Contents

A Need-Based Theory of Addiction **3**

The Foundational Moral Perspective **4**

Needs and Satisfiers **5**

The Need Ecology **6**

Perceived Needs **7**

Emotion as Need-State Change **8**

Emotional Accuracy Is Multidimensional **9**

Memory as Need Regulation Across Time **9**

Emotion and Memory Form a Recursive System **10**

Memory Does Not Preserve Objective Reality Directly **11**

Need-Memory Asymmetry **11**

Need-to-Satisfier Memory Compression **12**

The Need-Memory Attractor **13**

Alternative Need-Memory Density **14**

The Need-Regulation Loop **15**

From “Reward” to Need-State Improvement **16**

Need-Transition Learning **16**

Need-Causal Truncation **17**

Dependence as an Acquired Need State **17**

Craving as a Need-Based Emotion **18**

Wanting and Liking **19**

Satisfier-Significance Sensitization **20**

Interoception as Internal Need Sensing **20**

Anticipated Needs **21**

Satisfier Confidence **21**

Satisfier Scarcity **22**

Stress as Need-Threat Load **23**

Trauma as Adapted Need Prediction **23**

Habit in Need-Based Terms **24**

Whole-Need Arbitration **24**

Need-Horizon Compression **25**

Compulsion **25**

Need-System Capture **26**

Formal Working Definition of Addiction **26**

The Recursive Heart of Addiction **27**

A Multidimensional Capture Profile **27**

Perceived Regulatory Value and Moral Value **28**

Substance Classes Through a Need-Based Lens **29**

Polysubstance Use as a Need-Regulation Portfolio **30**

Autonomy **30**

Responsibility Without Condemnation **31**

Addiction Does Not Eliminate Agency **31**

Treatment as Need-System Reconstruction **32**

Medication as Need Stabilization **32**

Behavioral Treatment and New Need Evidence **33**

Structural Intervention Is Addiction Treatment **33**

Harm Reduction **34**

Recovery **34**

Recovery Is New Need History **35**

Recurrence **36**

Prevention **36**

Operationalizing Need-System Capture **37**

Measuring Need-Memory Convergence **38**

Measuring Need Differentiation **38**

Testable Predictions **38**

What Would Weaken the Theory? **39**

Avoiding Circularity **39**

Biology Is Not Replaced **40**

Relation to Existing Addiction Science **41**

Scope and Public-Health Relevance **41**

The Moral Consequence of Dependency **42**

Why Punishment Can Become Recursively Counterproductive **42**

A Need-Based View of Stigma **43**

Emotional Validation Without Emotional Infallibility **43**

The Deepest Need-Based Interpretation of Addiction **44**

The Deepest Need-Based Interpretation of Recovery **44**

Conclusion **45**

A Need-Based Theory of Addiction

Addiction as Recursive Capture of Need Regulation, Emotion, and Memory by a Satisfier

Abstract

This paper proposes a Need-Based Theory of Addiction (NBTA) grounded in Need-Based Morality: the proposition that moral value derives from the fulfillment or frustration of needs, weighted by properties such as urgency, foundationality, dependency, reach, persistence, fairness, and time. In the source framework, emotions are understood as nervous-system responses to changes in perceived need states: fear responds to perceived threats to important needs, sadness to perceived losses of need fulfillment, anger to perceived obstruction or violation of needs, joy to perceived improvement in need fulfillment, and so forth.

NBTA extends these premises into a unified account of substance use, craving, dependence, addiction, memory, recovery, and moral responsibility. It begins by distinguishing **needs** from **satisfiers**. A need is a condition whose fulfillment supports viable flourishing; a satisfier is a means by which one or more needs may be changed. Psychoactive substances are therefore not intrinsically needs. They are unusually powerful potential satisfiers that can alter actual need states, perceived need states, emotional need-state signals, memories of previous need regulation, expectations about future satisfiers, and the biological system performing the regulation.

The central proposal is that **addiction is maladaptive recursive capture of a being's need-regulation and need-memory systems by a satisfier or satisfier class**. Repeated use can cause many different need states to increasingly retrieve the same satisfier; memories can accumulate evidence that the satisfier reliably changes important internal states; cues can retrieve those memories and generate craving; biological adaptation can create genuine new shortfalls when the substance is absent; alternative satisfiers can become relatively inaccessible or weakly represented; and immediate need relief can acquire greater moment-to-moment mobilizing power than competing needs across longer time horizons. The resulting system can continue selecting the substance even while the person reflectively understands its substantial costs.

This framework interprets craving not as a meaningless or deceptive urge but as an emotion: a real response to a perceived need-state opportunity in which memory predicts that a particular satisfier can improve something important. The signal is generally useful information, but—as with all emotions—the inferred need, magnitude, causal attribution, satisfier exclusivity, or time horizon can imperfectly track reality.

Memory is incorporated as a core component of need regulation. **Memory is how yesterday's perceived need states participate in today's need regulation.** Emotionally significant need changes are learned; those memories later shape predictions and emotions; and repeated substance-mediated transitions can create a dense autobiographical network converging on the same satisfier. Recovery is therefore not adequately defined as abstinence. It is the progressive construction or restoration of a more accurate, diverse, resilient, autonomous, and sustainable need-regulation and need-memory ecology.

NBTA is presented as a proposed integrative framework, not an established clinical theory. It is designed to incorporate findings from incentive-sensitization, allostatic and withdrawal models, reinforcement learning, interoception and predictive processing, memory reconsolidation, social determinants, recovery capital, and treatment research while translating their functional content into a common need-based ontology. The paper concludes with operational variables, measurable predictions, failure conditions, and implications for prevention, treatment, harm reduction, autonomy, responsibility, and Need-Based Morality.

Keywords: addiction, needs, emotion, memory, craving, dependence, recovery, morality, interoception, reinforcement learning, need regulation

---

The Foundational Moral Perspective

Need-Based Morality begins from a simple proposition: when needs conflict, moral importance should track the degree to which actions fulfill or frustrate needs, with more urgent, foundational, dependent, widespread, enduring, and otherwise consequential needs carrying greater weight. The framework explicitly treats oxygen as morally more urgent than friendship when oxygen is critically absent, not because friendship lacks value, but because oxygen is more immediately foundational to nearly every other achievable need.

Its formal moral equation extends this principle by evaluating causal effectiveness, need urgency and foundationality, dependency, reach, duration and irreversibility, fairness, and temporal proximity.

The central moral unit in this theory is therefore not a behavior category such as *using drugs* or *being abstinent*. It is the resulting pattern of need fulfillment and need frustration.

This matters immediately.

Morphine given for otherwise unbearable postoperative pain may strongly fulfill urgent needs.

The same pharmacological class used under conditions producing fatal respiratory depression catastrophically frustrates the foundational need for continued life.

Alcohol shared in a context of modest recreation and social connection may produce favorable need changes at limited cost.

Alcohol consumed before driving can substantially threaten other beings' needs for bodily safety and survival.

Buprenorphine can create physiological dependence while at the same time substantially reducing the need-state instability, uncontrolled opioid exposure, overdose danger, and disruption associated with opioid use disorder. Evidence continues to support medications such as buprenorphine and methadone as major treatments for opioid use disorder.

There is consequently no coherent Need-Based Moral rule of the form

$$\text{psychoactive substance} = \text{immoral}.$$

Nor is there a coherent rule saying

$$\text{abstinence} = \text{highest good}.$$

The question is instead:

Which attainable trajectory most sustainably fulfills the relevant needs of all affected beings?

That question provides the moral ground on which the rest of the theory is built.

Needs and Satisfiers

A **need** is a state, condition, resource, relationship, capacity, or environmental property whose adequate fulfillment causally enables or preserves some dimension of a being's viable flourishing.

A **satisfier** is something capable of affecting one or more needs.

This distinction is essential.

Food is a satisfier of nutritional needs.

A home can satisfy needs for physical protection, sleep, privacy, predictability, temperature regulation, security of possessions, and social stability.

A relationship can satisfy connection, belonging, emotional regulation, mutual aid, identity, play, sexuality, meaning, or safety.

A psychoactive drug can satisfy or partially satisfy pain relief, threat reduction, energy, attention, sleep initiation, recreation, belonging, sensory exploration, appetite, emotional quiet, or escape from an intolerable physiological state.

The satisfier and the need must never be conceptually collapsed.

Let

$$N_i$$

denote a need and

$$X_j$$

a satisfier.

Usually,

$$N_i \neq X_j.$$

This distinction survives even when a satisfier becomes intensely important.

Someone saying

> "I need heroin"

may be accurately reporting an extremely powerful perceived need state. The proper need-based response is not dismissively:

> "No, you do not."

Instead the statement should be recursively unpacked.

It may contain actual or perceived shortfalls involving pain relief, autonomic regulation, withdrawal relief, emotional safety, comfort, predictability, escape from fear, relief from traumatic arousal, belonging, ritual, or other needs.

With physiological dependence, some of those shortfalls are genuinely being generated by drug absence.

The compressed conscious representation

may therefore contain considerable truth while still incompletely representing its own causal structure.

