Mapping recovery: A qualitative node map approach to understanding factors proximal to relapse among adolescents in a recovery high school

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ABSTRACT

Introduction: Despite data suggesting that recovery high schools are largely effective in reducing substance use, relapse in these settings is common. The goal of the current study was to characterize factors proximal to relapse among adolescents in a local recovery high school.
Method: Data for this study were 200 de-identified node maps (i.e., graphical break downs of a relapse event; randomly chosen from 600 available node maps) from the charts of students at a local recovery high school in a large Midwest city (Mean Age $= 16.8 \pm 1.9$ years, 64.1% male, 89.1% White). A four-phase process of qualitative data sorting examined features most frequently described in relapse episodes.
Results: The most common elements reported were using with others ($n = 153$, 76.5%), away from home ($n = 156$, 78.0%), and in response to negative affect ($n = 93$, 48.4%). Six relapse pathways emerged: coping ($n = 30$), acting out ($n = 15$), unexpected temptation (n = 30), planned lapse ($n = 19$), resistant to recovery ($n = 27$), and passive agency (n = 30). The pathways identified represent three critical failures in the recovery system: failure to cope, failure to guard against temptation, and failure of belief. Identifying these system failures can contribute to increased rapport and engagement, as well as planning for detailed and specific factors proximal for relapse for any given individual, both on the individual and system levels.
Conclusion: The use of node maps aligned with previous work, showed good face and content validity, can be used to reduce blame and increase engagement in substance use treatment among adolescents, and produced novel micro-frames with new vocabulary to accurately understand common factors associated with relapse among adolescents.

1. Introduction

Substance use disorder (SUD) is prevalent among adolescents (Substance Abuse and Mental Health Services Administration, 2018). Previous literature has shown alarming overdose rates for adolescents, with only one-third receiving timely addiction treatment (Alinsky et al., 2020). Additionally, despite data suggesting that current SUD treatments are effective in reducing substance use (Thomas & Deas, 2001; Waldron & Turner, 2008), relapse is common among this population (e. g., Godley et al., 2014), with one recent study finding a relapse rate of

38% over a five-year follow-up period following a 10-week treatment program (You et al., 2020). Thus, understanding the factors proximal to relapse is crucial to understanding the course of SUD and how best to improve recovery among adolescents. The current project's goal was to examine proximal factors related to substance use relapse among adolescents in a recovery high school.

The term "recovery" is often used to describe the process of behavior and lifestyle change that a person undergoes to overcome SUD. Research has defined recovery as "a voluntarily maintained lifestyle characterized by sobriety, personal health, and citizenship" (The Betty Ford Institute

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Consensus Panel, 2007). For the purposes of this investigation, the current study defines substance use "relapse" as any instance of substance use following treatment initiation.[1] The majority (60–70%) of adolescents engage in formal treatment as a result of external pressure and most relapse within 90 days of treatment cessation (Buckheit et al., 2018; Godley et al., 2014) and 47% of students resuming traditional high school following inpatient care return to their previous pattern of substance use within one year (Winters et al., 2000). This has led some to suggest that treatment for SUD should incorporate a system of recovery emphasizing not only abstinence from substance use, but also the restoration of quality of life that SUD has damaged (Laudet & Humphreys, 2013).

Social and environmental influences make up the strongest predictor of substance use relapse among adolescents (Anderson et al., 2008; Ciesla et al., 2008; Gangi & Darling, 2012; Ramo & Brown, 2008). The degree of social support for abstinence, the frequency of peer substance use, and the extent of family involvement in treatment are consistent pre-treatment and post-treatment predictors for adolescents' clinical course in treatment, with higher social support and involvement consistently associated with better outcomes (Buckheit et al., 2018). Lower severity of dependence, increased treatment engagement and completion, and more frequent mutual-help group involvement also predict more successful recovery outcomes (Buckheit et al., 2018). High-risk social situations coupled with lack of coping skills, low self-efficacy, and positive use expectancies all contribute to an initial "lapse" in sobriety, which then produces additional vulnerability toward continued use (Ramo et al., 2012). Social pressure, physiological withdrawal, and negative affect have also predicted relapse among adolescents (Cornelius et al., 2003). Although adolescents report negative mood and depression as a precursor to relapse (Anderson, Frissell, & Brown, 2007; Waldron et al., 2005), teens are more likely than adults to relapse in response to positive emotional states, such as those experienced during social events (Ramo et al., 2012; Ramo & Brown, 2008; Starks et al., 2010). Involvement with peers who continue to engage in substance use contributes substantial risk for those in recovery (Ciesla et al., 2008); conversely, associating with new friends after receiving treatment reduces the probability of re-initiating regular use by half (Ciesla, 2010).

Although school is important for lasting SUD recovery (Finch & Karakos, 2014; Moos, 2007), it also presents an environment of risk for substance use relapse (Finch et al., 2014). School-based substance use interventions have been implemented as early as 6th grade, and these interventions have shown success years later, post–high school; individuals had significantly lower substance misuse with reduction rates at 41% (Spoth et al., 2017). One emerging model for the treatment of adolescent SUD is the "recovery high school" or "sober school," which was developed as a collaboration among schools, parents, and treatment professionals as an education option for adolescents who have self-identified as "in recovery" from SUD (Bowermaster, 2008). Recovery schools are designed to provide a closed, nurturing environment where students can find the education, reinforcement, and peer support they need during a vulnerable time in the recovery process, while being insulated from the stigma and negative influences common to school settings (Moberg & Finch, 2008). Students enrolled in recovery high schools tend to have higher rates of pre-treatment drug use, more extensive mental health treatment histories, greater criminal activity, and more post-treatment health problems relative to the national sample of adolescents with SUDs who have not participated in recovery high schools (Tanner-Smith et al., 2018). Additionally, these programs have lower rates of enrollment and higher rates of turnover and dropout (Finch et al., 2014; Yule & Kelly, 2018). Despite these barriers, youth

who participate in recovery high schools are four times more likely to report full abstinence equally across substances at six-month follow-ups, and they tend to have less school absenteeism relative to students who are not enrolled at a recovery high school (Finch et al., 2014; Yule & Kelly, 2018).

