Summer School of Addiction Studies
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The Tail of the Raccoon: Secrets of Addiction

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“The Tail of the Raccoon: Secrets of Addiction”

A Scientific Short Story

Written By

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Illustrated by Steven James Petruccio
The Loss of Self-Control of Drug-Taking

- How and why this happens remains a mystery.
- Why is it that a person continues to use drugs, even when they are trying not to?
- How is it that the action of taking the drug becomes virtually automatic and disconnected from the intention to stop?
The Loss of Self-Control Occurs Without Awareness

- Why do so many addicts say “I was blind-sided.”?
- “I never saw it coming.”
- “I don’t understand how this happened to me.”
- “I knew that drugs could be bad, but this is pure evil.”
The Purpose of This Book

To introduce young readers to the scientific phenomenon of Sign-Tracking ...

... in the form of a woodland fable, as the Raccoon character goes off the deep end ...

... losing self-control that is mindful of drug addiction.
The Tail of the Raccoon, Part I: (Illustrated) Secrets of Addiction
In the beginning, the Raccoon enjoys a comfortable life on the shores of the Great Lake, happy to eat crayfish.
The Tail of the Raccoon: Secrets of Addiction

The emotional state of the Raccoon is revealed by his Song and by his Tail:
"Such A Beautiful Creature Am I",

"I am so handsome
I am so strong
I am so handsome
My Tail is so long."

"These Rings on my Tail
They are so fine
These Rings on my Tail
My Tail is all mine."
"So Many Crayfish"

“By the shore of the lake
At night I find
So many Crayfish
Out to dine."

"At the shore of the lake
Is where I'll be
So many Crayfish
Here for me."
An Agreement

The Raccoon will provide kindling wood for Mapache’s fire, in exchange for the delicious foods of the People.
Greeting Friends

The People provide Mapache, the blind Indian warrior, with food for the approaching Winter season.
The Pairing of Wood and Food

The Raccoon delivers firewood and receives delicious food rewards.
To the point …

- where the Raccoon did very little else.

- The Raccoon made repeated trips into the forest, to gather kindling sticks, which he promptly delivered to Mapache’s woodpile.

- Always waiting for the Raccoon were the delicious foods provided by Mapache.
Then one day, Mapache found the woodpile had only small sticks that were soaking wet.
Isquasis, the Indian Medicine Woman, saw the Raccoon racing about and in poor health.
“Over and Over and Over Again”

"To the stream I go
With a branch in tow
Over and over and over again
To the stream I go."

"Up and down the tree
Wood is here for me
Over and over and over again
Up and down the tree."
A Rescue Party is Dispatched ...  

To save Mapache from a cold and lonely death.
I squasis Nurses Mapache

back to health, and informs him of the Raccoon’s erratic behavior.
Isquasis Convinces the sickly Raccoon to come to her wigwam, where she hid him away, and tended to his wounds.
"Not Mine"

"Here by the lake
I was handsome and strong
Feeding on Crayfish
All the night long."

"Then came the food
So tasty, so fine
No Rings on my Tail
My Tail is not mine."
Mapache Returns to the Encampment of his people, where he tells the children stories of his adventures with the Raccoon, who came to be called Sign Tracker.
Sign Tracker Now Lives on the opposite shore of the Great Lake, away from the food of the People.
"Joy - To Be Free"

“Happy was I
Light and carefree
Feeding on Crayfish
A joy
Just to Be.

Now I am older
Wiser, that's me
Feeding on Crayfish
A joy
To Be Free."
The Tail of the Raccoon: Secrets of Addiction

The End
The behavior of the Raccoon in the story is modeled after scientific reports of Sign-Tracking.

Sign-Tracking is clearly visible when it interferes with the subject’s intended behavior.

This form of Sign-Tracking is called “misbehavior” and was first reported by the Brelands (1961, 1966).
What is Sign-Tracking?

- Pavlov’s dogs.
  - Object-Reward Pairings.
  - Produce an acquired reflex.
  - Behave toward the signal as though it were the reward.
Sign-Tracking Video
Lever - Food
The Loss of Self-Control

- Sign-Tracking is an acquired reflexive motor action sequence, (approach the object, contact the object, and then “consume” the object).

- Sign-Tracking is triggered by and directed at the object that signals the impending reward.
Drug-Taking in Humans

- Note that drug-taking humans typically experience the pairing of an object with the drug reward each time the drug is taken.

- For example, cocktail glass and alcohol, tooter and cocaine, bong and marijuana, capsule and pain killers, syringe and heroin.