This is one of the central distinctions of NBTA:

A perceived need for a satisfier can contain valid need information without making the satisfier itself a funda

---

The Need Ecology

A being does not possess a single need.

It exists within a changing **need ecology**.

Let

$$F_i(t)$$

represent the actual fulfillment of need i at time t, and let

$$F_i^*(t)$$

represent a contextually appropriate viable or desirable fulfillment level.

A simple actual shortfall measure is

$$S_i(t) = \max[0, F_i^*(t) - F_i(t)].$$

The being's need state can therefore be represented as a vector:

$$\mathbf{F}(t) = [F_1(t), F_2(t), \dots, F_n(t)].$$

Needs are not independent. They form something more like a network or hypergraph.

Sleep supports attention, physical health, emotional regulation, patience, decision capacity, immune function, learning, memory, work performance, and relationships.

Housing supports safety, temperature regulation, hygiene, privacy, sleep, predictability, social inclusion, employment, treatment adherence, and many other needs.

Connection can support belonging, safety, regulation, information, identity, meaning, resource access, caregiving, and resilience.

This recursive structure closely parallels the foundationality term already present in Need-Based Morality, in which the moral importance of a need partly reflects how strongly its fulfillment enables other needs.

A psychoactive substance therefore rarely affects only one isolated variable. It changes a network.

Alcohol may improve perceived social ease while degrading later sleep.

A stimulant may improve wakefulness while degrading subsequent restoration.

An opioid may dramatically improve pain while creating respiratory danger.

Cannabis may improve nausea or appetite while impairing particular forms of short-term memory or attention.

The correct unit of evaluation is therefore the **whole need trajectory**, not the most conspicuous immediate effect.

Perceived Needs

Nervous systems do not possess perfect direct access to objective need states.

They estimate them.

Let

$$\hat{F}_i(t)$$

represent perceived fulfillment.

Then

$$\hat{S}_i(t) = \max[0, F_i^*(t) - \hat{F}_i(t)]$$

represents perceived shortfall.

The distinction between

$$F_i$$

and

$$\hat{F}_i$$

is foundational to the theory.

A person can feel warm while dangerously hypothermic.

A person can experience intense fear while objectively safe.

A person can fail to feel a bodily danger.

A person can temporarily stop feeling hungry without having obtained nutrition.

A person can feel profound belonging in a relationship that is objectively exploitative.

A person can experience severe withdrawal distress even when they intellectually understand that the distress was partly created by previous drug adaptation.

In every case, the emotional experience remains real.

The relevant distinction is:

Emotional reality does not imply infallible need-state estimation.

That proposition allows NBTA to take emotions seriously without treating them as omniscient.

Emotion as Need-State Change

The theory adopts a strong need-based account of emotion:

> **An emotion is an embodied response to one or more perceived actual, anticipated, remembered, imagined, or socially represented changes in need states.**

This extends the source framework's treatment of joy, anger, love, sadness, fear, and disgust as signals concerning changing needs.

The important word is **perceived**.

An emotion responds to the nervous system's current model of a change.

It does not require that the model be perfectly accurate.

Very schematically,

$$E_k(t) = \Phi_k \left[\Delta\hat{\mathbf{F}}, \Delta\hat{\mathbf{F}}_{anticipated}, \Delta\hat{\mathbf{F}}_{remembered}, M, C, A, U \right],$$

where M represents memory, C context, A perceived agency or attribution, and U uncertainty.

Fear is therefore not merely an unpleasant sensation. It is a response to perceived threatened deterioration of important needs such as safety, bodily integrity, predictability, or control.

Sadness responds to perceived loss or reduction of an important source of need fulfillment.

Anger responds to perceived obstruction, violation, injustice, loss of agency, or preventable frustration of important needs.

Loneliness responds to perceived insufficiency of connection.

Boredom responds to perceived insufficiency or stagnation in engagement, stimulation, challenge, novelty, meaning, or related needs.

Shame responds to perceived deterioration in belonging, acceptance, social standing, dignity, identity integrity, or self-evaluated adequacy.

Guilt responds to perceived responsibility for frustrating important needs and often mobilizes repair.

Relief registers a reduction in perceived need threat or shortfall.

Joy registers favorable movement in important need states.

Pride can register improving competence, agency, identity coherence, social contribution, or successful self-regulation.

Hope responds to an increasingly favorable predicted future need trajectory.

Despair responds to a predicted inability to obtain important need fulfillment.

Craving, in the theory developed below, is likewise an emotion.

No emotion is therefore intrinsically morally wrong.

A painful emotion is not an enemy merely because it hurts. The pain itself often exists because the represented need transition matters.

The proper question is not:

> "How do I eliminate this emotion?"

It is:

> **"Which perceived need changes are generating this emotion, which parts of that representation are accurate, which are incomplete or miscalibrated, and what response best serves the underlying needs?"**

Emotional Accuracy Is Multidimensional

It is misleading to classify emotions simply as “true” or “false.”

A fear response may correctly register that something has changed while overestimating the magnitude of danger.

A craving may correctly identify that a substance will rapidly reduce withdrawal while incorrectly representing it as the only possible path toward eventual well-being.

A shame response may correctly identify social rejection while incorrectly concluding that the person is fundamentally unworthy of belonging.

An emotion can therefore be decomposed into several distinct forms of accuracy.

The perceived **existence** of a change may be accurate.

The inferred **need identity** may be accurate or inaccurate.

The estimated **magnitude** may be calibrated or miscalibrated.

The predicted **time urgency** may be appropriate or distorted.

The perceived **cause** may be correct, partly correct, or truncated.

The predicted **satisfier** may genuinely work while being inferior to alternatives.

The predicted **exclusivity** of that satisfier may be wrong.

The estimated **foundationality** of the need may be excessive or insufficient.

The representation of effects on **other beings** may be incomplete.

This gives Need-Based Addiction Theory a much richer interpretation of craving than calling it “irrational.”

Memory as Need Regulation Across Time

Memory is not an optional addition to this theory.

It is one of its central regulatory mechanisms.

The need-based definition is:

> **Memory is retained, reconstructable information about prior perceived need states, changes in those states, their emotional significance, contexts, actions, satisfiers, and consequences, used to improve prediction and regulation of future needs.**

In its simplest functional form, memory answers:

What situation was I in?

What happened to my needs?

What emotions signaled those changes?

What did I do?

What happened afterward?

A remembered regulatory episode can be represented as

$$m_k = \{c_k, \widehat{\mathbf{F}}_{before}, \mathbf{E}_k, a_k, \widehat{\Delta\mathbf{F}}_k, \widehat{\mathbf{F}}_{after}, \tau_k, \alpha_k\},$$

where c_k is context, a_k is action or satisfier, τ_k is temporal structure, and α_k is attributed causation.

Memory helps the organism estimate something like

$$P(\Delta F_i | a, c).$$

That is:

> Given that I feel this way in this kind of situation, what action has previously changed things?

Memory is therefore fundamentally prospective even when its contents concern the past.

Its function is to let yesterday's need experience participate in tomorrow's need regulation.

Hence:

Memory is how yesterday's perceived needs participate in today's needs.

Emotion and Memory Form a Recursive System

Emotion influences memory because strong perceived need changes tell the nervous system that an event may matter later.

Memory influences emotion because remembered need transitions alter present predictions.

The basic recursion is

perceived need change → emotion → learning/memory → prediction → new emotion.

A frightening memory can generate fear now because it generates a present prediction of possible safety deterioration.

A memory of profound connection can generate warmth or longing because it reactivates representations of connection fulfillment or its absence.

A memory of an opioid terminating intense withdrawal can generate craving because the memory predicts a large favorable need transition.

Research on addiction increasingly treats drug-associated memories as important contributors to persistent drug seeking, and memory-reconsolidation research investigates whether retrieved drug memories can sometimes be modified. Current reviews also emphasize important boundary conditions and unresolved translational questions; this is not yet a general method for simply rewriting addiction memories.

The need-based theory therefore does not propose "erasing" memories. It proposes understanding and, where possible, **updating need-memory models**.

Memory Does Not Preserve Objective Reality Directly

The memory system records experienced and inferred need history, not omniscient causal truth.

A person may accurately remember:

> "Alcohol made that night easier."

Yet that memory may underrepresent alcohol's contribution to next-day anxiety, disrupted sleep, relational damage, or future dependence.

A person may accurately remember:

> "No one helped me except the drug."

That may represent a cognitive omission.

But it may also accurately describe an environment in which no adequate alternative satisfiers were available.

Need-Based Addiction Theory must never confuse those cases.

Memory distortion and **accurate memory of satisfier scarcity** are very different phenomena.

Need-Memory Asymmetry

Drugs can produce a distinctive learning asymmetry.

Suppose a person experiences:

$$\text{anxiety} \rightarrow \text{alcohol} \rightarrow \text{relief within minutes.}$$

The transition is close in time, repeated, salient, and easy to attribute.

Suppose the same alcohol contributes to:

$$\text{worse sleep tonight,}$$

$$\text{relationship damage over months,}$$

$$\text{health damage over years.}$$

These consequences may be gradual, probabilistic, causally diffuse, or separated from the drinking episode by substantial delay.

