., emphasizing a specific theme). The use of hashtags (denoted with #) was created at Twitter in its early years to categorize similar content. Its benefits include finding others who share related content (if the account is public) and creating trending topics (i.e., those most popular that become apparent to others) (Twitter, n.d.). January 2020 Instagram hashtags demonstrate continued usage and engagement of recovery-related posts totaling: #recovery - 12million (m); #sober - 2.5m; #soberlife - 1.3m; #sobriety -1.1m; #alcoholfree - 403K; #Alcoholicsanonymous - 225k; #12steps - 201K; and #serenityprayer - 90k (Instagram, 2020). An unpublished study conducted by Laguna Treatment Hospital, an addiction center, provides results from their study of 135,000 Instagram posts from 2011-2018 with recovery-related hashtags (e.g., #sobriety) to demonstrate the magnitude and growth of the recovery community online (Recovery from Addiction on Social Media, 2019). Using data scraping (i.e., a data science term to download data from online sources) and sentiment analysis, results demonstrated that 73% of the posts had a positive sentiment about sobriety, 16% neutral, and 11% negative sentiment. It is unclear if sampling bias skewed towards positive recovery sentiments (i.e., less likelihood of sharing negative recovery experiences). Rooted in recovery traditions and societal norms, skepticism exists that those in recovery may not "out" themselves on social media with a self-identifying hashtag (e.g., #recovery, #soberlife) due to stigma, or anonymity, emblematic of 12-step programs (i.e., a reference to recovery-related programs like Alcoholics Anonymous). However, emphasis on wellness living in recovery may in fact make people proud of this identity rather than ashamed (The Betty Ford Institute Consensus Panel, 2007). Despite concerns of stigma and lack of anonymity, people still posted about their recovery experiences.

Evidence supports preference of social media, compared to other mediums, to sustain recovery. In a cross-sectional study of 259 people in outpatient treatment, 66% (171) thought that social media would be helpful in sustaining their recovery. These respondents preferred social media relative to static websites, text messaging, and smartphone applications (apps) to receive recovery-related content (Ashford et al., 2018). Although specific recovery-related smartphone

apps have been developed (e.g., Daily Strength or In The Rooms), general apps (e.g., Facebook, Instagram) or non-app online sites (e.g., online attendance at Alcoholics Anonymous) were preferred by a sample of 2,000 American adults in the National Recovery Study who responded to an online survey indicating they had previously had an issue with a substance and no longer do (Bergman et al., 2018). When considering offline recovery discourse, a bulk of recovery literature has been documented primarily, though sparsely, with mutual help programs (e.g., Kelly et al., 2020; Zemore et al., 2018). Yet, several reasons exist why social media may be appealing for those in recovery: easily accessible (Bergman et al., 2018; Marsch, 2012); hosts emotional support and strategic information; and offers a space for psychoeducation, self-management, and community during recovery (Marsch, 2012; Reif, 2019).

Social media does present its challenges too. For example, there is a propensity for social media users to be triggered (i.e., want to use a substance) by exposure to posts online (e.g., Ashford et al., 2018; Russell et al., 2022) or become addicted to social media (e.g., Bergman et al., 2018). Additionally, and more relevant to this study, researchers have demonstrated that perceptions of others are factored into posting content online. Specifically, self-presentation (i.e., being selective in how one conveys themself dependent on their desired outcome) and self-monitoring (i.e., changing oneself to self-present in a specific way) have been found in the posting motivations of alcohol-related content online (e.g., Steers et al., 2022). While this author is not aware of a similar study examining the posting intentions of those in AOD recovery, it is imperative to acknowledge that motivations and intentions for posting about this topic are unknown. Ultimately, activity on social media and recent reports demonstrate that social media is not only a host for recovery discourse but that self-disclosure is occurring. Given the aforementioned dearth of scientific evidence within recovery science, there is much to learn about peoples' experiences of recovery: the emotional experience, what helps them in recovery (e.g., connecting with others), current use status (e.g., abstinent), and treatment exposure. Better understanding these beliefs, particularly beliefs that are frequently discussed on social media, may provide insight into how self-love is utilized within recovery.

Self-Love Online

Self-love among laypersons is pervasive online and may be relevant to well-being and recovery. A Google search of "self*love" returns over 3 billion results with the first page offering blogs, articles, Pinterest memes, and Instagram quotes; many of which are invoked by lay authors and curators leveraging the concept for the attainment or sustainment of well-being. Specific to recovery, blogs describe self-love as: (radical) acceptance of flaws (e.g., Rowley, 2016; "the more I see not only *what a DEFIANT act it is to practice self-love, but how RADICAL an act it is,"* DrunkyDrunkGirl, 2018) and care for self (Ada, 2019), relation to other positive emotions (e.g., "self-love is absolutely central to happiness in life;" Rowley, 2016), authentic self (e.g., Ada, 2019), and improvement in life with self-love in comparison to past AOD misuse (e.g., Rowley, 2016). Examples of Instagram posts (2019) with a recovery-related hashtag (e.g., #soberselflove) emphasized:

- Self-love as personal accountability and being kind to yourself: "You will never speak to anyone more than you speak to yourself in your head, be kind to yourself."
- Self-love as authenticity and critical to recovery: An image reading "She threw away all of her masks, and put on her soul" with the corresponding caption speaking about putting her guard down to show the real her, despite feeling scared and vulnerable, and with the support of others, to be real in sobriety.

Interestingly, #selflove is more widely used on Instagram compared to self-acceptance, self-care, self-compassion, and self-esteem combined (Instagram, 2020). This suggests two things: first, that laypersons see these concepts as separate though it's not yet known if these hashtags and words co-occur within the same self-love, recovery posts; and second, self-love is worth exploring for its sheer volume indicative of a phenomenon.

At present, the only mention of self-love in empirical literature is constructed primarily by self-esteem and narcissism (e.g., Campbell et al., 2002). Yet, examining layperson beliefs offers an opportunity to explore potentially broader meanings. Additionally, negative affect has been historically examined in AOD treatment and recovery; when positive affect is assessed, it is with specific subpopulations and small sample sizes. These studies have primarily been conducted in experimental psychology and in surveys and interviews. Exploring these concepts on social media where these two areas—recovery and a positive affect concept, self-love—converge and are pervasive can further the fields' knowledge.

- RQ1: What similarities and differences are there in how #selflove is discussed on social media generally and compared to AOD recovery?
- RQ2: What co-occurrence of themes predict the invocation of abstinence talk and abstinence silence in social media posts of self-love and AOD recovery?
- RQ3: To what extent can AOD recovery content be predicted within #selflove posts?

Understanding how laypersons, via social media, think about self-love and related behaviors, such as sustaining recovery, may offer insights of a broader conversation of improving AOD prevention and treatment.

Research Objectives

The present, mixed-methods study examines lay beliefs of #selflove on social media sites and within the context of alcohol and other drugs (AOD) recovery. Specifically, this dissertation seeks to examine (1) the discourse of self-love - generally and within an AOD recovery context, (2) self-love's related AOD recovery concepts, and (3) the ability to predict AOD recovery context and #selflove content. It contributes to AOD recovery literature by: (1) gathering evidence on a positive affect-related concept (i.e., self-love) and its discourse within AOD recovery, (2) providing clarity to the definition of recovery by examining co-occurring themes within #selflove and recovery specific to abstinence, and (3) facilitating the identification of AOD recovery information for future study.

This study was conducted through an iterative process of collecting, analyzing, and interpreting social media posts and then theorizing and validating their meaning. In Chapter 3, I explore self-love discourse by employing topic modeling, a method that integrates machine learning and natural language processing, to identify topics of self-love in social media posts and in a smaller subsample that contains allusions to recovery. Data mapping visualization was used to present topics of self-love, identify which words and larger topics co-occurred within these topics, and ultimately compared to how self-love varies in a general context versus an AOD recovery context. In Chapter 4, I perform a deeper examination of self-love using content analysis manual annotation to decipher self-love concepts within allusions of recovery and utilized supervised machine prediction to inform the co-occurrence of self-love and AOD themes that are present when posts are classified as abstinence talk versus abstinence silence. In Chapter 5, I train an algorithm to identify AOD recovery information on social media.

III. Similarities and Differences of #selflove in a General Context & an AOD Recovery Context on Social Media

Chapter 3 explores the research question: What similarities and differences are there in how #selflove is discussed in a general context compared to AOD recovery on social media?

Methods

Data Collection

In 2019, the data collection year, social media usage was estimated at 3.48 active billion users (WeAreSocial, 2019). Data were collected from 2019 public posts where a user adds #selflove to the caption or comment of a post. Hashtags (#) are a social media function to compile posts around a specific topic making it easy for users to find this topic, and researchers have been leveraging this function for more than five years as a means of data collection (e.g., Malik et al., 2022). I chose to collect #selflove posts from two social media platforms: Instagram and Twitter. Instagram is a "free photo and video sharing app and website…[where] people can upload photos or videos...and share them with their followers or with a select group of friends" (Instagram, n.d.). In addition to its image and video capabilities, Instagram captures several forms of text data that are relevant to this study: captions and hashtags (which are embedded within captions and the comments section). Twitter is a microblogging and social networking service where users post messages known as 'tweets' (Twitter, 2022). Messages are written in text but may also contain accompanied images, website links, and videos. While most social media research is conducted with single-platform analyses, behavioral health researchers have been encouraged to use multiple sources of data (Ricard & Hassanpour, 2021), and studies have begun combining multiple platforms recently (e.g., Cirillo et al., 2022). Given the purpose of this study to maximize the amount of text data to analyze the discourse and lay beliefs of self-love and within an AOD recovery context, I have chosen to include both platforms in my study.

I chose these platforms for several reasons. First, the amount of text allowed on the site weighed heavily in the decision. Instagram users can write a caption of up to 2,200 characters, which is an estimated 310-550 words. Relative to other social media platforms, Instagram offers a large amount of space for users to share their experiences. While Twitter allows substantially less characters with a maximum of 280 characters, which equates to 40-50 words, it is a versatile and increasingly popular source for health-related content and research (e.g., substance use and well-being; Yeung et al., 2021). Second, Twitter has an official researcher API (i.e., Application Programming Interface). The official API lends itself to an easier and less biased data collection from Twitter, which is one of the main reasons Twitter, compared to Instagram, is more prevalent in social media studies utilizing text analysis (McCrow-Young, 2020). Third, both sites attract a large volume of users, as well as diverse populations, allowing for a more generalizable sample. In 2019, 290.5 and 814.5 million active users belonged to Twitter and Instagram, respectively (Statista, 2022a; Statista, 2022b), and both sites were in the top 20 most worldwide visited websites that year (Kemp, 2019). Various ages and racial/ethnic groups use these two platforms. Among a study of 1,507 US adults in 2019 who say they use social media, Instagram attracts more Black (40%) and Hispanic (51%) users than White (33%) users (Pew Research Center, 2019). Twitter also estimates that non-whites use its platform more than whites though the margin between these groups is 4% (20-24%). Twitter users tend to be more highly educated and in a higher income bracket than Instagram. The most frequent age groups to use Instagram

are ages 18-24 whereas Twitter attracts a slightly more mature audience typically ranging from 25-34 (Statista, 2019). While Instagram and Twitter have their strengths and limitations, combined these two platforms are a robust data collection source.

Other social media sites were considered but ultimately ruled out. In 2019, Facebook was the second most utilized social media platform (after YouTube) yet its privacy policies make it difficult to extract data. YouTube and TikTok, while just becoming popular at the inception of this study, supports video content which would have required transcription and is outside the scope of this study's methods. Reddit hosts forums based on shared interests, encourages credible posting through a reputation-incentivized function (known as a badge), and allows up to 40,000 characters per post. The reddits /r/selflove and /r/redditorsinrecovery have a community membership in the 30-50K range, respectively (Reddit, n.d.), yet Reddit was the least popular social networking site in 2019. For purposes of aggregating the breadth of self-love and AOD recovery discourse, Twitter and Instagram's user numbers far exceeded Reddits and thus were chosen for this initial study.

Both sites also host extensive conversations of #selflove. While it is not possible to estimate the number of #selflove posts in 2019 on Instagram due to the site's filtering restrictions to hashtag and username only—in 2021 at the time of data collection—public posts of #selflove reached 78 million (i.e., Instagram, 2021). Given Twitter's search functionality (and limitations), the entire volume of #selflove posts cannot be estimated. However, in the initial exploration of Twitter to determine if this site would be a viable collection source, over 200,000 unique posts were returned. When considering if these sites could also host AOD recovery discourse, initial searching of recovery related hashtags (e.g., #sober, #sobriety) demonstrated that these conversations were occurring. Additionally, three of the four predominant age categories of these platforms coincide with the average age (i.e., 25-49) amongst those identifying as being in recovery (Kelly et al., 2017).

Procedure

Two steps are involved in preparing social media posts for analysis: data scraping (i.e., a data science term to download data from online sources) and preprocessing (i.e., a data science term similar to data cleaning). Posts were captured from the year 2019 and the data ranges from January 1 to December 31; adhering to a 24hr clock set to GMT. My sample is restricted to just this year to minimize COVID-19 effects. Multiple approaches to data collection were used to collect a larger #selflove sample and a smaller #selflove subsample within an AOD recovery context. The approaches to collect #selflove posts are: scraping, recovery-related hashtags, manual retrieval, and utilization of a machine learning library. Scraping was used to generate the broader #selflove sample; the latter three generated the AOD recovery sub-sample and are thus discussed in the corresponding section.

Scraping of #SelfLove Posts.

Posts were scraped from Instagram and Twitter in two different ways. To collect from Instagram, and without an official API, Instaloader (i.e., a Python package; Python Software Foundation, n.d., Version 3.10.7; Instaloader, 2019, Version 4.4.2) was used to scrape posts and all files (.txt, .jpg, .json) were uploaded to a shared drive. A total number of 22,898 Instagram #selflove posts from 2019 were scraped. This is a subset of all #selflove content posted in 2019, and it is difficult to estimate if this is representative of all #selflove posts on the site (see note below). For comparison purposes, anecdotally and from watching the trends in #selflove over the past several years, I estimate 12million posts that year (due to a trend of 1 million new

posts/month). Twitter data was collected using the official Twitter Researcher API. Given the API's large volume and fast scraping speed1, four research assistants scraped Twitter once a week for four weeks in April 2021 resulting in 543,447 posts (i.e., including duplicate posts), which were saved in a .csv file. Again, due to Twitter's search functionality, it is difficult to estimate how representative this sample is of all #selflove posts on Twitter. Importantly when assessing for representativeness of the data, it is likely that some of the posts collected were boosted (i.e., a paid ad with the purpose of reaching more people) or from bots (i.e., automated, non-human accounts; McCrow-Young, 2021). Both are frequently documented as issues with social media data. Implications are that these posts are moved towards the top of the feed and thus increase their likelihood of being scraped. It is difficult to account for this in a large sample size, however, these were accounted for in the smaller subsample of AOD Recovery posts.

Twitter and Instagram posts were then merged into a .csv file. All scraped social media posts contain the date, associated media (e.g., image, website link, etc.), hashtag(s), caption, and comments. Figure 1 and Figure 2 show an example of scraped #selflove data from Instagram and Twitter, respectively.

Figure 1

Instagram Text (.txt) file From #selflove

```
I can't say anymore about it, but am not having a great start to 2019! 😭
All I can say is Mental Illness sucks!!
I will see my Care Co-ordinator on Monday and hopefully to get me up and running again! I know
recovery takes time, but still it sucks! There's absolutely no way I want to go back how I was
last year! I just need to find that mojo 💖💫

#mentalhealthwarrior #💪 #mentalhealthblogger #advocate #mentalhealth #💚 #mentalillness
#mentalwellness #depression #anxiety #panic #ptsd #mentalhealthservice #wellbeingservice #support
#crisisteam #talktherapy #Bedfordshire #selfcare #selfhelp #selflove #breakthestigma
#mentalhealthawareness #mentalillnessawareness #mentalhealthmatters #mentalillnesssucks
#positivequote #greatstartto2019
```

Figure 2

Extracted Twitter #selflove Post in .csv File[2]

I was able to sit in peace, let the negativity get blown away, and intake fresh oxygen 🙏
#marieunique #lakegregory #sanbernardino #mountains #selflove #selfcare #selfawareness #selfgrowth [redacted]

[1] As data collection continued into October 2020, the research team realized that Instagram changed their scraping procedures and limited scraping abilities due to the Cambridge Analytica scandal (McCrow-Young, 2021) and the 2020 American presidential election. The platform slowed the scraping speed to prevent the spread of misinformation, which resulted in ~100 posts/day collection rate. User forums speculated that this would be temporary but within 2 months, the scraping rate remained the same.

[2] In the image, the URL has been crossed out to maintain the poster's anonymity.

Exclusion Criteria of #SelfLove Posts.

Multiple steps were performed to preprocess the data to result in a final sample of #selflove posts (see Figure 3). Given that this study utilizes a data-driven approach, additional inclusion and exclusion criteria were refined once posts were collected and scraped, known as iterative querying (e.g., Muralidhara & Paul, 2018; Trilling, 2018). Posts were excluded if they were a duplicate post or primarily non-English. First, to prevent biasing towards topics (Schatto-Eckrodt et al., 2020), duplicates were checked within each platform. 356,666 posts were removed for being a duplicate of another post. Duplicate posts occurred for several reasons: the content was reposted by another use; the same caption was posted without credit to the initial poster (i.e., plagiarized posts; posted in Instagram but shared to the same user's account in Twitter and vice versa); the same post was picked up by multiple data scrapers; or the same post was present in both platforms. Second, for posts and ultimately findings to be interpreted by this English-speaking research team, 9,597 posts were excluded because they contained more than 50% non-English language characters. The Python library NLTK (NLTK, n.d., Version 3.7) was used to recognize and filter out non-English posts from our dataset. The research team also investigated the Python library LangDetect (langdetect, n.d., Version 1.0.9), but after reviewing the results, it was determined NLTK was more accurate in removing non-English posts.

Preprocessing of Data.

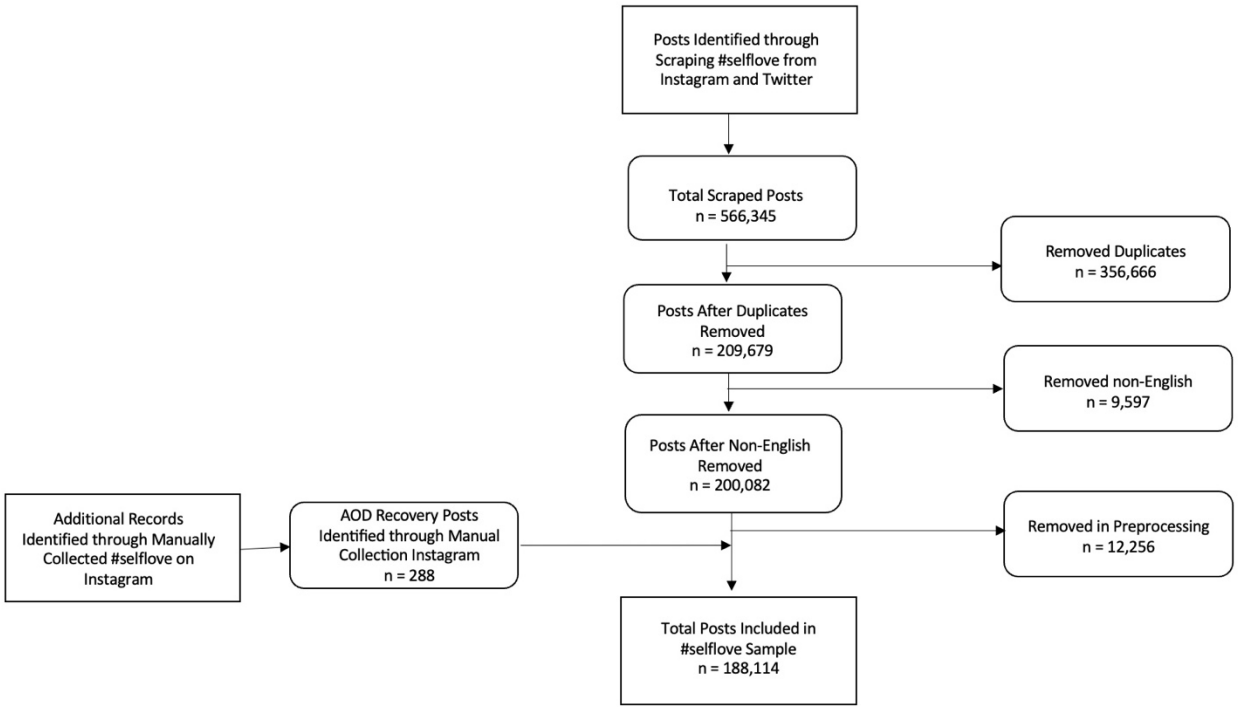
To prepare for analysis, the final posts were cleaned using a process called preprocessing, which reduces noisy text (i.e., slang, misspellings, repeated letters; e.g., Maier et al., 2018; Petz et al., 2015). I completed the following preprocessing tasks: transformed all text into lowercase, removing usernames (i.e., text that followed @), removed urls, transformed contractions into their full meaning (i.e., can't is can not), corrected typos by adding spaces between combined words (e.g., thatis becomes that is), removed punctuation, removed digits, reduced lengthened words ("looooooove" → "love"), tokenized the text (i.e., splitting a sentence into its most meaningful parts), spell checked, removed stopwords (e.g., "the", "a"), and conducted stemming and lemmatization (i.e., returns a word to its root form, e.g., organized → organize). These preprocessing steps resulted in each caption as a list of words that were used in the post that related to #selflove. For example, "I'm LOVING my daily walks with @(*username removed for anonymity*)" is transformed to ["love", "daily", "walk"]. The result is a remaining set of words that captures the essence of the post. It is recognized that choices made during preprocessing may impact results. For example, detecting social connection may be challenging in models that contain preprocessed text. This is addressed further in the study's limitations.

There are several preprocessing tasks that are specific to social media data or that must occur iteratively to take into account. For example, I removed emojis and trailing hashtags, which the research team identified as hashtag walls (i.e., a block of 10-30 hashtags at the end of a caption). Some scholars have recommended removing hashtags and their content altogether, while others have recommended just removing the hashtag (#) symbol (e.g., van Atteveldt et al., 2022). To reduce the noise from trailing hashtags while attempting to retain has many words as possible, I created a special hashtag rule to retain words that were embedded in the caption (i.e., signaling emphasis; "Today I'm feeling #blessed"). I also explored identifying text that had a sarcastic tone to prevent any mis-assessment of the meaning in interpretation. However, after exploring this possibility, it was deemed that there is currently not a reliable technique to identify sarcasm in text. In the spirit of utilizing a data-driven approach, additional preprocessing occurred iteratively. One instance of this was the necessary re-formatting of words that began with "self" (e.g., self-love, self-esteem, etc.) and contained different variations of the word (e.g.,

selflove, self-love, self love). In order for these words to be counted in their full meaning, and not be reformatted in lemmatization as two separate words of "self" and "love", all "self" words were constructed as "self___" (i.e., insert the stem and by removing the space and hyphen; e.g., selflove, selfesteem). Additionally, slang is often used in social media lexicon. Using NLTK, 104 slang words were transformed to the actual word (e.g., b/c and coz converted to "because"). Lastly, after all posts underwent preprocessing, some captions no longer had text in them and were blank; they were removed. In total, 12,256 captions were excluded during preprocessing.

Figure 3

Inclusion/Exclusion criteria for final sample of #selflove posts



Constructing the #selflove AOD Recovery Subsample.

To construct our sub-sample of AOD recovery posts, and as alluded to above, I used three approaches to find these posts. The objective was to collect as many AOD-recovery related posts from the #selflove sample.

First, I used social media's hashtag function once more to collect all AOD recovery posts within the #selflove dataset that were identifiable with a recovery-related theme. To determine the various themes and thus corresponding AOD recovery hashtags, I created a list of hashtags from several sources: those reported in AOD recovery literature (i.e., #alcohol, #drugs; e.g., Brazill-Murray, 2018)); those representative of the non-dominant recovery definition of abstinence to diversify the sample (i.e., #harmreduction, #sobercurious (chosen for its 168,521 posts compared to 366 #sobercuriosity; Instagram, February 2021)); and by using Google search to find sites that have reported on recovery-related hashtags and those that condense/count hashtags for the "most used recovery hashtags" (25 Recovery Hashtags You Need to Know, n.d.; Best #recovery Hashtags, n.d.; Socially Supported, n.d.). For the latter sources, and with the help of seven research assistants, I compiled all hashtags into a table. Then the team searched on Instagram for the total number of posts that contained that hashtag. I chose the most frequent 25 hashtags ranging from ~88,100 #recoverymemes to ~14million #recovery posts (Instagram, February 2021). Through these three sources, a list of 30 recovery-related hashtags was created (e.g., #sobriety, #recovery, #onedayatatime; see Table 1 for a full list). A column was added to the csv dataset to specifically identify posts that contained at least one of these 30 hashtags. Within the #selflove dataset, 3,074 of these posts were identified.

Second, after reviewing the 30 hashtags, it became clear that they tended to mirror primarily abstinence-related (e.g., sober) and 12-steps (e.g., #onedayatatime, #justfortoday) language. While abstinence and 12-step programs (e.g., Alcoholics Anonymous, Narcotics Anonymous, etc.) dominate recovery literature, evidence also demonstrates additional pathways for reaching recovery (Kaskutas et al., 2014; Kelly et al.; 2018). Including mutual help alternatives to 12-step programs (e.g., Women for Sobriety, SMART (Self-Management and Recovery Training) Recovery, LifeRing) may diversify the narratives about recovery and abstinence. While there are similarities to 12-steps, one differentiation is that these alternatives focus less on a spiritual aspect (e.g., higher power) (Zemore et al., 2018). The most frequently attended mutual help group attended outside of 12-step programs is SMART Recovery. I collected posts using purposive sampling via Instagram.com. Specifically, posts were searched using the criteria of #SMARTrecovery. Only posts that were posted in 2019 and contained #selflove were included; 288 #SMARTrecovery posts, like the one below, were included in the AOD recovery sample.