The current study seeks to characterize the factors proximal to substance use relapse among adolescents with SUD who are enrolled in a recovery high school, informed by principles of "root cause analysis." Root cause analysis is an approach researchers use to study adverse events, such as completed suicide or patient elopement, which "presumes that adverse events are more often a result of system vulnerabilities, rather than the failure of an individual" (Riblet et al., 2017). By applying this framework to substance use relapse events, we presume that an individual in recovery does not experience lapses due to any personal failings or fault of character but rather because the system of safeguards set up around them to guard their recovery process has been insufficient. The methodology for this study is a primarily qualitative, data-driven approach, as recommended by Miles and colleagues (Miles et al., 2014). We utilized node-link mapping, a counseling technique that uses graphic representation to chart events and enhance the counseling process (Collier et al., 2001), which research has previously shown to be effective with adolescents with substance use disorders (Bartholomew and Dansereau, 2008).

The primary aim of the current study was exploratory: to explore the inter- and intra-personal factors proximal to a relapse episode and identify distinct pathways to use among a sample of adolescents attending a recovery high school. The dominant frame for understanding and preventing substance use relapse is Marlatt and Gordon's (1985) cognitive-behavioral Relapse Prevention Model (Ramo & Brown, 2008); staff at the recovery high school where the current study collected data noticed that many of the risk and preventative factors proposed as important in this model were often overlooked in their adolescent students (Zielke et al., 2015). Thus, the rationale for this study was to explore how these relapse pathways might be conceptualized into new micro-frames to more accurately understand student relapse so that practitioners might identify protective interventions that are congruent to each specified relapse pathway (Zielke et al., 2015). The long-term goal of this research is to use the information gathered from this study to design and test novel strategies to reduce relapse rates among adolescents enrolled in recovery high schools, thus improving outcomes and quality of life among this vulnerable and high-risk group.

2. Material and methods

2.1. Chart data

Data for this study were 200 de-identified node maps (randomly chosen from 600 available node maps) from the charts of high school students at a recovery high school in a large Midwest city. The study implemented this process to reduce selection bias and to ensure the existence of additional samples for later replication. The project was deemed exempt by the local university Institutional Review Board.

2.2. Node maps

When students at the recovery high school reported a substance use relapse, they worked with a trained clinical specialist to create a graphical node map breakdown of the event. The goal of this process was to systematically record the student's recollection of how, where, when, and why the relapse event took place. The study used the following procedure (Zielke et al., 2015), similar to the behavioral-chain analysis exercise commonly used in Cognitive Behavior Therapy (Beck, 2011): First, the study recorded demographic and descriptive information about the student; then, the specialist worked with the student to construct a map of events by asking "What happened"; "Then, what happened?"; and so on until a complete chain of events encompassing

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[1] Although the term "relapse" carries a negative connotation, it is nevertheless used in this manuscript for the sake of clarity, given that it is the most common term used in both the extant literature and among people in recovery to describe their re-initiation of substance use following treatment.

the instance of use was recorded in black ink. Next, the study examined each step of the chain with the question, "What were you thinking here?" and the student's thoughts were recorded next to each point in the node map in blue ink. Next, the study examined each step with the question, "What were you feeling here?" and the student's feelings were recorded in green ink. Finally, staff invited the student to consider the event as a whole and their overall responses or reflections were recorded on the node map in red ink.

This process was done within the existing therapeutic relationship, making it an opportunity to engage in a therapeutic process of understanding the proximal factors related to the relapse to move forward in treatment. Fortuitously, this strategy makes it possible to study proximal factors related to substance use relapse among adolescents while also reducing retrospective and reporting biases and removing barriers associated with conducting research in this vulnerable but high-risk group. Although relapse would be detected via regular urine drug screens, the goal of the program is to encourage students to self-report use prior to a positive drug test result, thus increasing open and honest responding and reporting.

2.3. Data coding process

The study examined the node maps using a multi-stage process of qualitative analysis, based on a system outlined in Zielke et al. (2015) and informed by conventional content analysis (Hsieh & Shannon, 2005) with the goal of identifying overarching themes and pathways through a constant and comparative process (Miles et al., 2014). The team designed the study to implement these methods in several phases, though by necessity these phases were not linear and each stage of the coding process both added to and altered the existing coding scheme, making the stages interdependent and reciprocal.

2.3.1. Phase 1: forced coding

This phase, completed by the first and second authors, involved recording objective descriptive criteria from each node map into numeric codes, including demographic variables (age, sex, race, etc.), as well as features of the node maps themselves, such as the number of nodes per map, etc. This process is akin to directed content analysis (Hsieh & Shannon, 2005), where specific, pre-defined categories were selected.