- Sign-Tracking induced by repeated drug-taking will induce the subject to reflexively approach the object, contact the object, and “consume” the object.
The behavior of the raccoon in the story was modeled after reports of Misbehavior.

Pairings of an object with a reward induced Sign-Tracking in misbehaving raccoons (Keller and Marian Breland).

The raccoons were supposed to deposit the coin in the bank to receive a food reward.
Initially things went according to plan.

The raccoons picked up the coin, carried it to the bank, and deposited the coin into the slot, for which they were promptly rewarded with a morsel of food.

After awhile, however, the raccoons began to have problems.
The Loss of Self-Control

- Rather than deposit the coin, quickly and simply, the raccoons began to misbehave.

- They seemed unable to let go of the coin.

- They dipped the coin in the slot, then pulled it back out, to lick and gnaw and chew on the coin.
But, their behavior makes no sense.

Eating the coin serves no purpose, other than to delay, sometimes endlessly, the opportunity to eat the real food reward.

The raccoons were hungry. Their intention was to eat the food, but their action was to eat the coin, which caused them to lose the opportunity to eat the food.
The raccoons were Sign-Tracking.

Due to the pairings of the coin with the food, the raccoons associated the two and developed the Pavlovian Sign-Tracking response.

The raccoons behaved toward the coin as though it were food. They approached, contacted, and “consumed” the coin, and they could not stop.
Sign-Tracking Raccoons
Irrational Behavior

Sign-Tracking is not under the voluntary control of the subject ... Sign-Tracking occurs regardless of the intent of the subject.

Sign-Tracking is important because it provides a way of understanding how behavior can become irrational and illogical and defy free-will.
Sign-Tracking Induces the Disconnect Between Action and Intention

- Sign-Tracking may cause you to do something even though you intend not to do it.

- Sign-Tracking may induce a disconnect between action (what you actually do) and intention (what you are telling yourself to do).

- ...such as intending to restrain drug-taking, but instead, having yet another.
The Essence of the Problem of the Drug Addict

- The drug addict is unable to control their drug-taking.

- They take the drug even when they are trying not to.

- And, like Sign-Tracking, their action is directed at the object that signals the reward.
Drug Addiction Taken at Face Value

Drug-Induced Euphoria

Repeated Acts of Drug-Taking

Dependence/ Withdrawal
No One Sets out to Become a Drug Addict
Mysteries of the Addiction Process

The voices of addicts tell us ...

The mysterious loss of self-control:
“Why can’t I quit?”
“I want desperately to quit. So why do I keep doing this?”

The mysterious blind spot:
“How did this happen to me? I never saw it coming.”
“I was totally blind-sided.”
Drug Addiction Refracted Through the Prism of Sign-Tracking

Nosological Progression of the Disorder

- Drug Use
- Drug Abuse
- Drug Addiction
Drug Use
(Action Follows Intention)

- In the beginning ... drug-taking is controlled, voluntary, decision-based, and occurs only when intended.

- Drug use does not occur when the user decides not to do it.

- The action of drug-taking is connected to the intention to take the drug.
Drug Abuse
(Action Without Intention)

- After repeated acts of drug-taking, things may start to change ... so that the drug is taken even though the user did not actually decide to do it.

- Drug-taking just happens. Drugs are taken reflexively, mindlessly, thoughtlessly, as a matter of habit, on automatic pilot.

Drug Addiction (Action Despite Intention)

- The drug abuser has had enough and makes a firm decision to quit. All along the presumption was that it was merely a matter of deciding.

- The moment of truth ... watching yourself take the drug while instructing yourself not to do it. The action of drug-taking is disconnected from the intention to abstain.

- At this point, I am a drug addict. My intentions are meaningless. I have no free-will. I have no self-control. I am Powerless.
Drugs Cues
“People, Places, and Things”

- Cue reactivity studies reveal that stimuli associated with drug use become cues or triggers that increase urges and cravings and the desire to get high.

- Due to cue reactivity, drug addicts are well-advised to stay away from “People, Places, and Things” mindful of drug use.
Sign-Tracking: A special case of Cue Reactivity

- **The Type of Cue:** Sign-Tracking focuses on the cue which is the single best predictor of the impending drug effect. This is the object used to consume the drug.

- **The Response:** Sign-Tracking cuts to the chase, with its focus on the motor response, the action performed by the subject ... the act of taking the drug (approach, contact, consume).
More Tail of the Raccoon Stories:
“The Sign Tracker Trilogy”

The three scientific short stories of

“The Sign Tracker Trilogy”

depict the role of Sign-Tracking in the drug addiction process.
The Tail of the Raccoon, Part II: Touching the Invisible
The Tail of the Raccoon, Part III: Departures

A Scientific Short Story
by Barbara Zito & Arthur Tomie, Ph.D
Illustrated by Steven James Petruccio
Foreword by Mitchell Delmar
The Tail of the Raccoon, Part I: (Illustrated) Secrets of Addiction

Tail I introduces the reader to Sign-Tracking.