> #transformationtuesday
>
> My transformation is mental, and still a major work in progress. I am learning to love the body that gave birth to 3 beautiful baby girls. I am learning to love the hips that gave helped rock my babies to sleep. I am learning to love my stomach, rolls, stretch marks and all. I'm not 100% there yet, but I am proud of how far I have came. 1 month ago I had a hard enough time looking at my body in the mirror. Much less posting a picture of my bare tummy for every one to judge, but that alone is a major transformation! #transformationtuesday #csection #csectionmama #girlmama #momofgirls #sobermama #sober #smartrecovery #ilovemyself #letmeseesomestretchmarks #newblogger #bloggernewb #ignewb #healthymom #lovemybody #strongmama #momsinrecovery #soberisthenewblack #selfcare #selflove

Table 1

Hashtags Associated with AOD Recovery-Related Content: Pre- and Post-Exclusion

Hashtag	Potential Sample (n=4,592)		Final Sample (n=902)	
	Count	%	Count	%
#recovery	2637	57.4%	590	65.4%
#soberlife	718	15.6%	502	55.7%
#sober	737	16.0%	501	55.5%
#sobriety	654	14.2%	449	49.8%
#addiction	482	10.5%	316	35.0%
#onedayatatime	283	6.2%	167	18.5%
#soberliving	136	3.0%	130	14.4%
#alcoholicsanonymous	134	2.9%	127	14.1%
#narcoticsanonymous	101	2.2%	97	10.8%
#soberissexy	116	2.5%	94	10.4%
#addictionrecovery	133	2.9%	92	10.2%
#aa	45	1.0%	34	3.8%
#sobermovement	38	0.8%	34	3.8%
#odaat	44	1.0%	28	3.1%
#cleanandsober	29	0.6%	24	2.7%
#alcohol	51	1.1%	21	2.3%
#12steps	26	0.6%	21	2.3%
#recoveryispossible	43	0.9%	16	1.8%
#drugs	29	0.6%	16	1.8%
#justfortoday	21	0.5%	11	1.2%
#sobercurious	12	0.3%	10	1.1%
#na	7	0.2%	7	0.8%
#recoveryquotes	8	0.2%	5	0.6%
#recoverywin	7	0.2%	5	0.6%
#recoveringaddict	3	0.1%	2	0.2%
#recoveryjourney	1	0.0%	1	0.1%
#recoverycommunity	1	0.0%	0	0.0%
#harmreduction	1	0.0%	0	0.0%
#recoverymemes	0	0.0%	0	0.0%
#recoverysayings	0	0.0%	0	0.0%

Third, to identify posts that had recovery-related content in the #selflove dataset but that would have been excluded because they lacked one of the recovery-related hashtags, a dictionary of search terms was created to find these posts. The research team used word embeddings to create a list of words that capture relationships (e.g., similarities) with recovery-related content within our #selflove posts. Word embeddings are constructed (e.g., using Gensim (Version 4.2), a Python library that allows algorithms to interpret text data) by converting a document (e.g., a social media post) into word vectors (i.e., word2vec) where the collection of vectors indicates the location of a specific word. Specific to this study, the number is generated by the Continuous Bag of Words (CBOW) method in the word2vec model. The algorithm accounts for these various vectors and determines semantic similarities (e.g., the common example that *king* is to *queen* as *man* is to *woman*; Hammar et al., 2018).

Relevant to this study, I started with three words - 'sober', 'drugs', 'addiction'. These words were chosen to offer a range of recovery definitions and substances (i.e., sober which can often imply abstinence and often alcohol; drugs to account for those who may be practicing harm reduction, which evidence suggests is common in opioid-recovering communities; and addiction for those who may be speaking in the past tense about their former problems). Once these words are in the vector space, the algorithm can detect similar numerical placements and thus surrounding words. This resulted in targeted words that occurred frequently with recovery content, which were 'getting', 'clean', and 'recovery'. Using these six words, I created a column in the #selflove dataset to classify if the captions contained either these exact words or associations to these words, yet did not have a corresponding AOD recovery hashtag. An example of a post from this approach is below; note that there are no AOD recovery related hashtags but the word "sober" appears in the text.

> Congrats to [name] for two years sober today. If you love a good before and after show, [theirs] has been amazing to watch! 😍😍😍 #sailing #cruising #sailinglife #boatlife #pacificnorthwest #pacificnorthwestwonderland #womenwhosail #saillikeagirl #womenonthewater #womenatthehelm #salishsea #pugetsound #badassthriving #liveaboard #middleagedwoman #middleageadventure #thrivingnotsurviving #personalajourney #inspiringwomen #resilience #selflove #compassion #mentalhealth #authenticity #middleagedman #relationshipgoals #relationshipadvice

Within the #selflove dataset, 1,167 of these posts were identified.
With these three approaches, this resulted in 4,529 posts that could be potentially related to AOD recovery.

Exclusion Criteria of #selflove AOD Recovery Subsample. All potential AOD recovery posts within the #selflove sample were reviewed to determine inclusion/exclusion in the AOD recovery subsample. The objective of this step was to identify gold-standard posts that clearly addressed AOD recovery. Posts were excluded for several reasons (see Figure 4). 360 posts were excluded because the caption was not clear (e.g., a sole emoji "100", "Totally agree", "this"). Similarly, 84 were removed if the captions contained only hashtags (e.g., with minimal words or due to a text typo, ultimately missed during preprocessing). In both exclusion cases, corresponding media (e.g., image, link, video) may have been provided, yet procedurally the media was not examined in the assessment. So these posts were excluded if the caption alone did not present clear meaning. 139 were promotional meaning they advertised goods or services

and/or where #selflove was seemingly used for its popularity to attract users rather than for its relevance to the good/service or genuine engagement with the self-love concept). Boosted posts also fell in this category. 33 posts were duplicates of other posts and were removed to prevent biasing analysis. 2 were removed because it was partly in another language and was not decipherable.

While the content was unique and decipherable, 3,009 posts were removed because they did not specifically allude to AOD recovery. Posts were removed for the following reasons because they primarily focused on: mental health recovery (n=1,228), eating disorder recovery (n=165), trauma recovery (n=112), and narcissistic abuse recovery (n=67). 360 were difficult to decipher the type of recovery or addiction (e.g., *"You Are Good Enough - My Journey Overcoming Addiction"),* which I call ambiguous posts. These were largely derived from the AOD-related hashtags of #recovery or #addiction. 75 posts were excluded because they contained pro-substance use content, for example the emphasis of cannabis in multiple hashtags:

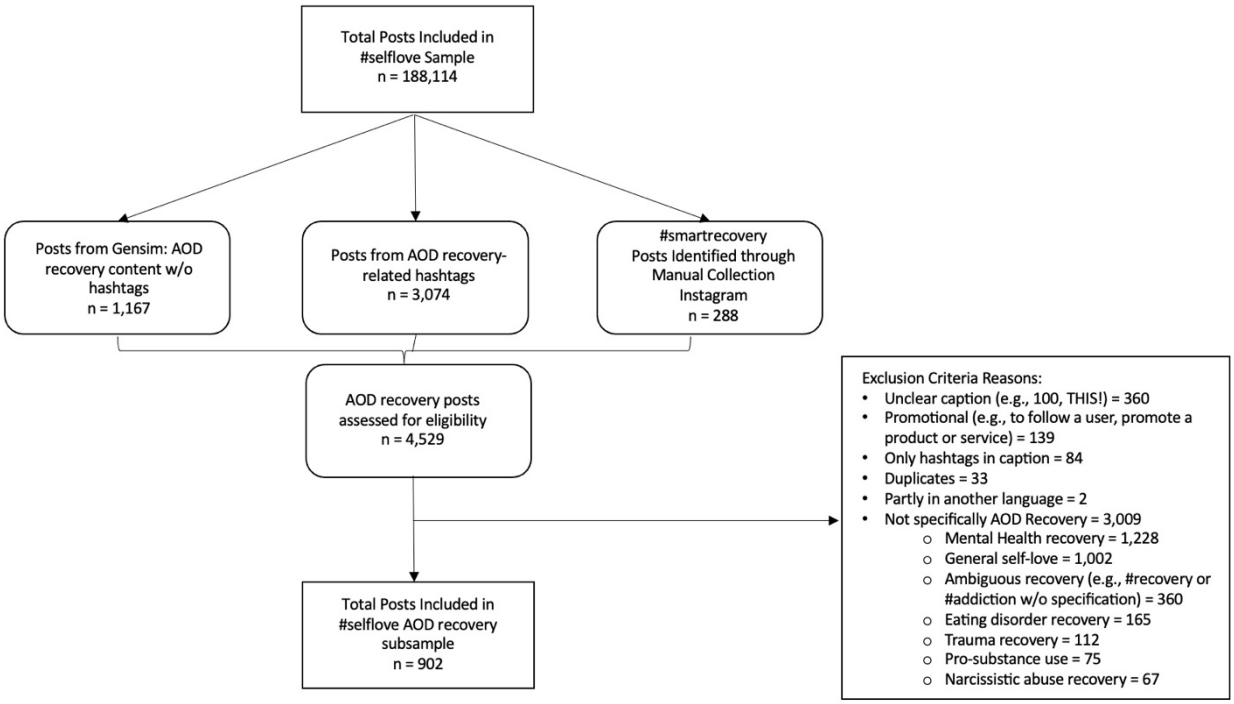
> i read this line about self love. it said: try to do one self love act a day and it has helped me get through so much✨💞 #ilovemyself #selflove #instagram #loveyourself #onelove #heart #girlswhosmokeweed #bongrips #sublime #marijuana #marijuanamodels #kindness #KindredSpirits.

Lastly, 1,002 posts had no semblance of AOD recovery and spoke generally about self-love. These were largely derived from the correlated word library data collection method, though some included a recovery-related hashtag but referred to recovery outside of a non-behavioral health context. Appendix A contains a post with both #recovery and #rehab yet is referring to having self-compassion; the poster undergoes rehabilitation and recovery for a broken leg.

Of the 4,592 potential AOD recovery, 3,679 posts were excluded from #selflove AOD-specific analyses resulting in 902 AOD recovery posts: 683 from the recovery hashtags, 150 from #smartrecovery; and 69 from the recovery-related word dictionary.

Figure 4

Exclusion criteria for final sub-sample of AOD recovery #selflove posts



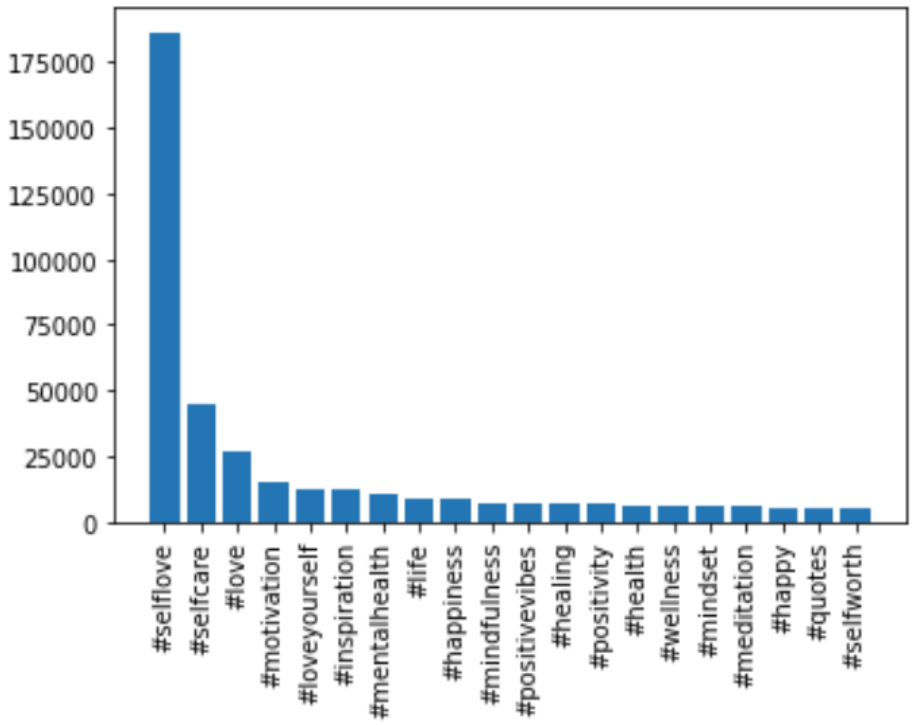
Descriptives: #selflove & #selflove AOD Recovery Subsample

Two datasets resulted from the above procedures: a general #selflove sample and a #selflove AOD Recovery subsample. After applying exclusion criteria, the total final #selflove sample consisted of 188,114 posts with an average collected 513 posts per day throughout the calendar year of 2019. Average word count per post is 26 words (*SD*=17), which equates to roughly 20,191 pages of double-spaced text. I ran a descriptive analysis on the user ids and hashtags based on the preprocessed, clean dataset. In the extracted #selflove sample, there are 85,757 unique user ids from our dataset and the average number of posts per user id is 2.25 (*SD*=7.51). Note, this equates to the usernames retrieved in our sample only and does not imply the number of total users who posted about #selflove in 2019.

Among these #selflove posts, 1,454,785 hashtags are used of which 134,405 are unique hashtags. #selflove was tagged 186,330 times in a post's caption with the remaining 1,784 tagged in a post's comments section. The top 5 most used hashtags within the #selflove posts are: #selfcare (45,143), #love (26,327), #motivation (15,164), #loveyourself (12,425); #inspiration (11,978); see Figure 5 for the most used 20 hashtags. Five themes can be deduced from these hashtags: care for the self (selfcare, loveyourself, mindfulness, meditation); positive emotions (happiness, happy, love, inspiration); attitude (motivation, positive vibes, positivity, mindset, quotes); wellness (mental health, life, healing, health, wellness); and views of the self (self-worth).

Figure 5

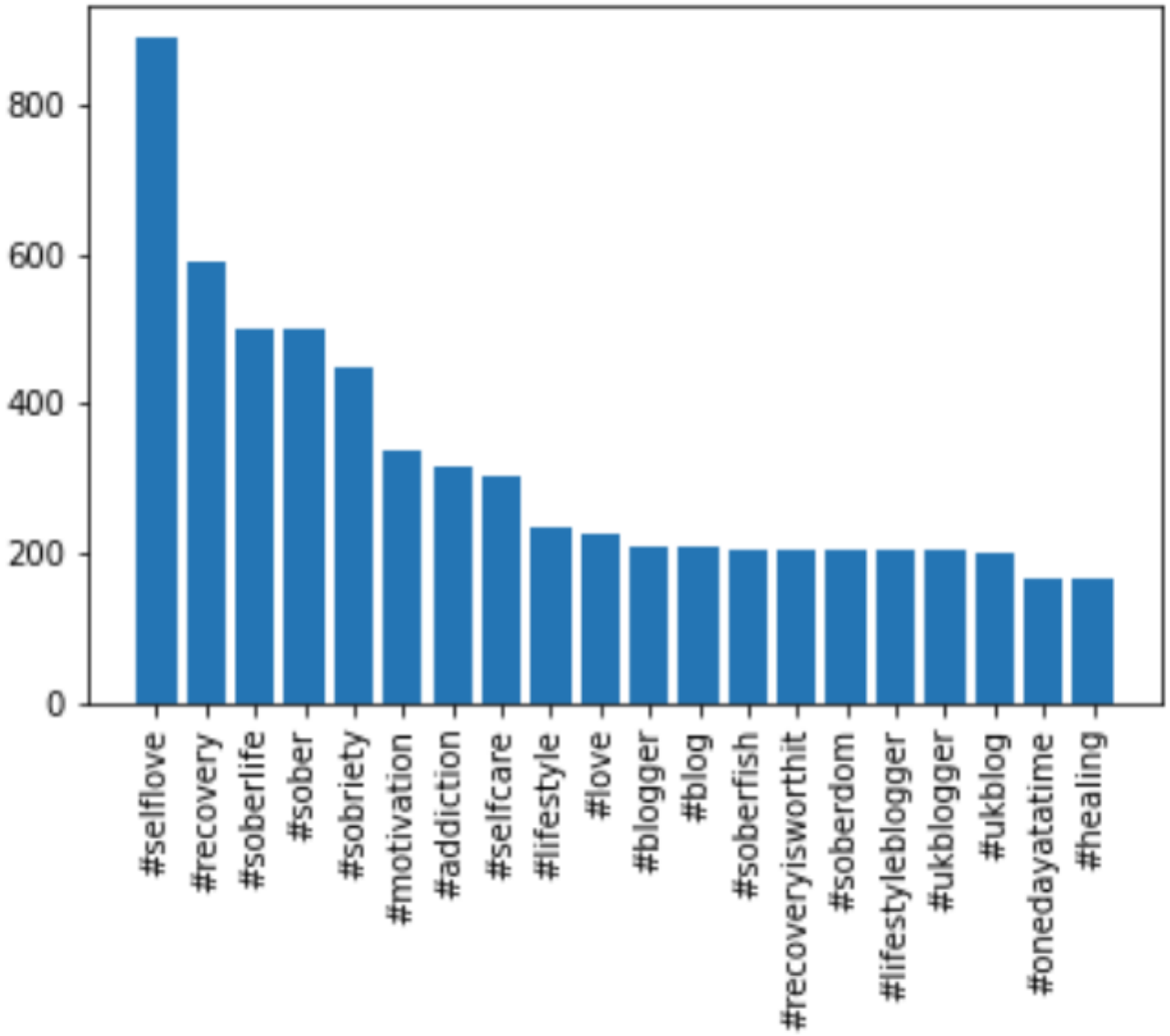
20 of the Most Frequent Hashtags in the General #selflove Sample



Our total final sample of #selflove and AOD recovery contains 902 posts. Average word count is 40 words (*SD*=38), which equates to 149 pages of double-spaced text. I ran a descriptive analysis on the user ids and hashtags of the #selflove AOD recovery subsample. In this subsample, there are nearly 427 unique user ids with an average number of 2.13 posts (*SD*=9.50). In the 902 posts, 11,390 hashtags are used of which 2,504 are unique. #selflove was tagged 889 times in the post's caption and the remaining 13 posts contained #selflove in the comments. The most used hashtags within the subsample are: #recovery (590), #soberlife (502), #sober (501), #sobriety (449), #motivation (338); see Figure 6 for the most used 20 hashtags.

Figure 6

20 of the Most Frequent Hashtags in the AOD recovery #selflove Sub-sample



When considering the prominent hashtags in both samples, there are a few overlaps. #motivation appears in the top 5 most common hashtags. While #selfcare and #love are in the top 5 of the #selflove sample, they are in the top 20 in the AOD recovery subsample. #healing is in both samples' top 20.

Ethics Statement

This study was deemed exempt from the University of California-Berkeley Institutional Review Board; per NIH (2019) guidelines and UC-Berkeley IRB (Committee for the Protection of Human Subjects, 2016); "exempt" because data was extracted from existing and public data (i.e., Instagram posts that are not from private accounts). Given the research team's partnership with the University of Amsterdam (UvA), this study underwent review and was approved by the UvA's Ethics Review Board. Discussion around ethics for social media data collection has been prevalent in recent years and is still ongoing (e.g., boyd & Crawford, 2012). Several guidelines

offer assistance in how to proceed. First, when social media data is collected using hashtags, the assumption is that a user has utilized a hashtag to be a part of a larger conversation meaning there is awareness and even an expectation that their post may be seen by others (Townsend & Wallace, 2016). Second, one could argue that the content may be sensitive (i.e., people in recovery), thus the NIH advises that individual posts not be utilized, specifically in a manner that would reveal the identity of the social media poster. Given the complexities of this debate, care was taken to keep the privacy and anonymity of posts by removing usernames in cited posts, paraphrasing posts, and confirming that posts cannot be linked back to a user through a search engine (Townsend & Wallace, 2016). Lastly, data were aggregated for counts and topics, which are not specific to one particular user.

Topic Modeling Analysis: Determining Topics of #selflove and #selflove AOD Recovery

Topic modeling is a type of analysis within computational modeling. To orient social scientists to this relatively new method, I have provided an overview of computational modeling.

Computational Modeling and Analysis Overview

With the proliferation of "big data," researchers and traditional statistical analysis are converging with computational methods. The social sciences are embracing computational methods (e.g., Muralidhara, & Paul, 2018; Rodriguez & Storer, 2020) using algorithms to explore, predict, and "spot patterns of language that suggest new interpretations and theories" (Blei & Smyth, 2017, p.1). Algorithms are a set of instructions that humans program into machines. When a machine is instructed to act like a human, this is artificial intelligence. If the machine is instructed to predict future data based on past data, then this is machine learning (i.e., using an algorithm to program, ("learn") the machine to make predictions). Machine learning has been successfully employed on social media (e.g., Paul & Drezde, 2014; Sarker et al., 2016; Vermeer et al., 2019) and specifically Instagram (e.g., Gencoglu & Ermes, 2018; Muralidhara & Paul, 2018) and Twitter (e.g., Cavazos-Rehg et al., 2015) within the broader context of behavioral health issues (e.g., depression; Reece & Danforth, 2017) and narrowly, substance use (Eshleman et al., 2017; Hassanpour et al., 2019; Kim et al., 2017)).

Utilizing machine learning in the social sciences and more specifically in addiction and recovery research has its benefits. Researchers can conduct risk assessments, inform treatment outcomes and policy, incorporate multiple forms of data within a study (e.g., through text analysis of social workers' case notes), and explore behavioral patterns and trends on social media (Barenholtz et al., 2020; Kim et al., 2017). Computational modeling has afforded the exploration of various addiction and recovery research questions: prediction of the severity of developing an SUD with longitudinal data (Hu et al., 2020); expansion on drug and recovery discourse by examining linguistics and language used when someone transitions from use into recovery (Lu et al., 2018); assessment of the likelihood of engaging with recovery-related communities (Eshleman et al., 2017); and identification of users susceptible to relapse (Jha et al., 2021).

Machine learning is categorized as either unsupervised or supervised. Both forms are used in this dissertation though supervised machine learning is addressed in a later section. Unsupervised learning uncovers latent concepts (Silge & Robinson, 2017). It allows a preselected algorithm, chosen for its suitability to the type of data, to organize data into an algorithm output (i.e., the outcome, which will result in self-love themes, known as topics or clusters). The output is not known by the researcher and is generated based on how closely the

input data (of which the researcher advises parameter estimates) is related to one another. The approach is exploratory and inductive, rather than hypothesis-driven (Trilling, 2018). Scholars have likened this method to grounded theory, even demonstrating convergence of results when comparing unsupervised machine learning and grounded theory in a case study (Baumer et al., 2017). The similarity between the two is that theorizing, collecting data, analyzing, and interpreting are integrated and occurring iteratively.

Topic Modeling Analysis.

One type of analysis within unsupervised machine learning is topic modeling. To answer how self-love compares in a general context versus an AOD recovery-related context, the aim was to explore latent themes within the social media posts and gather frequent co-occurring words within posts. Topic modeling generates co-occurring themes (i.e., topics), similar to clusters in quantitative analysis, by identifying latent variables within the entire dataset of social media posts (Trilling, 2018). Topics are derived from the input source, known as documents (i.e., social media posts). One post may have 60% of topic 1 and 40% of topic 2, whereas another post may have 70% of topic 1 and 30% of topic 2 (Silge & Robinson, 2017). Topics are then broken down into common words. A group of words (30 for this study) are emblematic of the topic. One benefit of topic modeling is that common words can appear in multiple topics allowing for more informed specificity in defining the topic (Silge & Robinson, 2017). By examining the words in a cluster (i.e., topic), it is possible for human interpretation to assign a label to the topic, which gives the cluster of words specific meaning. Understanding this meaning and ultimately utilizing topic modeling to offer descriptive analysis of a social media phenomena (i.e., hashtag data collection of #selflove) have been encouraged by social work scholars (e.g., Rodriguez & Storer, 2020).

To transform words into a data-readable format (i.e., vectors), I performed feature extraction on the preprocessed text (i.e., each word in the text becomes an independent variable, which is known as a feature in computational modeling terms). This was done to assign a mathematical representation of 0 to 1 to the social media text. Tf-Idf (i.e., term frequency-inverse document frequency) was used to convert the words to a natural language processing (NLP) readable format (Ramos, 2003). Term frequency measures how often a term appears in the document and Inverse document frequency measures how often a term appears in the entire corpus. This method is beneficial because it penalizes more common words by assigning them a lower weight yet also accounts for more specific (i.e., rare) words; together, a more accurate representation of words is considered. The resulting value ultimately assigned a probability to each word in the corpora (i.e., dataset). Using an algorithm, known as Latent Dirichlet Allocation (LDA; Blei et al., 2003), topics were created with words that closely group to one another. These words have the knowledge to cluster together because the #selflove and AOD recovery datasets were trained on Gensim (i.e., a Google News-derived natural language processor using the Python language; Řehůřek & Sojka, 2010; Řehůřek & Sojka, 2011). Topic modeling and LDA have shown to be consistent and efficient when analyzing social media posts, specifically short text like those from microblogging sites such as Twitter (Albalawi et al., 2020). Thus, words occurring frequently throughout the sample clustered more closely since they had a higher probability of co-occurring within a given topic.

Choosing Topic Model Parameters. To choose the optimal topic modeling parameters, standards are typically adhered to; however, these have not yet been defined on managing the ambiguity of parameter selection (Maier et al., 2018). For example, several considerations were

taken into account when selecting the number of topics (k). Specifying fewer topics can lead to a broader frame in which topics should be further delineated. In contrast, inputting a higher topic number can make it difficult to decipher between topics. After examining social media research (e.g., Schatto-Eckrodt et al., 2020), I ran the coherence score (a value from 0-1) for topics ranging from 3-12. A high coherence score is interpreted as the ability to understand a given topic assuming familiarization with daily-speak without needing to know the actual context (Blair et al., 2020). Several considerations go into factoring the coherence parameter. Using extant NLP research on short text as guidance, I set the document topic density (α) to 0.05 and topic word density (β) to 0.01. For the #selflove and recovery datasets, I set the number of iterations to 40 and 1,000, respectively (Lossio-Ventura et al., 2021). The larger number of iterations, the more computationally expensive it is (e.g., more consumption of computer memory). Given the larger size of the #selflove dataset, a smaller number of 40 iterations was used.

Over the course of running multiple iterations, the model generated a list of words and corresponding proportion (θ) that each word belongs to a specific topic. Since topic models are probabilistic, results can vary each time the model is run. To prevent this and allow for replicability of results, I set a random seed. Lastly, Fan and colleagues (2019) advise utilizing not only coherence to generate a more quality interpretation, but to also consider word relevance (λ) in a topic. Since the same words can appear in more than one cluster (known as "soft" clustering), adjusting the relevance allows the model to not be as saturated with the same words across topics and allows for a clearer picture of distinction between clusters. A relevance of 1 displays the probability of each word belonging to a given topic (i.e., most frequent) with the drawback that the same words appear across various topics and dominate the interpretation. A relevance of 0 accounts for specificity (i.e., very specific terms are generated though they do not aid in the general meaning of the cluster; Ioana, 2020). Sievert and Shirley (2014) advise adjusting the relevance between 0.30 to 0.60 so that more frequent words are penalized and distinction between clusters is visible, yet interpretation is still possible.

Interpretation of Topic Modeling. Keeping in mind that topic modeling is an iterative process, parameters were adjusted iteratively until self-love topic labels were deemed as final descriptions by the research team (Maier et al., 2018). As an additional check, data were visualized using data mapping onto a Principal Component Analysis (PCA) plot (i.e., converts a high dimensional vector space to a 2-dimensional space, pyLDAvis (Version 3.3.1); Sievert & Shirley, 2014), which aided in interpreting groupings of words within a cluster and across clusters. The distance (close vs far) and size (small vs large) between clusters depict how similar/different the clusters are to one another and how (not) prevalent the topic is to the corpus, respectively. Each word's relevance, saliency, and frequency within a topic and across topics were mapped. This ensured validity of the topics by people who have domain knowledge (Trilling, 2018). Topic interpretation for both samples follows.

#selflove Sample Results. The #selflove sample's highest coherence score was .46 with 6 topics. Studies have shown that social media data can have lower coherence scores since data can be considered noisy (Blair et al., 2020). Interpretation was determined best with a relevance of 0.60. A combination of most frequent (λ=1) and specific (λ = 0.60) words for each of the 6 topics are provided in Appendix B. Figure 7 illustrates how the topics map to one another on a two-dimensional plot. Taking into consideration the topic modeling visualization as well as the words per topic, the #selflove sample's 6 topics are: (1) validating the self (2) loving the self (3)

coping (4) wellness (5) self-care (6) engagement with others. The most frequent 10 words in each topic are displayed in Figure 8.