2.3.2. Phase 2: qualitative discovery

This phase, completed by the first and second authors, involved reading through each node map and making note of salient emergent features that qualitatively identify the map, using mode conventional content analysis techniques (Hsieh & Shannon, 2005). This first stage of qualitative sorting was the vaguest and involved primarily recording (1) quotes from the maps that indicated some significant piece of data about the reporting student (e.g., "If something comes to mind, I do it"), (2) brief summary identifiers of salient features in the unfolding narrative of the relapse itself, (e.g., *Called old using friend, No plans, Went to Broad Ripple*), and/or (3) noteworthy descriptors about the situation or environment that the team did not code in previous steps (e.g., *Out of school—Spring Break*). The team then examined and organized the notes, producing a series of new codes to be used in subsequent analysis.

2.3.3. Phase 3: qualitative sorting

Next, the first author reviewed all of the node maps again to sort them into broad categories based on shared features. Two examples of such sorting categories were "intentional use" and "negative mood state."

2.3.4. Phase 4: characterizing pathways to relapse

The fourth and final stage of qualitative analysis involved re-sorting the above categories several times to produce meaningful categories of characterization by combining, dividing, and reorganizing the

Table 1
Frequency of demographic variables by emergent pathway.

Path #	Path name	n	Demographics Age M (SD)	Sex F	Sex M	Race W	Race NW	Family History SUD Pos	Neg	Unkn.	Yrs using M (SD)	Psych n (%)	Recovery Involvement Meetings None	Min.	Reg.	Sig.	Sponsor None	No Contact	Contact	Days abstinent M (SD)
Failure to cope																				
1	Coping	30	16.7 (1.4)	9 (30.0)	21 (70.0)	28 (93.3)	2 (6.7)	23 (76.7)	4 (13.3)	3 (10.0)	4.5 (2.3)	9 (30.0)	14 (46.7)	8 (26.7)	3 (10.0)	5 (16.7)	23 (76.7)	4 (13.3)	3 (10.0)	139.8 (209.7)
2	Acting out	15	16.33 (1.1)	11 (73.3)	4 (26.7)	13 (86.7)	2 (13.3)	14 (93.3)	0 (0.0)	1 (6.7)	4.1 (2.2)	7 (46.7)	5 (33.3)	4 (26.7)	0 (0.0)	6 (40.0)	11 (73.3)	3 (20.0)	1 (6.7)	92.3 (127.9)
Failure to guard against temptation																				
3	Unexpected temptation	30	17.3 (1.3)	9 (30.0)	21 (70.0)	27 (90.0)	3 (10.0)	23 (76.7)	7 (23.3)	0 (0.0)	4.8 (2.4)	5 (16.7)	15 (50.0)	3 (10.0)	7 (23.3)	5 (16.7)	23 (76.7)	5 (16.7)	2 (6.7)	71.7 (73.7)
4	Passive agency	30	16.6 (0.9)	12 (40.0)	18 (60.0)	26 (86.7)	4 (13.3)	28 (93.3)	2 (6.7)	0 (0.0)	3.6 (1.8)	5 (16.7)	7 (23.3)	13 (43.3)	3 (10.0)	7 (23.3)	30 (100.0)	0 (0.0)	0 (0.0)	126.1 (224.6)
Failure of belief																				
5	Planned lapse	19	16.9 (1.4)	5 (26.3)	14 (73.7)	18 (94.7)	1 (5.3)	16 (84.2)	1 (5.3)	2 (10.5)	4.0 (1.4)	1 (5.3)	5 (26.3)	4 (21.1)	1 (5.3)	9 (47.4)	17 (89.5)	1 (5.3)	1 (5.3)	98.3 (66.6)
6	Resistant to recovery	27	16.9 (1.1)	8 (29.6)	17 (58.6)	26 (96.3)	1 (3.7)	22 (81.5)	4 (14.8)	1 (3.7)	3.9 (1.9)	4 (14.8)	13 (48.1)	9 (33.3)	3 (11.1)	2 (7.4)	26 (96.3)	0 (0.0)	1 (3.7)	22.8 (64.7)

Note. Frequency of demographic and recovery-related variables of interest for each pathway (Path). Age, Years Using (Yrs using), and Days abstinent are shown as Mean (Standard Deviation). All other variables are shown as *n* (%). Sex is shown as male (M) and female (F). Race is separated into white (W) and non-white (NW). Family history for substance use is shown as positive (Pos), negative (Neg), and unknown (Unkn.). Psych = presence of co-occurring psychological disorder. Meetings = degree of participation in weekly recovery support meetings, shown as none, minimal (Min.), regular (Reg.), or significant (Sig.).

categories. The goal in this process was to ask, "What type of relapse is this?" and sort the node maps into meaningful "pathways" based on all of the available criteria, described above, simplified into their highest-order components. This process produced more than a dozen pathways. The study then defined each pathway in terms of its characteristics with regard to salient narrative features. As we defined the pathways, it became evident that several of them were either too vague or too similar to one another to be reasonably considered distinct pathways, and so they we combined or reordered them once again. Once the team thus defined the final six pathways, the team reviewed each map again and compared it against the defining criteria for its respective pathway to ensure that the characteristic features were not violated. This produced an additional period of resorting, though the study retained all previously defined pathways. Finally, the study sorted all pathways by the failure in the system it was thought to represent.

3. Results

3.1. Person- and episode-related descriptors

Overall, 64.1% of the maps were from males and 89.1% were from students who identified as White, with an overall mean age of 16.8 years (SD = 1.9 years). The majority of maps reported substance use or abuse in the student's immediate biological family (86.5%). The students in this sample reported a mean age of onset for substance use of 12.7 years (SD = 1.7 years), with an average of 4.1 years (SD = 1.9 years) using. Most maps reported attending zero recovery/support-group meetings (38.5%) and having no sponsor (81.8%). The number of days abstinent up to the relapse ranged from 0 to 1200 days, with a mean of 88.6 days (SD = 143.1), with cannabis as the most frequently used substance during the relapse episode (55.2%).