Thus the immediate benefit can be more easily learned, retrieved, and emotionally represented than the total delayed cost.

Call this:

$$\boxed{\text{need-memory asymmetry.}}$$

It explains how a person can possess strong autobiographical evidence that the substance "works" even when the complete need trajectory is unfavorable.

The remembered benefit is not necessarily imaginary.

It may simply be **causally and temporally incomplete**.

Need-to-Satisfier Memory Compression

Suppose someone repeatedly drinks when lonely.

They learn:

$$N_{\text{connection shortfall}} \to D.$$

They also drink when afraid:

$$N_{\text{safety/regulation shortfall}} \to D.$$

Then when bored:

$$N_{\text{engagement shortfall}} \to D.$$

Then when ashamed:

$$N_{\text{belonging/dignity shortfall}} \to D.$$

Repeatedly routing different need states through the same satisfier can eventually compress these distinctions:

$$\boxed{\text{bad internal state} \to D.}$$

Consciously this may appear simply as:

> "I need a drink."

The statement can represent several need-state changes compressed into one satisfier-oriented emotion.

NBTA calls this **need-to-satisfier memory compression**.

The reverse process is **need differentiation**.

Recovery may increasingly transform

I need the drug

into:

I am lonely

or

I need sleep

or

I am frightened

or

I am in withdrawal

or

I need stimulation

or

I need relief from pain.

Once the need is differentiated, the possible satisfier set expands.

The Need-Memory Attractor

Over years, thousands of episodes can accumulate.

A conflict retrieves the drug.

A celebration retrieves the drug.

A neighborhood retrieves the drug.

A bodily sensation retrieves the drug.

A person retrieves the drug.

A smell retrieves the drug.

Loneliness retrieves the drug.

Pain retrieves the drug.

Eventually many paths through autobiographical and associative memory converge upon the same satisfier:

$$m_1 \to D$$

$$m_2 \to D$$

$$m_3 \to D$$

$$\vdots$$

$$m_n \to D.$$

This is a **need-memory attractor**.

The substance is no longer supported by one belief or one association. It is supported by a dense network of remembered regulatory episodes.

That helps explain why intellectual education alone can be insufficient.

The person may already know perfectly well that the drug is harming them.

What they also know—through thousands of lived episodes—is that it reliably changes certain states.

Both forms of knowledge can coexist.

Alternative Need-Memory Density

Recovery creates a competing historical record.

Every episode of

$$\text{loneliness} \rightarrow \text{connection} \rightarrow \text{better}$$

adds evidence.

Every episode of

$$\text{craving} \rightarrow \text{time/support} \rightarrow \text{craving passes}$$

adds evidence.

Every episode of

$$\text{fear} \rightarrow \text{accurate safety response} \rightarrow \text{need restored}$$

adds evidence.

Every episode of

$$\text{pain} \rightarrow \text{effective alternative treatment} \rightarrow \text{relief}$$

adds evidence.

Call the growing body of successful alternative regulatory experience **alternative need-memory density**.

Recovery is partly the process by which

$$M_{\text{alternative}}$$

becomes rich enough, credible enough, and context-general enough to compete with

$$M_D.$$

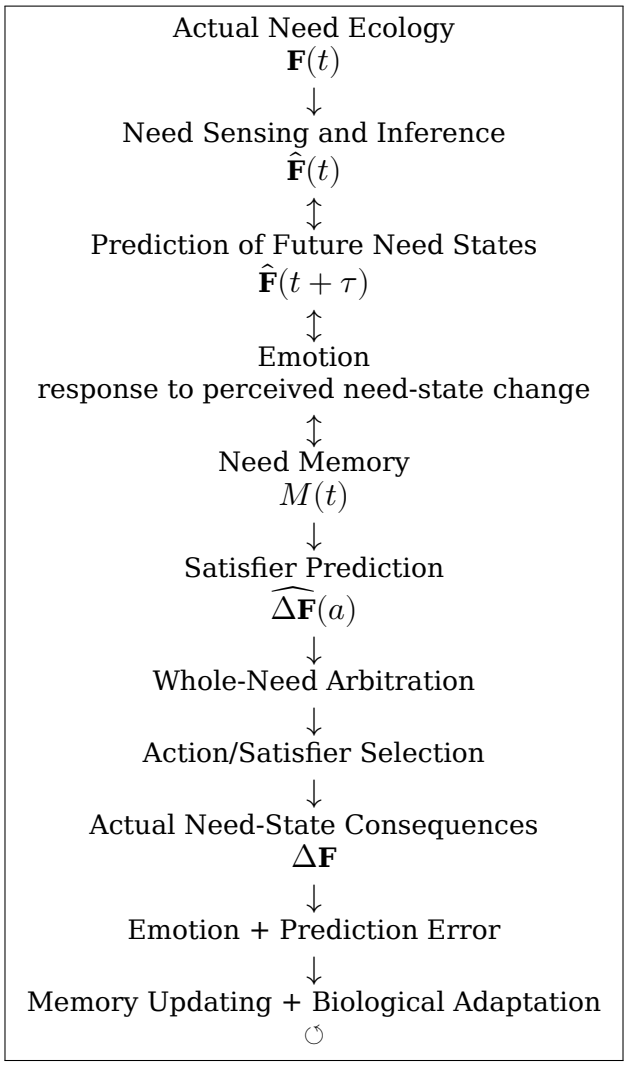
This suggests a profoundly different picture from permanent heroic resistance.

With sufficient new learning, the non-drug pathways themselves can become easier to retrieve.

Recovery can become recursively self-reinforcing.

The Need-Regulation Loop

The complete architecture can now be expressed as:



The entire loop operates inside a physical, relational, economic, cultural, and institutional environment that determines both needs and available satisfiers.

A psychoactive substance is unusually capable of influencing almost every stage.

It can alter actual need states.

It can alter need sensing.

It can alter emotions.

It can alter memory encoding and retrieval.

It can alter confidence in satisfier predictions.

It can alter attention and whole-need arbitration.

It can alter the biological baseline against which later needs are experienced.

And it can alter future learning about itself.

This is the recursive foundation of addiction.

From "Reward" to Need-State Improvement

Conventional addiction science frequently uses the term **reward**.

Need-Based Addiction Theory interprets the relevant functional content as:

> **an actual or perceived favorable change in one or more need states, or information predicting such a change.**

This is deliberately broader than pleasure.

Food can improve nutritional need states before conscious pleasure is considered.

Social approval can improve belonging.

Termination of withdrawal can improve regulatory stability.

A drug can reduce pain.

A medication can improve attention.

A gambling win can improve perceived resource acquisition while simultaneously creating a financially destructive long-run trajectory.

The conventional concept of reinforcement can similarly be translated.

Reinforcement becomes:

> learning that a state, action, or satisfier predicts improvement of a perceived need state or prevention of its deterioration.

Traditional **negative reinforcement** becomes especially straightforward:

$$\text{need threat/shortfall} \rightarrow a \rightarrow \text{shortfall decreases.}$$

The probability of selecting a in similar future states increases.

The term "negative" here does not mean morally bad. In need language, it is simply successful removal of a perceived unfavorable need state.

Need-Transition Learning

The organism continually learns:

$$P(\Delta F_i | a, c).$$

Suppose alcohol repeatedly reduces socially generated fear.

The person receives evidence:

$$\text{social threat emotion} \rightarrow \text{alcohol} \rightarrow \text{fear decreases.}$$

The immediate learning can be completely rational.

Suppose nicotine repeatedly removes nicotine-withdrawal irritability and concentration difficulty.

The person receives accurate short-horizon evidence:

$$\text{nicotine} \rightarrow \text{state improvement.}$$

Suppose an opioid terminates withdrawal.

Again:

$$D \rightarrow \text{major improvement.}$$

The problem is not necessarily that the nervous system learned incorrectly.

Often it learned a locally correct causal edge while incompletely representing the larger causal graph.

Need-Causal Truncation

This produces an important NBTA concept: **need-causal truncation**.

The remembered causal model may be:

$$D_t \rightarrow \text{relief.}$$

The fuller trajectory may be:

$$D_{t-1} \rightarrow \text{adaptation} \rightarrow \text{drug absence} \rightarrow \text{withdrawal} \rightarrow D_t \rightarrow \text{relief.}$$

The last edge is real.

But if it dominates representation while the preceding edges carry little emotional or memory weight, the person experiences:

> "The drug fixes my problem"

without equal moment-to-moment representation of:

> "Previous exposure is partly producing the problem the next dose fixes."

This is especially relevant to dependence-producing substances.

It does not make withdrawal suffering unreal.

Quite the opposite.

The withdrawal need state may be entirely real.

It simply has a recursively generated causal history.

Dependence as an Acquired Need State

Repeated substance exposure can change physiological regulation.

Allostatic and opponent-process accounts of addiction have long emphasized that repeated drug exposure can shift reward and stress-related systems so that later use increasingly removes an aversive state rather than merely adding pleasure. Koob's work describes a transition in which drug taking is increasingly driven by relief from withdrawal-related distress and what the conventional literature calls "negative affect."

NBTA translates the latter term into specific perceived need deterioration.