After reviewing those topics and noticing large overlap between clusters and small tokenization within some of the topics, I condensed the 6 topics into 4 topics resulting in a coherence score of 0.41 (e.g., see Park et al., 2022). Due to the overlap, the plot in Figure 7 demonstrates the similarities between topics validating the self and loving the self, as well as, coping strategies and wellness. Condensing these groupings into two categories makes sense: (1) relationship with the self (2) well-being. Additionally, a majority of the corpus is within these two categories; they are slightly broader than the two other topics, topics 5 and 6. These remaining two are smaller meaning that less words from the corpus are within the topics, yet they are still distinct and boundaried. Their distance from the four closely clustered topics is also accounted for. They have been labeled as (3) self-care and (4) engagement with others. Additionally, Table 2 displays the topic number and its corresponding topic name, top words, topic description, percent of the entire #selflove words (i.e., corpus) within that topic, percent of posts which have that topic as the dominant topic of all topics, and an example of a social media which is highly representative (98 or 99%) of that topic (e.g., Sanders et al., 2020).

Figure 7

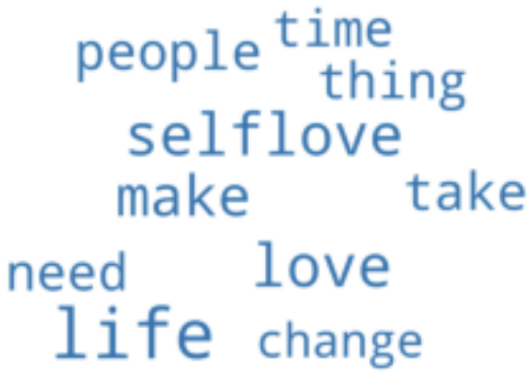
6 Topics of #selflove

Note. Topics 1&2 are category 1. Topics 3&4 are category 2. Topic 5 is 3, and topic 6 is 4.

Figure 8

Word Clouds of general #selflove

Topic 1: Validating the self



Topic 2: Loving the self

Topic 3: Coping

Topic 4: Wellness

Topic 5: Self-Care

Topic 6: Engagement with others

Table 2

General #selflove Posts by Topic Name, Description and Example

Category #	Category Name	Topic #	Label	% of Words Within Topic	% of Posts with Dominant Topic	Most Frequent Topic Words	A Representative Post of Topic
1	Relationship to Self	1	Validating the Self	26.4	30.5	life, love, selflove, make, take, people, time, need, thing, change	When you're good enough , you're good enough Someone can think you're good enough and someone else can think of something else about the same you ! Point is, you will never be good enough if you try to please everyone BUT you'll Always Be Good Enough For Yourself 🤷🏾‍♀️#selflove
		2	Loving the Self	19.4	20.75	love, self, selflove, life, others, recovery, loving, healing, send, need	We often talk to ourselves in a way that we would never talk to other people! Love this reminder from [@username removed] as well as the mindful day 7 challenge of listen to how you speak to yourself and try to use kind words! #selflove #selftalk #benicetoyourself

Category #	Category Name	Topic #	Label	% of Words Within Topic	% of Posts with Dominant Topic	Most Frequent Topic Words	A Representative Post of Topic
2	Well-being	3	Coping Strategies	19.1	18.35	year, selflove, day, time, get, one, addiction, go, like, know	Took a 1/2 day to process today. I spent much of my childhood hiding my emotions from my parents & family, but now that I am equipped to process emotions, I admit it's tough, yet fantastically liberating. #selfcareisnotselfish #selflove #feelingfeelings 💞I'm weird, I know. 😉
		4	Wellness	13.7	11.4	selflove, day, health, body, welfare, mental, new, today, yes, goal	I am so proud of how far I have come with my weight loss and mental health journey to be a better and healthier me :) I feel so much more beautiful than I have ever before ❤️ I still struggle but I suppose that's why it's called a journey. #selflove #tuesdaySelfie #wieghtloss
3	Self-Care Activities	5	Self-Care Activities	11.8	10.44	selflove, beauty, skin, like, beautiful, hair, girl, face, today, look	#selfcare today is face masks and a cold one after a looooooong arse day. HAPPY WEEKENS FOLKS😘 #selflove
4	Engagement with Others	6	Engagement with Others	9.6	8.14	new, post, selflove, happy, link, check, follow, good, bio, morning	Happy Sunday everyone Such a great day hope everyone enjoy the day as I do #sundayfunday [@username removed] New York New York

Relationship to Self. *Relationship with Self* was the dominant topic detected within a majority of posts (51.25%). This topic demonstrates validating and loving the self and at times speaks of the self in relation to another. Validating oneself (e.g., "you're enough" and "trust yourself") is characterized with ideas of self-worth and self-trust and being intentioned to take action to prioritize the self (e.g., "What makes you happy right now You have choices & free will right now and you will never be good enough if you try to please everyone"). Various action verbs "take", "believe", "make", "change", "know", and "think" (see Figure 8 and Appendix B) are also present for this topic. Being an individual with another (e.g., "trust others" and "fall for someone who makes you feel…"), which is characterized by "people" "someone" "anyone" and "others", could suggest that the self is not solely acting for its purpose alone. There is also insistence on the word "love" "kindness" and loving oneself unconditionally (e.g., "become more unconditionally loving with ourselves") and treating the self like a friend would (e.g., "Talk to yourself like you would talk to someone you love Love yourself unconditionally as you love your children"). These are reminiscent of self-acceptance and self-compassion, respectively. The word cloud for this topic stresses the importance of "love", "loving", "self", "others", and also suggests that one may be showing love as a form of "healing" and "recovery." Instances of "motivation" and "journey" imply the process of self-love and the motivation to make changes. One potential finding may be that self-love is caring for the self in everyday life and also in challenging times. It also involves a fluid relationship with the self (indicative of various "self" words like acceptance, compassion, worth, trust) and in the presence of another.

Well-being. *Well-being* was the dominant topic found within 29.75% of the posts. Well-being is characterized by: coping with hardship and physical, emotional, and mental wellness. "Hopefully i'll feel better tomorrow", "took a ½ day to process" and "You need to know how to improve your mood instantly*"* are examples of strategies to cope using reframe, giving time to process, and boosting emotions. Some of these posts discussed "addiction", "trigger", "help" and "let" "go." Wellness includes "physical" and "mental" "wellness" and emphasizes the "body", "health", and "healthy." An example post is: "Healthy relationships at home and work are a priority for a healthy wellbalanced individual. One of the best ways to have a healthy relationship is by setting up boundaries." Activities to be healthy are "gym", "coach", "fitness", and "breath" while also accounts of "eating", "food", "fuck", and "craving" go express difficult mental health instances. Some expressed feeling proud and happy for improving their mental health, and a post stated "Your current state of selflove is reflected in your current state of health." The focus on body, mind, and health—when it requires coping strategies or healthy activities— informs this category's label of well-being.

Self-Care. *Self-care* contained 11.8% of the corpus and was the dominant topic in 10.44% of all #selflove posts. This category includes activities like "massage", "coffee", "having a cold one", "homemade meal", "face masks", and "conversations with mom." Self-care also was spoken about in terms of "beauty" rituals with specific body references, such as: "skin", "hair", "face" and "eye." Feelings of the self could also be evoked: "queen", "beautiful", and "cute." "Saturday" was also found, likely due to the common adage of "Self-care Saturday." Self-care and self-love are frequently used synonymously. Given that #selfcare was the most common hashtag in the #selflove sample, it is no surprise that self-care related content has its own distinct topic. This also is an opportunity to somewhat distinguish it from self-love.

Engagement with Others. *Engagement with others* contained 9.6% of the corpus and was the dominant topic in 8.14% of all #selflove posts. Two patterns emerged: one, expressing pleasantries to others; and two, promoting goods and services. Expressing pleasantries (e.g.,

"Happy Sunday everyone Such a great day hope everyone enjoy the day") are well wishes in the form of "Happy Monday" and "Good morning." There are also a majority of words that imply sharing with others (on social media) (e.g., here is my new blog*)* and encouraging them to "like" "share" "new" "post" "video" "link" and "bio" to gain recognition. They may be sharing content and self-promoting goods and services with "free" "gift" "event" "shop" "art" "episode" and "music." At times the pleasantries are used in the social media engagement and other times they are not. While there could be an intent to connect with others, the dominant intent of the post may be self-promoting and indicate either narcissism, the capitalistic and commercialization of self-love, or simply using the #selflove because of its popularity to expand post exposure.

#selflove AOD Recovery Subsample Results.

The AOD recovery subsample's coherence score was highest at .47 with 10 topics. Figure 9 maps the 10 topics in a 2-dimensional space. Relevance was determined best at .60. A combination of most frequent (λ=1) and specific (λ = 0.60) words for each of the 10 topics are provided in Appendix C. I interpreted the 10 topics as: (1) finding the positive (2) reflecting on the past (3) overcoming mental health issues in sobriety (4) caring for the pain of the past (5) finding meaning/feeling positive emotions (6) taking action (7) tools for struggling (8) having positive views of the self (9) building new beginnings and (10) getting help with sobriety.

After reviewing those topics and noticing large overlap between clusters and small tokenization within some of the topics, I condensed the 10 topics into 4 topics, which had the 2nd highest coherence score at .46 (e.g., see Park et al., 2022). Interpreting the various words and representative posts per topic resulted in the #selflove AOD recovery subsample's 4 categories: (1) process of growth (2) learning from the past (3) building new beginnings and (4) getting help. Table 3 displays the topic number and its corresponding topic name, top words, topic description, percent of the #selflove AOD recovery words within that topic, percent of posts which have that topic as the dominant topic of all topics, and an example of a social media post which is highly representative (98 or 99%) of that topic.

Figure 9

10 Topics of the #selflove AOD recovery subsample

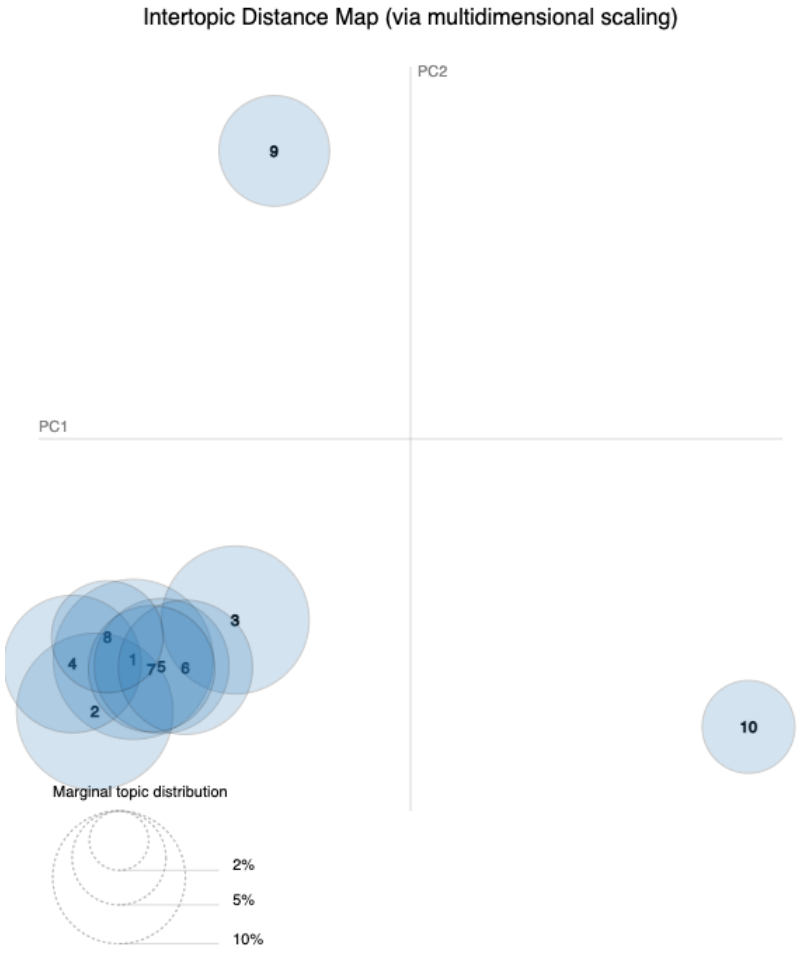


Table 3

AOD Recovery #selflove Posts by Category Including Topic Name, Description and Example

Category #	Category Name	Topic #	% of Corpus Words Within Topic	% of Posts with Dominant Topic	Description	Most Frequent Topic Words	A Representative Post of Topic
1	Process of growth in sobriety	1	14.50%	15.08%	finding the positive perspective	sober, day, addiction, one, life, recovery, need, today, love, thing	Monday Motivation👌👊I am always in awe of my all of my daughters. Their beauty, their brains, their incredible personalities-all so different from one another, but have many similarities as well. Some days are rough, to the point I wanna cry because nothing is going right. I feel like all I am doing is telling someone to "knock it off" or I am dealing with one meltdown after another. Then night time comes and all those negative feelings go away as I am tucking them in. They give me the best hugs. The best good night kisses, and even tell me how they're so happy I am their mommy! All these things help remind me that even if it's a bad day, I am still so thankful I am spending it with them. That I am present in their lives, clear headed and sober. I am thankful that my daughters have a mother that is there for them when they're having a rough day, a meltdown, even a tantrum. I am thankful that my daughters know how much their Mama unconditionally adores them. This weekend was a rough one, behavior wise, but I am so thankful for it! I felt like my parenting skills were being tested, but I also feel like I succeeded! I am proud of myself. I'm not perfect. There are plenty of things I need to work on, but I am doing a damn good job, and am enjoying Motherhood too! #sobermomtribe #sobermoments #sobermomblog #sobermomchronicals #soberliving #recovery #addictionrecovery #wedorecover #soberwomen #soberwife #selflove #selfcare #mondaymotivation #smartrecovery #stayathomemom #blackgirlmagic #mixedkids #mixedgirlmagic #mixedandproud #cantstopwontstop #naturalhair #mixedmonday #curlyhair #curlyhairgang #perfectlyblended #teamnatural #naturalhairstyles #kinkyhair #naturalhairkidsove
		3	12.40%	13.53%	Overcoming mental health issues in sobriety	sober, love, today, recovery, life, go, sobriety, addiction, step, help	Just a tip that I hope people can benefit from that suffer from #anxiety to keep the mind busy. This is how some of my weekends go 🤷‍♂️ I've learned to enjoy my own company since I became sober, sobriety has helped my #mentalhealth tremendously. Some people don't need to get sober to improve their mind state and I applauses that 👏🏻. I've learned I can go out to a bar on my own stay sober, meet new people... and trust me I can still find ways to have fun and make an ass out of myself 😂 who gives a flying f@ck what people think.

Category #	Category Name	Topic #	% of Corpus Words Within Topic	% of Posts with Dominant Topic	Description	Most Frequent Topic Words	A Representative Post of Topic
		5	10.30%	8.87%	Finding meaning/feeling positive emotions	love, work, life, time, year, get, recovery, people, sober, make	That no addict seeking recovery, need ever die. It's my week off and I want to take some time out to express and share my experience through out the past 12 years of struggle with addiction. I am grateful to be living a life i live today. And want to show my gratitude towards my guide for life [username] , my family and lastly my god of understanding....•Thank you so much of handling me in my worst. Thank you so much of taking me out of the dark world and showing me a small light of hope. Thank you to the people who give me a place in their life. Thank you for making me feel my worth in their life. I am all because of you peoples effort and guidance. Thank you for the love. #WeekoffDay #beinghuman #BeingThoughtful #recoverydays #Grateful #blessings #Gratitude #LifeOnLifeTerms #LivingInReality #SelfHEAL #miracleshappen #learningfrommistakes #Serenity #onedayatatime #goals #inspiration #lifechange #change @hashtags_club #success #happy #mindset #transformation #jesus #selflove #healing #happiness #motivation
1	Process of growth in sobriety	6	10.20%	10.75%	Taking action	life, addiction, sober, selflove, today, day, change, know, work, someone	MASSIVE ACTION... It's sometimes the hardest thing for us to do when we are consumed by fear. Fear of mistakes we made, problems coming our way soon, things we haven't dealt with coming to the surface… It all requires us to CONFRONT fear right in the face. It takes courage, but most importantly it takes being BRUTALLY honest. I can believe my own shit all day, but until i actually realize that I need HELP and there IS MORE WORK TO DO, i will remain sick and stuck in fear. What's the solution? MASSIVE ACTION #spiritualmaintenance#healing #recovery #sobriety#wellness #mentalhealthrecovery#mentalhealthawareness#mentalwellness #mentalhealthmonth#mentalhealthquotes #selfhelp#selflove #selfrespect #selfcare#addiction #buildingabeautifullife#onedayatatime #smartrecovery#alcoholicsanonymous#narcoticsanonymous #sober #soberaf#partysober #soberlife
		7	9.00%	10.98%	Tools for struggling	addiction, day, morning, beautiful, wishing, help, sober, go, life, know	If you or someone you know is struggling with some sort of addiction, know this we do recover, with the proper sources and the right help you will recover, dedicate yourself to your new life and live it, ask for help and do things you wouldn't normally do that you may not want to do change everything take the help given and you too can have a great life and fulfill your dreams! Comment below if you or you know someone who is struggling with addiction, we are here to help, we can offer you all the proper recourses and help to recover today comment below to see results! #recovery #smartrecovery #sober #soberlife #newbeginnings #helpingothers #selfless #selfcare #selflove #loveyourself #youcandoit #werecover #willfulness #selfwill #respect #live #lifeisbeautiful #sobernetwork #recoveryresources

Category #	Category Name	Topic #	% of Corpus Words Within Topic	% of Posts with Dominant Topic	Description	Most Frequent Topic Words	A Representative Post of Topic
1	Process of growth in sobriety	8	7.10%	7.54%	Having positive views of self	thing, one, love, make, sobriety, life, time, feel, remember, change	For #Valentines I got to celebrate self love and acceptance. And 1 yr and half sober under my belt. Not too bad. 😄 For anyone else that feels lonely know you are loved. I love you ❤️ You have meaning and you are on the verge of a breakthrough. #HappyValentines #selflove care
2	Learning from the past	2	12.40%	9.90%	Reflecting on the past	life, addiction, learned, people, help, feel, need, like, know, remember	*prepare for long personal note* Today was my last day of undergraduate classes, and what a journey it's been. I want to say that my life is a fucking rollercoaster man. I've learned and grown and truly created a sense of self awareness over the past four years. I want to thank everyone who has ever helped me in anyway. To go to [program removed] has been such a blessing and even though I am sad to leave I can remember and appreciate all the good things I've learned and become grateful for. For example, I know how to talk to new people and converse like a person now! I've also learned how to do my taxes, and be responsible. I have learned to travel on my own ✈️ and I've learned to be positive and kind to myself. I've learned to complain less and be grateful more. I've learned how to have $2 in my name but still not let it stop me. I've learned to ask for help and even better how to help myself. I've learned about self analyzation and how I was raised to seek disaster but to recognize these unhelpful qualities and move on in a compassionate way. Yes, my college degree lead me to compassion. I've learned to take action when needed and to stand up for what I feel is right. I've learned that life is unfair but to linger on the pain gets me nowhere. I've learned how to be sober and detach myself from harmful addictions. I've learned real friendships and love. I've learned self love. And most importantly I've learned that I'm always going to keep learning but to be open and receptive to new ideas, ways of living, and new relationships is the 🗝 to my growth. I think the greatest gift we have in this life is growth. Thank you for reading my little memo and many cheers for the future🌄Ft. Bronze made from loss wax technique topped with cupric patina.#bronze #sculpture #cupric #patinnest ##artwork_in_studio #art #artistsoninstagram #artist #artwork #artoftheday #selfcare #selflove #selfie #selfreflection #landscape #painting #paint #portrait #portraitpainting #artcollectors #artdealer #work #motivation #friendship #love #fineartpainting #paintingoftheday #painting🎨 #paintmixing

Category #	Category Name	Topic #	% of Corpus Words Within Topic	% of Posts with Dominant Topic	Description	Most Frequent Topic Words	A Representative Post of Topic
		4	10.70%	7.87%	caring for the pain of the past	want, love, time, best, think, one, see, life, pain, know	Meditation:Is ok to be sad, sadness is a gift from G'd. Is long standing grief and it takes a strong soul to accept it. Sometimes is ok to embrace sadness and console and caress it as if it was a little kitten or a bird, until is ready to pass or go to the light. Once I acknowledge why it did hurt then is when the journey of healing starts. Is ok to be sad now and then. What I cannot feel I cannot heal.#sad #healthy #recovery #onedayatatime #alanon
3	Building new beginnings	9	6.90%	8.98%	building new beginnings	new, life, book, let, recovery, big, day, sober, year, time	When we drink, or use there, is a sence of endlessness. Every direction it's the same. Having 18 years of more than just sobiety I have been able to lift the fog to which I am grateful and thankful every day. There has been a rumbling of sobriety in the national news as of late and I am so excited for all my sober folks out there who have been making their lives better everyday with limited recognition at best. You Are All Powerhouses!!! As people are hearing about sobriety in the press right now I am so excited. I've had a number of people talk to me about the idea that they "may" have a drinking issue. This is a great time in our world when we can change the conversation, strip the stigmas and start to heal. I am so happy that the idea of not drinking is growing and that being yourself, myself, ourselves is building momentum. There is no reason to check out of your life when you know its a gift, not a sentence. If you feel like you're imprisoned release yourself with a bit of curiosity. I love you and there are millions pulling for you. Thank you [@media outlets] for the coverage and [@ recovery influencers usernames] and all the others participating in this conversation, for your contributions, and your vulnerability. #sobriety #recovering #recovery #sobercurious #recoverypodcast #onedayatatime #tothineownselfbetrue #alcoholicsanonymous #smartrecovery #selfawareness #selflove #intherooms #inthenews . This pic is from Finesterra, Spain, The End of the World. [@usernames]
4	getting help	10	4.90%	7.32%	getting help with sobriety	sober, like, help, morning, saturday, life, selflove, sobriety, understand, fuck	congratulations 🎉, I have to say this is a huge accomplishment and I'm pretty jelly. I throw my clean time away not long ago... I almost had 9 months. #sober #soberlife #soberissexy #loveyourself #stillnotafraid #aa #selflove

Process of Growth. *Process of growth* was the dominant category encompassing 63.5% of the posts across six topics: taking action (e.g., "what are you plans towards achieving your goals in 2020"; "seek for the truth about yourself and strive towards improving yourself everyday"); tools for struggling (e.g., "Go to the mountains, Go to the beach, Go for a spa day"; "Don't allow your emotions to overpower your intelligence"), overcoming mental health issues in sobriety (e.g., "There's clearly a connection between substance abuse and mental health disorders"; "Alcoholism and addiction does not discriminate. They say from jail to Yale"), having positive views of the self (e.g., "It all begins with mindset. Place yourself in situations that can expand your awareness"), finding meaning and feeling positive emotions (e.g., "what sets your soul on fire I mean really on fire your passion your love your motivation"; "In recovery we also need to know we are getting better sober and clean for ourselves and not for other nor relatives"), and finding a positive perspective (e.g., "My transformation is mental and still a major work in progress. I am learning to love the body that gave birth to 3 beautiful baby girls"; "there's going to be bad days relapses breakdowns tears but there's going to be so many more smiles laughter and good memories.")

Learning from the Past. *Learning from the past* was captured in 23.1% of the posts. Themes within these posts and common words are emblematic of: reflecting on the past and what was learned (e.g., "Recovering individuals will likely feel guilt and shame about their past addictive behaviors and this can be a trigger to use"; "to "live one day at a time" is to focus on the present moment and not have to worry about the past or future"; "Self-forgiveness is an important part of self-acceptance") with common words of "remember" and "learn"; and caring for the pain of the past (e.g., "I'm sorry I lied to keep all the pain inside"; "Sometimes I used to get caught up in thinking people couldn't see past my past") with words like see, pain, and know.

Building New Beginnings. *Building new beginnings* was detected in 6.9% of the posts. Two examples of this topic are: "Somehow in less than four years of sobriety I have written and released three books" and "Going through recovery will mean youre definitely doing something different from your usual self." Words emblematic of this topic include "new" and "life", and there is also an emphasis on "time" with "day" and "year." Given that this is distinctly situated away from the other topics in Figure 9, the focus appears to capture change around moving forward and future-oriented thinking.

Getting Help. *Getting help* was detected in 4.9% of the posts. Two examples of this topic include: "I feel like I'm struggling with something I can't seem to get my head around it"; and "In this episode Tina and I discuss the meaning of CARE in our lives. The discussion was deep meaningful and made us both a bit vulnerable." Some words that represent this topic are "help", "care", "talking", "discussion", and "meaningful." This category emphasizes tangible sources of support when struggling with sobriety.

Interpretation: Comparison of General #selflove to AOD Recovery #selflove. When interpreting how laypersons discuss #selflove generally compared to how laypersons discuss #selflove within an AOD recovery context on social media, I found similarities and differences. The following categories were found within both the #selflove posts and the #selflove AOD recovery subsample:

- *relationship to self*: prioritizing and validating ourselves in conjunction with others. This category was prevalent in the tools for struggling, finding meaning, and taking action for recovery (as part of the process and growth category).
- the process and journey of changing behavior: of self-love and AOD recovery

- *well-being*: being healthy, incorporating the positive, practicing self-care activities, and coping (e.g., weathering hardship and struggle, tips/tools to cope with negative emotions and thoughts, views of self such as acceptance and self-worth, and getting help)

Discussion of engaging with others on social media was exclusive to the #selflove posts. In terms of the #selflove AOD recovery posts, learning from the past was specific to this sample and not detected in the #selflove posts.

IV. Classification of Abstinence-Content Using Co-Occurring Themes

Chapter 4 explores the research question: What co-occurrence of themes predict the invocation of abstinence talk versus abstinence silence in social media posts of self-love and AOD recovery? The objective is to determine self-love and AOD recovery themes that predict abstinence talk and abstinent silence in social media posts. Implications of this are that practitioners can have language for discussing abstinence.

Methods

While the previous chapter utilized unsupervised machine learning to organize latent topics, the next two chapters make use of supervised machine learning, which is a deductive approach to input data to predict outcomes (Zhang, 2010). With the assistance of an already trained algorithm, regressions and Bayesian statistical analyses are performed to predict the accuracy, recall, and precision of existing data to predict future data. Pertinent to this study, two procedures and corresponding aims are categorized within supervised classification: first and addressed in this chapter, learning an algorithm to classify themes of self-love and AOD recovery into either abstinence talk or abstinence silence, and second and addressed in the next chapter, assessing the various performance metrics of the algorithm to determine how well it can classify AOD recovery from non-AOD recovery content in #selflove posts.

For this research question, content analysis was used in tandem with supervised machine learning (Lewis et al., 2013) where annotation and coding of the self-love posts informed abstinence talk vs silence (i.e., the outcome variable) for the supervised classification predictive models (Trilling, 2018). Critiques of "big data" and privacy have called out the need to not just rely on the machine but to supplement the data with verified cases (Baumer et al., 2017, Fiske & Hauser, 2014; Lazer et al., 2014). This aims to consider context and preserve the initial meaning by considering words within their context (known as word embeddings; e.g., Maier et al., 2018, boyd & Crawford, 2012). Yet, meanings (e.g., very happy vs. happy) can still be lost. To maintain context sensitivity, content analysis is a method that also explores latent content but with a hybrid of inductive coding and deductive questioning. Content analysis answers questions about whether something is present, and to what extent and how (Riffe et al., 2019).

Thus, two processes are included in this analysis: first, manual annotation (i.e., content analysis) of social media posts and second, supervised classification. Annotation is required because the results of the annotation (a binary 0/1 for absence or presence of a variable) are the input data to train the supervised classification of abstinence talk or silence. By supplementing topic modeling with these two additional methods, small meanings (overlooked in topic modeling) can be gleaned and predictions about the themes of self-love within an AOD context can be made. Ultimately, I utilized a method (e.g., content analysis annotation) likened to grounded theory to determine if themes found within the posts translate to high performance metrics, thus creating more confidence in recognizing that these themes could co-occur within allusions of self-love and AOD recovery.