Most of the relapse episodes reported using with others (75.5%), typically with "old using friends" (32.8%) and using away from home (77.1%). The most common emotion described was negative affect (48.4%) and most commonly, node maps reported eager anticipation of substance use (24%). The majority of maps (64.1%) reported not identifying as an addict (e.g., saying "I am not an addict" or using language inconsistent with being an "addict," such as "I can control using" or "I can quit anytime"). Sixty-nine maps (35.9%) reported being out of school at the time of the relapse.

3.2. Pathways to relapse

The study identified a total of six pathways, organized into three system failures: failure to cope, failure to guard against temptation, and failure of belief. The narrative features of each pathway are reported here; we show full demographics of each pathway in Table 1 and complete frequencies of the features for each pathway in Table 2.

3.2.1. Failure to cope

The first system failure observed in these data is a failure to cope with emotional or affective distress (including the Coping and Acting Out pathways).

Pathway 1: Coping.

This pathway is characterized by episodes of use that are preceded by either a state of significant negative affect, the experience of a potentially traumatizing event, or an attempt to alleviate a negative condition related to physical health or an overwhelming load of small stressors experienced overtime. Many of the maps in this pathway expressed no initial intent to use and use was reported as an attempt to "escape" from a negative mood state and the undesirable circumstances of life. Negative affect was prevalent and reported throughout the maps. Cognitive processes included either a commentary on those negative feelings (e.g., "I hate feeling this way," "this is awful", wanting to "blot out" their

thoughts/feelings and "not feel for a while") or a description of the life event(s) related to the negative mood (most common for maps describing tragic events). Maps describing poor physical or mental health described few cognitions overall (e.g., "no thoughts," "wasn't thinking," "just tired") and described reasons for use rather than details of the episode (e.g., "get pills to help sleep," "wanting to sleep"). Maps describing a series of stressors often included thoughts that were fatalistic in nature (e.g., "f-it," "whatever," "need a break"), leading to a concession or break in the pattern of recovery (e.g., going to a party where the student knows there will be drugs, skipping school/meetings, or cancelling plans with a sponsor).

Pathway 2: Acting out.

This pathway is characterized by a deliberate act of substance use that the individual uses to spite or punish another, demonstrate personal autonomy, or break rules. In this pathway, individuals describe using as a form of rebellion, a transgressive act performed with the specific intent to be transgressive or to gain control. Maps in this pathway described a denial of intent to use. Maps described an event or situation that marked a turning-point where the student decided to use, commonly an interpersonal conflict (e.g., an argument with a parent or significant other), which produced a state of intense negative mood (e.g., "uncontrollable anger"). The maps described thoughts that a close other exercised authority over the individual (e.g., "[boyfriend] didn't want me to use," "[mom] yelled at me for being late," or "[parent] told me to get out"). The maps described hostile cognitions toward authority, recovery and/or the world (e.g., "f the world", "f you", no point to any of this"). Additional thoughts described antisocial or rebellious motives (e.g., "felt good to be bad," "feels good to misbehave") or a deliberate intent to punish another (e.g., "wake up call for mom," "knew it would piss him off"). The use students described was often more intense or risky in nature, including use of multiple substances, use of unusual substances (e.g., overdosing on OTC medication, huffing inhalants), and buying from strangers.

3.2.2. Failure to guard against temptation

The next type of system failure evident in these pathways is the failure to guard against temptation (including the Unexpected Temptation and Passive Agency pathways).

Pathway 3: Unexpected temptation.

Maps in this pathway are characterized by no reported initial plan to use and a source of temptation preceding use. This pathway included two similar, but slightly different, circumstances: either ongoing engagement in recovery that is interrupted by an unexpected opportunity to use, or decreased involvement in recovery activities coupled with an opportunity to use.

For those in the first circumstance, whose recovery was unexpectedly interrupted, maps tended to report relatively long (several weeks or months) periods of abstinence, that became routine and were a product of a carefully controlled environment, rather than the product of regular effort immediately prior to use. Students report that they had become isolated prior to use and begun to drift into a "recovery void," such that they were no longer active in their own recovery and were just "going through the motions". During these use episodes, an unexpected opportunity to use occurred (e.g., the student finding an old stash of drugs somewhere in their house or discovering other readily accessible drugs that are not closely monitored, such as a parent's pain prescription). These maps then described a period of preparation, in which the student waited for an opportune time to use (e.g., waiting until parents had left the house or gone to sleep). Thoughts were sparsely reported and were not related to using. Affect reported was typically flat or "bored" at the beginning of the map, followed by a period of anxious excitement leading up to the instance of use. Maps in this pathway described using

Table 2
Frequency of episode-related variables by emergent pathway.