Initially:

$$D : F_i^{baseline} \rightarrow F_i^{improved}.$$

After sufficient adaptation:

$$\neg D : F_i^{adapted} \rightarrow F_i^{withdrawal}.$$

Then:

$$D : F_i^{withdrawal} \rightarrow F_i^{less\ withdrawal}.$$

The function of the drug has changed.

What originally produced surplus favorable change increasingly restores a drug-altered deficit.

Thus:

$$\boxed{\text{use} \rightarrow \text{adaptation} \rightarrow \text{absence shortfall} \rightarrow \text{emotion signaling shortfall} \rightarrow \text{use.}}$$

The perceived substance need becomes increasingly accurate at the immediate level because drug absence now genuinely worsens important states.

This yields a key proposition:

$$\boxed{\text{Addiction can transform a partially mistaken perceived need into a partially self-created real need state.}}$$

That does not make the drug a fundamental need.

It makes safe treatment of the acquired dependency morally important.

Dependence and addiction must nevertheless remain distinct.

A patient can become physiologically dependent on a medication without their entire need-regulation system becoming captured by it.

Conversely, gambling can produce powerful addiction-like capture without pharmacological withdrawal.

Therefore:

$$\boxed{\text{dependence} \neq \text{addiction.}}$$

Craving as a Need-Based Emotion

The mature definition is:

> **Craving is an emotion generated when current or anticipated need-state information activates a memory-supported prediction that a particular satisfier can produce an important favorable need-state transition, thereby mobilizing attention, physiology, memory retrieval, and action toward that satisfier.**

We can write:

$$C_D(t) = \Psi[\hat{\mathbf{S}}(t), M_D, \widehat{\Delta \mathbf{F}}_D, \pi_D, c_t, A_D].$$

Here $\hat{\mathbf{S}}$ represents perceived need shortfalls, M_D drug-related memory, $\widehat{\Delta \mathbf{F}}_D$ predicted improvement, π_D confidence, c_t context, and A_D acquired dependency.

Craving therefore contains meaningful information.

It generally says:

> "My system believes an important need-state improvement is available through this satisfier."

That is valuable information.

It does **not** prove that the satisfier is optimal.

It does not prove that it is unique.

It does not prove that its long-horizon effects are favorable.

It does not prove that the predicted shortfall is perfectly calibrated.

But the craving is not meaningless.

The correct need-based response to craving is therefore neither automatic obedience nor dismissal.

It is **interpretation**.

What need change is being represented?

What memory is being retrieved?

What does the drug genuinely provide?

What alternative satisfiers exist?

What time horizon is currently represented?

What relevant needs are absent from the current arbitration?

Wanting and Liking

Modern incentive-sensitization theory provides an especially important constraint on any addiction theory.

Robinson and Berridge distinguish incentive "wanting" from hedonic "liking" and argue that sensitized motivational responses to drug-related cues can become powerful even when corresponding pleasure does not increase and may diminish. Their 2025 thirty-year review continues to develop this distinction.

Need-Based Addiction Theory translates:

liking into positive emotional registration of perceived favorable need-state change;

wanting into satisfier-directed need mobilization.

Therefore:

$$\boxed{\text{satisfier-directed mobilization} \neq \text{experienced need fulfillment.}}$$

A person can strongly seek something they no longer greatly enjoy.

That is not paradoxical if memory, cue salience, predicted relief, physiological adaptation, and action mobilization have become partially dissociated from hedonic experience.

This is one reason NBTA does not define addiction as excessive pleasure.

Satisfier-Significance Sensitization

Drug-associated cues can acquire disproportionately strong motivational properties.

Need-Based Addiction Theory interprets this as **satisfier-significance sensitization**.

A bottle is no longer merely a visual object.

It represents:

$$\text{rapid relief}$$

or:

$$\text{belonging} + \text{ritual} + \text{relief} + \text{anticipated intoxication}.$$

A syringe can represent:

$$\text{end of withdrawal}.$$

A cigarette after conflict can represent:

$$\text{rapid regulatory transition}.$$

Thus:

$$\text{cue} \rightarrow \text{need-memory retrieval} \rightarrow \text{predicted need improvement} \rightarrow \text{craving}.$$

Incentive-sensitization research strongly supports the proposition that drug cues can acquire unusually powerful motivational salience, while NBTA interprets *why that matters* through a need-regulation framework.

Interoception as Internal Need Sensing

Interoception concerns the sensing and representation of internal bodily conditions.

NBTA interprets interoception as one major information stream through which the organism estimates bodily need states.

Internal information concerning pain, arousal, heart rate, breathing, gut state, temperature, fatigue, nausea, withdrawal, bodily tension, and related states informs:

$$\hat{\mathbf{F}}.$$

Contemporary work on substance-use disorders increasingly examines altered interoceptive processing within predictive-coding frameworks, in which the brain continuously predicts and updates representations of internal bodily states.

Need-Based Addiction Theory translates this into:

> The organism does not merely react to needs; it continuously infers them.

This matters because drugs can alter both the underlying bodily state and the system estimating that state.

Anticipated Needs

Need regulation is predictive.

Fear can arise before physical harm occurs because the system predicts deterioration of safety.

Hope can arise before improvement occurs because the system predicts better need fulfillment.

Craving can arise before withdrawal becomes severe because the system predicts:

$$\text{future shortfall} + D \rightarrow \text{future improvement}.$$

Thus:

$$\Delta \hat{F}_i^{anticipated}$$

can generate emotion now.

This is central to mature addiction.

The person need not currently be in catastrophic withdrawal.

A memory-supported prediction of future discomfort may be enough to produce present craving.

Satisfier Confidence

A satisfier competes not only on expected magnitude of benefit but on **predictability**.

Let

$$\pi_{ij}$$

represent confidence that satisfier j will change need i as expected.

A friend may or may not answer.

A new therapist may or may not help.

Finding stable housing may take months.

A relationship repair attempt may fail.

Alcohol, however, may have changed consciousness almost every previous time it was consumed.

Nicotine may rapidly alter withdrawal.

An opioid may rapidly terminate opioid withdrawal.

Therefore:

$$\pi_D$$

can become extremely high.

The drug may dominate not merely because its benefit is large, but because it is **reliably and rapidly obtainable**.

This creates another moral implication.

Sometimes improving addiction requires not simply teaching alternatives but making alternatives **reliably available**.

A satisfier that theoretically exists but cannot be accessed when needed is not functionally equivalent to one immediately available.

Satisfier Scarcity

Suppose one person possesses many reliable ways of regulating distress:

$$A(N) = \{X_1, X_2, \dots, X_{15}\}.$$

Suppose another has unstable housing, severe pain, little money, weak social support, unreliable healthcare, disrupted sleep, dangerous surroundings, and few safe recreational opportunities.

If a drug reliably changes the relevant state,

$$A(N) \approx \{D\}.$$

The second person's high drug centrality is not fully explained by a distorted brain.

Part of it exists objectively in the environment.

NBTA calls this **satisfier scarcity**.

This moves the theory beyond the skull.

The regulating system is:

$$\boxed{\text{body} + \text{brain} + \text{memory} + \text{relationships} + \text{environment} + \text{institutions} + \text{available satisfiers}.}$$

Research on recovery and social determinants likewise supports the importance of housing, employment, social support, treatment accessibility, violence exposure, and related environmental conditions in substance-use trajectories.

Need-Based Addiction Theory therefore rejects the idea that social conditions are merely "background factors."

They are components of the need-regulation system itself.

Stress as Need-Threat Load

The word *stress* can be translated more precisely.

> **Stress is coordinated mobilization produced when important needs are perceived as threatened, deteriorating, uncertain, or costly to protect.**

A rough need-threat load can be represented as

$$\Lambda(t) = \sum_i W_i \hat{S}_i U_i,$$

where W_i is perceived need importance and U_i includes uncertainty or threat.

Unstable housing, violence, chronic pain, social rejection, poverty, unpredictable employment, caregiving burden, and trauma reminders can all contribute to high need-threat load.

A substance that rapidly reduces the emotional experience of this load can become an extraordinarily competitive satisfier.

The substance may not solve the underlying problem.

But it may solve the immediate **experience** of the problem.

That distinction is central.

Trauma as Adapted Need Prediction

Trauma cannot be reduced to one mechanism, but a need-based component can be described as follows:

> **Traumatic adaptation includes persistent changes in need sensing, prediction, emotion, memory, action readiness, and relational expectation after experiences in which important needs were severely threatened, frustrated, violated, or made uncontrollable.**

The person may learn:

$$\text{vulnerability} \rightarrow \text{danger}$$

or

$$\text{people} \rightarrow \text{danger}$$

or

$$\text{bodily arousal} \rightarrow \text{threat}.$$

Fear, anger, shame, grief, vigilance, emotional numbing, or other emotional responses then reflect the predicted need implications of current or remembered conditions.

If a substance repeatedly changes those states:

$$\text{trauma-linked need signal} \rightarrow D \rightarrow \text{relief},$$

the drug can become embedded in regulation of trauma-associated memory.

The underlying action remains need-directed even when its later consequences become destructive.

Habit in Need-Based Terms

Habit is useful but should not define addiction.