Sample

902 #selflove AOD recovery posts, known in the previous chapter as the subsample, were deemed as gold standard by a team consisting of this PI and research assistants.

Procedure

Two types of analyses are included in answering this research question: manual annotation and classification using decision tree modeling (i.e., a type of algorithm).

Qualitative: Manual Annotation. The aim of annotation (i.e., a computational modeling term commonly known as content analysis in the social sciences; van Atteveldt et al., 2022) is to translate meaningful units (i.e., observable content in the post; e.g., celebrating a sobriety anniversary) into more latent variables in the form of codes (Erlingsson & Brysiewicz, 2017; Riffe et al., 2019). Upon reviewing the relevant literature, I gathered deductive units into a spreadsheet to anticipate potential codes (e.g., Arendt, 2018). They included:

- *Abstinence* - Present if post mentions abstaining from an AOD or mentions sobriety
- *AOD substance* - Present if post mentions a specific substance, such as alcohol, marijuana, etc.
- *Treatment* - Present if post mentions undergoing, completing treatment, harm reduction, or choosing not to attend treatment
- *Time in Recovery* - Present if post mentions how long the person has been in recovery or sobriety (e.g., celebrating a sober birthday, i.e., anniversary of entering sobriety)
- *Emotions* (positive, neutral, or negative) - Present if post mentions specific emotions (e.g., gratitude/thankful, calm, sad)
- *Views of the Self* - Present if post mentions self-compassion, self-esteem, self-acceptance, narcissism
- *Connection/Support with Others* - Present if post describes seeking support from someone else

It was also assumed that inductive units would be found. In order to find them and include them into a comprehensive Excel spreadsheet, the research team and I began reviewing #selflove AOD recovery posts. A training protocol was developed for the annotators by the PI and Student Team Lead. The leads developed an annotation guide to decipher categories and codes within posts (adapted from suggestions in Erlingsson & Brysiewicz, 2017). As part of training and codebook development, the annotators practiced independently on #selflove content not included in the final sample and also coded in pairs. Additionally, readings on domain-specific content and reflexivity activities (e.g., Hamby, 2018) were given in the weekly team meetings. Coding guidelines were established and a question log was set up to track coding questions. During weekly meetings, the annotation team (including the PI and Student Team Lead) discussed questions, evaluated disagreements through anonymous voting, resolved disagreements through re-training, established coder consensus, and dropped codes in some instances (Hennessy et al., 2022).

Self-love and AOD recovery codes were compiled into a codebook using deductive (i.e., gleaned from relevant literature) and inductive (i.e., established in iterative annotation; Hall, 2018) reasoning. For example, the code “alcohol” contained a description that included alcohol-related lexicon (e.g., booze, hangover, drunk) used in a study that examined quitting drinking on Reddit (Tamersoy et al., 2015). Inductive codes emerged when annotators began coding and noticed themes that were absent from the codebook. Annotators raised these in weekly meetings, and the team came to a consensus on the new code. Coding occurred in an Excel spreadsheet where each row represented a social media post, and a column represented a code (see Appendix D). All posts were coded by a team of seven research assistants, known here as annotators—a necessary step to secure validity in social media studies (e.g., Sarker et al., 2016; Trilling, 2018).

Annotators populated each Excel cell with either a 0 (code absent) or a 1 (code present). To ensure a thorough codebook and clear operationalization for each code, each code contained a description and examples from social media, and inclusion and exclusion information was added to some codes for clarity (Fonteyn et al., 2008; Zolnoori et al; 2019; see Appendix E).

The final codebook resulted in 16 categories and 95 codes (See Appendix F for a list of these). The categories are the following with several examples of codes provided for each category: tone of the post (e.g., cautionary, playful, motivational); subject of the post (i.e., the actor in the post; I/me, you, no mention which was marked as everyone); positive emotions (e.g., gratitude, joy); negative emotions (e.g., sadness, shame); coping strategies including both positive and negative (e.g., reframe, self-destructive); views of self defined by cognitions and attitudes about the self (e.g., self-compassion, narcissism); spirituality (e.g., new age principles, journey and process, deity); taking action for the self (e.g., self-care activities, taking responsibility); connecting with others (e.g., family, friends, community); recovery definition (abstinence, alternative to abstinence such as harm reduction, relapse); time in recovery (e.g., years in sobriety); recovery support (e.g., 12-steps, alternative to 12-steps like Smart Recovery; recovery slogans, treatment); (articulated) benefits of recovery (e.g., quality of life, reflections such as lessons learned); AOD substance (e.g., alcohol, drugs, craving); demographics (e.g., poster references their age, gender); and other physical and mental health challenges (e.g., depression, anxiety).

Interrater reliability was obtained (e.g., Sarker et al., 2016). Given that there are more than two raters and the outcome variable is nominal, Fleiss Kappa was calculated and ranged from .32 (slight) - .67 (substantial) with an average of .50 (moderate) across coder pairs (Landis & Koch, 1977). Eighty percent is desired per traditional social sciences' content analysis standards. However, no standard has yet been set to this author's knowledge in social media and computational methods, and scholars have continued with their analysis with sub-optimal inter-annotator reliability (e.g., Burscher et al., 2014; D. Trilling personal communication, 2020; Cavazos-Rehg et al., 2015; Rutherford et al., 2022). In a systematic review examining methodologies used in assessing tobacco-related content on Instagram, 19/27 studies reported some form of annotator agreement (e.g., kappa), and they ranged from .38-1.0 on studies that utilized content analysis, at times in conjunction with machine learning (Malik et al., 2022). Additional training was provided after each round of IRR test. To offset the moderate kappa and bolster the results, all posts were double coded by the two most experienced (i.e., on the study the longest) coders. Any discrepancies were discussed and remedied. These annotated posts were used to inform the decision tree model.

Quantitative: Decision Tree Classification. Decision tree modeling is not new to social sciences. It has traditionally been conducted using likelihood rate chi-square statistics to estimate expected versus actual counts (e.g., Tse et al., 2014). Advantages of decision trees are that they are easy to interpret and relatively easy to carry out (typically little preprocessing or algorithmic tuning are needed). Disadvantages are that slight changes in the data can result in big adjustments to the tree, and decision trees can be less accurate than other algorithms (Barenholtz et al., 2020). I chose to use decision trees because of their interpretability and potential application for practitioners. Additionally, while accuracy was important to account for in this analysis, it was not the only metric that was considered. Rather than being interested in the ability of the algorithm to predict a future sample of themes in a random sample of #selflove and AOD recovery posts, I am more interested in the content that is generated, meaning the specific

themes (i.e., annotation codes) that either predict abstinence talk or abstinence silence in the posts. Given this, the area under the curve (AUC), a metric to determine the ability of the algorithm to distinguish between the two outcome classes, is also important. Ultimately, I made the choice to balance accuracy with interpretability when classifying abstinence talk or abstinence silence.

Variables. The target variable/outcome I predicted is "Abstinent Content in Posts Detected" (0 No, 1 Yes). There was an unequal distribution of 781 (87%) Abstinence Talk (1) compared to 121 (13%) posts of Abstinent Silence content (0). Abstinence talk was indicated if the content referenced being sober or sobriety, staying clean, quitting a substance, or no longer using. Content could either be in the caption or a hashtag (e.g., #sober). Abstinence silence was detected if there was no mention of abstinence in the caption, including hashtags (e.g., "Alcohol was so tempting when I was in a depression / burnout period. It gave me a brief mental holiday away from it all, but ultimately made my life at the time much, much worse #recovery #anxiety #depression #selflove*")*.

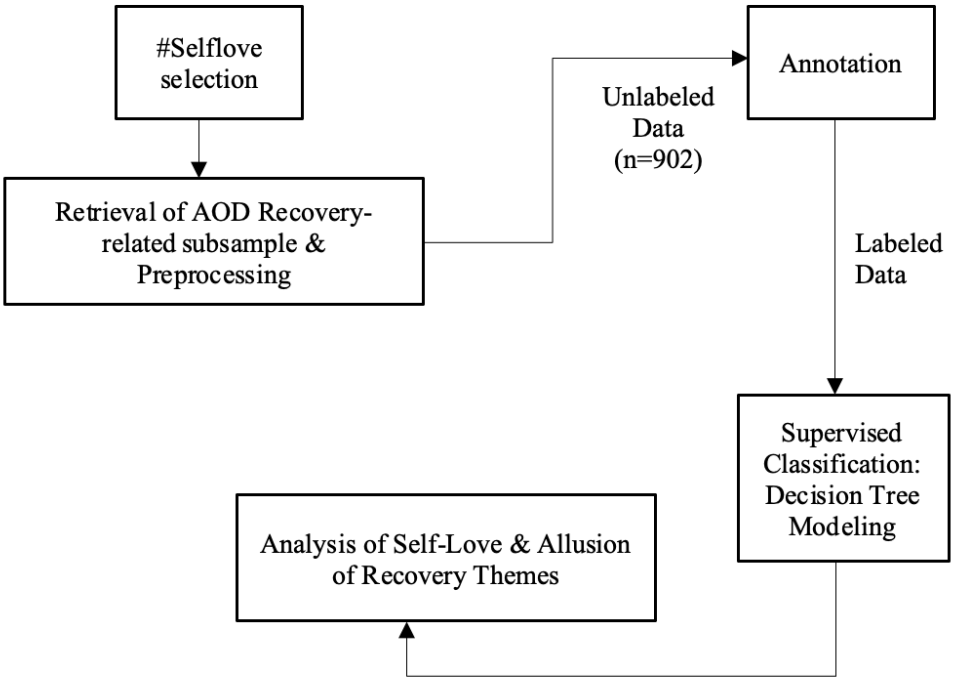
The 95 self-love and AOD recovery themes (i.e., annotation codes) were considered for the model and are likened to each be an independent variable (i.e., known as features in data science language). Upon reviewing each of the codebook categories, I deduced that several categories would be removed from the analysis: Demographics (4 corresponding codes, e.g., age, gender), Tone of the Post (7 corresponding codes, e.g., motivational, cautionary), and Subject of the Post (3 corresponding codes, e.g., I/me, you). The two latter categories were retained for descriptive analysis purposes. However, as suspected and anticipated as a limitation, the Demographics category was removed altogether since it ultimately was difficult to decipher how this category could be interpreted. Thus, for this modeling, I've chosen 81 of the 95 features to include in this modeling based on self-love and AOD recovery theory that could be helpful for practitioners (i.e., self-love (e.g., self-compassion, feeling your feelings) and AOD recovery themes (e.g., celebrating a sober birthday)). See Appendix F for a list of all 81 features and their frequency in the sample. Descriptive analysis revealed the five most frequent codes in the #selflove AOD recovery subsample were: 87% (781) abstinence talk; 39% (355) love; 25% (255) responsibility; 24% (218) recovery slogans; and 21% 12-step meetings (188).

Analysis

For the decision tree to classify each of the posts into a given path of self-love and AOD recovery themes to predict abstinence talk or silence, the 81 variables were converted into features using the Scikit-learn Python package (Sklearn Version 1.1.2; i.e., a general-purpose machine learning application that supports a form of supervised classification; Pedregosa et al., 2011). I then split the 902 posts into 2 subsamples, known in machine learning as a train set and a test set, using the industry standard of 80% and 20%, 721 posts in training and 181 in testing, respectively (e.g., Hassanpour et al., 2019; van Atteveldt et al., 2022). Since the training set has more posts, it can be subject to overfitting of the models, so a smaller test set is utilized to assess the performance of the model (once it has been learned/trained). While 902 posts is considered a relatively small sample for machine learning classification particularly with this large number of features, studies have found adequate performance metrics (e.g., n=391 Reddit posts; Garg et al., 2021) and a case can be made for choosing child codes for granularity compared to parent categories (Crible & Degand, 2019). Figure 10 demonstrates the integration of annotation and supervised classification.

Figure 10

Integration of Annotation and Supervised Classification Processes



Note. Adapted from Sarker et al., 2016.

To account for the imbalance in abstinence talk and abstinence silence posts, I randomly oversampled the minority classes (i.e., silence posts). While synthetic imputation (SMOTE) has been found to generate better results, I chose random oversampling (i.e., duplicating existing 0/1 values in the minority class) to have the imputed values actually reflect my data (compared to a synthetically generated 0/1 array; e.g., Christodoulou et al., 2020). Once implementing random oversampling, and with the training set, I assessed the model's best hyperparameters using a process known as GridSearchCV; using this feature allows for better algorithm performance. The ideal model values for each parameter were: a maximum tree depth of 12, a minimum sample leaf of 10, and a minimum sample split of 10. This generated a very large and difficult to interpret tree. Aligned with best practices for tuning, I conducted pruning techniques. I removed the maximum tree depth parameter to prune the tree (remove features that were less important) and tried various combinations of the other parameters.

To aid in assessing how to prune the parameters, I used several plots to balance accuracy with purity of content and ensure overfitting was not an issue (see Appendix G); alpha and entropy were assessed. First, when alpha increases, less important nodes (i.e., decision points, self-love and AOD recovery themes in this study) are pruned resulting in key themes that remain that signify the important decisions to predict abstinence talk or silence. This technique is known as cost complexity determination (Pedregosa et al., 2011). I identified that alpha of 0.01 was ideal to the model by assessing validation results with the test dataset. Second, entropy is a metric for measuring the strength of the prediction (i.e., scale of 0 to 1). Higher entropy (i.e., 1)

means there is more disorder and less purity (i.e., more heterogeneity) in the prediction. This is compared to lower entropy (i.e., 0), which means there is less disorder (and more purity in the prediction). The aim is to have a (decision) split with lower entropy that also has a high percentage of cases (e.g., 100%) from the sample, which indicates a stronger prediction of co-occurring themes to generate either abstinence talk or abstinence silence. Since a lower alpha results in more purity, I assessed the tradeoff between accuracy and purity and based my modeling on finding a balance between the two metrics.

Results

Two factors are important when considering the results: first, the themes, that when considered together (i.e., co-occur), either predict abstinence talk or silence; and second, the strength of each prediction. To interpret the co-occurring themes of self-love and AOD recovery, I used the training set to capture the largest amount of social media posts when analyzing the classification of abstinence talk versus abstinence silence. Findings demonstrate 21 paths of classified posts' prediction where a percentage of posts is either classified as either containing abstinence talk or abstinence silence. The point at which the tree stops growing is known as a leaf, and this is where the path is determined to be either talk or silence. As seen in Figure 11, the top node is the root, which is alcohol, and it splits into two nodes, which are drugs and recovery slogan (e.g., one day at a time). (For the full decision tree, see Appendix H.) The algorithm is trained to split at the theme (i.e., feature/decision) that will decrease impurity. These first few splits are the most predictive of abstinence talk (T) versus silence (S). When referring to Figure 11, the tree is read by following the path from the root (Alcohol), then asking "Was alcohol mentioned in the posts?". A response of "no" moves down the tree and to the left to Drugs, whereas a response of "yes" moves down the tree and to the right to Recovery Slogans. Continue moving down the tree by asking "Was (feature) mentioned in the posts?". The decision tree algorithm determines which of the annotated codes/features are most important in predicting abstinent talk or abstinent silence co-occurring themes by choosing to split with a maximum impurity reduction. The nodes closest to the root can be seen as most important for the decision, but the feature importance must also be considered. Table 4 lists the importance features ordered from the highest to lowest importance where a higher score means that the feature (or theme in this case) is more important in determining this model's target prediction, abstinence talk.

Table 4

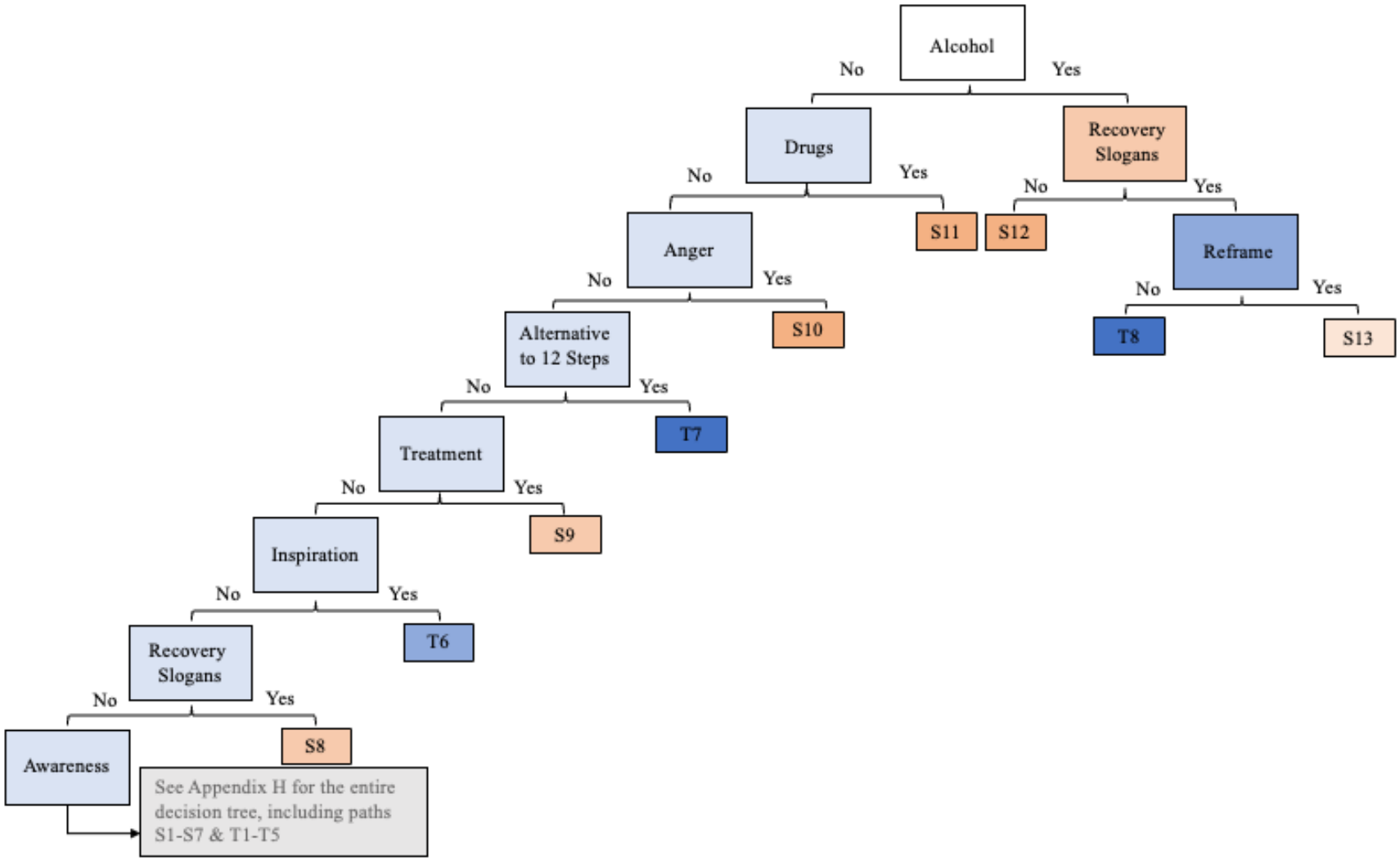
Most Important Features, Ranked Highest to Lowest, in Abstinence Talk vs. Silence Prediction

Rank	Feature Name	Code	Codebook Description
1	Alcohol	ALC	Alcohol, alcoholic, alcoholism, beer, beers, beverage, booze, boozing, cocktail, drink, drinking, drinks, drug, drunk, hammered, hangover, intoxicated, liquor, pissed, pot, rum, shitfaced, shot, shots, vodka, whiskey, wine
2	Recovery Slogans	RSLO	Common terminology sayings specific to recovery (e.g., one day at a time, just for today, Big Book, serenity prayer)
3	Alternative to 12-Steps Meetings	ALT	Non-12step meetings such as SMART Recovery, Life Ring, Women in sobriety
4	Inspiration	INS	Feeling excited due to something external, a creative impulse so that you're motivated to want to take action, make a change, do better
5	Treatment	TX	Treatment related services like attending an outpatient or inpatient program, mention of a therapist or counselor, sober living
6	Joy	JOY	Happy (in the moment pleasure and content), joy (pleasure and contentment)
7	Drugs	DRU	Indicating a use of drugs, such as any mention of drugs or being drug free; NOT alcohol: Acid, meth, LSD, molly, mushrooms, shrooms, ecstasy, coke, heroin, pills
8	Self-Validation	VAL	A combination of trusting and treating yourself with care—recognizing or confirming your own feelings or worthiness, giving yourself permission, being gentle with yourself, it's OK to be me, being your best friend, being a "home" for yourself, having faith in gut feeling, intuition, trusting in oneself, self-love/self-care is not selfish
9	Freedom	FREE	To think, speak, and act as one wants

Rank	Feature Name	Code	Codebook Description
10	Awareness	AWA	Knowing oneself / self-knowledge. This could look like attunement of thoughts/feelings, being mindful. Inner peace. Knowing at the core, knowing who you are
11	Anger	ANG	Frustrated, which is milder than anger. Upset, distressed, annoyed, usually because of an inability to do or change something/a situation. Angry, mad, pissed, antagonism, hostility, rage. Strong, intense emotional state usually provoked by a specific upsetting situation
12	Gratitude	GRA	Thankful, grateful, #blessed
13	Friends	FRI	Mentions of friendship, connecting with friends
14	Self-Compassion	SCO	An attitude towards oneself of kindness, shared humanity, and mindfulness; specifically in the context of suffering, forgiving yourself
15	Reframe	REF	When someone mentions having a hard time/in the midst of not doing well. They then take perspective (e.g., see all the good that is already happening), seeing experience in a new/different light, growth mindset like open to change, being flexible in a hard time
16	12-steps Meeting	@12S	Recovery support that references "meetings", Alcoholics anonymous, AA, narcotics anonymous, NA, Al-Anon, Alateen
17	Calm	CAL	Serenity, feeling ease, contentment, no worries, peace
18	Love	LOV	"I love myself," feelings of care, affection. Can include love for self, love for others

Figure 11

A Decision Tree Modeling Section of the 8 Abstinence Talk (T) vs. 13 Abstinence Silence (S) Paths



When assessing the test sample (20% of the dataset which is equal to 181 social media posts) for algorithm performance, and shown in Table 5, the model accuracy (i.e., the number of correct predictions over the total number of predictions made) was 70%. An overall positive sign is that the AUC is .89, which is an 89% probability that the model can distinguish between abstinence talk compared to abstinence silence. Another way of looking at it is that the model does a good job of predicting whether a post is abstinent talk or abstinent silence (i.e., F1 score of 0.80). When the model can accurately identify abstinence talk (i.e., recall of .69), it does so with very high precision (i.e., 0.96) ultimately demonstrating purity in the model (Korstanje, 2021). However, as evident from the confusion matrix run on the test dataset which assesses specificity and sensitivity (see Appendix I), the model does a poor job predicting abstinence silence posts, which is likely due to our uneven distribution of abstinence talk (161) to abstinence silence (20) posts. In sum, these calculations determine the extent to which the learned supervised classifier can predict self-love and AOD recovery themes based on human annotation.

Table 5

Decision Tree Modeling Performance Metrics on Test Set of Abstinence Talk vs Silence

Model	Precision	Recall	F1	Accuracy	AUC
Overall Model	0.956522	0.691824	0.80292	0.701657	0.892738
Abstinence Silence (0)	0.26	0.77	0.39	-	-
Abstinence Talk (1)	0.96	0.69	0.80	-	-

Interpretation: Co-Occurring Themes of Self-Love and AOD Recovery

While prediction and performance metrics clarify the strength of the model, it is the co-occurrence of self-love and AOD recovery themes that I was interested in. It is perhaps more accurate to say then that the results indicate prediction-informed linkages between self-love and AOD recovery themes to determine either abstinence talk or abstinence silence. Table 6 highlights the co-occurring themes' paths that are abstinence talk (T), and Table 7 lists the co-occurring themes' paths that are abstinence silence (S). By looking at each pathway, also reflected in the corresponding Figure 11, either talk or silence is predicted based on the themes that occur together. When looking at each pathway in the corresponding tables, an X represents "no" meaning that the theme is particularly and distinctly not indicative of the pathway, and the ✓ means "yes" the theme is present in the pathway. For example, in path T8, Alcohol and Recovery Slogans have a ✓, yet Reframe Perspective has an X. Thus, the presence of Alcohol and Recovery Slogans and the absence of Reframing predicts abstinence talk.

The strength of the prediction is determined by the amount of entropy, which is depicted with a color gradient (light to dark) of blue and orange. As seen in Figure 11, blue and orange indicate abstinence talk and silence, respectively, where the aim is to have a darker hue: a darker blue and darker orange indicates lower entropy. Based on the larger number of dark blue nodes, Figure 11 demonstrates that the model does a better job at predicting abstinence talk than abstinence silence. The performance metrics also reflect this. Five claims can be drawn from these results: four abstinence talk and one abstinence silence. Claims were largely deduced based on a low entropy (i.e., more purity and thus less heterogeneity) and a large percentage of cases

Table 6

Abstinence Talk: Co-Occurring Themes and Percent of Classified Cases

Path #	Co-Occurring Themes in Path						Cases in (Silence, Talk)	% Cases Predicted as Talk	Entropy
T1	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	0, 193	100%	0.0
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation	Freedom	Self-Compassion	Gratitude			
	X	X	X	X	X	X			
	Friends	12-steps Groups							
	X	X							
T2	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	4, 9	69%	0.89
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation	Freedom	Self-Compassion	Gratitude			
	X	X	X	X	X	X			
	Friends	12-steps Groups							
	X	✓							

Path #	Co-Occurring Themes in Path						Cases in (Silence, Talk)	% Cases Predicted as Talk	Entropy
T3	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	13, 19	59%	0.974
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation	Freedom	Self-Compassion	Gratitude			
	X	X	X	X	X	✓			
T4	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	0, 11	100%	0.0
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation	Freedom	Joy	Calm			
	X	X	X	✓	X	X			
T5	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	0, 18	100%	0.0
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Love	Joy					
	X	✓	✓	X					

Path #	Co-Occurring Themes in Path						Cases in (Silence, Talk)	% Cases Predicted as Talk	Entropy
T6	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	3, 91	97%	0.204
	X	X	X	X	X	✓			
T7	Alcohol	Drugs	Anger	Alternative to 12-steps			0, 70	100%	0.0
	X	X	X	✓					
T8	Alcohol	Recovery Slogans	Reframe Perspective				0, 27	100%	0.0
	✓	✓	X						

predicted within the path (e.g., 97-100%). Within each of the claims, I provide illustrative examples from the raw data to highlight the themes explored.

Abstinence Talk. Findings support four claims that predict abstinence talk: expressing positive emotions and with awareness; using recovery slogans amidst mentioning alcohol; alternative to 12-steps lack of focus on substance and anger; and taking responsibility to feel good.