Path #	Path name	n	Features											Substances used
			People used with		Places of use		Identify as an addict			Affect				
			Alone	Others	Home	Out	Yes	No	Uncertain	Flat	Mixed	Pos	Neg	n (%)
Failure to cope														
1	Coping	30	12 (40.0)	OUF – 8 (26.7) SO – 1 (3.3) HP – 2 (6.7) S – 1 (3.3) NOS – 6 (20.0)	9 (30.0)	Friends – 8 (26.7) Park – 5 (16.7) NOS – 4 (13.3) Car – 1 (3.3) TxF – 1 (3.3) Town – 1 (3.3) Miss – 1 (3.3)	3 (10.0)	14 (46.7)	13 (43.3)	4 (13.3)	1 (3.3)	3 (10.0)	22 (73.3)	Cannabis – 16 (53.3) EtOH – 9 (30.0) Opioid – 3 (10.0) Cocaine – 1 (3.3) Halluc – 2 (6.7) Benzo – 4 (13.3) OTC – 3 (10.0) "Pills" – 6 (20.0) NOS – 1 (3.3)
2	Acting out	15	3 (20.0)	OUF – 4 (26.7) SO – 2 (13.3) HP – 3 (20.0) NOS – 3 (20.0)	2 (13.3)	Friends – 4 (26.7) Park – 1 (6.7) NOS – 4 (26.7) Car – 1 (6.7) Work – 1 (4.5) Event – 1 (6.7) School – 1 (6.7) Miss – 1 (6.7)	4 (26.7)	5 (33.3)	6 (40.0)	2 (13.3)	0 (0.0)	1 (6.7)	12 (80.0)	Cannabis – 6 (40.0) EtOH – 7 (46.7) Opioid – 4 (26.7) Benzo – 1 (6.7) Synth – 1 (6.7) Inhalant – 1 (6.7)
Failure to guard against temptation														
3	Unexpected temptation	30	11 (36.7)	OUF – 9 (30.0) SO – 1 (3.3) HP – 1 (3.3) S – 1 (3.3) NOS – 7 (23.3)	10 (33.3)	Friends – 5 (16.7) Park – 2 (6.7) NOS – 5 (16.6) Car – 4 (13.3) Work – 2 (6.7) Event – 1 (3.3) Miss – 1 (3.3)	9 (30.0)	13 (43.3)	8 (26.7)	16 (53.3)	0 (0.0)	5 (16.7)	9 (30.0)	Cannabis – 17 (56.7) EtOH – 6 (20.0) Opioid – 5 (16.7) Cocaine – 1 (3.3) Benzo – 2 (6.7) OTC – 1 (3.3) "Pills" – 2 (6.7) Amphet – 1 (3.3) Synth – 2 (6.7)
4	Passive agency	30	0 (0.0)	OUF – 17 (56.7) HP – 2 (6.7) FAM – 1 (3.3) NOS – 10 (33.3)	1 (3.3)	Friends – 14 (46.7) Park – 1 (3.3) NOS – 10 (33.3) Car – 2 (6.7) TxF – 1 (3.3) Town – 1 (3.3)	1 (3.3)	28 (93.3)	1 (3.3)	2 (6.7)	3 (10.0)	7 (23.3)	18 (60.0)	Cannabis – 21 (70.0) EtOH – 9 (30.0) Opioid – 2 (6.7) Halluc – 2 (6.7) "Pills" – 1 (3.3) Synth – 1 (3.3)
Failure of belief														
5	Planned lapse	19	1 (5.3)	OUF – 8 (42.1)	2 (10.5)	Friends – 10 (52.6)	2 (10.5)	17 (89.5)	0 (0.0)	2 (10.5)	4 (21.1)	5 (26.3)	8 (42.1)	Cannabis – 11 (57.9)

Table 2 (*continued*)

Path #	Path name	n	Features										
			People used with		Places of use		Identify as an addict			Affect				Substances used
			Alone	Others	Home	Out	Yes	No	Uncertain	Flat	Mixed	Pos	Neg	n (%)
				SO – 1 (5.3) HP – 4 (21.1) FAM – 1 (5.3) NOS – 4 (21.1)		Park – 1 (5.3) Car – 3 (15.8) Event – 1 (5.3) School – 1 (5.3) Miss – 1 (5.3)								EtOH – 6 (31.6) Opioid – 2 (10.5) Cocaine – 1 (5.3) Benzo – 1 (5.3) "Pills" – 1 (5.3) Synth – 1 (5.3) NOS – 1 (5.3)
6	Resistant to recovery	27	10 (37.0)	OUF – 7 (25.9) SO – 1 (3.7) HP – 2 (7.4) FAM – 1 (3.7) NOS – 6 (22.2)	10 (37.0)	Friends – 6 (22.2) Park – 3 (11.1) NOS – 5 (18.5) Car – 1 (3.7) TxF – 1 (3.7) School – 1 (3.7)	1 (3.7)	25 (92.6)	1 (3.7)	3 (11.1)	2 (7.4)	9 (33.3)	13 (48.1)	Cannabis – 17 (63.0) EtOH – 7 (25.9) Opioid – 1 (3.7) Cocaine – 1 (3.7) Halluc – 2 (7.4) Benzo – 1 (3.7) OTC – 4 (14.8) "Pills" – 5 (18.5) Amphet – 2 (7.4) Synth – 2 (7.4) Inhalant – 1 (3.7) NOS – 1 (3.7)

Note. Frequency of use episode-related variables (People, Places, and Things) for each pathway (Path). All variables are shown as *n* (%). People = who is present during use, separated as Alone or with others (Others); OUF = old using friends, HP = hope peers, SO = significant other, NOS = others not-otherwise-specified. Places = place where substance use took place, separated as Home or away from home (Out); Friends = friend's house, NOS = somewhere away from home not-otherwise-specified, TxF = treatment facility, Miss = missing data. EtOH = alcohol, Benzo = benzodiazepines, Synth = synthetic cannabis, Halluc = hallucinogen, Amphet = amphetamines, OTC = over-the-counter medication, "Pills" = medication tablets not-otherwise-specified.

alone and in secret and after the fact reported that the use was "not worth it."