A **habit** can be interpreted as a highly accessible, relatively low-deliberation need-regulation pathway created through repetition.

Instead of reconstructing:

$$\text{Which need is changing?} \rightarrow \text{Which satisfiers exist?} \rightarrow \text{Which trajectory is best?},$$

the system can use:

$$\text{cue/state} \rightarrow D.$$

This saves computational effort.

Most habits are adaptive.

Pathology arises when a cached pathway continues dominating after it ceases to serve the broader need ecology.

Importantly, evidence does not justify reducing all addiction to a simple transition from goal-directed action to habit. Addiction is heterogeneous, and human evidence for universal habit dominance remains mixed. NBTA therefore treats habit as one possible contributor to capture rather than its essence.

Whole-Need Arbitration

The conventional phrase **self-control** is often morally loaded and insufficiently precise.

NBTA replaces much of it with **whole-need arbitration**:

> **The capacity to maintain sufficiently broad representations of competing needs, satisfiers, beings, causal chains, memories, uncertainties, and time horizons so that they can influence action selection.**

This requires working memory, attention, planning, prediction, emotional interpretation, memory retrieval, access to alternatives, and the ability to delay locally dominant actions.

The key comparison is not:

$$\text{desire} \quad \text{versus} \quad \text{willpower}.$$

It is:

$$\boxed{\text{one strongly mobilized need-satisfier pathway} \quad \text{versus} \quad \text{the broader need ecology}.}$$

Someone can explicitly believe:

> "My health and family matter more than this drug"

while, during intense craving,

$$W_{\text{relief now}} \gg W_{\text{health later}}$$

at the level actually controlling action.

Their factual beliefs and momentary mobilizing weights are not identical.

Need-Horizon Compression

Human beings naturally give immediate outcomes more motivational weight than distant ones.

Addiction can intensify this problem.

Define an individual temporal weighting function:

$$\delta(\tau).$$

Need-horizon compression occurs when future need effects lose present motivational power unusually rapidly.

The person may intellectually know:

> "This could damage my liver in ten years."

But the future need state has little present emotional force relative to:

> "This can stop my withdrawal in ten minutes."

The knowledge is present.

The **need weight** is not equivalent.

This distinction helps explain why education about long-term consequences often fails to resolve addiction.

The problem may not be ignorance.

It may be a competition among differently represented time horizons.

Compulsion

NBTA defines compulsion as:

> **Repeated execution of a highly privileged need-regulation pathway despite concurrent representation of substantial competing need frustration, because that pathway repeatedly wins moment-to-moment whole-need arbitration.**

Compulsion therefore does not require believing the behavior is globally good.

A person can know it is harmful.

The relevant pathway can still have enormous mobilizing force.

Nor does compulsion imply absence of all agency.

Agency can be constrained, variable, scaffolded, strengthened, or weakened.

Need-System Capture

We can now state the central mechanism.

Normally a need has multiple possible satisfiers:

$$A(N_i) = \{X_1, X_2, \dots, X_k\}.$$

Addiction increasingly creates:

$$A(N_i) \to \{D\}$$

for multiple needs simultaneously.

At the same time, many contexts and memories increasingly map toward D.

Thus:

$$\{N_1, N_2, N_3, \dots\} \to D$$

and

$$\{M_1, M_2, M_3, \dots\} \to D.$$

The satisfier gains centrality in both the need network and memory network.

NBTA calls this **need-system capture**.

> **Need-system capture is a state in which one satisfier gains disproportionate control over the regulation of multiple needs, emotional responses, predictions, memories, attention, and actions, while the system becomes progressively less able to employ alternative pathways or adequately protect competing needs.**

High centrality alone is not sufficient for addiction.

A parent may devote extraordinary resources to a child.

A scientist may devote enormous attention to research.

A musician may practice for many hours.

Those patterns can be highly central while producing broad net need fulfillment.

The pathological element is not intensity.

It is **capture plus substantial preventable broader need frustration**.

Formal Working Definition of Addiction

The full working definition is:

> **Addiction is a persistent, recursively self-reinforcing capture of a being's need-regulation and need-memory systems by a particular satisfier or satisfier class. Through repeated need-state effects, emotionally weighted learning, memory convergence, cue retrieval, prediction, biological adaptation, and environmental selection, the satisfier becomes disproportionately central to regulating one**

or more needs. Addiction becomes increasingly harmful when this pathway repeatedly dominates whole-need arbitration despite substantial preventable frustration of other important needs across the person, other affected beings, and longer timescales.

The compact definition is:

Addiction is maladaptive recursive capture of need regulation and need memory by a satisfier.

Here **maladaptive** must never mean socially disapproved.

It means:

> the trajectory produces more preventable frustration of important needs than realistically available alternatives.

The Recursive Heart of Addiction

The most important causal statement is:

Addiction occurs when a satisfier repeatedly changes needs, emotions, and memories in ways that

In abbreviated form:

$$D_t \to \Delta F_t \to E_t \to M_{t+1} \to \hat{Q}_{D,t+1} \to C_{D,t+1} \to D_{t+1}.$$

Repeated exposure can additionally change biology:

$$D_t \to A_{t+1},$$

where A represents adaptation/dependence.

Now the substance modifies the conditions under which its next dose will be evaluated.

That is the recursion.

The system making tomorrow's decision is no longer identical to the one that made yesterday's.

A Multidimensional Capture Profile

NBTA does not presently reduce addiction to one numerical score.

A more defensible beginning is a multidimensional profile:

$$\mathbf{z}_D = (C, X, M, Q, A, H, K, S, R; G, B).$$

Here C denotes need centrality: how many important needs are routed through the satisfier. X denotes satisfier exclusivity: how uniquely necessary it appears. M denotes need-memory convergence: how much regulatory memory points toward it. Q denotes cue retrieval power. A denotes acquired dependence. H denotes need-horizon compression. K denotes calibration error in need

states or causal expectations. S denotes satisfier scarcity. R denotes restriction of whole-need arbitration. G denotes genuine need benefit produced by the substance. B denotes broader need burden produced by the overall trajectory.

This last pair is crucial.

A theory that measures only harms will misunderstand why the substance remains important.

$$G_D$$

can be large.

A drug may genuinely provide pain relief, sleep initiation, social belonging, appetite, relief from trauma-related arousal, concentration, energy, recreation, or withdrawal relief.

Any intervention that removes D without accounting for G_D risks worsening the person's actual need state.

The fundamental treatment question therefore becomes:

What genuine need fulfillment would removing this substance take away, and how will those needs be met in

---

Perceived Regulatory Value and Moral Value

Behavioral selection and moral evaluation must remain distinct.

The nervous system acts on perceived regulatory value.

A simplified internal action-value function might be:

$$\hat{V}(a,t) = \sum_i \int \hat{W}_i(t,\tau)\, \pi_{ia}\, \widehat{\Delta F}_{ia}(\tau)\, \delta_{person}(\tau)\, d\tau.$$

Here $\hat{W}_i$ is the momentary perceived importance of need i, π_{ia} confidence that action a will help it, $\widehat{\Delta F}_{ia}$ the predicted need change, and δ_{person} temporal weighting.

This predicts behavior.

It does not define morality.

Need-Based Moral Value instead evaluates actual expected effects across relevant beings, incorporating causal confidence, urgency and foundationality, dependency, reach, persistence, fairness, and time.

Thus one can have:

$$\hat{V}(D,t) > \hat{V}(A,t)$$

while:

$$MV(A) > MV(D).$$

This is the **need-alignment problem**.

The action with greatest momentary perceived regulatory value is not necessarily the action with greatest whole-system moral value.

Substance Classes Through a Need-Based Lens

Alcohol commonly functions as a satisfier for social ease, reduced perceived threat, respite, play, ritual, belonging, sleep attempts, or emotional quiet. Acute intoxication can reduce inhibition and impair judgment and memory, meaning that real competing needs such as safety, future welfare, fidelity, or another person's consent can lose representational strength even though those needs have not objectively become less important. With dependence, alcohol absence can itself produce severe need deterioration. Abrupt withdrawal from substantial alcohol dependence can be medically dangerous; the need-based framework therefore strongly favors safe medical management rather than treating withdrawal suffering as something a person should simply endure.

Nicotine often functions through alertness, attentional regulation, ritual, social belonging, pause-taking, or relief from nicotine withdrawal. Repeated exposure creates an especially dense ecology of cues because dosing may occur many times each day in recurring contexts. The resulting withdrawal can include craving, irritability, and concentration difficulty, making nicotine appear—and in the immediate withdrawal context actually become—a highly effective regulator. This is almost a model case of a satisfier that partly creates the shortfall it later relieves.

Cannabis can function through relaxation, sensory engagement, appetite, nausea relief, sleep attempts, pain relief, emotional quiet, exploration, or play. THC can alter memory, salience, attention, time perception, and emotional interpretation. Some dependent users experience craving, irritability, nervousness, sleep disruption, appetite changes, or restlessness during withdrawal. These are not merely "bad feelings"; in NBTA they are embodied responses to deteriorating perceived regulation and need states.