Claim 1: Expressing Positive Emotions with Awareness. 9.6% of the predicted cases fall within paths T4, T5, and T6. These demonstrate that amidst not mentioning various themes (e.g., alcohol or drugs; anger; alternative to 12-step programs; treatment; recovery slogans; self-validation; joy and calm), several other themes were present, specifically focused on expressing positive emotions, and at times being aware of emotions. These posts are not discussing recovery-related content, such as substances, treatment, mutual help groups or slogans, but are focusing on freedom in T4, awareness and love in T5, and inspiration in T6, which contained the most number of predicted cases (91). Some examples from the raw data are:

> **Freedom (T4):** I love this adventure of creating my life to be whatever I fucking want it to be. #selflove #sober #recovery

> **Awareness and Love (T5):** Loving yourself through #procrastination rather then #shaming yourself can motivate you to accomplish tasks and goals. [url removed] #NewYearsGoals #goals #recovery #addicted #addiction #addict #soberlife #sober #RecoveryPosse #selflove #selflove2019 #procrastinate

> **Inspiration (T6):** Follow your heart not the crowd.✨✨✨✨👉👉👉👉 [username removed] ..#meditation #followyourheart #Spiritualawakening #changeisgood#cosmicconsciousness #intuition #1111#spiritualquotes #traumarecovery#awakening #powerofpositivity #lawofattraction #selfcare #sober #soberlife #inspirationalquotes #innerpeace #higherconsciousness #ascension #love#traumarecovery #5d #reiki #positivevibes #selflove #selfcaretips #freethinker #abundance #trusttheprocess #loveyourselffirst #selfcaretips💯

Gratitude was also found exclusively in path T3; however, the results were not as strong since the entropy demonstrated high disorder (0.97). Given gratitude's prevalence in abstinence-based groups like 12-step programs, this may indicate that in combination with a self-love discourse other positive emotions are more important and meaningful for people.

Claim 2: Use of Recovery Slogans with Alcohol Mention. Path T8 demonstrates alcohol and use of recovery slogans (e.g., one day at a time; #odaat), without mentioning their struggles (e.g., in recovery) and reframing it. This path has an entropy of 0 with 100% of samples in this path being classified into abstinence talk. These posts may include slogans like #onedayatatime or #odaat, or they may refer to a time when they drank alcohol or are now alcohol free but without putting into perspective what they may have experienced in the past (e.g., hardship or struggle). Some examples from the raw data in this path are:

> Sobriety; a life beyond your wildest dreams? #sobriety #sober #motivation #life #wellness #goals #inspiration #recovery #wedorecover #sobergoals #odaat #soberlife #soberliving #addiction #alcoholfree #freedom #wellness #selflove

> I don't remember much from my drinking days but I remember when alcohol stopped working... #sober #sobriety #recovery #wedorecover #life #motivation #soberlife #wellness #odaat #motivation #inspiration #selflove

Recovery slogans, such as one day at a time (i.e., the insistence to stay in the present moment living each day as it comes without getting caught up in the future), originate from 12-step groups. These groups are widely known to support abstinence and the largest group is Alcoholics Anonymous. It's no surprise that alcohol is mentioned and that combined these slogans predict abstinence talk. Equally interesting is that 12-step groups were not linked in this path. Discussion of 12-step groups were present in an estimated 9 cases to predict abstinence talk in path T2, amidst the absence of other themes previously mentioned including alternative to 12-step programs, yet its high entropy (0.89) equates to a weak prediction of abstinence talk. This may indicate that people prefer the significance of these slogans rather than identifying with 12-step communities.

Claim 3: Alternatives to 12-steps with No Mentions of Substance and Anger. With an estimated 70 cases predicting abstinence talk 100% of the time, path T7 supports the idea that alternatives to 12-step programs were present in discussions that did not discuss alcohol, drugs, or anger. When examining the annotated posts prior to decision tree oversampling, 95% of posts falling in this path contain #smartrecovery, which is an alternative to 12-steps program (e.g., Alcoholics Anonymous). Like 12-steps programs, SMART recovery has historically been known for supporting an abstinence approach, yet they promote a secular approach and one that provides mutual help through evidence-based strategies (i.e., SMART tools, e.g., cognitive behavior therapy). Focus is on the present and future and less about the past (SMART Recovery, n.d.). Thus, not mentioning anger may indicate that conversations may be solution-focused. Additionally, while evidence in alternatives to 12-steps is scant, findings have demonstrated that those attending alternatives, compared to 12-steps, have a lower chance of lifetime abstinence (Zemore et al., 2018). This is not surprising given SMART Recovery's recent adoption of supporting harm reduction viewpoints at their meetings (S. Zemore, personal communication, April 2022). When the data for this study was collected in 2019, omitting discussions of a particular substance could have been less frequent as internal shifts were occurring to support harm reduction and corresponding substances (e.g., opioids).

Claim 4: Taking Responsibility for Well-Being. One of the largest probabilities of the estimated posts with random oversampling of the minority class (193/1244, or 16%) belonged to path T1, of which 100% of the cases demonstrate that a variety of themes were not present in abstinent talk posts. The absence of these themes in the posts were: substances, specifically alcohol or drugs; mutual help groups, specifically alternative to 12-step programs and 12-step groups; treatment; recovery slogans; views of the self specifically self-validation and self-compassion; positive emotions of inspiration, freedom and gratitude; anger, friends, or having awareness of thoughts and feelings. Not mentioning these topics predicts abstinence talk in #selflove and AOD recovery posts. Two posts in the raw data from this path are:

> If you Change nothing, NOTHING will change!! This is YOIR life, YOIR Choices, YOUR Dreams, YOUR Happiness!! Don't wait for regret to set in when you realize it's too late, and you did nothing!!👊👊💯💯#positivity #addiction #livelife #happiness #selflove #sobriety

> And breathe...finished work for 10 whole days. Time for full on self care and self love 🙌🏻💞 #MentalHealthMatters #selflove #selfcare #sobriety #youcandothis

The large number of themes that are not mentioned in this path of abstinence talk begs the question of what themes were prevalent when these were not. In a post-hoc analysis of the annotated posts (i.e., raw data prior to decision tree oversampling) in the T1 path, theme frequencies conclude several that were most prevalent in the posts: while previously mentioned positive emotions were not discussed in this path, others were expressed, such as love and being intentioned; taking action in the form of being responsible and self-care activities, coping through resilience, and connecting with community. These can be summarized into the 13 most frequently found themes further broken down into two categories: 9 (69%) of these originated from the positive emotion category and 4 (31%) were from *the taking action for the self* category. Findings may indicate that these emotion expressions are also used in tandem with actions when people speak about sobriety and self-love.

Abstinence Silence. While there are more abstinence silence paths (13) than talk (8), there is greater heterogeneity when predicting silence (see Table 7). One strong claim can predict abstinence silence in the self-love and AOD recovery posts: mention of alcohol without use of recovery slogans.

Claim 1: Use of Alcohol without Recovery Slogan Mentions. One of the largest probabilities of the estimated posts with random oversampling of the minority class (216/1244, or 17%) belonged to path S12, which indicates mentioning alcohol but not recovery slogans. While the entropy (0.55) for this path contains some heterogeneity, it is worth mentioning given the large number of cases relative to the overall sample as well as the high classification of 87% into abstinence silence. Some examples from the raw data are:

> Alcohol was so tempting when I was in a depression / burnout period. It gave me a brief mental holiday away from it all, but ultimately made my life at the time much, much worse #recovery #anxiety #depression #selflove

> I want to be the best me I can be.
> "If I could change one attitude it would be this… You don't have to be an alcoholic or have 'a problem' to want to remove alcohol from your life." [username removed] #rethinkthedrink

Since there are a large number of cases in this pathway and only two themes were given, there could be several reasons for why alcohol (and not recovery slogans) predicts abstinence silence. Those who belong to this category may not identify with an abstinence identity, such as someone who is sober curious or practicing harm reduction (and thus not abstaining or defining themselves as "clean"). Being in recovery, which can often be equated with abstinence and intertwined with recovery slogans and mutual help groups, may not be central to their identity

(Kaskutas & Ritter, 2015). Rather they could speak about problem remediation without identifying as having recovered. For example, they might be someone who naturally resolved their substance use problem. Using recovery slogans may be off-putting for certain people because of their association with what it means to either be in recovery or be affiliated with 12-step programs. Additionally, someone may be more focused on decreasing their substance use due to comorbidity with another mental health issue (e.g., depression).

Based on these claims, there are several factors that differentiate abstinence talk and abstinence silence. Abstinence talk is predicted by: expressing positive emotions, using recovery slogans, lacking focus of substance and anger in alternative to 12-steps programs, and taking responsibility. Abstinence silence was predicted in discussions that mentioned alcohol in some capacity (e.g., past use) without referencing recovery slogans. Certainly the (lack of) presence of recovery slogans is a clear difference between talk and silence. This could relate to the primarily 12-step origins of these slogans and potential enmeshment with an abstinence approach at these meetings. It may also signal that those who do attend 12-step programs are more apt to identify with a slogan, and publicly share it, rather than announcing their 12-step membership; anonymity and "attraction rather than promotion" are key tenets of these groups. Additionally, expressing various positive emotions predicted abstinence talk, though a small, unreported percentage (3%) of cases also predicted silence through several co-occurring paths. While the nuances are challenging to decipher, it is curious that gratitude was not a strong predictor of abstinence talk, particularly due to its focus in 12-step programs. Perhaps when combined with self-love, other positive emotions take center stage and prevail in discussions. This could have several implications for understanding various recovery identities and pathways—whether abstinent or not—and how self-love is integrated into AOD recovery discourse.

Table 7

Abstinence Silence: Co-Occurring Themes and Percent of Classified Cases

Path #	Co-Occurring Themes in Path						Cases in (Silence, Talk)	% Cases Predicted Silence	Entropy
S1	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	6, 5	55%	0.994
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation	Freedom	Self-Compassion	Gratitude			
	X	X	X	X	X	X			
	Friends								
	✓								
S2	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	12, 10	55%	0.994
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation	Freedom	Self-Compassion				
	X	X	X	X	✓				
S3	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	12, 2	86%	0.592
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation	Freedom	Joy	Calm			
	X	X	X	✓	X	✓			

Path #	Co-Occurring Themes in Path						Cases in (Silence, Talk)	% Cases Predicted Silence	Entropy
S4	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	10, 0	100%	0.0
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation	Freedom	Joy				
	X	X	X	✓	✓				
S5	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	34, 21	62%	0.959
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Self-Validation						
	X	X	✓						
S6	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	42, 15	74%	0.831
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Love						
	X	✓	X						
S7	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	10, 0	100%	0.0
	X	X	X	X	X	X			
	Recovery Slogans	Awareness	Love	Joy					

Path #	Co-Occurring Themes in Path						Cases in (Silence, Talk)	% Cases Predicted Silence	Entropy
	X	✓	✓	✓					
S8	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment	Inspiration	77, 40	66%	0.927
	X	X	X	X	X	X			
	Recovery Slogans								
	✓								
S9	Alcohol	Drugs	Anger	Alternative to 12-steps	Treatment		77, 28	73%	0.837
	X	X	X	X	✓				
S10	Alcohol	Drugs	Anger				41, 11	79%	0.744
	X	X	✓						
S11	Alcohol	Drugs					57, 17	77%	0.778
	X	✓							
S12	Alcohol	Recovery Slogans					216, 13	87%	0.545
	✓	X							
S13	Alcohol	Recovery Slogans	Reframe Perspective				8, 4	67%	0.918
	✓	✓	✓						

V. Prediction of AOD recovery content within #selflove posts

Chapter 5 explores the research question: To what extent can AOD recovery content be predicted within #selflove posts? The objective is to identify social media posts that have allusions to #selflove and AOD recovery content. Implications of this are that additional data could be identified and users recruited to advance AOD recovery research.

Methods

Sample

The aim of this analysis is to develop an algorithm that can classify AOD-recovery content. In order to do that, non-AOD recovery needs to be incorporated into the model so that the algorithm can learn how to decipher between the two lexicons. The aforementioned annotation process in Chapter 4 was the same to determine the binary category of AOD and non-AOD recovery. The subsample of #selflove consists of two types of posts: 902 AOD recovery and an equal number of non-AOD recovery for a final sample size of 1,804. The AOD subsample is the same reported in the two previous chapters. The 902 non-AOD recovery subsample was randomly sampled from the larger #selflove dataset. If a post was excluded in the AOD recovery sample, it could be included in the non-AOD subsample.

The non-AOD subsample has an average word count of 27 words (*SD*=19), which equates to 101 pages of double-spaced text. I ran a descriptive analysis on the user ids and hashtags of the #selflove AOD recovery subsample. There are 855 unique user ids with an average number of 1.05 posts (*SD*=0.39). In the 902 posts, 6,727 hashtags are used of which 2,970 are unique. #selflove was tagged 891 times in the post's caption and the remaining 11 posts contained #selflove in the comments. The most used hashtags within the subsample are: #selfcare (215), #love (115), #loveyourself (72), #motivation (60), #inspiration (59). An example of a #selflove non-AOD recovery post is: "Cheesing hard while camping. Here's a pic of me 100% makeup free. A few years ago I wouldn't even leave the house without makeup, let alone post a picture like this! #selflove."

Analysis: Machine Learning Classification of AOD-Recovery Content

I used four classifiers that are commonly used with social media data prediction: Logistic regression, Naive Bayes, XGBoost, and DecisionTree (e.g., Garg et al., 2021; Gencoglu & Ermes, 2018). To convert the social media data into an algorithm-readable format, the subsample with AOD and non-AOD posts underwent the same preprocessing as the other two datasets, except for one exception. I have chosen to retain the hashtag content. Studies have found that conducting preprocessing on Twitter text (e.g., retaining hashtag content, removing urls and usernames) improves the accuracy of the algorithm (e.g., Keerthi Kumar & Harish, 2018). A case can be made for retaining hashtag content when the hashtags are specific to the content being predicted. I have decided to do the latter because posters use recovery-related hashtags to indicate their views, and thus the hashtags (e.g., #serenityprayer) aid in what is being predicted (i.e., AOD recovery language in social media posts).

Using the preprocessed text, I created features for the classifiers, known as feature extraction. This obtains a mathematical representation for the social media text since the text has no inherent value and needs to be assigned a mathematical value. To determine the best feature

representation, I tried four types of vectors which organize each unique word (i.e., feature) into a vector: two countvectorizers Tf-Idf and bag of words (BOW) using Sklearn; and two word embedding vectors continuous bag of words (CBOW) and skip gram. Tf-Idf (term frequency/inverse document frequency) measures how important a word is to a document in a corpus by calculating the term frequency (i.e., how often a term appears in the document) and inverse document frequency (i.e., how often a term appears in the entire corpus). BOW accounts for the vocabulary of the word and its occurrence (e.g., van Atteveldt et al., 2022). CBOW weights the neighboring words as the input and outputs the target word, while skip gram weights the target word as the input and outputs the neighboring words (van Atteveldt et al., 2022). While word embeddings (i.e., CBOW and skip gram) tend to perform more accurately with social media data given their inherent property of considering surrounding, neighboring words when assigning a feature's position in a vector, countvectorizers (i.e., Tf-Idf and BOW) have performed well with short text (e.g., Twitter microblogs). To be precise, I included all four. This meant that 16 sets of results were generated; four classifiers using each of the four feature representations.

I used 80% (1143) of the data to train the classifiers and 20% (361) of the data as a test set. This means that the algorithm was able to read the preprocessed text from each caption and learn how it was categorized (pre-determined as either AOD or non-AOD recovery by the annotators). Having learned that information, and using the test dataset, the classifiers then guessed which category the given post should be allocated to (e.g., Sarker et al., 2016). I used GridSearchCV to optimize the model parameters, and where applicable, regularization was considered to limit overfitting by penalizing model coefficients that would contribute to overfitting. With the test set, I used 10-folds cross-validation (i.e., a process run in Python and likened to bootstrapping) on the test set of 361 posts (180 AOD and 180 non-AOD) with each of the classifiers to help with our model selection since our dataset is relatively small for this type of modeling.

Results and Interpretation: AOD Recovery Content Classification. The aim of this research question is to be able to target AOD recovery amidst other content, so accuracy (i.e., correct predictions of all data) and the F1 score are the best metrics to evaluate the algorithm's performance with ideal values closer to 1 than 0. Given that I am interested in finding particularly AOD recovery posts (i.e., positive cases), the F1 score is appropriate because it accounts for the tradeoff of precision and recall in positive cases (Korstanja, 2021). Precision indicates the probability of correctly identifying positive cases amongst all the posts suspected as AOD recovery, and recall indicates the probability of actually successfully retrieving those that are AOD recovery. I ran performance metrics on train and test sets on all four classifiers and determined the results between the two sets are not too drastic, which provides reassurance that the test set will generate a conservative estimate of the algorithm's performance.

After reviewing the test sets' metrics for each of the 16 models, Tf-Idf and BOW performed slightly better than the word embeddings skip gram and CBOW (see Appendix J). While all performance metrics are exceptionally strong, the Naive Bayes algorithm performed consistently worse (metrics in .80s range) compared to the three other algorithms. I have chosen logistic regression as the better performing algorithm due to its consistency across various data representations. Specifically, Logistic regression with Tf-Idf and BOW performed equally well, as demonstrated in Table 8, with an F1 of .99 and an accuracy of .99. In general, the countvectorizers' algorithms performed just slightly better than the word embeddings. This could be due to the smaller sample size and short text.

Table 8

Performance Metrics of Data Representation by Model

	Model (Test)	Precision	Recall	F1	Accuracy	AUC
Tf-Idf	LogisticRegression	0.984211	0.989418	**0.986807**	**0.98615**	1
	Naive Bayes	0.833333	0.925926	0.877193	0.864266	0.987641
	XGBoost	0.994624	0.978836	0.986667	0.98615	0.997264
	DecisionTree	0.989247	0.973545	0.981333	0.980609	0.997165
BOW	LogisticRegression	0.994652	0.984127	**0.989362**	**0.98892**	1
	Naive Bayes	0.915789	0.920635	0.918206	0.914127	0.986831
	XGBoost	1	0.978836	0.989305	0.98892	0.997743
	DecisionTree	0.984293	0.994709	0.989474	0.98892	0.997165

I have chosen to focus on Tf-Idf with logistic regression for consistency, given that Chapter 3 also vectorized the data by Tf-Idf. Additionally, with logistic regression, feature importance can be extracted based on the coefficients. The higher the coefficient then the higher correlation with AOD recovery text (compared to non-AOD recovery text) (e.g., Garg et al., 2021). Table 9 demonstrates the top 20 words (with the most important at the top) in the classification task of AOD recovery compared to non-AOD recovery with sober, addiction, sobriety, ata (short for the slogan “one day at a time”) and recovery at the top of the list emphasizing the words specific to misuse, abstinence, and recovery with rehab also included in the top 20. Substance is also prevalent with words alluding to alcohol (e.g., alcohol, alcoholic, alcoholism, martini) and heroin. Allusions to mutual help groups also make the list (e.g., alan is short for al-anon and sac, which is a recovery group located in Sacramento).

Table 9

Tf-Idf Logistic Regression Feature Importance in Predicting AOD Recovery-Related Text

Attribute	Importance
sober	161.619579
addiction	141.360933
sobriety	125.604067
ata	72.637503
recovery	53.739987
alcoholism	45.889816
pay	35.02906
alan	30.706177
admit	29.216527
oda	29.047173
alcohol	26.505058
alcoholic	24.518986
rehab	23.863058
heroin	19.935413
sac	19.753287
commitment	19.173809
grateful	18.470347
fine	17.845728
inspiring	17.307958
martini	16.597773

Several taking action verbs and experiencing emotions are also present. “Commitment”, “admit” and “pay” speak to intentioned actions of committing to the self and to taking responsibility, potentially indicating self-empowerment, as well as potentially admitting past struggles or defects. Examples of commitment from the posts are: “Sobriety and recovery is a commitment to self” and

> Committing to your sobriety can help be protection against those subtle triggers, prevent relapse &; keep you healthy, happy &; sober. This valentines day, be ready to commit to change.

Admit was also found to be an important term in the prediction of AOD recovery content. The first of 12-steps in Alcoholics Anonymous (n.d.) is “we admitted we were powerless over alcohol—that our lives had become unmanageable.” The posts also reflect this tone, particularly the importance of being honest with oneself amidst a struggle or wrongdoing: “I admitted I had

no power over my addictions, fears and love schemes, that was killing me" and "How often do you admit that you are wrong? Sometimes we need this to Del [deal] with addiction and plan towards recovery." Lastly, "pay" may indicate that there is ultimately a reward while navigating the process of (behavior) change, even when it is challenging. Examples include: "It's a trail of tears in the beginning BUT the PAY OUT IS HUGE!" and

> I'd been dreading yesterday- 1st Christmas alone in 42 years...but it couldn't have been more perfect ❤️ Gratitude was high and peace flowed in. 🙌🏻🌟 Self care and self love really does pay off #selflove #sober #aa #selfcare #mentalhealth #joinin #bekind.

Additionally, emotions also standout as an important aspect in deciphering between self-love posts in an AOD recovery context compared to a non-recovery context, particularly inspiration and gratitude. Perhaps inspiration can be seen as the preceding emotion to self-empowerment and with the purpose of connecting to others around meaningful messages.

> You are already who you need to become, you just don't realize it YET. You need to find that inner strength inside of yourself, and push it outwardly towards your friends, family, and loved ones. INSPIRE others, create, love, and motivate others.

In the below post, the poster shares about their own gratitude and also engages with others by asking about their gratitude and signaling community with the #writingcommunity:

> What are you grateful for today? I'm thankful I maintain #sobriety #onedayatatime even with #bipolardisordertype1 . I'm thankful I am in charge of my #selfcare . I'm thankful I know my competition is my own procrastination. #DailyGratitude #selflove #WritingCommunity

By differentiating between self-love within AOD recovery compared to non-AOD recovery, knowledge is gained about language indicative of recovery particularly related to abstinence, substance, self-empowerment, and positive emotions. These terms are reminiscent of all four conceptualized recovery dimensions (e.g., abstinence, spiritual, essential, and enriched; Kaskutas, et al, 2014). Implications of these findings are that a future, unlabeled sample (i.e., non-differentiated subset of AOD vs non-AOD content) of #selflove posts could ideally identify AOD recovery-related content amidst a large corpus of social media posts. Recruitment of online users and further exploration of self-love and recovery lay beliefs could be possible, as well as deciphering how views of those in AOD recovery could be beneficial to self-love messaging in non-AOD communities.

VI. Discussion

This dissertation, which is the first study to this author's knowledge that explores #selflove, sought to uncover lay beliefs about self-love. It is an initial step in making meaning of the general concept of self-love and the specific concept of self-love within the AOD recovery community. Self-love on social media was found to encompass four primary categories: relationship to the self, wellness, self-care, and engagement with others. Within an AOD recovery and #selflove context, four categories emerged: process of growth, learning from the past, building new beginnings, and getting help. Both samples—#selflove generally and the AOD recovery subsample—contained numerous similarities within these topics, such as prioritizing the self, utilizing coping strategies, and a process of change. Key differences are that the AOD recovery subsample highlighted learning from the past while the self-love sample included self-promoting discourse (within the *engagement with others* category). Additionally, in a quest to predict AOD recovery content, this study was also able to develop an algorithm with 99% accuracy and an F1 score of .99 (which factors in precision and recall) to differentiate between AOD recovery content and non-AOD recovery content within #selflove. Words related to abstinence (e.g., sober), substance (e.g., alcohol, heroin), self-empowerment (e.g., commit, admit), and positive emotions (i.e., gratitude, inspiration) were found to be important in predicting AOD recovery content compared to non-recovery content. Lastly, when narrowing the focus to the #selflove AOD recovery subsample to predict abstinence talk and abstinence silence (i.e., no mention of abstinence), several paths of co-occurring self-love and AOD recovery were. Abstinence talk was predicted by expressing positive emotions, taking responsibility, using recovery slogans and mentioning alcohol, and discussing alternatives to 12-steps programs without mentioning AOD substance and anger. Abstinence silence was predicted in discussions that mentioned alcohol in some capacity (e.g., past use) without referencing recovery slogans. Based on these findings, layperson beliefs about self-love and within AOD recovery are discussed below as a relationship with the self, well-being, and self-care.

Relationship with the Self

Having a *relationship with the self* category contained the most words (~46%) in the self-love corpus. This category is explained by validating the self and loving the self. Both validation and love for the self mentioned prioritizing the self in terms of self-preservation, focusing on one's own value and not pleasing others, and speaking to oneself in a kind manner (e.g., "You deserve to treat yourself as you would treat a dear lifelong friend. Talk to yourself like you would talk to someone you love"). The idea of having a relationship with the self also reflected the presence of the other (e.g., 8%; setting a boundary, prioritizing the self); for example: "Be your number 1 fan and always put you first. ♡[name removed for anonymity]. #selflove #putyoufirst #donttakecareofeverybodyor." In a similar vein, insisting on being good enough for oneself without comparison to others and releasing both expectations and pleasing others were detected:

> When you're good enough, you're good enough. Someone can think you're good enough and someone else can think of something else about the same you ! Point is, you will never be good enough if you try to please everyone BUT you'll Always Be Good Enough For Yourself 🤷🏾‍♀️.

Thus, *relationship with the self* was found in the posts to refer to the individual, as well as, acting for the self in the presence of another.

Extant literature supports this idea. Findings of prioritizing the self were confirmed in a recent study examining self-love accounts on Instagram (Jerrentrup, 2022). Though the sample size was small (n=90), themes of prioritizing were interpreted as independence (e.g., "make yourself a priority") and distance from others (e.g., "sometimes you have to make yourself unavailable to heal"). Prioritizing the self as a means of loving others, either as a necessity to love others or to intentionally choose a love interest, were also found in this dissertation.

> Always Put #YOU First! Engaging in #SelfLove often feels egotistic hence why many choose to refrain from it as they fear such a relationship. But always remember that loving yourself is a never ending path to self discovery and a first step to loving others.

While these ideas are specific to the self, they are not exclusive of the other. Theories of self-love support the duality of the self and other. The relationship with oneself exists separately yet dependently with another; love for the self is influenced by relationship with another and vice versa. Yet, this claim has mixed support in the literature. Historically, Kohut (as interpreted by Gorday, 2000) in his theories of self-psychology discussed love of others (i.e., object love) as a way to strengthen self-love, yet he doubted if the self could be the object and could be loved (i.e., by the self). He cautioned that nurturing the self would be the negative connotation of self-love, narcissism. Fromm (1947) agreed that the self and other are not independent of each other: "Not only others, but we ourselves are the 'object' of our feelings and attitudes; the attitudes toward others and toward ourselves, far from being contradictory, are basically conjunctive" (p. 129). His view differs from Kohut's in that he gives control to the self in their own loving. Additionally, he speaks of self-love as a way to bolster connection with others. hooks (2000) supports this claim by seeing priority of the self as preservation to connect better when the self is restored. In a thematic analysis of interviews exploring wellness with 9 black gay men, holistic self-love was one of six resulting themes (Joe et al., 2022). Within the holistic self-love theme, self-preservation and prioritization were emblematic of wellness wholeness; described as appreciating all aspects of the self (e.g., mental, physical, spiritual, and emotional). While it was mentioned that holistic self-love may be perceived by others as selfish, its intent is to revive the self in order to better connect with others. Whereas narcissism is explained as selfishness and preoccupation with the self, those who are narcissists view themselves as superior to others, ultimately not benefiting the other. Additionally, while self-esteem—depending on the definition—could be perceived as similar to self-love due to emphasis on the unconditional regard for appreciating the self, it does not emphasize the importance of having a relationship with the self. Lay beliefs that self-love is a relationship to the self, and not without regard for the other, offers preliminary evidence of additional talking points to extend self-love's conceptualization further than self-esteem and narcissism.