For those experiencing anhedonia or boredom, the maps reported that the student did not seek out the encounter and that the student offered initial resistance or had some internal debate as they decided how to respond. Feelings individuals described were anxiety and uncertainty. The decision to use was accompanied by thoughts indicating surrender, such as "f-it" or "whatever." After using, the maps reported thoughts related to the consequences of their actions. Subsequent feelings reported included self-criticism, regret, and a negative mood for majority of pathways.

Pathway 4: Passive agency.

This pathway is characterized by a specific chain of events and/or actions by which the individual places themselves into a situation where they will have the opportunity to use without explicit intent to do so. In these maps, students contacted and met up with old using friends, went to a place where old using friends tend to congregate, or visited a location where they knew drugs would be present. The maps either reported no specific purpose in these actions or provided vague reasons for the actions (e.g., "I can go and not use"). In these maps, students reported that others initiated substance use and that the student showed some initial resistance to using, but eventually agreed to use. Thoughts

and feelings were sparsely reported in these maps. Thoughts that were reported tended to be descriptions of a lack of conscious thought, such as "autopilot," "no thoughts," or "on automatic." Feelings reported are generally flat or absent before the use, becoming positive after use. The decision to use was generally accompanied by a thought showing surrender, such as "f-it," "whatever," or "no big deal."

3.2.3. Failure of belief

The third type of system failure in these pathways is a failure of belief (including the Planned Lapse and Resistant to Recovery pathways).

Pathway 5: Planned lapse.

This pathway is characterized by a specific, explicit intent to use. Often, this intent occurred after a long period of abstinence and after a more recent period during which the student reported beginning to reminisce about using. The use was reported to be part of a plan laid out ahead of time and generally corresponded with the student being away from school, going on a trip, or some other special occasion. The maps described the thought that a "break" from recovery was deserved. Thoughts included strategies or remarks about avoiding detection. Affect was generally positive and described excited anticipation for use. Other thoughts included reassurances such as, "I know how to handle [using]," and/or rationalization that the use episode does not represent

a problematic pattern of behavior (e.g., "I'll quit later, in time for UDS").

Pathway 6: Resistant to recovery.

This pathway is characterized by a resistance or lack of commitment to recovery. The maps in this pathway either described use that was planned out ahead of time and deliberate, with expressed hostility and/or resistance to the recovery process or usual or habitual substance use that is not a breach in recovery because no current or past attempt to remain abstinent is reported. For use that was deliberate, they report thoughts that justified using (e.g., "need to get [use] over with while I'm young," "[using] is no big deal every once in a while," or "everyone goes wild sometimes"). Other thoughts included specific hostility or resistance to the idea of recovery, such as "don't want to be forced," "they just want to control me," "this is all bullsh—." For use that was habitual, the maps in this pathway described activities, including use, with practical but limited details. Use was reported as part of a normal day and not as a significant event. Thoughts and feelings reported described the day's activities and were not specifically related to substance use. No internal resistance or attempts to avoid use were reported and justification was not indicated. Using was described as "just part of life."

4. Discussion

The theoretical foundation for this analysis was in keeping with the principles of root cause analysis, which assumes that an adverse event (in this case, a relapse) is produced by a failure in the system (Riblet et al., 2017). Through the process of qualitative sorting, the study arranged individual events into emergent pathways toward relapse, and then examined these for the "root cause" that contributed to their function. To this end, we propose that these relapse events can be thought of as occurring not due to failures in the individual, but through failures in the system of recovery which they pursued. The current findings are consistent with previous literature on adolescent substance use, which suggests good face and content validity for this innovative approach for assessing relapse events among adolescents, suggesting robustness of the current results and the potential to expand research and clinical utility for the field of adolescent substance use. The current study supports that node mapping may be an important tool for use with adolescents who have substance use disorders (supported by previous work by Bartholomew and Dansereau, 2008). Additionally, this approach provides a more comprehensive understanding of the relapse event, and facilitates therapeutic alliance, support, and trust for both the therapist and client, as node mapping provides a forum for the expression of personal experiences and issues and is associated with increased attention/focus, greater engagement, and increased motivation for change (Pitre et al., 1998). Last, this framework produces novel microframes with new vocabulary to more accurately understand common factors associated with relapse among adolescents.

The current study identified pathways to relapse that we can categorize into one of three critical failures in the recovery system: failure to cope, failure to guard against temptation, and failure of belief. All three of these critical failures in the system are considered, not only for how they explain each pathway to relapse occurring, but also for how they relate to substance use treatment and recovery program interventions. Identifying these overarching failures in the system is helpful because incorporating a node map approach of the reasons underlying a relapse event makes it possible to apply insight into how to prevent the same type of relapses from occurring in the future through interactions between therapist and client. Using this node map approach may be especially useful for adolescents experiencing frequent relapses, clients with minimal "buy-in" or faith in the system and their therapist, and for youth with minimal internal insight and reflection who cannot easily identify why they are relapsing and what would best support their recovery journey. Taking a "critical failure" approach removes blame from the client, reduces stigma, and increases the partnership between the

client and the therapist to prevent future relapse episodes. The benefit of this approach is that it may provide practitioners a more dynamic understanding of relapse as an experientially based unfolding set of events with critical points for intervention (Zielke et al., 2015).