Opioids can be exceptionally powerful satisfiers because severe pain itself represents an urgent threat to bodily well-being and function. Opioids can dramatically reduce pain and emotional distress. With dependence, however, withdrawal creates profound genuine shortfalls, while overdose threatens respiration and survival. The unusually large transition

$$\text{severe withdrawal/pain} \rightarrow \text{rapid relief}$$

can provide extremely powerful need-memory evidence.

Stimulants such as cocaine and methamphetamine may become linked to energy, wakefulness, competence, engagement, confidence, sexuality, performance, or sustained activity. They can increase the perceived significance of current goals while hunger, fatigue, sleep, or longer-term bodily needs lose immediate motivational strength. A subsequent crash can generate fatigue, low motivation, or reduced ability to experience ordinary fulfillment, making redosing comparatively attractive.

Benzodiazepines and other sedatives can strongly reduce fear and anxiety—that is, reduce emotional responses representing perceived threats to safety, predictability, control, or related needs. If the danger estimate was exaggerated, this may improve regulation. If real danger exists, the same reduction can underweight useful safety signals. Repeated use can generate dependence, and abrupt withdrawal from substantial benzodiazepine dependence can be medically dangerous. Their memory-impairing properties also raise the possibility of asymmetric learning in which immediate relief is strongly represented while some competing consequences are poorly encoded.

Classic psychedelics present a different architecture. They can alter perceived meaning, salience, self-other boundaries, memory, emotional processing, and need interpretation without usually producing the same withdrawal-based capture architecture characteristic of nicotine, alcohol, sedatives, or opioids. A psychedelic experience may expose a genuine hidden need—such as connection—while simultaneously attaching an inaccurate explanation to it. NBTA therefore separates:

the need-state insight

from

the interpretation explaining the insight.

An experience can contain a useful emotional signal without making every conclusion drawn during it true.

Polysubstance Use as a Need-Regulation Portfolio

Polysubstance use becomes particularly understandable under NBTA.

Different substances may occupy different regulatory functions:

$$D_1 \to N_{\text{energy}},$$

$$D_2 \to N_{\text{calm}},$$

$$D_3 \to N_{\text{sleep}},$$

$$D_4 \to N_{\text{social ease}}.$$

One substance may also be used to correct another substance's effects.

This predicts **function substitution**.

If one substance is removed while the need it served remains unresolved, another satisfier capable of producing a similar transition may become more central.

Therefore merely stopping one drug does not guarantee the underlying need-regulation architecture has changed.

Autonomy

Need-Based Addiction Theory defines autonomy as:

> **A being's effective capacity to participate in shaping how its needs are understood, prioritized, and met across meaningful time horizons.**

Autonomy is therefore not equivalent to absence of external restraint.

It depends on access to information, working memory, sufficiently accurate need perception, future representation, alternatives, freedom from coercion, relevant capacities, and some practical ability to act.

Addiction can restrict autonomy by narrowing satisfier alternatives, compressing the represented future, amplifying cue-driven pathways, creating dependence, and repeatedly allowing one pathway to dominate whole-need arbitration.

Yet drug use does not necessarily decrease autonomy.

Adequate analgesia may restore autonomy to someone incapacitated by pain.

Medication for opioid use disorder may greatly expand autonomy by reducing withdrawal and uncontrolled illicit-drug seeking.

Treating severe anxiety can increase participation in relationships or work.

Autonomy must therefore be evaluated as a need outcome, not inferred from whether psychoactive substances are present.

Responsibility Without Condemnation

Need-Based Morality permits a more useful concept of responsibility than moral blame.

Causation, capacity, responsibility, and condemnation are not the same thing.

Someone may have caused harm while having substantially constrained capacity at the time.

Someone else may not have caused the original problem but may presently have exceptional ability to prevent further harm.

A forward-looking need-based concept of responsibility asks:

> **Who now has what capacity to prevent, reduce, or repair which need frustrations?**

Responsibility should therefore consider causal contribution, foreseeability, knowledge, available alternatives, dependency, coercion, and capacity.

This does not erase accountability.

It makes accountability functional.

If a person intoxicated by alcohol endangers others, those others' safety needs remain fully real.

The user's need for relief cannot cancel another person's need for consent, bodily integrity, property, trust, or survival.

Need-Based Morality therefore supports firm boundaries where they protect high-priority needs.

Compassion and protection are not opposites.

Addiction Does Not Eliminate Agency

Calling addiction a fully involuntary process creates another problem: agency itself is an important need and capacity.

People with addiction routinely delay use, avoid cues, seek help, protect others, change environments, take medications, develop alternative routines, and recover.

The better formulation is:

agency can be constrained, biased, context-dependent, scaffolded, strengthened, or weakened.

Treatment should therefore increase **usable agency**, not merely demand that a person exercise capacities that the present need-regulation system cannot reliably mobilize.

Treatment as Need-System Reconstruction

The first need-based treatment question is not:

> "Why won't you stop?"

It is:

What important needs is this substance currently helping to regulate?

That inquiry changes the structure of treatment.

If the drug regulates withdrawal, treat withdrawal.

If it regulates pain, treat pain.

If it regulates loneliness, increasing real connection matters.

If it regulates danger generated by unstable housing, housing matters.

If it regulates traumatic need-threat responses, those need predictions and memories matter.

If it supplies social belonging, simply removing the substance may also remove a social world.

If it supplies play or stimulation, a life containing nothing but deprivation is not a sufficient replacement.

Treatment becomes **need-system reconstruction**.

This includes improving immediate biological safety; stabilizing acquired dependency; identifying underlying needs; interpreting emotions as need-state information; differentiating compressed need states; identifying memories and contexts that retrieve the substance pathway; expanding truncated causal models; creating reliable alternative satisfiers; generating successful alternative memories; increasing whole-need arbitration; repairing structural deficits such as housing or healthcare; and building autobiographical evidence of personal agency.

These are not separate philosophical goals.

They are different parts of one regulatory system.

Medication as Need Stabilization

Medication fits comfortably within this framework.

Medication can lower acquired shortfall enough for the rest of the system to reorganize.

For opioid use disorder, methadone and buprenorphine are established treatments, and real-world studies continue to associate access to medications for opioid use disorder with improved treatment engagement and reductions in fatal overdose.

From a need perspective:

$$F_{\text{withdrawal regulation}} \uparrow,$$

$$F_{\text{survival safety}} \uparrow,$$

$$F_{\text{predictability}} \uparrow,$$

while chaotic need-state oscillation can decrease.

Physiological dependence on medication therefore cannot by itself show treatment failure.

Dependence is one property of the need system.

The morally relevant question is the whole need trajectory.

Behavioral Treatment and New Need Evidence

Contingency-management approaches are particularly interesting because they create reliable, short-horizon favorable consequences for behaviors compatible with recovery.

Need-Based Addiction Theory interprets this as changing the competitive action landscape.

Instead of:

$$D \rightarrow \text{highly reliable favorable transition},$$

the person begins receiving repeated evidence that:

$$A \rightarrow \text{favorable transition}.$$

Each successful episode also becomes a memory.

Thus intervention changes both present value and future need-memory.

This may be one reason behavioral reinforcement approaches can have substantial effects in stimulant-use disorders.

Structural Intervention Is Addiction Treatment

If housing instability produces deteriorating:

$$F_{\text{safety}}, F_{\text{sleep}}, F_{\text{predictability}}, F_{\text{privacy}}, F_{\text{hygiene}}, F_{\text{agency}},$$

then housing is not merely “social context.”

Housing is direct need fulfillment.

Likewise, employment can supply income, structure, agency, identity, belonging, and future predictability.

Healthcare can reduce untreated pain.

Social connection can supply belonging and regulation.

These can directly alter the relative need-value of a drug.

Recovery-capital research likewise treats resources in the person, family, social network, and community as important to sustained recovery, though exact definitions and measurements remain an active research area.

Need-Based Addiction Theory offers a unified interpretation:

> recovery capital consists largely of accessible capacities, relationships, environments, memories, and resources capable of sustainably satisfying needs.

Harm Reduction

Need-Based Morality makes harm reduction conceptually straightforward.

Suppose an intervention leaves some drug use unchanged while reducing:

$$\text{overdose},$$

$$\text{infectious disease},$$

$$\text{dangerous withdrawal},$$

$$\text{housing loss},$$

or:

$$\text{isolation}.$$

Those are real need improvements.

The intervention has moral value even if abstinence has not occurred.

This does not imply that remaining drug-related harms should be ignored.

It means that all meaningful need improvement counts.

The relevant moral metric is not purity.

It is need fulfillment.

Recovery

NBTA defines recovery as:

> **The progressive restoration or construction of a more accurate, diverse, resilient, autonomous, and sustainable need-regulation and need-memory ecology.**

Recovery therefore tends toward:

$$F_{\text{important needs}} \uparrow,$$

$$|\hat{F} - F| \downarrow,$$

$$\text{satisfier diversity} \uparrow,$$

$$\text{need differentiation} \uparrow,$$

$$\text{alternative need-memory density} \uparrow,$$

$$\text{whole-need arbitration} \uparrow,$$

$$\text{agency} \uparrow,$$

while:

$$\text{drug centrality} \downarrow,$$

$$\text{satisfier exclusivity} \downarrow,$$

$$\text{need-memory convergence on the drug} \downarrow,$$

$$\text{broader preventable need burden} \downarrow .$$

Abstinence may be the best route to that state for many people and substances.