Scant Evidence of Views of the Self

While self-love has historically been operationalized as narcissism and self-esteem, as well as its related concepts of self-compassion and self-acceptance, it was surprising that this dissertation did not find more instances of these. In the #selflove categories, instances of validating the self and loving the self were apparent in the *relationship with the self* category. This resembles mentions of unconditional love, such as "Love yourself unconditionally as you

love your children", being kind to the self, and trusting oneself; all which are indicative of a self-acceptance aspect of self-love. Evidence for self-acceptance is supported in one of the only studies to conceptualize self-love. A recent thematic analysis of 13 interviews with psychotherapists found that self-love was partially conceptualized as self-acceptance (i.e., being at peace with oneself; in addition to self-contact and self-care; Henschke and Sedlmeier (2022). However, within the AOD recovery posts, there was scant evidence of views of the self. For example, the majority of mentions consisted of positive (as compared to negative) views of self: (6.7% (61) self-respect; 5.7% (52) self-compassion; 4.8% (43) self-acceptance; and 1.4% (13) self-esteem. Thus, while self-acceptance was detected in the topic modeling, various views of the self, while small, were detected. Further understanding of self-love is needed to parse out these differences, yet several potential views offer clarity.

Scant evidence of views of the self could be a result of the historical difficulty in disentangling the concepts—a topic of discussion in recent years (e.g., Neff, 2011). Recently, Henschke and Sedlmeier (2022) found that self-love was distinct from self-compassion and self-esteem, due to an individual's propensity to not only experience suffering, but also joy, and its lack of focus on evaluating the self, respectively. In a sample focused on self-love, this could explain why few instances of self-esteem emerged. Interestingly, self-compassion was found more than self-esteem, and this may speak to the idea that self-compassion originates from suffering (Neff, 2003a), which is perfectly reasonable given the adversity associated with AOD misuse and the process of growth and development needed in AOD recovery to undergo behavioral changes (e.g., Kaskutas et al., 2014). Additionally, self-determination, an overlooked concept in this dissertation though recently found to partially explain self-love (Joe et al., 2022), could be examined in future studies of self-love and recovery. The idea of personal competence, autonomy, and relatedness leading to intrinsic motivation and well-being (self-determination theory; Ryan & Deci, 2000) have been written about widely in AOD recovery theory (e.g., Best et al., 2016). An attitude of motivation was prevalent in the posts, so this future line of research may offer insight into how self-determination, self-love, and recovery are related. It could also be that the relatedness aspect of self-determination speaks to this dissertation's findings that a relationship with the self occurs in tandem and for closeness to others.

Negative views of the self, compared to positive ones, were found less in the posts. While narcissism was not originally hypothesized as a potential layperson belief about self-love within recovery, it cannot be ignored given the historical operationalization of self-love that includes narcissism (e.g., Martens, 2011). There were slight detections of narcissism in the AOD recovery subsample. The most frequent negative view of the self, self-hate, was detected in 40 (4.4%) posts. In this dissertation, 4.1% (37) posts were found to exhibit narcissism. A small percentage of posts spoke about being in past relationships with narcissists and the need to set boundaries to banish co-dependency with narcissists. The literature offered guidance in detecting narcissism. The use of more profane language and less first-person usage has indicated narcissism in text ("I", "me"; DeWall et al., 2011). There are two types of narcissism; as opposed to grandiose narcissism, which manifests as superiority, exhibitionism, and a lack of empathy, vulnerable narcissism showcases someone who needs to be admired, has shame, and avoids others due to cynicism (Paramboukis et al., 2016). Both forms of narcissism are interested in elevating themselves and are enticed by status (Grapsas et al., 2020; Kowalchyk et al., 2021). One way to elevate their status is through self-promotion, which was found in the *engagement with others* category, encouraging followers to buy goods and products. It is also no surprise that narcissism

manifests on social media by asking others to follow their social media account (e.g., #follow4follow; Paramboukis et al., 2016).

Narcissism was detected in posts through the use of #follow4follow or #followme, or profane language (e.g., fuck) with an emphasis on the 1st person. One example of the latter is characterized by: *yea, cus mfs ain know this but guess who sober off that shit? bitch, ME you guessed it. did it by myself, and within a month and a half, 17lbs+ is gained, and I couldn't be more stoked to know it was me, myself and I ! ion need a mf, bitch i'm 100% independent fytb* 🤩🖤 *#selflove.* One reason narcissism may not be prevalent is because in order to maintain and sustain recovery, an emphasis is placed on healing around the past, particularly shame (e.g., the belief that I am bad). Vulnerable narcissism has been linked to shame in furthering addictive behavior (Bilevicius et al., 2019). While posters may not have been reporting their shame on social media, their recovery depends on healing from shame due to shame's mediating role in furthering addictive behavior (Bilevicius et al., 2019). Additionally, addiction has been described as a self-focused illness with a tendency towards narcissism (e.g., Jauk & Dietrich, 2019). As someone in recovery shifts their identity from a person misusing AOD, they assume a new, recovery-oriented identity (Best et al., 2016). While narcissism was not prevalent in this dissertation's findings, literature explains its presence in those recovering from AOD, who are in the process of changing views and behaviors that more align with being less self-focused, instead having positive relationships with others and being a part of a larger community (Leamy et al., 2011).

In summary, *Relationship with the Self* offers preliminary evidence of self-love as prioritizing and accepting the self within a duality of the individual and the other. Additional research could explore self-determination's role within self-love and recovery and continue to disentangle understanding of the "self" concepts.

Well-Being: Expressing Positive Emotions, Coping with Adversity, & Empowerment

Another layperson belief found in this dissertation was that self-love means well-being, particularly expressing positive emotions, coping with adversity, and believing in empowerment. *Well-being* was found to be the dominant category in 29.75% of the #selflove sample and contained the second most words in the corpus. It also contained specific words of "addiction," "recovery," and "addictive" (see Appendix B) indicative of mental health and healing, so it is no surprise that the AOD recovery posts also contained similar content in their *process for growth* and *building new beginning* categories. Content broadly speaks to coping (for mental health) and wellness. Posts detailed hardships and adversity while simultaneously sharing coping strategies; for example, tools for struggle, overcoming mental illness, having a positive outlook (e.g., "It all begins with mindset. Place yourself in situations that can expand your awareness") and expressing positive emotions and meaning. The importance of feeling healthy—either through physical activity or healthy relationships—was also found.

The literature offers insights into these findings. The decision to name this category is partially inspired by the PERMA model of well-being: Positive emotion, Engagement, Relationships, Meaning, and Achievement (Seligman & Csikszentmihalyi, 2000). The model of sustainable mental health explains that resources (i.e., positive emotions, positive reframing, and high-quality relationships) allow someone the ability to adapt and be resilient, which leads to well-being, as opposed to mental illness (Bohlmeijer & Westerhof, 2021). Several frameworks of mental health, and more specifically recovery, support these findings. The CHIME conceptual framework for personal (mental illness) recovery is explained by Connectedness, Hope and

optimism, Identity, Meaning in life, and Empowerment (Leamy et al., 2011; Van Weeghel et al., 2019). A study examining bipolar disorder recovery supported the idea of taking responsibility for one's actions and using tools to bolster well-being (Tse et al., 2014). Additionally, emergent are well-being and holistic recovery's incorporation into AOD recovery models, and studies are finding support for preventing relapse, as negative reduction and symptom focus are being lessened (e.g., Gutierrez, et al., 2022). Considering these jointly, findings support the importance of positive emotions, empowerment, and connection; each is detailed below. This may suggest that well-being is integral to self-love and within an AOD recovery context.

Self-Love as Expressing Positive Emotions

The ability to boost positive emotions and experience them were found in both #selflove's *well-being* and the AOD recovery subsample's *process of growth* categories. Various positive emotions were mentioned in the AOD recovery #selflove subsample, in ranking order: 39% (355) love; 20.2% (182) intentioned; 17.3% (156) inspired; 15.5% (140) joy; 9.8% (88) hope; 8% (77) gratitude; 8.7% (78) calm; ~3% for amusement, pride, and awe; and 1.7% (15) curious. Love has been found to improve social connection and well-being, and decrease harmful health outcomes (e.g., Fredrickson, 2013). The high frequency of love in the posts and the presence of these additional emotions alludes to the conceptualization of love as a phenomenon where other positive emotions are experienced: inspiration, hope, gratitude, serenity, amusement, pride, awe, and interest (Fredrickson, 2009). Positive emotions are theorized to broaden coping by building an individual's internal resources for resilience and further attainment of additional resources (e.g., social connection, more positive emotions; Fredrickson, 2004; Garland et al., 2017). Additionally, a recent conceptualization of self-love found that perceiving one's emotions and cognitions, known as self-contact (i.e., paying attention and perceiving oneself), was one of three facets of self-love (Henschke & Sedlmeier, 2022). This idea is represented in this study by the theme of awareness. Descriptive analysis shows awareness was the primary coping mechanism detected in 19.5% (176) of the AOD recovery subsample. Awareness and love were also found as a path that predicts abstinence talk. Perceiving the self and experiencing love may be beneficial in AOD recovery. Initial findings demonstrate that positive emotions and coping discourse may be indicative of self-love in AOD recovery posts and further research needs to be conducted to understand their potential benefits.

While expressing and experiencing positive emotions were integral to self-love discourse in this dissertation, specific positive emotions were found to determine AOD recovery content and predict abstinence talk. Gratitude and inspiration were important features in predicting AOD recovery content, compared to a subsample of non-AOD recovery in #selflove posts.

Gratitude. While gratitude is certainly found in the self-love posts, it is specific to AOD recovery. Gratitude has been conceptualized as promoting recovery through adaptive coping and strengthening social bonds, to name a few (Chen, 2017). Within self-help groups, a common adage is that helping others is gratitude in action; it is a common ethos of AOD mutual help groups and is prevalent with "giving back" (i.e., helping others just as they helped you; Kaskutas et al., 2014). Additionally, gratitude has been written about pervasively, particularly with the emergence of positive psychology interventions in the past 20 years, and it has a robust scientific base to support its benefits (Bolier et al., 2013). Self-transcendent emotion research, including gratitude, posits that one is taken out of oneself (i.e., transcends the small self) to recognize the vastness of the world and encourage social connection (Stellar et al., 2017). Evolutionists posit that gratitude's purpose is to encourage group coordination through altruistic reciprocity (Allen,

2018). While gratitude is seen as a protective factor in well-being, it is no surprise that it is a determining factor in predicting AOD recovery content. This may speak to a rich tradition of expressing gratitude in recovery rather than the absence of gratitude in the general expression of self-love; in fact the opposite, as "thankful" was one of the most common words in the *well-being* category. Interestingly, while gratitude predicted abstinence talk, it was a weak prediction. Given the co-occurrence of recovery themes within self-love, it may be that other positive emotions (e.g., joy, love, inspiration) are more central to abstinence conversations. The behavioral changes needed to abstain from using substances may require the induction of other emotions.

Inspiration and Empowerment. Inspiration was also found to predict both AOD recovery content (compared to non-AOD content in #selflove posts) and abstinence talk. This is likely attributed to an overall motivational tone of the posts. #inspiration (11,979) and #motivation (15,165) were amongst the top 20 hashtags in #selflove posts, and #motivation was the 5th most common hashtag (37%; 338) in the AOD recovery subsample. Additionally, the majority of AOD recovery posts (53%; 481) were found to have a motivational tone (compared to six other categories such as personal, educational, playful, and cautionary). Posts spoke about inspiration and motivation in terms of empowerment, resilience, and taking action for change. The words "commit", "admit", and "pay" predicted AOD recovery content, and taking responsibility (e.g., with actions) predicted mentions of abstinence talk. Literature situates these concepts within behavior change.

Motivation has been found to play a key role in behavior change (e.g., Transtheoretical model of health behavior change; DiClemente & Prochaska, 1998) and specifically in AOD treatment (DiClemente et al., 1999). Interventions such as motivational interviewing and motivational enhancement therapy focus on recognizing and questioning thought processes as a way to move through various stages of behavior change. Recovery is situated primarily within the fourth (Action) and fifth (Maintenance) stages of change. Behaviors of taking action to achieve recovery and maintain it (e.g., abstinence) are spoken about as requiring a commitment whose efforts pay off. Being honest with oneself (e.g., admitting mistakes) is a highly endorsed definition of recovery, as is recovery as a process of growth and development; both were found in this study as well as others (e.g., Kaskutas et al., 2014; Witkiewitz et al., 2021). For those who attend 12-step programs or practice abstinence, motivation was found to be one of the mechanisms of change (along with self-efficacy, coping skills) for recovering individuals attending AA (Kelly et al., 2009). Semblances of inspiration, motivation, and empowerment in the posts are aligned with recovery literature and may explain changes to behavior that are required to initiate and maintain recovery, though this study cannot confirm this.

Findings from this study may also suggest that motivation not only benefits empowerment in behavioral change; it also serves as a coping mechanism. The use of "you," known as generic-you, has been found to be a meaning-making function to normalize a negative experience (Orvell et al., 2017). AOD misuse, struggling in recovery, or hardships in daily life could exemplify a negative experience. Counts of the posts' subject (e.g., I, you, they) used in each of the AOD Recovery #selflove posts reveal that 34% (305) of the posts were directed at "you," compared to 30% (267) written with "I/me" and 39% (348) to everyone (though these categorizations are not mutually exclusive). While posts ranged from self-disclosures (use of "I") to a general message (e.g., mental health awareness day) for "everyone," it was surprising that there were almost an equal number of "you" posts. These posts are motivational and advice-giving (even including a quote): "Believe in yourself. No matter how big the challenge is. It is

astounding, all that you can accomplish when you believe you can. #FridayMotivation #selflove #Believe #youareworthy #positivethinking #getitdone #DreamBig #sober #Addiction." Use of "you" may allow the poster to detach from the self (Orvell et al., 2017), such as personal challenges experienced with things that "weighed [them] down": ""Accept yourself, love yourself, and keep moving forward. If you want to fly, you have to give up what weighs you down." -Roy T. Bennett ❤️#selflove #moveforward #keepgoing #soberliving #lovewithoutmartinis #strength #mentalhealth #letgo #cleanandsober." A similar tone appears where this person (below) identifies as "myself" in "not drinking" though shifts to "you" and distances themselves by saying "I love you." Either they are no longer going through this, or it is too painful to identify with "checking out of…life." An excerpt from a post:

> I am so happy that the idea of not drinking is growing and that being yourself, myself, ourselves is building momentum. There is no reason to check out of your life when you know it's a gift, not a sentence. If you feel like you're imprisoned release yourself with a bit of curiosity. I love you and there are millions pulling for you.

Being able to detach may be a coping mechanism which allows someone to focus on moving forward with an inspired and motivational perspective. The motivational and inspirational aspect of self-love and AOD recovery may indicate behavioral changes such as persevering during painful times and acting in one's best interests for well-being. Further research to elucidate how these positive emotions may be a mechanism to initiate behavior change in a self-love context is needed.

Slight Detection of Negative Emotions. Somewhat surprisingly, negative emotions were only slightly detected in the posts. Pain was the most frequently found negative emotion in 4.3% (39) of all posts. Considering its ranking amongst all possible themes, it was the 40th (of 81) most frequent theme. Pain was mentioned in the second most common AOD recovery category and captured in 23.1% of the posts: *learning from the past*. With these posts, people spoke about caring for the pain of the past (e.g., "I'm sorry I lied to keep all the pain inside"), yet these typically were in the context of reflection and what they had learned. This may emphasize the importance of growth in recovery and focus on "one day at a time" (existing in the present moment instead of dwelling on the past and worrying about the future). Self-conscious emotions (e.g., shame), confusion, anger, fear, worry, and sadness were found in 2-3% of the posts. In a pathway predicting abstinence talk, not mentioning anger was included as an important theme. Small mentions of negative emotions could be due to several possibilities. First, AOD treatment and recovery have primarily focused on reducing negative emotions. Shame has been found to be a predictor of both misuse and relapse, and thus sharing about shame is encouraged in recovery communities. One participant in treatment for an opioid use disorder shared that being open about their struggles allowed them not to disclose secrets and thus internalize shame of use (Hooker et al., 2022). Additionally, one of the four most endorsed definitions of recovery is the ability to handle negative emotions without using drugs (Kaskutas et al., 2014). While this may be reflected in the various coping findings presented above, it is surprising that few negative emotions were found in the #selflove AOD recovery posts.

Second, the social media platform and concepts of self-love and recovery may prevent people from sharing negative emotions. Hochschild (2012) posits that people express certain emotions because they are adhering to feeling rules (i.e., norms about how feelings are shared in social contexts). Within the self-love realm and online, it may go against societal rules to speak

about negativity. In American culture, negative emotions are seen as harmful, yet in Eastern Asian cultures, negative emotions are normalized and seen as an intricate part of relationships (Curhan et al., 2014; Pressman et al., 2014). The cultural context informs the meaning of negative emotions. The positive psychology movement emerged in Western society in the early 2000s; Lomas and Ivtzan (2016) caution that this movement may have lessened the importance of negative emotions, despite their benefits (e.g., facilitating self-care behaviors; Disabato et., 2022). Toxic positivity is the suppression of negative experiences by overcompensating and overgeneralizing with positive expressions (e.g., "You got this!" and "Believe in your body!"; Sokal et al., 2022). Within the #selflove sample, descriptive analysis of hashtags found in the top 20 most frequent hashtags that there were 6,948 and 6,664 instances of #positivevibes and #positivity, respectively. It is difficult to assess the authenticity and meaning behind these tags, though they are put into question given a current culture of toxic positivity and its presence online (Sokal et al.; Upadhyay et al., 2022). Given the motivational tone and emphasis on positive emotions and positive outlook (i.e., reframe), toxic positivity may be present in this sample. Additionally, the focus on well-being, particularly wellness and coping, in the self-love AOD recovery posts may suggest that it is acceptable to discuss the past only in the context of the solutions and how the change occurred. Rather, there may have been less of an opportunity for authenticity (e.g., focusing on the mess while it was happening) in favor of demonstrating mastery of coping. Lomas and Ivtzan (2016) suggest that emotions be seen in the dialectic for both their positive and negative attribute, and even deter someone from labeling them as such, at the risk of precluding the full human emotional experience. They present the duality that love is an emotion that can elicit both positive (e.g., care and attachment) and negative reactions (e.g., anticipatory feelings of loss and vulnerability). While one of recovery's most endorsed definitions includes "being honest with myself" (Kaskutas et al., 2014), further study of self-love is needed to elucidate authentic expressions of genuine self-love to understand how it may be beneficial for experiencing positive emotions and coping.

Self-Love as Connection

Findings supporting connection in the self-love posts are not clear. When revisiting the earlier claim that self-love is a relationship with the self, evidence supported that others spoke of loving themselves as a way to connect with others. The bidirectionality of self-love within a relationship of self and others is reflected in various ways in the data depending on who the relationship is with, and what the relationship is about. Connecting with others was explored in the AOD recovery subsample in terms of specific people they connected with—like friends and community, support services such as therapists and 12-step (mutual aid) meetings, connection as a benefit of recovery, and getting help (i.e., help seeking behavior). When thinking of the *who* in the relationship, instances of connecting with a community were the largest group detected (18.3%; 165), which isn't surprising given that references to mutual help groups, namely 12-steps (20.8%, 188) and alternatives to 12-steps (14.8%; 133), were present. Mentions of others were relatively small in comparison: 3.9 % (35) family, 3.4% (31) friends, 2.3% (21) a partner, and 0.11% (1) a sponsor. The *what* of the relationship was found in offering or doing behaviors that positively impact others (i.e., prosociality) and connecting with others as a benefit of recovery in 6.1% (55) and 1.2% (11) of the posts, respectively. Asking for help was coded in 6% (54) of the posts while *getting help* was detected, via machine learning, as a latent topic in 5% of the corpus. Words emblematic of connecting with others were not explicitly found when predicting AOD recovery content. While there were instances of connection in the posts, Russell

and colleagues (2021) found that 45% of their recovery videos referenced social support (e.g., talking to a sponsor, getting help from a family member). It is surprising there were not more references in this sample to individual persons though it is unsurprising that community was the largest indicator of connection.

Interestingly, two of the abstinence talk co-occurring theme paths may shed some light on *how* connection appeared in an AOD recovery context. The presence of recovery slogans and alternatives to 12-steps mutual help programs (in tandem with other themes) predicted abstinence talk. Recovery slogans (e.g., one day at a time) do not explicitly speak to connection yet their origin in mutual help programs may indicate that these posters are connected to a mutual help group. Broader models of recovery (e.g., CHIME) and more specifically AOD recovery, emphasize the benefits of social connection and social identity (i.e., personal networks and group membership allow someone in AOD recovery to shift from an addict identity to a recovering one; Best et al., 2016), respectively. Mutual help groups, such as Alcoholics Anonymous, echo this idea: "AA has a simple program that works. It's based on one alcoholic helping another" (AA, n.d.). Yet it is difficult to parse broader claims of social connection in regard to self-love and AOD recovery in this study. One reason for mixed findings could be that while the sample was heavily abstinent talk, the sample contained few instances of mutual help hashtags. This may be explained by a 12-step ethos to remain anonymous and "attract not promote" (AA, n.d.). While mentions of alternatives to 12-step programs predicted abstinence talk, it is unclear how this group affiliation is emblematic of social connection in the data. Additionally, *engagement with others* was a distinct category and the dominant topic in 8.14% of all #selflove posts. While this contained self-promotion, it also involved posters wishing each other well (e.g., Wishing you a beautiful day). Though this may be viewed as an act of kindness and prosocial behavior, it may also suggest that self-love allows for higher-quality connections with others. It is understood that one can love themselves and others, yet this study did not report on how self-loving impacts others and facilitates social connection. One future line of work would explore the associated comments in the posts to assess the responses for connection and determine, via follow-up interviews, if and how self-love is translating to connection and love for others.

In summary, when considering these #selflove layperson beliefs as evidence for positive emotions, empowerment, and connection to well-being, it is difficult to determine if well-being was found in the AOD recovery subsample posts due to the recovery or self-love component. Semblances of well-being have been found in recent self-love and recovery studies. In interviews with 19 participants from a stigmatized community—identifying as black, same-gender-loving-men—three themes emerged related to self-love: freedom of identity (and outside of societal expectations), pride and connection to their community, and personal growth and resilience that originated from adversity and their identity (Brooks et al., 2022). A recent study of self-love points to a differentiation of self-love from love and self-esteem and points to the conceptualization of well-being, and specifically positive emotions. In open-ended questions with ~1,500 Brazilian adults about 5 schemas of love (of which self-love was one), discriminant analysis found self-love to be a distinct schema from the other forms of love (e.g., romantic, parental). Self-love was explained as self-esteem (i.e., liking yourself and your characteristics), as well as well-being (i.e., joy, happiness with yourself and others), peace (i.e., calm, serene), and freedom (i.e., acting freely without worrying about others) (Natividade et al., 2022). Lastly, in a Canadian study specific to recovery, 2,044 participants were diagnosed with a lifetime substance use disorder. After 12 months, 68% of these individuals reached diagnostic recovery (i.e., absence of 12-month psychopathology), of which only 10% had optimal well-being.

Optimal well-being was operationalized as: recovery; scoring above the 25th national percentile on psychological well-being; and below the 25th percentile on disability measures (Devendorf et al., 2022). Nevertheless, optimal well-being needs to be a high priority for recovery, and well-being needs further articulation within the self-love and recovery concepts. Further exploration of how self-love and recovery operate in tandem opens a potential to expand this line of research.

Self-Care

Intriguing is that the *self-care* topic was a distinct category in the self-love posts. Self-care contained 11.8% of the corpus and was the dominant topic in 10.44% of all #selflove posts. A descriptive analysis of hashtags found that #selfcare was the most frequent hashtag, used 45,145 times. Mentions of warm meals, face masks, beauty rituals, and conversations with Mom were several examples given in the posts. In the AOD recovery #selflove sample, 142 posts mentioned self-care (e.g., meditation and baths); the 10th most frequent theme found. In the Substance Use Recovery Evaluator (SURE) questionnaire, self-care is one of seven sections and includes items related to: caring for mental health, caring for physical health, eating a good diet, sleeping well, and having a good routine (Neale et al., 2016). While self-care was not found to be predictive in the AOD recovery models of AOD specific content or abstinence talk, it may mean that self-care is particularly relevant for both AOD recovery and general self-love. Self-care, along with self-contact and self-acceptance, was found to conceptualize self-love (Henschke & Sedlmeier, 2021). Given that self-care is often utilized synonymously with self-love, this offers preliminary evidence that self-care is one facet of self-love.

Self-care has seen an influx in popularity in recent years (i.e., a 2019 search found a peak of self-care publications in 2015), and there are calls to expand this literature base (Riegel et al., 2021). The World Health Organization (n.d.) defines self-care as "the ability of individuals, families and communities to promote health, prevent disease, maintain health, and cope with illness and disability with or without the support of a health worker." Preliminary evidence supports its association with emotions. A 10-day daily diary study conducted with 289 adults found that those who experienced more positive emotions was associated with more participation in more self-care behaviors (Disabato et al., 2022). Experiencing negative emotions predicted, in lagged analysis, more self-care the next day. A caveat is that these findings are associations, unidirectional, and covariates need further articulation. While self-care, like self-love, has an empowering facet, there also is a dark side to these concepts which need to be considered in research. Wiens and MacDonald (2021) caution that self-care activities can further a neoliberal agenda by pushing the commodification of self-care products and the competition to demonstrate "you're living your best life." Origins of self-care, however, derive from activist communities with the purpose of preservation and restoration in the face of sociopolitical oppression (Lorde & Sanchez, 2017). Like all things, grassroots movements are co-opted by dominant norms for profit. As self-care, and consequently self-love, continue to expand their evidence base, it is imperative to situate terminology thoughtfully and consider implications for the individual and others in a broader sociopolitical context.

Abstinence Talk-Heavy Sample: Impact on Self-Love and Recovery Findings

One curious and unanticipated finding concerned the large extent (87%) of allusions to abstinence (i.e., three of the top 5 hashtags included the word sober: #soberlife, #sober, #sobriety) in the AOD recovery self-love subsample. While abstinence has historically been the dominant narrative in recovery literature and practice (Witkiewitz et al., 2020), it is known that

there are various pathways to recovery. Thus, this abstinence talk focus in the posts may suggest a bias in how people are willing to identify and in a public forum like social media. A recovery identity that includes abstinence is a socially accepted norm (Witkiewitz et al., 2021), and thus may make people more likely to identify with this content (e.g., #sober). Even those characterized for furthering a harm reduction approach shared their sobriety status. In an examination of a Reddit forum to help those stop using opioids, 64% (47) of 73 users across 100 posts identified their sobriety status: 17 as recovering; 16 as sober less than 30 days (i.e., withdrawing); and 14 currently using opioids (i.e., sober less than 48 hours; D'Agostino et al., 2017). While the forum did not specifically suggest abstinence, the forum identified as a community for those recovering from opioid use disorder. These varying forms of identity support evidence that recovery is nuanced, and social norms may play a role in where and how recovery is discussed.