The first system failure observed in these data is a failure to cope with emotional or affective distress (including the Coping and Acting Out pathways). A student uses a maladaptive strategy for dealing with an adverse situation, event, or interpersonal conflict (e.g., an argument, poor health, tragedy, or simply the common injuries of daily life). Thus, this pathway represents not just negative affect, but also a failure to cope with such affect and adversity and, in some cases, an attempt to regain feeling in control through using. Adolescent irritability and anger may be misrepresented as recovery resistance; however, with this node map approach, the therapist and adolescent can quickly identify failure to cope themes, triggers, and action plans to prevent future relapse when a triggering event arises. Doing so can create space for a therapeutic contract that allows both the client and therapist to leave with the same understanding and plan. In this way, they can work together, using the vocabulary and words of the client, to structure individualized and ongoing coping strategies based on the individual findings of one's node maps. This finding is consistent with existing literature showing that negative affect is a well-acknowledged risk factor for relapse among adolescents (e.g., Anderson, Frissell, & Brown, 2007; Waldron et al., 2005) and many existing SUD treatments already include coping skills and affective regulation skills as key active components (Winters et al., 2011). Good evidence exists that coping can be improved by psychotherapy and that improvements in the ability to regulate negative affect produce overall reductions in substance use among adolescents (e.g., Allsop, 1990; Cooney et al., 1997; Grahn, 1993; Hides et al., 2021; Khan, 2019; Ramos et al., 2018; Timeo et al., 2019; Zapolski & Smith, 2017).

The next type of system failure evident in these pathways is the failure to guard against temptation (including the Unexpected Temptation and Passive Agency pathways). In these pathways, students were subjected to the temptation to use substances because of external forces that they had not properly guarded against. This finding is consistent with the large literature acknowledging how drug cues pose risk for relapse (Brown & Lawrence, 2009; Hearing et al., 2008; Sun, 2007; Weiss et al., 2001; Yen & Chang, 2005). Thus, existing SUD treatment includes creating drug cue–free treatment environments (e.g., during inpatient treatment; Manning et al., 2016; White & Mee-Lee, 1988), reducing drug cues in the real world, and planning ahead for when one is presented with a drug cue to avoid relapse (e.g., de Andrade et al., 2019; Larimer et al., 1999; Sahker et al., 2019). Utilizing node maps of relapse episodes to guide conversations related to relapse allows for a structured, individualized, and presumably relevant approach to understanding temptations (i.e., frequency, themes, etc.) and creates a client-led discussion on what is most challenging and tempting for them, all of which may increase internal insight, confidence, and understanding.

The third type of system failure in these pathways is a failure of belief (including the Planned Lapse and Resistant to Recovery pathways): failing to believe that one is an addict, failure to believe that substance use is a problem, failure to believe that recovery can work, failure to believe that sobriety is worth the cost, failure to believe in the consequences of using, and failure to believe that life will get better. Popular 12-step programs have a saying, "it works if you work it;" thus, not going to meetings, contacting their sponsor, etc.—in other words, not working the recovery program—is a proximal factor for relapse, which is why treatment interventions and recovery programs emphasize the need for buy-in, i.e., for those in recovery to commit to their own recovery (Kelly et al., 2008). Utilizing this approach and walking the client through a relapse-related node map serves as a therapeutic exercise engendering self-discovery, understanding of resistance, and motivational encouragement. Students who have a failure in the system may also have self-doubt and disbelief regarding their own recovery self-efficacy, and this activity can facilitate relevant and applicable conversations around personalized barriers preventing recovery. Some advocate to embrace

resistance as part of the recovery process, encouraging those in recovery to explore their hesitancy to be in recovery with the goal of creating conditions that uniquely work to move individuals from hesitancy to commitment (Carroll et al., 2012; Mitchell et al., 2011; Rzetelny et al., 2016; Zweben, 1989).

The study also identified a number of individual factors proximal to relapse that were common across pathways. First, the literature has shown that keeping company with old using friends or others related to a person's past substance-using lifestyle poses a threat to successful recovery (Ciesla et al., 2008; Sun, 2007). This finding was present in many node maps reviewed. This term encompasses both *using* and *friend*; using around a person who is trying to stay sober puts that person at risk of re-initiation of use, but *friend* is equally important because social influences are both a critical component to successful recovery (Fisher, 2014; Gangi & Darling, 2012; Sun, 2007) and the greatest risk for relapse events (Anderson, Ramo, et al., 2007; Ciesla et al., 2008; Ramo & Brown, 2008). Resisting the invitations of or completely avoiding association with an old using friend is likely difficult for adolescents. Unsurprisingly, of those node maps that described using with other people, the vast majority were in the company of an "old using friend." Node maps encourage adolescents to provide additional information in a non-accusatory or blaming way. By obtaining this information, the therapist can recognize the appropriate facilitators to relapse and provide helpful solutions (i.e., psychoeducation on relationships and interpersonal functioning, assertiveness training, and a goal of fostering new healthy friendships at the recovery high school).

Second, most node maps reported using at a place other than at home. However, understanding patterns across use at other locations turned out to not be useful, as it was difficult to deduce specific patterns that are meaningful between, for instance, "hang outs" and "in the car" and "friend's house." Somewhat of a key and meaningful pattern of difference is home vs. not home, but even there, the qualitative review of these maps indicated that most physical places of use are about the situation rather than the place itself, and, in almost all circumstances, the key factor appears to be the other people involved in the use episode. This is helpful insight for researchers and clinicians utilizing node maps in the future; clearly the more detailed they are, the more useful they can be in aiding an understanding of recovery journeys. Many use locations do not in themselves have a particular innate risk for adolescents (i.e., teenagers for instance, cannot go into bars, which would be an obviously risky place for someone attempting to remain sober).