For others, medication, substitution, moderation, or harm-reduction trajectories may produce greater total sustainable need fulfillment.

The theory itself cannot decide the answer in advance.

It requires evidence about actual outcomes.

Recovery Is New Need History

This may be the most important practical implication of the memory model.

Recovery is not merely:

> “Do not perform an old behavior.”

It is the accumulation of lived evidence:

> “I can survive this state.”
>
> “This emotion tells me something useful.”
>
> “I can identify the underlying need.”
>
> “I have another way to meet it.”
>
> “I can ask for help.”
>
> “People sometimes respond.”
>
> “Craving can change without being obeyed.”
>
> “My actions can improve my state.”
>
> “My future is not inaccessible.”

These become memories.

Those memories alter prediction.

Prediction alters emotion.

Emotion alters action.

Action creates new outcomes.

Thus:

$$A_t \to \Delta F_t^{favorable} \to E_t \to M_{alt,t+1} \to \widehat{Q}_{alt,t+1} \to P(A_{t+1}) \uparrow .$$

Recovery therefore has the same recursive form as addiction—but with increasingly diversified and sustainable need fulfillment.

Addiction is not the only attractor. Recovery can become an attractor too.

Recurrence

The term *relapse* can imply total failure.

Need-Based Addiction Theory prefers understanding recurrence as:

> **re-emergence of a previously dominant need-regulation pathway under a particular configuration of needs, emotions, memories, cues, satisfiers, and capacities.**

Old memory is not necessarily erased by recovery.

A severe loss, old environment, pain episode, social reunion, sleep deprivation, or other state can make an older pathway temporarily more retrievable.

This does not mean the newer learning disappeared.

The useful questions become:

What need changed?

Which emotion represented that change?

Which old memory was retrieved?

What did the drug promise?

Which alternative was inaccessible?

Which need disappeared from whole-need arbitration?

What new information can this episode contribute?

Recurrence then becomes information for updating the regulatory model rather than proof of personal worthlessness.

Shame after recurrence is itself an emotion representing threatened belonging, dignity, identity, or acceptance. If shame then retrieves an old drug pathway, condemnation can inadvertently strengthen the very cycle it is intended to interrupt.

Prevention

Prevention should not be reduced to increasing fear of drugs.

Fear itself is a need-threat response.

A more comprehensive preventive strategy develops **need literacy**: the ability to identify changing needs; **emotion literacy**: the ability to interpret emotions as information about those changes; **satisfier differentiation**: understanding that a preferred satisfier is not identical to

the need itself; **causal literacy**: recognizing both immediate effects and recursive long-horizon loops; **memory literacy**: understanding that vivid immediate benefits may be more retrievable than diffuse delayed costs; **satisfier diversity**: maintaining multiple reliable routes to important needs; and **structural fulfillment**: reducing chronic deficits in housing, safety, healthcare, belonging, agency, meaningful activity, and related needs.

This generates a general prevention hypothesis:

The richer and more reliable the need-satisfaction ecology, the harder it should be for one satisfier to captur

---

Operationalizing Need-System Capture

The theory must eventually become measurable.

One candidate measure is **Need-Regulation Concentration**.

For need i, let

$$p_{ij} = P(\text{select satisfier } j | N_i).$$

Then:

$$NRC_i = \sum_j p_{ij}^2.$$

If regulation is diversified across many satisfiers, NRC_i is relatively low.

If almost every episode routes to one satisfier:

$$NRC_i \to 1.$$

A substance-specific centrality measure might be:

$$C_D = \sum_i \omega_i p_{iD},$$

where ω_i weights the importance of the underlying needs.

A complementary satisfier-diversity measure can use entropy:

$$H_i = -\sum_j p_{ij} \ln p_{ij},$$

with effective satisfier count

$$D_i = e^{H_i}.$$

This provides an empirical way to ask whether regulatory diversity predicts resilience.

Measuring Need-Memory Convergence

A corresponding memory measure can estimate how frequently spontaneously retrieved regulatory memories support a particular satisfier.

Let m_k denote a retrieved memory and L_k its need salience.

Then:

$$M_D = \frac{\sum_k L_k I(m_k \to D)}{\sum_k L_k}.$$

High M_D means a large proportion of accessible, need-relevant autobiographical evidence points toward the drug.

The theory predicts that, all else equal,

$$M_D \uparrow$$

should predict greater cue- and emotion-triggered craving.

This can be tested experimentally.

Measuring Need Differentiation

Another proposed variable is **need differentiation**.

A person can be asked to identify the underlying need changes associated with episodes of craving.

Low differentiation produces representations such as:

> "I just feel bad and want to use."

Higher differentiation produces:

> "I am exhausted, lonely, socially threatened, and beginning opioid withdrawal; the loneliness and withdrawal are currently strongest."

The theory predicts that greater differentiation should increase the probability of selecting functionally matched alternative satisfiers.

This parallels findings in emotion-differentiation research but makes the underlying theoretical object the need state rather than emotion labels alone.

Testable Predictions

The framework makes several empirical commitments rather than merely redescribing known phenomena.

First, similarity between a person's current need-state profile and their need-state profile before previous substance use should predict craving beyond generic measures such as "bad mood."

Second, greater need-memory convergence on a drug should predict stronger emotion-triggered and cue-triggered craving.

Third, greater effective satisfier diversity for important needs should predict lower vulnerability to recurrence, controlling for drug severity and physiological dependence.

Fourth, need differentiation should predict more adaptive selection among alternative satisfiers.

Fifth, alternative need-memory density should predict regulatory resilience beyond factual knowledge about drug harms.

Sixth, immediate drug-benefit memories should, in at least some addiction phenotypes, be more rapidly retrievable or emotionally vivid than temporally diffuse long-run cost memories.

Seventh, pharmacological treatment that rapidly reduces withdrawal should decrease the acquired-dependency component of addiction faster than it decreases cue-memory convergence; this predicts measurable dissociation between withdrawal relief and persistent cue craving.

Eighth, reflective need weights and momentary mobilizing need weights should diverge during intense craving. People may continue explicitly reporting that family and health are more important while their immediate action system gives greater weight to rapid relief.

Ninth, direct structural fulfillment of a previously unmet need should reduce the centrality of drugs that served that function even when the intervention never attempts to change the person's beliefs about drugs.

Tenth, different drugs and individuals should exhibit distinguishable capture profiles rather than one universal "addiction mechanism."

Eleventh, when a substance is removed without replacing its need function, migration toward functionally similar satisfiers should be more likely.

Twelfth, clinical approaches that validate emotions and cravings as need information while examining their calibration should improve need identification and perhaps treatment engagement relative to approaches that frame the same emotional experiences simply as irrational impulses to suppress.

These propositions are empirically vulnerable, as a useful theory should be.

What Would Weaken the Theory?

NBTA would be substantially weakened if independently measured need states consistently failed to improve prediction of craving or recurrence over simpler existing constructs.

It would be weakened if satisfier diversity showed no relationship to regulatory resilience.

It would be weakened if need-memory convergence had little relationship to cue or emotional reactivity.

It would be weakened if improving objective need conditions—such as pain, housing, safety, or reliable social support—systematically failed to change the regulatory centrality of substances serving those functions.

It would be weakened if emotion-specific need representations proved less useful than simpler valence or reward models.

It would be weakened if addiction were eventually shown to be adequately explained by one mechanism bearing little relationship to need regulation.

Most importantly, it would fail scientifically if "need" were allowed to become a circular explanation.

Avoiding Circularity

The statement:

> “People use drugs because they need to”

is not a theory.

Nor is:

> “Whatever someone repeatedly wants must be a need.”

Needs must be defined independently of the satisfier used to infer them.

Evidence for a proposed need should come from converging sources such as physiological requirements, deprivation effects, developmental evidence, behavioral regularities, self-report, social-functioning evidence, impairment when the condition is absent, and improvement produced by multiple independent satisfiers.

Therefore:

drug use cannot itself prove the existence of a drug need.

Likewise, one emotion cannot uniquely identify one need.

Fear can arise from many threatened needs.

Anger can arise from many forms of perceived obstruction.

Sadness can concern many losses.

The appropriate relationship is probabilistic:

$$P(N_i|E_k, c, M),$$

not:

$$E_k = N_i.$$

This preserves the principle that all emotions are responses to perceived need changes without forcing a simplistic one-emotion/one-need mapping.

Biology Is Not Replaced

Need-Based Addiction Theory is an integrative level of explanation, not an alternative to pharmacology or neuroscience.

Receptor binding matters.

Dose matters.

Route of administration matters.

Metabolism matters.

Genetics matters.

Neuroplasticity matters.

Organ toxicity matters.

Respiratory depression matters.

Withdrawal physiology matters.

The need framework explains why these biological facts matter **to a living being** and how they participate in perception, emotion, memory, action, and morality.