One explanation of why the subsample is abstinent talk-heavy is that this identity may be profoundly tied to group orientation, which needs to be asserted (e.g., shared on social media); identity is critical to someone's recovery. CHIME posits that recovery allows an individual to create a new, positive identity and also create a collective identity (Leamy et al., 2012), and SIMOR conceptualizes that recovery may be passed along social networks (e.g., AA) through social influence (Best et al., 2016). Findings from a cross-sectional study of 121 users of a social network site (e.g., Intherooms.com with a Facebook and smartphone app component) demonstrated that after participants engaged in content like daily meditations and message board threads, they self-reported benefits from the past 90 days: motivation for abstinence/recovery (83%) and strengthening of their recovery identity (69%) (Bergman et al., 2017). Yet, recovery is repeatedly explained as a non-homogenous description (e.g., Witkiewitz et al., 2021). Using latent class analysis of 9,328 participants who completed a survey about definitions of recovery, 5 typologies were found: 12-step traditionalist (i.e., abstinence and high lifetime 12-step attendance), 12-step enthusiast (i.e., endorses abstinence and spirituality but a lesser extent), secular (i.e., non-abstinence, believe recovery is physical and mental), self-reliant (i.e., low endorsement of social supports, e.g., giving back, having non-using friends), and atypical (i.e., importance of process of growth and development; Witbrodt et al., 2015). Characteristics—such as abstinence, spiritual, and social interaction—varied the most across these classes and formed the differentiations across these classes. When applying these theories and findings to this study, asserting specific recovery identities, such as abstinence, and posting about it on social media may help someone in their recovery.

Additionally, recovery has been described as a process of growth and change, which was also confirmed in this study's topic modeling findings as the dominant category. Yet, identity may also change the more time spent in recovery. In semi-structured interviews conducted with 47 people five years after their first post-12-step treatment interview, some still assumed the recovery identity while others did not. While all 47 people at the initial interview identified themselves as being in an on-going recovery process and as sober, some explained their current state as a de-identification process where recovery was no longer central to their life (von Greiff & Skogens, 2021). With these various recovery identities, it begs the question of the best way to assess remission from AOD misuse if various perspectives of recovery (e.g., natural recoverers) do not identify with recovery or may not publicly share (i.e., post) about it.

It could be that the various terms and methods to capture the meaning of recovery are still falling short of including those not identifying with the term recovery (e.g., natural resolvers, those who matured out, former heavy users). Cunningham and Godinho (2021) presented

evidence to support that recruitment, particularly via screening questions of recovery, were not accurately reflecting the prevalence. Surveys to describe recovery identity have historically given participants four possible responses: medication assisted recovery; used to have a problem with alcohol but no longer do; do you consider yourself to be in recovery; and did you consider yourself to be in recovery (e.g., Kaskutas et al., 2014; Kelly, Abry, et al., 2018). Based on their study of former hazardous drinkers (non)recovery identity, they assert that by providing these survey options, it is underestimating former hazardous drinkers (who, even if meeting diagnostic criteria, never felt they had a problem) and overestimating this same group who see themselves as being in recovery. Specific solutions to address the screening question problem, and ultimately lead to more accurately capture AOD misuse, were not given. However, one suggestion could be to include a question: "Has anyone important in your life told you that you do or did have a problem with AOD misuse?". This could partially circumvent denial which may be at the root of not endorsing a former problem (Ann Stoddard Dare & Derigne, 2010). Another study suggested not depending on alcohol consumption as a primary indicator of (alcohol) addiction recovery (Witkiewitz et al., 2021). This step would disentangle severity of use, abstinence, and recovery. Capturing various recovery perspectives will allow researchers, practitioners, and recovery communities to prevent AOD misuse more widely and facilitate recovery rather than focusing on a specific subset of those "in recovery."

In an attempt to ensure various recovery perspectives were captured in the data and better understand how self-love may play a role in recovery, post-hoc analysis was conducted. Problematic with a large abstinence subsample is that recovery definition may be enmeshed with substance and pathway. Those who equate abstinence to being in recovery, compared to "self-changers," also attended more 12-step meetings and received formal treatment (Kaskutas & Ritter, 2015). Thus, efforts were made to disentangle the two. To address this, non-abstinence centered labels were examined. First, people may identify as an ex-addict, recovering or recovered (vs. in recovery; Doukas & Cullen, 2009). A post-hoc search in the larger #selflove dataset was conducted of #exaddict, #recovering and #recovered to determine the extent of missed posts and thereby unintentional omittance of recovery perspectives. Zero posts contained #exaddict. 58 #recovering posts were found; a majority discussed eating disorder recovery, healing from an unhealthy relationship dynamic, or perfectionism. Of these 58, there were 3 specific to AOD, and it was confirmed that these were already captured in the AOD recovery subsample. 12 #recovered posts were also present in the ~188,000 social media posts, and all 12 discussed eating disorder recovery so these were not pertinent to the AOD recovery subsample. Second, literature also supports the importance of not only individual recovery identity but group identity (Doukas & Cullen, 2009). While Alcoholics Anonymous, Narcotics Anonymous, and 12-step were included in the sampling strategy, various alternative to 12-step programs (and #SmartRecovery) that were not initially included were subsequently searched: #dharmarecovery, #lifering, and #womenforsobriety (and #wsf for short). Results demonstrated that 1 #dharmarecovery, 0 #lifering, 2 #womenforsobriety, and 0 #wsf were found in the #selflove posts. Of these and after undergoing inclusion/exclusion, the #dharmarecovery post remained in the sample. Thus, even though attempts were made to include non-abstinent views, either in self-identification or group affiliation, in the #selflove dataset, an abstinent narrative remained as the prevailing one.

An additional, post-hoc analysis attempt was made to thoroughly include all potential recovery perspectives to account for recent literature. In Russell and colleagues (2022) content analysis of 82 of the most liked recovery videos on TikTok, they used 20 recovery-related

hashtags to find their sample. Their reasons to include these hashtags were derived from SUD keywords in the literature and exploration of hashtags on YouTube and TikTok. They attempted to broadly cover abstinence and non-abstinence as well as quality of life and well-being. In a post-hoc comparison of this dissertation's 30 hashtags with theirs, six hashtags were not included in this dissertation: #wedorecover, #recoveryposse, #relapse, #relapseprevention, #soberaf, and #alcoholism. While all hashtags were found in the larger #selflove, some posts with these hashtags were excluded for not meeting inclusion criteria. Thus, despite various post-hoc searches aimed to include missing recovery identities and address criticism that the sample was heavily abstinence-talk focused, it was discovered that these viewpoints were already included in the sample or missing from the dataset altogether. To further research on the utility of self-love in AOD recovery, future studies would benefit from exploring self-love in various settings and specifying recovery identity.

Limitations of the Study

This study is not without limitations. First, results may not generalize across genders. Gender may be a factor to posting with #selflove. Self-love may be primarily conceptualized within a female identity. Love and self-love are topics frequently discussed by women (hooks, 2000), and self-love and self-acceptance have been critiqued for being situated exclusively with and furthering white, hegemonic views (Gillon, 2019). When considering gender differences in AOD recovery, findings support that women are less likely to seek treatment for alcohol use disorder, including specialty services (e.g., inpatient or outpatient AOD support) and 12-steps programs. Additionally, more women (47%), compared to men (24%), endorsed the statement that the problem would get better by itself, which was listed as the primary reason for not seeking help (Gilbert et al, 2019). Women have also been attracted to non-12step online communities to share personal stories in written form (see review in Davey, 2021). This raises several interesting questions that cannot be answered in this study and begs for future research. Utilizing in-depth interviews or questions to determine women's motivations for posting with #selflove and recovery-related hashtags may provide ideas for resolving the gendered treatment gap. Additionally, if posters are seeking social media, as compared to treatment, they would qualify as natural resolvers. It would be helpful to better distinguish various recovery identities online. Future research needs to examine views of self-love across genders, and also consider how women's use of social media may offer a pathway or deterrent to recovery.

Second, this study does not assess actual behaviors. While this study documents how people may write about self-love, findings do not demonstrate how publicly written words translate into actual beliefs or actions. People may be writing about self-love and recovery though not acting on it. Additionally, "fake it 'til you make it" is a common adage in treatment and recovery. Particularly because things can tend to get worse before getting better (e.g., self-esteem and happiness; Kelly et al., 2017), users may be posting about self-love to talk/feel themselves into it though not actually experiencing it. Further research can explore how writing about self-love may lead to well-being, a better relationship to the self and others, and AOD recovery outcomes such as quality of life.

Third, using social media as a data collection site presents challenges. There is a self-promoting aspect to social media, as found in the *engagement with others* category, and it can be challenging to decipher between the genuine use of a hashtag to signal agreement with the concept versus utilization of a trending, popular hashtag for exposure and profit (e.g., #selflove). Additionally, social media tends to skew positive, has been criticized for its inauthenticity, and

has proven to be addictive. While self-love may have a purpose of outwardly connecting with others, it could be an internally validated process. Yet self-love and AOD recovery were explored on social media, a platform which uses likes and comments as currency for external validation. The motivation of the poster is unknown. Additionally, evidence suggests that emotion expression online may not accurately capture a person's subjective experience (Kross et al., 2019). Due to this and the critiqued performative nature of social media, it is difficult to judge the veracity of the content.

Fourth, recovery results may not represent the full spectrum of recovery perspectives. The sample is heavily abstinent talk-focused and capturing various recovery perspectives has historically proven challenging. Additionally, social media could feed posters' addictive personality traits, meaning that their use of social media may replace their old addiction with an internet addiction. A study of those who used recovery-related use of online technology (ROOT) found a 12% prevalence of internet addiction than those who did not engage with ROOT (4%; Bergman et al., 2018). It is possible that these people post more, thus erroneously suggesting a dominant narrative rather than representing a potential minority amongst those in the recovery community.

Fifth, this study did not include analysis of corresponding images. This could result in underestimated, lower instances of narcissism in the #selflove sample. Posts containing selfies (a self-captured photo usually taken with a cell phone) are associated with vulnerable narcissism (e.g., Barry et al., 2017). Examples from this study show that users included the word "selfie" in their captions and infer a corresponding image: "Pardon all the selfies but I'm learning to LOVE MYSELF. Hope all of you beautiful humans have an amazing day! ☀️#selfie #selfiesunday #selflove #wakeupmakeup #goodvibes." Research is inconclusive about social media behavior that manifests as self-esteem or narcissism (Barry et al., 2017). There is still much to be gained by clarifying the murky lines of self-empowerment compared to narcissism.

Methodological Limitations

Methodological limitations within the study offer future directions for subsequent studies. First, future research should obtain social media poster demographics (e.g., age, gender, race, education) and recovery definitions (e.g., what does recovery mean, mutual help group affiliation, time in recovery, severity of previous problem). Thus, as generally critiqued within computational methods, the results may be broader and lack generalizability to specific demographic groups (boyd & Crawford, 2012). Second, future research should sample a larger range of posts, even those that were not tagged with one of the hashtags. For example, a post may be tagged with #recovery, and discuss self-love, yet it would not be included if the social media poster did not use #selflove in the caption. Similarly, while this study attempted to address this limitation for #selflove posts tagged without a recovery-related hashtag by training a word embedding to find these posts in the #selflove sample, only 5% (62) potential posts were retained after assessing for inclusion/exclusion criteria. Given the highly skewed nature of the AOD recovery subsample, additional methods must be examined. For example, in a review of these excluded posts, a dominant narrative was about "pain" (e.g., chronic pain, feeling pain). Since it has been widely reported that the opioid crisis originated with the over-prescription of pain medicine (e.g., oxycodone), training word embeddings that target subsequent domain knowledge may create more diverse recovery perspectives. Both of these limitations again present evidence for the lack of generalizability in the self-love and AOD recovery findings.

Third, preprocessing presented several challenges. Preprocessing techniques are in their infancy and were evolving while data collection and analysis were occurring. While attempts were made to be as thorough as possible, there is room for improvement. For example, incorrectly detecting intention and tone of voice (e.g., sarcasm, *I love cravings, yeah right*) could misrepresent results, perhaps noting a positive valence where a negative valence was the initial intention; some scholars claim it is nearly impossible to fully account for this (e.g., Trilling, 2018). Without specifically asking the poster in this study, the next best option researchers have identified is to search for #sarcasm within the post and eliminate the post from the sample (Joshi et al., 2017). This was done in the subsample of 902 #selflove AOD recovery posts, and 2 instances of sarcasm (i.e., #sarcastic, #sarcasm) were found. The team debated the posts and coded accordingly. Another drawback is that the removal of certain stop words may lessen understanding in a specific context. For example, consider the preposition "with." This study is interested in relationships with the self and others, so statements such as "I had a long talk with myself" becomes "long talk." The stop word, "with", and "myself" are removed. When usernames are provided, in this case relevant to its use alongside "with" (e.g., "went with @sally), the username can be converted to a generic code as opposed to removing altogether). Yet knowing exact specifics of *who* the connecting action was performed *with* (e.g., a random username, a friend, a partner) gives context about the meaningfulness of the connection (particularly in behavioral health where it is widely known that connections are key). While the AOD #selflove subsample analysis and results were not impacted by this, interpretations from topic modeling and recovery content prediction may have been impacted. Future studies warrant further exploration into preprocessing techniques, which continue to evolve as computational modeling becomes more popular, that account for and adapt to domain knowledge.

Strengths of the Study

This study contributes to extant literature by a) examining a positive affect-related concept, self-love, with a large sample size b) contributing to AOD recovery literature with positive-affect findings and c) using newer methodologies of computational modeling to offer another source of evidence of layperson narratives of self-love and topics within AOD recovery. Except for one study published earlier this year on self-love, which examined 90 posts across 10 of the most popular self-love accounts on Instagram (Jerrentrup, 2022), to this author's knowledge, this is the first study to explore #selflove. The large sample size of this study contributes to a convincing, broader understanding of self-love. Self-love has historically been defined as self-esteem and narcissism in the research literature, and benefits of self-love have been included in various publications (see review in Henschke & Sedlmeier, 2021). Yet despite its popularity in popular culture and mention in research articles, there is confusion about the concept (Henschke & Sedlmeier, 2021; Jerrentrup, 2022). In a content analysis of 90 Instagram posts derived from the 10 most popular self-love accounts (e.g., @myselflovesupply), found main themes of independence, self-reliance, strength, and growth (Jerrentrup, 2022). In semi-structured interviews with 13 psychotherapists, thematic analysis revealed three key concepts: self-acceptance, self-care, and self-contact (i.e., giving attention to the self; Henschke & Sedlmeier, 2021). This study's self-love findings are in line with recent conceptualizations of self-love, yet lay beliefs about self-love from this study provide evidence of a potential broader conceptualization of self-love as well-being and a relationship to the self.

This study allowed for further understanding of self-love within a specific context and may articulate how self-love can be applied to and discussed in behavioral health. While AOD

recovery has been examined in two social media studies (i.e., 81 of the most liked recovery videos on TikTok, Russell et al., 2021; characterization of short-term and long-term drinking abstainers on Reddit, Tamersoy et al., 2015), this is the first study to this author's knowledge to explore a positive affect-related concept, such as self-love, on social media within an AOD recovery context. Extant substance abuse literature has primarily assessed emotions in social media text using sentiment analysis and by computing emotions as a binary (positive or negative; e.g., Cavazos-Rehg et al., 2015). This study sought to expand the exploration of emotion with AOD recovery by assessing for 25 emotions. The utilization of social media and accompanied computational modeling methodologies allowed for the potential of robust findings and also the ease to collect a subsample of AOD Recovery posts for comparison purposes. Recruiting AOD recovery perspectives from social media diversified historical participant recruitment methods situated primarily in treatment centers, self-help groups, word-of-mouth, and advertisements, and it captured additional data to support those collected via surveys and interviews. While some elements of the data were skewed, findings also supported extant AOD recovery definitions and introduced innovative computational designs (i.e., decision tree) to link co-occurring themes of self-love and recovery. These strengths give greater confidence in self-love's potential use in AOD recovery and more broadly behavioral health.

Implications and Future Research

Lay beliefs about self-love suggest that self-love may be broader than conceptualized historically and recently in scholarly literature. Findings from this mixed methods study suggests self-love is about having an unconditional relationship with the self, meaning that it is present and important during both good times and bad. It offers suggestions that self-love speaks to being joyful and inspired, practicing self-care activities, validating oneself, and taking actions to support health and overall well-being. Future research would benefit from developing a measure of self-love to determine the validity and reliability of these various lay beliefs and is a starting point prior to assessing its role in behavioral health.

Findings also suggest that self-love is compatible with AOD recovery and has the potential to be useful in recovery interventions. Lay person beliefs demonstrate that both self-love and recovery emphasize health—motivation to make changes, coping strategies to obtain it, and ongoing care to sustain it. Pervasiveness of mental health, coping, and wellness within self-love and AOD recovery posts is well-situated for this time in history. Alcohol-related deaths (i.e., liver disease and mental and behavioral disorders) increased 26% from the start of 2019 to the end of 2020 (Spencer et al., 2022). With mental health issues on the rise post-COVID, including AOD misuse, and discussion of an exacerbated loneliness epidemic (Campion et al., 2022), it is important to bolster discourse around protective factors for mental health. In a study conducted with just over 43,000 participants, results found that while there was a large gap of those who sought treatment and showed help-seeking behaviors, findings demonstrated that comorbidity with a mental health issue (e.g., depression, anxiety) and those who were single (i.e., never married, widowed, separated, or divorced) predicted seeking treatment (Compton et al., 2007). Mental health conversations are a conduit for seeking treatment and offer an opportunity for practitioners to discuss recovery. Recovery is a ubiquitous term used across various mental health conditions. With the field's recognition that recovery is a person-centered, ongoing process (Watson, 2012), self-love, in its focus on having a relationship with the self and well-being, may be well-suited for further exploration in recovery and behavioral health. By examining self-love within an AOD recovery context, researchers can begin to explore a line of

work with self-love in a larger theoretical framework, as a protective factor in recovery, and as a discourse in behavioral health interventions.

It is imperative to offer a caution when considering self-love discourse within AOD recovery and broader behavioral health. Misappropriated messages of self-love may further toxic positivity and neoliberalism. An aspect of self-love predominant in recovery discourse, self-empowerment, has been criticized as a way to further the neoliberal agenda and particularly by burdening women to be independent, internalizing blame, and instilling a mentality to do and be more (e.g., Gil & Orgad, 2015; Ruanglertsilp, 2022). This looks like: love yourself so that you can produce more; if you're not succeeding then it is your fault; and buy this product to feel better about yourself. Additionally, while self-love's (beneficial) roots – from Fromm, Lorde, and hooks – integrate others and connection, self-love at times has been morphed, along with self-care, into supporting a capitalistic agenda. Caution needs to be heeded when speaking about self-love as self-empowerment and self-care – not because of its falsity, but rather because of what is omitted. Self-love is not only about the self. While acting self-loving may be self(ish), the connotation need not represent only benefiting the self. Society's obsession with the self—from detriments of self-doubt and self-censoring to (supposed) solutions of self-confidence and self-empowerment—centers the individual and omits structural and cultural forces that get to the root of the problem (Gil & Orgad, 2015). Those interested in self-love can learn from recovery communities and their embrace of social support and prosociality. While empowerment is necessary to enact behavior change within the *self*, a fundamental recognition is needed; one that insists others are required: pertinent to care for and support one another during this process. Motivation and actions for change and growth (i.e., self-empowerment) can be for the self and for others as long as the other (society) is also centered. Further research needs to be conducted to: first, examine the idea that self-love leads to better quality connections; and second, assess linguistics and dialogue that situates the self and others to create systems of care to benefit the collective. Indeed, this is perhaps what makes a well and loving society. While self-love and recovery can go together, self-love the concept can learn about reciprocity of the self and others from recovery communities.

Another implication of this dissertation is to continue exploring positive affect research within AOD recovery. In recent years, the importance of incorporating enjoyment in recovery has arisen (Kaskutas et al., 2014), and studies have recently examined thriving within recovery (Gutierrez et al., 2022). Just as recovery perspectives are no longer exclusively concentrating on abstinence, and now recognizing broader definitions, more evidence is needed to explore a shift from negative affect symptom reduction to how people can enjoy life without their AOD misuse. This study illustrates the importance of inspiration, gratitude, and other positive emotions; it offers a chance to explore positive emotions and well-being in AOD recovery. AOD recovery has suggested gratitude is key. Perhaps when combined with self-love, other positive emotions take center stage and prevail in discussions. This could have several implications for understanding more about how people sustain abstinence, who identifies with being sober (or not) and through which pathways, and how this could potentially relate to how people view recovery and their association with it (e.g., identifying or not with the need to equate recovery with abstinence). Furthering dialogue about how life in recovery can be enjoyable may be key to sustaining recovery. Future studies can benefit from exploring this topic with providers and participants in community settings and treatment centers, as well as through online communities.

Lastly, training algorithms with specific recovery-related words to expand the knowledge base of recovery perspectives may hold promise. In this dissertation, "alcoholism", "alcohol",

and “alcoholic” were identified as the top 20 most important words to differentiate #selflove in AOD recovery compared to non-AOD recovery posts. Additionally, mentioning “alcohol” without recovery slogans predicted abstinence silence. Findings may suggest that people are willing to speak about their misuse and identify with the disease of alcoholism or being an alcoholic, and this is happening in non-abstinent-focused conversations too. This has implications for using this algorithm with a future sample to find alcohol-related language on social media, but it also points to the compatibility of self-love within this sphere. Perhaps this presents initial evidence to the potential of having a dialogue about self-love with those struggling with AOD misuse. Alcohol is the most researched drug (Sobell et al., 2000), which may be due to its socially acceptable, de-stigmatized nature. Interestingly, heroin (and more broadly, opioids) and medication-assisted treatment (MAT; i.e., medication that contains small doses of opioids and lessens severe withdrawal effects to decrease usage) are highly stigmatized (Andraka-Christou et al., 2022; Madden, 2019; McElrath, 2017), yet “heroin” was also an important word differentiating AOD recovery from non-recovery posts in conversations including #selflove. Though past recommendations have called for an increase in MAT providers, one recommendation is to change the dialogue of treatment in systems of care (McDonald et al., 2022). Studies have begun to examine opioid use and recovery on social media (e.g., Garg et al., 2021), and using an algorithm to find more of these accounts is imperative to changing the stigmatized, recovery discourse. It may also offer inklings about how these folks are identifying (if not as #harmreduction, with 12-steps, or sobriety-related terms). For example, it could be that MAT users aim for both tapering off MAT and long-term sobriety (Hooker et al., 2022). More nuanced language that speaks to an individual’s recovery process without including abstinence can be sought with algorithms to identify users having these conversations. With shifts away from an abstinent-only recovery focus and the emergence of moderation movements, particularly on social media (e.g., Dry January and sober curiosity; Davey, 2021), there is an opportunity to fine-tune recruitment and modeling. Having this knowledge will allow providers to communicate better with those struggling with AOD misuse.

Conclusion

Perhaps the most important lesson to be learned from this study is that lay beliefs suggest a broader understanding of self-love than just self-esteem and narcissism, and offer several key areas of focus when considering its utilization in AOD recovery and behavioral health. The study’s large sample size offers potential in-roads to how self-love may be beneficial: having a relationship with the self, experiencing well-being, and practicing self-care activities. This study contributed to recovery discourse to highlight initial distinctions between general self-love and specific uses of self-love in AOD recovery contexts, and how general messaging of self-love may be improved by turning to recovery communities. It also made suggestions on how to capture more, diverse recovery perspectives, generally and online. This work has a larger goal of building a future line of research to examine self-love as a mechanism to prevent AOD misuse and diseases of despair and facilitate behavioral health interventions in treatment and recovery.

VII. References

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Appendix A: Example of Excluded Post

Just gave an interview to Finland about how self-compassion was the key that helped me through the time when I went from professional athlete to not being able and allowed to sweat or move for 4,5 months at all. It was pretty crazy..••Everything changed in one day. How do you stay sane when everything seems to go wrong after that day, week after week, even month after month?.••Thoughts. 💭 How you guide your thinking at those moments matter so much. Which kind of thoughts give you even a bit of relief of what you are going through right now? It was and is the self-compassionate ones for me. 💞The ones where I decided to love myself and the leg despite the construction mode. ➡️ Broken leg (or whatever body part or even body itself) will not define us as persons. Learning to love yourself and your body, being compassionate towards it and yourself, when you are a mess is so hard - but also simply just necessary for getting back into life that matters/live a life where you matter. (Because you do.) 🤗❤️ ••••••#selfcompassion #recover #rehab #mindfulness #selfdevelopment #vulnerability #courage #process #recovery #journey #love #athlete #formerathlete #struggle #health #mind #body #selflove

Appendix B: 30 Most Relevant Terms of #selflove 6 Topics with Word Relevance (ƛ)

Words from All Topics	1 Validating the Self (ƛ)		2 Loving the Self (ƛ)		3 Coping (ƛ)		4 Wellness (ƛ)	
	1	0.6	1	0.6	1	0.6	1	0.6
love	life	life	love	**love**	year	**year**	selflove	health
new	**love**	make	self	**self**	selflove	**addiction**	day	body
self	selflove	take	selflove	selflove	**day**	**get**	**health**	mental
year	**make**	people	**life**	recovery	**time**	go	**body**	welfare
post	**take**	change	**others**	healing	get	day	**welfare**	day
health	**people**	thing	**recovery**	others	**one**	time	**mental**	yes
body	**time**	need	**loving**	loving	**addiction**	holiday	new	healthy
follow	**need**	feel	**healing**	quote	**go**	one	today	video
link	thing	time	send	send	like	back	yes	goal
mental	**change**	want	need	worth	know	like	**goal**	selflove
check	**feel**	always	**worth**	life	**let**	work	year	posted
welfare	**want**	else	one	reminder	work	know	every	every
beauty	**always**	love	give	motivation	back	let	life	food
addiction	one	someone	**help**	**respect**	**holiday**	would	**healthy**	**wellness**
life	**know**	**selflove**	**quote**	issue	would	selflove	make	**eating**
make	**let**	happiness	**relationship**	word	going	still	take	**fuck**
others	**someone**	everything	**enough**	relationship	good	class	video	**physical**
good	**care**	matter	first	**spiritual**	today	going	work	**craving**
happy	**think**	care	know	give	thing	last	help	**breath**
bio	else	never	best	**substance**	feel	week	feeling	**coach**
skin	**give**	**moment**	**people**	enough	week	really	**mind**	major
take	**never**	**anyone**	word	support	still	done	important	**thankful**
day	**good**	sometimes	talk	journey	help	**trigger**	woman	part
via	**find**	think	**day**	**kindness**	really	got	**food**	**gym**
recovery	**others**	find	reminder	individual	got	together	part	**weight**
morning	matter	give	**motivation**	**power**	want	good	feel	**priority**
vibe	happy	**believe**	way	instar	need	today	posted	**today**
book	everything	keep	support	talk	think	**begin**	time	list
change	**see**	let	**positive**	**somebody**	see	**ready**	**happy**	**confident**
holiday	happiness	one	**journey**	**learn**	last	great	way	**fitness**

Note: Words with ƛ=1 are listed in order of frequency for the top 30 words

5 Self-care (λ)		6 Engagement with Others (λ)	
1	0.6	1	0.6
selflove	beauty	**new**	new
beauty	skin	**post**	post
skin	hair	selflove	link
like	face	**happy**	check
beautiful	girl	**link**	bio
hair	selfllove	**check**	via
girl	beautiful	**follow**	vibe
face	man	**good**	follow
today	Saturday	**bio**	morning
look	black	**morning**	read
get	baby	via	book
day	oh	**book**	addictive
Saturday	like	vibe	happy
man	cute	read	blog
black	makeup	Friday	Friday
send	wake	addictive	shop
care	sleep	**share**	share
got	**natural**	**blog**	good
baby	handle	please	art
woman	queen	Sunday	click
oh	tweet	**free**	event
time	cup	Monday	visit
welfare	ticket	**shop**	**episode**
night	hey	**story**	story
cute	**hot**	**listen**	Sunday
makeup	**eye**	**available**	song
eye	look	**art**	**music**
queen	**massage**	**click**	date
wake	**relax**	**event**	Monday
sleep	**coffee**	**gift**	**listen**

Note: Words with λ=1 are listed in order of frequency for the top 30 words

Appendix C: 30 Most Relevant Terms of 10 AOD Recovery #selflove Topic with Word Relevance (λ)

Words from All Topics	1 (λ) - Finding the positive		2 (λ) - Reflecting on the past		3 (λ) - Overcoming mental health issues in sobriety		4 (λ) - Caring for the pain of the past		5 (λ) - Finding meaning/feeling positive emotions	
	1	0.6	1	0.6	1	0.6	1	0.6	1	0.6
want	sober	**sober**	life	**learned**	sober	**today**	want	**want**	love	love
new	day	**day**	addiction	**remember**	love	**step**	love	best	work	**work**
learned	addiction	**one**	learned	**relationship**	today	**sober**	time	**pain**	life	year
work	one	**addiction**	people	people	recovery	**love**	best	**think**	time	time
love	life	**recovery**	help	**help**	life	**go**	think	love	year	**passion**
beautiful	recovery	**thankful**	feel	feel	go	**alcoholism**	one	time	get	**get**
morning	need	life	need	life	step	**recovery**	pain	see	people	**make**
go	today	need	like	**future**	sobriety	**sobriety**	see	lie	recovery	people
thing	love	even	know	individual	addiction	**help**	life	**past**	sober	**give**
remember	thing	today	remember	**behavior**	help	**health**	go	sometimes	make	**acupuncture**
sobriety	even	Wednesday	find	**forgiveness**	day	**life**	know	**admit**	feel	studio
day	going	follow	relationship	ask	selflove	**rock**	need	**wine**	give	life
like	feel	Saturday	may	like	one	**weekend**	recovery	**fight**	others	others
wishing	follow	class	way	addiction	new	**addiction**	past	could	take	recovery
sober	Saturday	going	past	**past**	alcoholism	**abuse**	sober	one	know	**feel**
past	like	**transformation**	work	find	health	**selflove**	sometimes	everyone	want	**take**
make	get	shop	new	**therapist**	keep	**walk**	could	go	self	**service**
book	help	thing	love	little	people	**higher**	drug	**battle**	selflove	head
Saturday	thankful	**family**	one	may	want	**com**	thing	**embrace**	today	**fire**
help	Wednesday	send	little	need	get	**sensation**	addiction	ok	passion	**thank**
addiction	send	**feel**	time	girl	need	**relate**	lie	**trigger**	thank	self
big	selflove	**love**	thing	know	rock	**new**	everyone	experience	best	place
year	time	**learning**	future	**guilt**	free	**keep**	trigger	key	start	**strength**
positive	class	**motive**	make	addictive	alcohol	**day**	experience	**drug**	much	**worthy**
thought	always	tag	ask	way	let	**one**	friend	friend	thing	**experience**
alcoholism	struggling	like	individual	also	clean	**clean**	everyone	everyone	need	best
recovery	wishing	get	also	**recovering**	abuse	**ne**	fear	**sadness**	place	**healing**
thank	find	always	let	work	mental	**craving**	talk	know	experience	**heal**
today	good	struggling	free	knowing	weekend	**free**	even	sorry	healing	**loving**
feel	morning	eating	girl	person	happy	**mental**	find	need	heal	sober

Note. Words with λ of 1 are listed in order of frequency for the top 30 words. Words that are bolded were considered when labeling each topic.