Pairings of a small object with a reward induces the loss of self-control.
The Tail of the Raccoon, Part II: Touching the Invisible

Tail II explores further the role of Sign-Tracking in the drug addiction process.

Object-reward pairings experienced during each act of drug-taking induce the loss of self-control of drug-taking.
Tail III depicts the enormous impact of drug addiction on the individual and on the family.

Repeated attempts to quit are each thwarted by cue-induced relapse to drug-taking.
How Will Sign-Tracking Contribute to Drug Addiction?

- Sign-Tracking is a model of the loss of self-control of drug-taking.
- Sign-Tracking accounts for the inability to stop an ongoing episode.
- Elevated problem drinking, for example, is expected when Sign-Tracking of alcohol drinking develops.
In the Cocktail Lounge

- Evidence of Sign-Tracking of Drug-Taking in the Real World.

- Sign-Tracking is sensitive to the correlation between the object (cocktail glass) and the rewarding effect of the drug (alcohol).

- In humans, there is evidence that losing control of alcohol drinking is directly related to the correlation between the glassware and the alcohol.
Problem Drinking Rates Vary with Alcohol Drinking Styles

- The Range of the Drinking Repertoire:
  - The Broad Drinking Repertoire (Labouvie)
  - The Narrow Drinking Repertoire (Jellinek)
Problem Drinking Rates
Vary with Alcohol Drinking Styles

- Common vs Specialized Glassware:
  - Common Glassware (Mediterranean Europe)
  - Specialized Glassware (Northern Europe)
Therapeutic Remedies

- Drinking too much?

- Reduce the correlation between your favorite glassware and alcohol.

- This will reduce the effectiveness of your favorite glassware as a trigger that elicits Sign-Tracking.
The Martini in the Soup Bowl

- Drink your favorite alcoholic beverage from a variety of different containers (soup bowl, baby mug, paper cup).

- Drink your favorite alcoholic beverage from common glassware typically used to drink non-alcoholic beverages.
The Milk in the Cocktail Glass

- Use your favorite specialized containers (cocktail glass, flute, goblet, stein) to drink non-alcoholic beverages, such as milk, vegetable juice, chocolate drink, soda, water, lemonade.

- Use your favorite specialized containers (cocktail glass, flute, goblet, stein) to serve soup, salad, steamed vegetables, kale, quinoa.
The voices of addicts tell us:

The mysterious loss of self-control:

“Why can’t I quit?”

“I want desperately to quit. So why do I keep doing this?”
Mystery #1:
Sign-Tracking Induces Loss of Self-Control

- Sign-Tracking is induced by repeated pairings of an object with a reward.

- Sign-Tracking is an automatic reflex that is triggered by the object used to consume the drug.

- Sign-Tracking is disconnected from the intention of the subject, compelling the subject to approach, contact, and “consume” the object used to consume the drug.

- Sign-Tracking leads to loss of self-control of drug-taking.
Revisiting the Mysteries of Addiction

The voices of addicts tell us:

The mysterious blind spot:

“How did this happen to me? I never saw it coming.”

“I was totally blind-sided.”
Mystery #2: Sign-Tracking is Seen But Not Really

- The Tail of the Raccoon, Part II: Touching the Invisible, depicts the transition from initial drug use down the slippery slope into poorly controlled drug abuse.

- Sign-Tracking of drug-taking is involuntary but the action is perfectly camouflaged to pass for an intended or voluntary act of drug-taking.

- We are unaware of our loss of control of drug-taking because we are blind to Sign-Tracking, which is invisible because it is misconstrued as an act of voluntary drug-taking.
The Excuse

“I must’ve changed my mind.”

- The drug user decides to stop, to terminate an ongoing episode of drug-taking, but, due to Sign-Tracking, violates this specific intention and reaches out to have yet another.

- This is a blatant violation of free-will and should set off alarms, except it is misconstrued as an intended action, something along the lines of “I must’ve changed my mind.”
How does Sign-Tracking fit with what we know about the neurobiological substrates of reward and addiction?

Activation of the brain’s reward/addiction pathway produces pleasure, association, and psychomotor activation, which are all components of Sign-Tracking.
The Neurobiology of Reward and Addiction

- The Ascending Mesolimbic Dopamine Pathway (AMDP) terminating in the nucleus accumbens is the brain’s reward circuit.