A complete explanation can simultaneously say:

> "This drug activates these receptors and changes these circuits"

and:

> "Those changes reduce a perceived need shortfall, create an emotionally salient memory, and increase the future centrality of the drug as a satisfier."

The descriptions operate at different but compatible levels.

Relation to Existing Addiction Science

NBTA should not claim that existing addiction research has already proven the proposed framework.

Rather, several major findings constrain and motivate it.

Incentive-sensitization provides strong reason to distinguish satisfier-directed "wanting" from hedonic "liking."

Allostatic and negative-reinforcement models provide evidence that repeated drug exposure can create worsening baseline or withdrawal-related states so that later use increasingly removes suffering rather than merely producing pleasure.

Interoception research supports treating internal bodily-state estimation and predictive inference as relevant to craving and substance-use disorders.

Memory-reconsolidation research supports treating drug memories as active contributors to later motivation while also warning that memory modification is context-dependent and incomplete.

Recovery-capital and social-determinants research supports expanding the unit of explanation beyond neural circuitry to include social relationships, housing, resources, and accessible opportunities.

What is new in NBTA is the proposal that these apparently different mechanisms can be described as changes within a common need-regulation architecture.

Scope and Public-Health Relevance

The theory concerns a highly heterogeneous population.

According to the 2025 U.S. National Survey on Drug Use and Health, approximately 44.6 million people aged 12 or older—15.3% of that population—met criteria for a past-year substance-use disorder. This included 25.7 million people with alcohol use disorder and 26.0 million with a drug use disorder, with overlap between those groups.

Any adequate theory therefore has to explain enormous diversity.

Some people have severe physiological dependence.

Some have strong cue-driven craving with modest withdrawal.

Some use principally for pain.

Some use for belonging.

Some use primarily to suppress trauma-related need-threat signals.

Some use for energy or performance.

Some experience substantial pleasure.

Others continue long after pleasure has diminished.

Some live in rich environments containing many alternative satisfiers.

Others live in environments where the substance may genuinely be one of the most reliable available regulators.

A theory that explains only one of those trajectories cannot be a general theory of addiction.

The Moral Consequence of Dependency

Need-Based Morality creates a particularly important reversal.

Dependency does not reduce someone's moral worth.

If dependency makes someone unable to independently satisfy an urgent need, the dependency term in the moral framework can actually increase the priority of appropriate assistance. The source equation explicitly assigns greater weight where a being cannot independently supply a needed condition.

Thus a person experiencing severe withdrawal is not morally discredited by the fact that the withdrawal resulted partly from earlier behavior.

Their present suffering exists.

Their physiological needs exist.

The relevant moral problem is how to safely meet those needs while reducing recursive causes of future shortfall.

This supports treatment over abandonment.

Why Punishment Can Become Recursively Counterproductive

Suppose punishment for substance use causes:

$$F_{\text{housing}} \downarrow,$$

$$F_{\text{employment}} \downarrow,$$

$$F_{\text{belonging}} \downarrow,$$

$$F_{\text{dignity}} \downarrow,$$

$$F_{\text{predictability}} \downarrow .$$

Those deteriorations generate emotions because they are perceived need-state changes.

Fear can increase because safety and predictability have worsened.

Sadness can increase because sources of support have been lost.

Anger can increase because needs are perceived as obstructed or unfairly frustrated.

Shame can increase because belonging and social worth appear threatened.

If the person's memory system already contains:

$$\text{fear/sadness/anger/shame} \rightarrow D \rightarrow \text{relief},$$

punishment can increase retrieval of the drug pathway.

This does not mean consequences and boundaries are never necessary.

It means that consequences should be evaluated according to what they actually do to needs.

A policy that creates more of the states driving substance regulation may be self-defeating even if its intention is deterrence.

A Need-Based View of Stigma

Stigma is especially problematic because addiction often already contains a need-memory network linking distress to substance use.

Stigma can deteriorate belonging, dignity, safety, trust, employment, and healthcare access.

The resulting emotional responses are not irrational obstacles.

They are signals that important needs have worsened.

A system that then interprets the resulting distress as evidence of personal moral deficiency can create a second-order loop:

$$\text{addiction} \rightarrow \text{stigma} \rightarrow \text{need frustration} \rightarrow \text{emotion} \rightarrow \text{drug-memory retrieval} \rightarrow \text{craving}.$$

A need-based approach therefore aims to reduce harmful behavior without needlessly damaging the very conditions required for successful regulation.

Emotional Validation Without Emotional Infallibility

The theory's emotional stance can be summarized as:

$$\boxed{\text{validate the signal; investigate the model.}}$$

If someone is afraid, the fear is real and is signaling a perceived threat to needs.

Investigate the threat.

If someone is ashamed, the shame is real and is signaling perceived deterioration in belonging, dignity, identity, or related needs.

Investigate those needs.

If someone is craving heroin, the craving is real and is signaling a remembered opportunity to improve an important state.

Investigate the state, the memory, and the alternatives.

This is different from both extremes:

> “Your feelings are always factually correct.”

and:

> “Your feelings are irrational noise.”

All emotions generally perform useful regulatory work because they represent perceived changes in needs.

Their usefulness does not require perfect correspondence to reality.

The Deepest Need-Based Interpretation of Addiction

The ordinary view sometimes portrays addiction as an alien force invading an otherwise rational person.

NBTA instead treats addiction as something that emerges from ordinary adaptive capacities.

The organism should remember what relieved suffering.

It should seek reliable satisfiers.

It should learn from large state improvements.

It should anticipate future shortfalls.

It should react strongly to threats.

It should automate frequently successful responses.

It should adapt physiologically to repeated conditions.

It should give urgent needs greater motivational priority.

Every one of those functions is ordinarily useful.

Addiction can arise when they recursively converge upon one unusually powerful satisfier.

Thus addiction is not necessarily the failure of need regulation.

It can be the **pathological success of locally useful need-regulation mechanisms operating inside an increasingly distorted or impoverished larger system**.

The system learns something true:

> “This works.”

But increasingly fails to represent the fuller proposition:

> “This works for this need, over this timescale, under these conditions, while affecting all of these other needs, and alternatives may exist.”

That may be the conceptual heart of the theory.

The Deepest Need-Based Interpretation of Recovery

Recovery is not war against desire.

It is not the defeat of emotion.

It is not the deletion of memory.

It is not obedience to abstinence as an intrinsic moral law.

Recovery is increasing sophistication of need regulation.

It means becoming better able to perceive what is actually changing.

It means treating emotions as information.

It means identifying the need beneath the compressed satisfier representation.

It means expanding the satisfier set.

It means creating environments in which better satisfiers are genuinely accessible.

It means accumulating lived memories that other pathways work.

It means accurately incorporating the substance's real benefits and real costs.

It means extending the represented time horizon.

It means protecting other people's needs.

It means strengthening agency by increasing effective options.

It means changing physiology safely when dependence exists.

It means building enough favorable need history that tomorrow's nervous system has different evidence from yesterday's.

The recursive recovery process is therefore:

better need recognition → better satisfier selection → better need outcome → emotion registering improve

The process can compound.

Conclusion

Need-Based Addiction Theory begins with neither drugs nor disease.

It begins with a living being that has needs.

The being must continually estimate those needs, anticipate how they may change, experience emotions in response to perceived changes, remember what previously happened, identify possible satisfiers, select actions, and learn from the consequences.

Psychoactive substances enter this ordinary need-regulation system as unusually potent satisfiers.

They can genuinely meet needs.

They can conceal needs.

They can alter perceived needs.

They can change emotions that represent need-state transitions.

They can create powerful memories of relief or fulfillment.

They can acquire extremely high satisfier confidence.

They can become linked to many internal and external cues.

They can change the biological baseline until their absence creates new genuine shortfalls.

They can compress many distinct needs into the conscious representation:

I need the drug.

And they can change the organism that will evaluate the next opportunity to use them.

This produces the central recursive loop:

need → emotion → memory → satisfier prediction → drug use → changed need state → emotion → update

Addiction emerges when that loop increasingly captures the need-regulation system while producing substantial preventable frustration of other important needs.

The proposed concise definition is therefore:

Addiction is maladaptive recursive capture of need regulation and need memory by a satisfier.

Yet the same recursive principles permit recovery.

Alternative satisfiers can work.

Need states can become differentiated.

Withdrawal can be medically stabilized.

Environments can improve.

Relationships can become reliable.

Pain can be treated.

Fear can become better calibrated.

Shame can give way to restored belonging and dignity.

Agency can increase.

Successful alternative regulation can create new memories.

Those memories can change future predictions.

What once felt like the only workable satisfier can become one remembered pathway among many.

Accordingly, the highest-level moral response to addiction is neither condemnation nor indiscriminate gratification of craving.

It is:

understand the needs accurately, respect the emotions that report their perceived changes, under

That principle unifies the proposed science and morality of addiction.

It also produces a broader possibility: addiction may eventually be understood not principally as a special pathology of drugs, but as a particular failure mode of a universal process by which beings learn how to meet their needs.

And if that is correct, recovery is not merely the absence of addiction.

It is the construction of a need ecology sufficiently rich, accurate, resilient, remembered, and humane that no single satisfier must carry the impossible burden of meeting nearly everything.