6 (λ) - Taking action		7 (λ) - Being in the addiction		8 (λ) - Having positive views of self		9 (λ) - Building new beginnings		10 (λ) - Getting help with sobriety	
1	0.6	1	0.6	1	0.6	1	0.6	1	0.6
life	life	addiction	**beautiful**	thing	thing	new	new	like	**understand**
addiction	addiction	day	morning	one	mix	life	book	sober	episode
sober	sober	morning	**addiction**	love	one	**book**	**big**	understand	stranger
change	**change**	beautiful	**wishing**	make	make	let	**opportunity**	Saturday	hello
selflove	drug	wishing	day	sobriety	remember	big	page	morning	huge
today	someone	help	Tuesday	life	**narrative**	recovery	**drink**	sobriety	**assault**
day	selflove	sober	go	time	else	day	let	selflove	**discussion**
know	**today**	go	**escape**	feel	bad	year	**art**	help	**meaningful**
drug	**shit**	know	**help**	remember	look	time	gate	life	tina
someone	rid	life	**bipolar**	change	thought	sober	june	episode	sa
work	**sick**	Tuesday	**disorder**	never	**action**	opportunity	excited	sa	alan
need	term	let	**prayer**	would	**trust**	page	second	alan	single
recovery	fish	someone	proper	thought	sobriety	drink	**positive**	single	actually
keep	**keep**	would	someone	look	related	positive	believe	actually	image
take	**fear**	good	mind	week	never	sobriety	life	fol	**sexual**
fear	brain	going	allow	Saturday	hurtful	**believe**	year	**care**	discuss
month	month	thing	least	selflove	week	loved	**sparkle**	**fuck**	area
good	know	send	recovery	action	**gratitude**	**happy**	**flower**	never	like
way	work	follow	know	bad	busy	thank	news	**wishing**	**talking**
much	day	**mind**	let	going	**motivate**	thing	constantly	year	Saturday
like	take	**positive**	would	stop	wake	need	aka	new	fol
fish	nothing	**struggling**	**critical**	feeling	**afraid**	one	**mindset**	**feel**	ala
brain	**anger**	selflove	orson	could	poem	loved	**conversation**	stranger	care
towards	towards	want	based	else	**powerful**	let	**loved**	hello	bit
every	**perspective**	disorder	ought	know	**feel**	energy	**happy**	huge	**vulnerable**
start	need	love	alumnus	mix	**change**	Thursday	**thank**	assault	alcoholic
alcohol	every	escape	**died**	gratitude	would	look	recovery	discussion	event
see	long	bipolar	seeker	busy	love	thinking	let	meaningful	possible
going	ir	tell	writer	goal	**story**	**fear**	day	tina	pay
morning	aha	say	shut	live	Saturday	every	happened	image	fuck

Note. Words with λ of 1 are listed in order of frequency for the top 30 words. Words that are bolded were considered when labeling each topic.

Appendix D: A Section of the Codebook

	READ ME	Code Abbreviation	Code	Description/Example
Category	3	Positive Emotions (Content alludes to or specifically states one of these emotions)		
		AMU	Amusement	Funny, laughing, LOL E.g. "I'm excited for a Friday night with my husband and kiddos meeting the soon to be in-laws. My mother-in-law is getting married. Lots of new grandkids names to remember. Lol" ; "I definitely can't be the only one who blasts on some Britney and has a sober boogie with their pet!😂"
		AWE	Awe	wow! (i.e., hard to fully grasp that you're so amazed by it) ; a feeling that you are "small compared to something larger", reverence for something (e.g. nature, beauty, God) E.g. "Just take it all in, and it's truly amazing" ; "When I stopped drinking I was in complete awe of the world"
		CAL	Calm	Serenity, feeling ease, contentment, no worries, peace E.g. "I'm just feeling all types of sentimental & just wanted to share that I'm really content and grateful right now in this moment & it's a beautiful feeling"
		COU	Courageous	Brave, ready to face or endure something that will be hard or painful E.g. "People who ask for help are brave" ; "There has got to be a better way. And there is. You just have to be Brave"
		CUR	Curious	Interested E.g. "I'm curious, what brought you here?"
		ENE	Energized	Excitement, elation, high arousal emotion E.g. "I feel FUCKING GREAT 😊 !!!!" ; "Can I just exclaim how stoked I am truly to be working at this job I'm at"
		FREE	Freedom	To think, speak, and act as one wants E.g. Recovery can be some tough shit, and the freedom is worth all of it" ; "I wanted freedom and clarity from all the bullshit and I have found itttttttt" ; "It means FREEDOM. Freedom from self-doubt, shame, guilt, negative self-talk, self-hatred, and addiction"
		GRA	Gratitude	Thankful, grateful, #blessed E.g. "I'm so grateful the party ended and healing began" ; "I am so thankful for my community and soul fam that I met along the way and aligned with"
		HOP	Hopeful	Optimistic about the future, encouraged, "i'm just getting started", "there's more to come", telling myself: you can do it! I can do it! I'm doing the best I can E.g. "I'm at a point now where I have hope I will be okay!" ; "I began to wake up in the morning with hope"

Appendix E: A Section of the Social Media Post Coding Sheet

	Coding Instructions	Positive Emotion													Negative Emotion												Coping Strategies					
Coder	Social Media Post	AMU	AWE	CAL	COU	CUR	ENE	FREE	GRA	HOP	INS	INT	JOY	LOV	PRI	ANG	ANX	CNF	FEAR	SCS	HOL	LON	OVE	PAI	REJ	SAD	AVO	AWA	FF	POS	SFD	REF
B	Grateful for the opportunity to spread awareness about making behavior adjustm	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	If you want to read #stories of #recovery from severe #emotional problems,#mer	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	Currently listening to 🎶🎵🎤🎙️🎼🎸🎺🎷🥁 #musicislife [redacted]#fem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	If you want to read #stories of #recovery from severe #emotional problems,#mer	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	"If you are putting the needs of your significant other before everything and every	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
B	Don't buy into the toxic diet culture bs you're being sold this month. Be strong, ca	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	This is an album about restoration after heartbreak...	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
B	#alcohol #sobriety #better #courage #selflove Last Year I Drank Tequila by Richi	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	#TogetherTuesday | LIKE AND SHARE this TWEET with a friend and let them kr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
B	My 3yr old just walked up to the mirror, checked herself out for a quick sec, plant	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	Sometimes taking time out of your day to ground yourself can make all the differ	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	Help Break The Silence. Get your copy today! [redacted]	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	Good Morning HAPPY FRIYAY! When you know better you do better -Maya Ang	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
B	20% off #Marble #Landscape #yogamat on [redacted]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	😉 Love & light Radicals.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
B	Happy Sunday 🌞 #SundayThoughts #SundayWisdom #subdayrecovery #mealp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	This Tuesday, we're learning how to take personal inventory!!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix F: Frequency of Codes in #selflove AOD Recovery Subsample

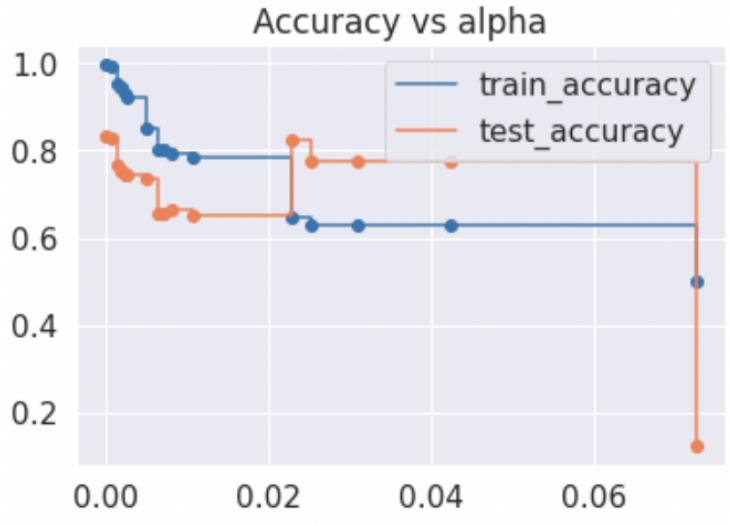
Category Name	Code Abbreviation	Code Name	Frequency	% of All Posts
Tone of the Post	CAU	Cautionary	36	3.99%
	EDU	Educational	36	3.99%
	MO	Motivational	36	3.99%
	PER	Personal	481	53.33%
	PLA	Playful	298	33.04%
	DIS	Discontent	26	2.88%
	PR	Promotional	27	2.99%
Subject of the Post	EVE	Everyone	138	15.30%
	IME	I / 1st person	263	29.16%
	YOU	You / 2nd person	300	33.26%
Positive Emotions	AMU	Amusement	31	3.44%
	AWE	Awe	26	2.88%
	CAL	Calm	78	8.65%
	COU	Courageous	60	6.65%
	CUR	Curious	15	1.66%
	ENE	Energized	74	8.20%
	FREE	Freedom	59	6.54%
	GRA	Gratitude	77	8.54%
	HOP	Hopeful	88	9.76%
	INS	Inspired	156	17.29%
	INT	Intentioned	182	20.18%
	JOY	Joy	140	15.52%
	LOV	Love	355	39.36%
	PRI	Pride	24	2.66%
Negative Emotions	ANG	Angry	21	2.33%
	ANX	Anxiety	35	3.88%
	CNF	Confused	24	2.66%
	FEAR	Fear	25	2.77%
	SCS	Self-Conscious Emotions (Embarrassed, Guilt, Shame/Ashamed)	26	2.88%
	HOL	Hopeless	5	0.55%
	LON	Loneliness	8	0.89%
	OVE	Overwhelmed	12	1.33%

Category Name	Code Abbreviation	Code Name	Frequency	% of All Posts
	PAI	Pain	39	4.32%
	REJ	Rejected	3	0.33%
	SAD	Sad	18	2.00%
Coping Strategies	AVO	Avoiding feelings	8	0.89%
	AWA	Awareness	176	19.51%
	FF	Feeling Feelings	30	3.33%
	POS	Positive Self-Talk	38	4.21%
	SFD	Self-destructive	37	4.10%
	REF	Reframe	123	13.64%
	RES	Resilience	119	13.19%
	EFF	Self-efficacy	89	9.87%
	VAL	Self-validation	71	7.87%
View of Self	AUT	Authenticity	42	4.66%
	NAR	Narcissism	37	4.10%
	ACC	Self-acceptance	43	4.77%
	SCO	Self-compassion	52	5.76%
	CRI	Self-criticism	13	1.44%
	HATE	Self-hate	4	0.44%
	EST	Self-esteem / self-confidence	40	4.43%
	RPT	Self-respect	61	6.76%
Spirituality	JOU	Journey of self-love	118	13.08%
	NEW	New age principles	76	8.43%
	PRE	Spiritual presence or entity	44	4.88%
Taking Action For The Self	ASK	Ask for Help	54	5.99%
	PRO	Prosocial	55	6.10%
	SC	Self-care	142	15.74%
	BOU	Setting boundaries	71	7.87%
	RSP	Responsibility	225	24.94%
Connecting with Others	FAM	Family	35	3.88%
	FRI	Friend	31	3.44%
	COM	Community	165	18.29%
	PAR	Partner	21	2.33%
	LSLO	Slogans	11	1.22%
Recovery Definition	ABS	Abstinent	781	86.59%
	AAB	Alternative to Abstinent	21	2.33%

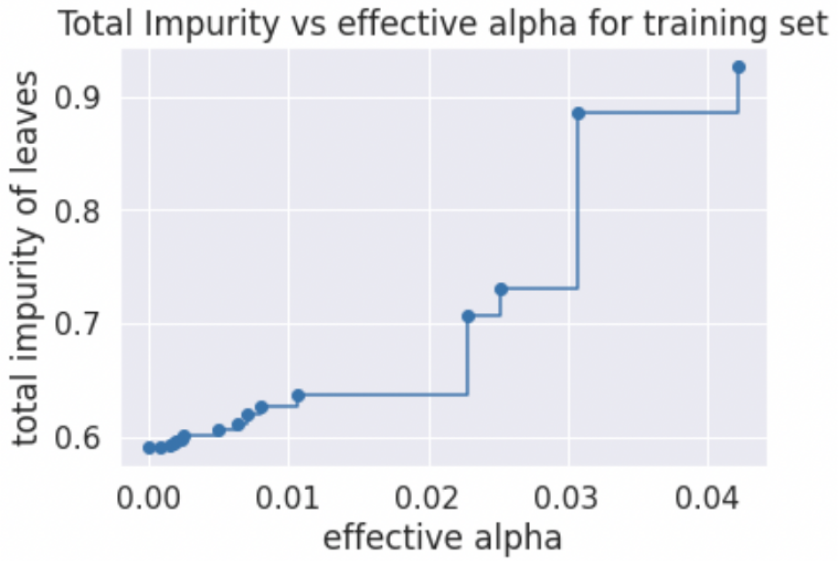
Category Name	Code Abbreviation	Code Name	Frequency	% of All Posts
	RE	Relapse	24	2.66%
Time in Recovery	NUM	Amount of time	43	4.77%
	CEL	Celebrated	30	3.33%
Recovery Support	12S	12-step meeting	188	20.84%
	ALT	Alternative to 12-step meetings	133	14.75%
	RSLO	Recovery slogans & literature	218	24.17%
	SPO	Sponsor	1	0.11%
	DTX	Detox	3	0.33%
	TX	Treatment	114	12.64%
Benefits of Recovery	BEH	Behavioral Changes	18	2.00%
	CON	Connect With Others	11	1.22%
	QOL	Quality of Life	39	4.32%
	RFL	Reflection	60	6.65%
AOD Substance	ALC	Alcohol	123	13.64%
	DRU	Drugs	66	7.32%
	CRA	Craving	4	0.44%
	OD	Overdose	6	0.67%
	INX	Intoxicated	3	0.33%
Other Physical & Mental Health Challenges	MDD	Depression	56	6.21%
	AD	Anxiety disorder	55	6.10%
	TRA	Trauma/PTSD	43	4.77%
	SUI	Suicidal	11	1.22%
	OMI	Other mental health challenges	123	13.64%
	PHY	Physical health challenges	10	1.11%

Appendix G: Decision Tree Modeling - Plots of Performance Metrics

When alpha is 0, the tree will overfit due to an accuracy of 100% with the training data and approximately 82% of the testing data. With the stable blue and orange lines, an alpha between 0.01 and ~0.021 is ideal to maximize algorithm accuracy and lessen overfitting.

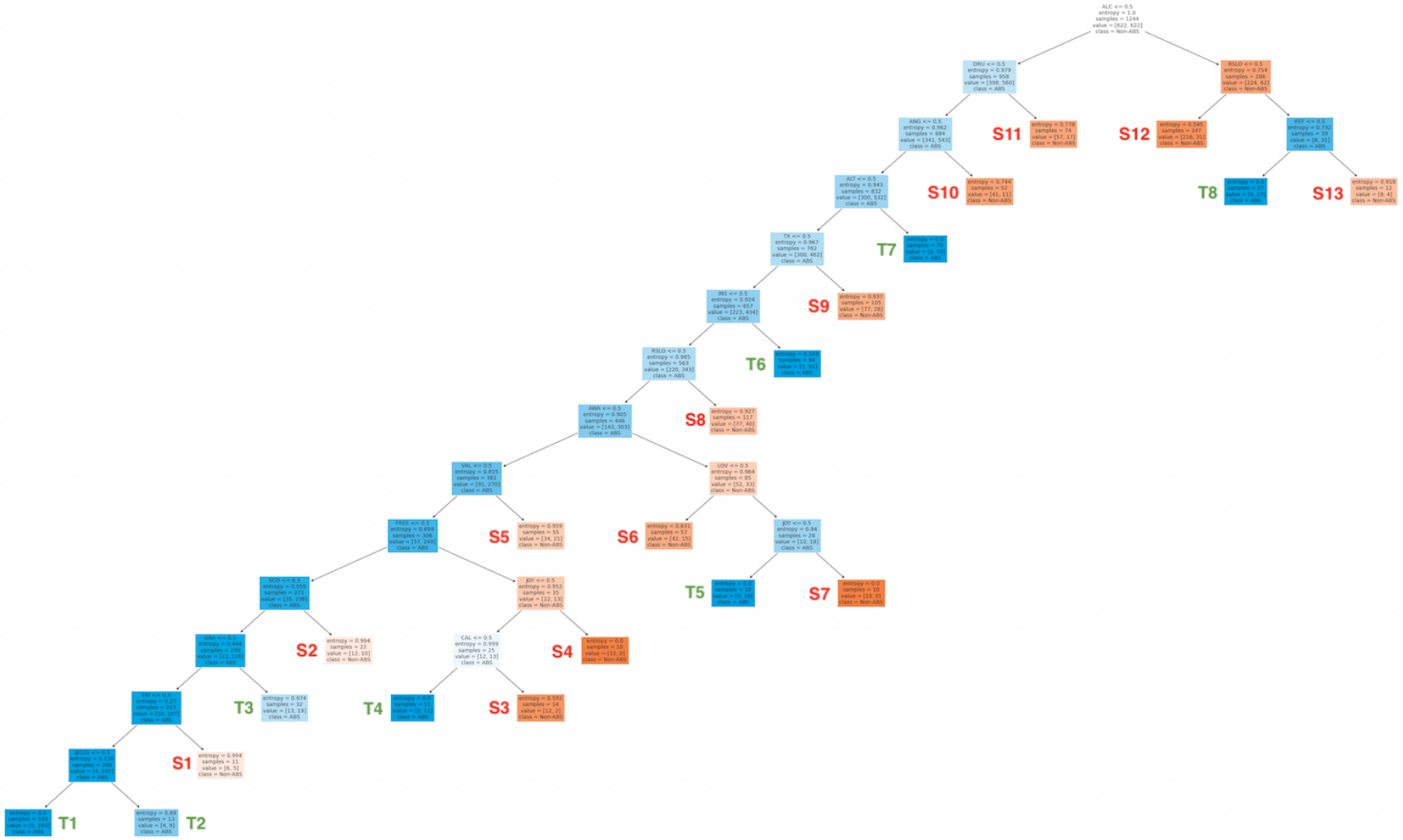


This plot demonstrates that an alpha closer to 0 will maximize the purity of the tree nodes.



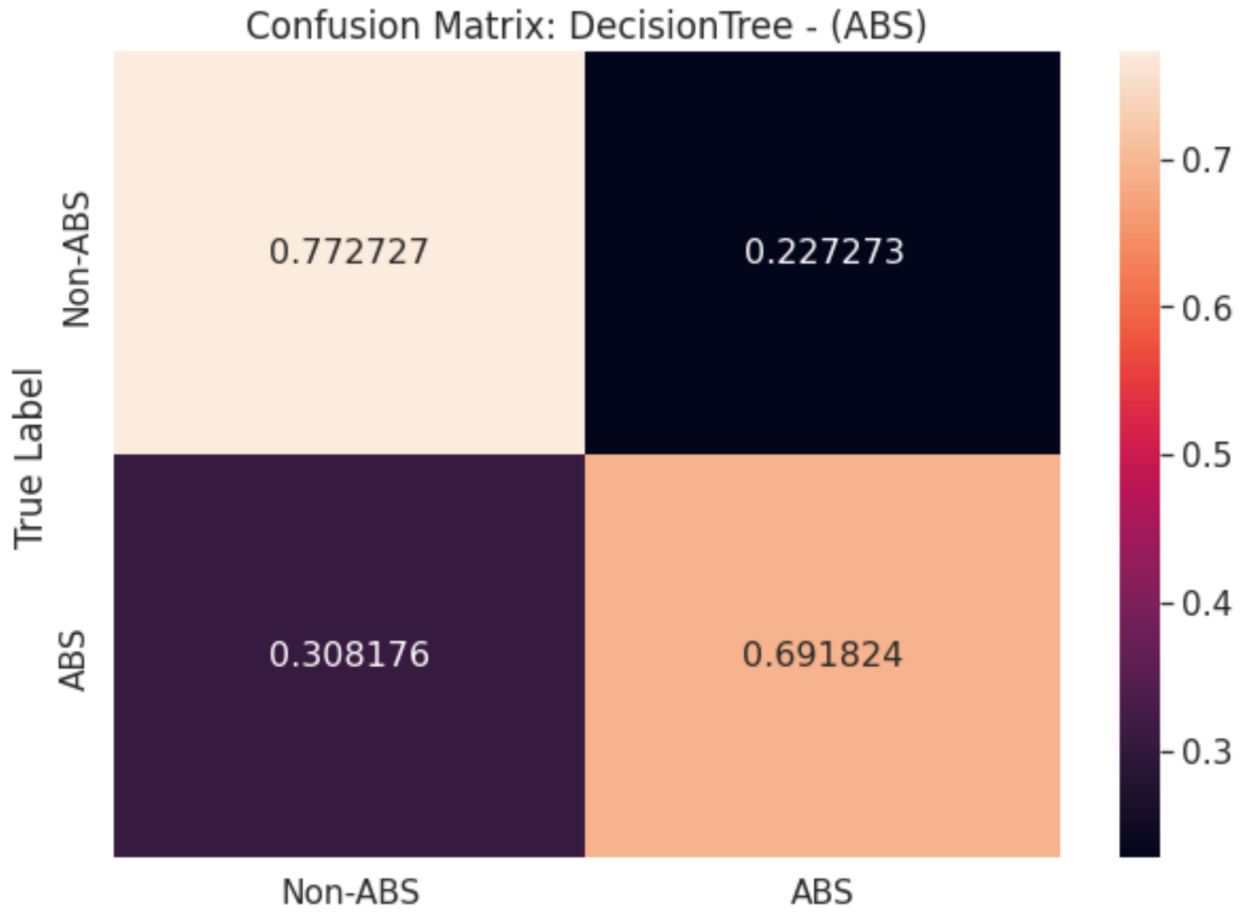
Taken together, an alpha of 1 is ideal because it balances accuracy and purity.

Appendix H: Decision Tree Modeling of Abstinence Talk (T) vs. Abstinence Silence (S) Paths



Appendix I: Confusion Matrix of Abstinence Talk vs. Silence Decision Tree Model

The confusion matrix of the final model predicting Abstinence Talk (ABS) and Silence (non-ABS).



Appendix J: Performance Metrics for Each Prediction Model by Algorithm

When comparing the F1 and accuracy scores across data representation type, Tf-Idf and BOW (both countvectorizers) in general performed slightly better than skip gram and CBOW (word embeddings). While performance metrics are generally extremely strong, bolded F1and accuracy scores represent a performance metric less than .90. Apparent is that BOW's algorithms are all in the .90s making a case, and the Naive Bayes algorithm performs worse than the other algorithms.

	Model (Test)	Precision	Recall	F1	Accuracy	AUC
Tf-Idf	LogisticRegression	0.984211	0.989418	0.986807	0.98615	1
	Naive Bayes	0.833333	0.925926	**0.877193**	**0.864266**	0.987641
	XGBoost	0.994624	0.978836	0.986667	0.98615	0.997264
	DecisionTree	0.989247	0.973545	0.981333	0.980609	0.997165
BOW	LogisticRegression	0.994652	0.984127	0.989362	0.98892	1
	Naive Bayes	0.915789	0.920635	0.918206	0.914127	0.986831
	XGBoost	1	0.978836	0.989305	0.98892	0.997743
	DecisionTree	0.984293	0.994709	0.989474	0.98892	0.997165
CBOW	LogisticRegression	0.967568	0.94709	0.957219	0.955679	0.995377
	Naive Bayes	0.913907	0.730159	**0.811765**	**0.822715**	0.905099
	XGBoost	0.943503	0.883598	0.912568	0.911357	1
	DecisionTree	0.957576	0.835979	**0.892655**	**0.894737**	0.976081
Skip Gram	LogisticRegression	0.989899	0.962132	0.975818	0.976438	0.995427
	Naive Bayes	0.906412	0.73352	**0.810853**	**0.830908**	0.894712
	XGBoost	1	0.995792	0.997892	0.997921	0.999996
	DecisionTree	0.986547	0.925666	0.955137	0.957034	0.984675