Third, negative affect and boredom were the most frequently cited affective experiences prior to a relapse event. Research has shown both positive and negative affect to be significantly implicated in relapse, particularly among adolescents in recovery (Anderson, Frissell, & Brown, 2007; Starks et al., 2010; Waldron et al., 2005). Compared with adults, adolescents in recovery have been shown to be more likely to relapse while in a positive affective state (Ramo et al., 2012; Ramo & Brown, 2008); however, instead of constituting a "positive emotion" pathway in itself, the way that positive affect contributed to the other pathways turned out to be nuanced. The Passive Agency pathway, for instance, includes frequent reports of positive affect motivating the desire for social contact, and so those emotions are important to this pathway even though they did not represent the overall valence of emotion that defined it. Perhaps the closest thing to a "positive affect" pathway in these data could have been extracted from those pathways describing deliberate use. The Planned Lapse and Resistant to Recovery pathways included a significant amount of positive affect related to substance use, but since this did not seem to be particularly indicative of the underlying problem that led to these relapses, the study team did not judge positive affect to constitute a major thematic element and, at least in the current sample, did not seem to be a driving factor for relapse among these youth. More generally, if adolescents tend to be more at risk for relapse when feeling apathetic or bored, recovery high schools could implement additional structure or activities to increase meaning for the students (e.g., setting additional goals in tandem with their

recovery goals, increasing accessibility and motivation for external hobbies or passions like film, music, art, science, fitness, etc.).

Although many commonalities exist across pathways, certain discrepancies among the six pathways are worthy of discussion. For the Acting Out Pathway (collapsed under Failure to Cope), onset of use was associated with interpersonal conflict and these adolescents often reported being angry or upset following a conflict with a parent figure or significant other. This corroborates previous research that established a positive relationship between substance use and coping with problems through anger or emotional outbursts (Bugen & Hawkins, 1981; Wills, 1986). However, unlike the other five pathways, the Acting Out pathway consisted mostly of females. This may be best understood through previous literature, as one study showed the impact of life stress on substance use had a greater effect for girls than boys (Wills et al., 2001). Family conflict has also correlated with SUD for girls but not boys, and girls who experience family conflict are at elevated risk for SUD, which is partially explained by conduct problems (Hummel et al., 2013; Skeer et al., 2011). Due to the plethora of interpersonal stressors reported by females in this pathway and their lack of control in resolving these issues, when feeling angry or upset, they may feel hopeless, desire more control, and act out by using. Knowledge of this pattern could be leveraged in treatment through planning adaptive responses to such feelings before they occur.

4.1. Limitations

The findings of this study should be considered with the following limitations. All of the data in this analysis related to an instance of use and the study carried out this analysis post hoc; thus, while the findings of this study contribute a more detailed look at the process of thoughts and events surrounding an instance of substance use, they do not allow for any prediction or comparisons based on those factors. The data were de-identified node maps selected randomly from those generated over several years at a recovery high school; as such, it is possible that some of the node maps could have come from the same student, preventing quantitative statistical tests since assumptions of independence may be violated. Furthermore, the study randomly selected the node maps to reduce selection bias; because of this, the selected node maps used for this study were not stratified based on demographics, and the authors were not able to compare the 200 node maps selected to the remaining 400 node maps on factors like demographics. However, the authors have no reason to believe significant discrepancies exist between the selected and unselected node maps as they were randomly selected. The extent of information included in the unpacking process was different among node maps since the purpose of unpacking is instructional and therapeutic, not one designed to generate data for research; thus, we were limited to the written information present on the node maps. Finally, the sample contains proportionally more White students than the general demographics of the recovery high school and the general population; thus, these characteristics may not necessarily be representative of the larger population of adolescents with SUD.

5. Conclusions

This study represents a significant step in a program of research aimed to better understand the factors proximal to substance use relapse among adolescents in a recovery high school. Although a number of previous studies have examined factors relating to relapse events in similar populations (e.g., Anderson, Frissell, & Brown, 2007; Anderson, Ramo, et al., 2007; Gonzales et al., 2012; Kristen et al., 2006), this study has the advantage of incorporating behavioral chain analysis data, which provide additional insight into the events, thoughts, and feelings that occur directly before instances of substance use, and showed good face and content validity compared to previous research into relapse among adolescents.

In particular, this study identified failures of the system, not the

individual, that can reduce blame and be leveraged and targeted to improve long-term treatment outcomes in a collaborative therapist-client relationship. Overall, the most important system failures proximal to relapse were failures to cope, failures to guard against temptation, and failures of belief. Identifying these system failures can contribute to increased rapport and engagement between client and clinician, as well as planning for detailed and specific factors proximal for relapse for any given individual, both on the individual and system levels. The inherent assumption underlying this work is that the system can be changed and improved to reduce such failures in the future, which will lead to better individual treatment outcomes. Importantly, examining not only the individual contributing factors relevant to each relapse event, but also the system failures, makes this a collaborative problem-solving process between youth and therapist, rather than an adversarial one. Although adolescents need external supports and activities to boost and maintain their recovery processes (Acri et al., 2012), the majority reported relapsing due to complex emotions, life events, and environmental stressors that may largely be out of their control (Gonzales et al., 2012). Adolescents might not always understand the reasons why they have relapsed and how to ask for additional support to prevent such relapses in the future. The process that this study used allowed adolescents to express and better understand their complex emotions, thoughts, and behaviors leading to relapse in a nonjudgmental or penalizing way, within the confines of their established therapeutic relationship. Furthermore, the process allowed youth and therapist to work together to identify system failures proximal to relapse and to identify strategies to prevent such relapse episodes in the future. Thus, node maps may be a helpful tool that is easily added to existing therapeutic modalities and programs, allowing youth to take an active and collaborative approach to examine how best to support and maintain their own recovery.

Declaration of competing interest

None.

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