- Natural rewards, such as food, water, and sex activate the AMDP.

- Drugs of abuse (alcohol, cocaine, amphetamines, opiates, semi-synthetic opiates, marijuana, etc) hijack the AMDP.
The Integrated Functions of the AMDP Reward Pathway

- Elevated DA activity in AMDP produces 3 effects:
  - Association. Stimuli that predict the reward are identified.
  - Action. Psychomotor activation, arousal and investigation, to get more reward.
The Story of the Starving Ancient Beast

- Please visit our supporting educational website: http://tailoftheraccoon.com/

The Story of Johnnny
Having a Drink

Individual Differences in the Tendency to Sign-Track

Sign-Tracker (ST) Phenotype: Reacts to the insertion of the lever that predicts the delivery of food by approaching the location of the lever (Sign-Tracking).

Goal-Tracker (GT) Phenotype: Reacts to the insertion of the lever that predicts the delivery of food by approaching the location where the food will be delivered (Goal-Tracking).
Individual differences in vulnerability to Sign-Tracking confers vulnerability to drug addiction:

- Sign-Tracker (ST) Phenotype
- Goal-Tracker (GT) Phenotype
Sign-Tracker (ST) Behavioral Phenotype versus Goal-Tracker (GT) Behavioral Phenotype

- ST Rats are more addiction prone:
  - Self-administer more abused drugs (alcohol, cocaine, amphetamine, and opiates).
  - More vulnerable to cue-induced relapse.
  - Less responsive to cue extinction therapy.
The ST Phenotype and the Addictive Personality

- Why is the ST Phenotype addiction-prone?
- Sign-Trackers respond emotionally to objects paired with reward.
- For the ST Phenotype, the object is liked, wanted, desired, because the object provides feelings of pleasure and comfort.
- Approaching the object draws them into the drug-taking situation, where there is overwhelming temptation.
The Tail of the Raccoon, Part I: (Illustrated) Secrets of Addiction
Sign-Tracking and Drug Addiction for Professionals

- Theoretical reviews and book chapters:
  - Sign-Tracking Model of Loss of Self-Control (2016)
  - Sign-Tracking Model of Alcohol Abuse (2014)
  - Brain Research Reviews (2013)
  - Clinical Psychology Reviews (1995)
  - Neuroscience and Biobehavioral Reviews (1996)
Sign-Tracking and Drug Addiction for the General Public

- For Parents
- For Teachers, Students, Counselors, Coaches, Librarians, Nurses, Youth Group Leaders, Reading Group Volunteers
- For Drug Rehabilitation Counselors
The Addiction Epidemic

- Drug use is becoming more prevalent in younger populations.
- Social media platforms have made drugs more available to younger children.
- Parents need to start the conversation and maintain an ongoing discussion with their children about drugs.
Opening the Addiction Conversation

- Parents are faced with the enormous challenge of opening a conversation and maintaining an ongoing discussion about drugs with their child.

- This conversation can quickly turn into a minefield.

- The wrong approach. The absolute abstinence, zero tolerance, pounding the table approach diminishes the credibility of the parent and removes the parent from all future discussions.
Young children are enchanted by the antics of the Raccoon, while they learn that action can become disconnected from intention.

Parents can plant in their child the seeds of understanding of the loss of self-control.

Parents can help the child see the connection between losing self-control and becoming addicted to drugs.
For the Parent
Opening the Conversation About Drugs

- While this scientific short story is appropriate for a wide range of ages, it is uniquely aimed at younger audiences, 4-9 years old, as a primary prevention tool.

- The story is designed to help a parent open the conversation about drug use with their child. The antics of the raccoon deliver a message about the loss of self-control, which provides an easy entre into the more serious topic of drug use.
Additional Resources for the Parent

- Available at the educational website: www.tailoftheraccoon.com
- Parent Flyer
- Wake-Up Call for Parents
- Guide for Parents
Additional Resources for Instructors and Drug Addiction Counselors

- Available at the educational website: www.tailoftheraccoon.com
  - Instructor’s Guide
  - Lesson Plans for 4-5 Grades (Tail I)
  - Sign-Tracking and Drug Addiction
  - Sign-Tracking and the Loss of Self-Control
Sign-Tracking is the enigma of the drug addiction process.

Sign-Tracking reveals the vulnerability of the mind to ritual, at an unconscious level.

The scientific short stories of “The Sign Tracker Trilogy” warn younger audiences that it is dangerous to experiment with the recreational use of drugs.
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- Johnson & Johnson School Nursing Program
- NJ TV Community Forum
- Carrier Clinic
The End

Thank You  !!