

Why The Hijacked Brain Theory Of Addiction Is Wrong: The Dynamic Tension Theory Of Drug Use And Dependence

Introduction

The term **Hijacked Brain** does not originate in medical or other scientific journals. This term comes to us from a popular PBS television series about addiction hosted by Bill Moyers in 1998 which by and large presented Leshner's (1997) model of addiction as a brain disease. Simply put the **Hijacked Brain Theory** states that when people with a genetic predisposition to addiction are exposed to a drug, the pleasure center which is located in the Limbic System goes wild and "hijacks" the brain away from the Prefrontal Cortex wherein reason resides. Under this theory the Limbic System supposedly represses all possibility of rational thought in the Prefrontal Cortex. The hijacked brain will pursue the addictive substance until death occurs--unless treatment, usually in the form of the 12 steps, intervenes and saves the life of the "diseased" addict. This model also leaves people to believe that their only choices are abstinence or death. The following sums up the Hijacked Brain Theory in a simple formula:

- **Genetic Predisposition + Exposure To Drugs = Addiction → Inevitable Death**

The Hijacked Brain Hypothesis fits in well with the popular mythology that addiction is a progressive and chronic disease which leads inevitably to death unless treated. However, the Hijacked Brain Hypothesis is completely at odds with almost everything which scientific research has discovered about addiction and recovery from addiction. The scientific reality is that the majority of people with an addiction will overcome it on their own without specialty addictions treatment and without attending AA or other 12 step groups. Moreover, many people recover from substance dependence by cutting back instead of via abstinence. In this paper I propose that a **Dynamic Tension Model of Drug Dependence** can make the correct predictions about what scientific research really tells us about drug use and drug dependence.

The flaw of the Hijacked Brain Hypothesis is that it posits a static Prefrontal Cortex and fails to take Environment into account. Under the Hijacked Brain Hypothesis the only changing element is the Limbic System which grows ever more lost in the pursuit of pleasure. If the Prefrontal Cortex changes at all under the Hijacked Brain Model, it is only seen as growing weaker as the Limbic System grows stronger.

The **Dynamic Tension Model of Drug Dependence** proposes that the Prefrontal Cortex (PFC), the Environment (E) and the Limbic System (L) are all dynamic entities which change over time. I propose that simple one dimensional vector representations can be used to give us a useful model of all the phenomena of drug use and dependence. I posit that one way to recover from addiction involves strengthening the Prefrontal Cortex and the Environmental variables against addiction. This is what is usually seen in the case of self-recovery and rational programs like SMART. An alternative road to recovery involves setting up opposing forces in the Limbic System--I propose that this is what generally happens in AA.

What do the words addiction and recovery mean?

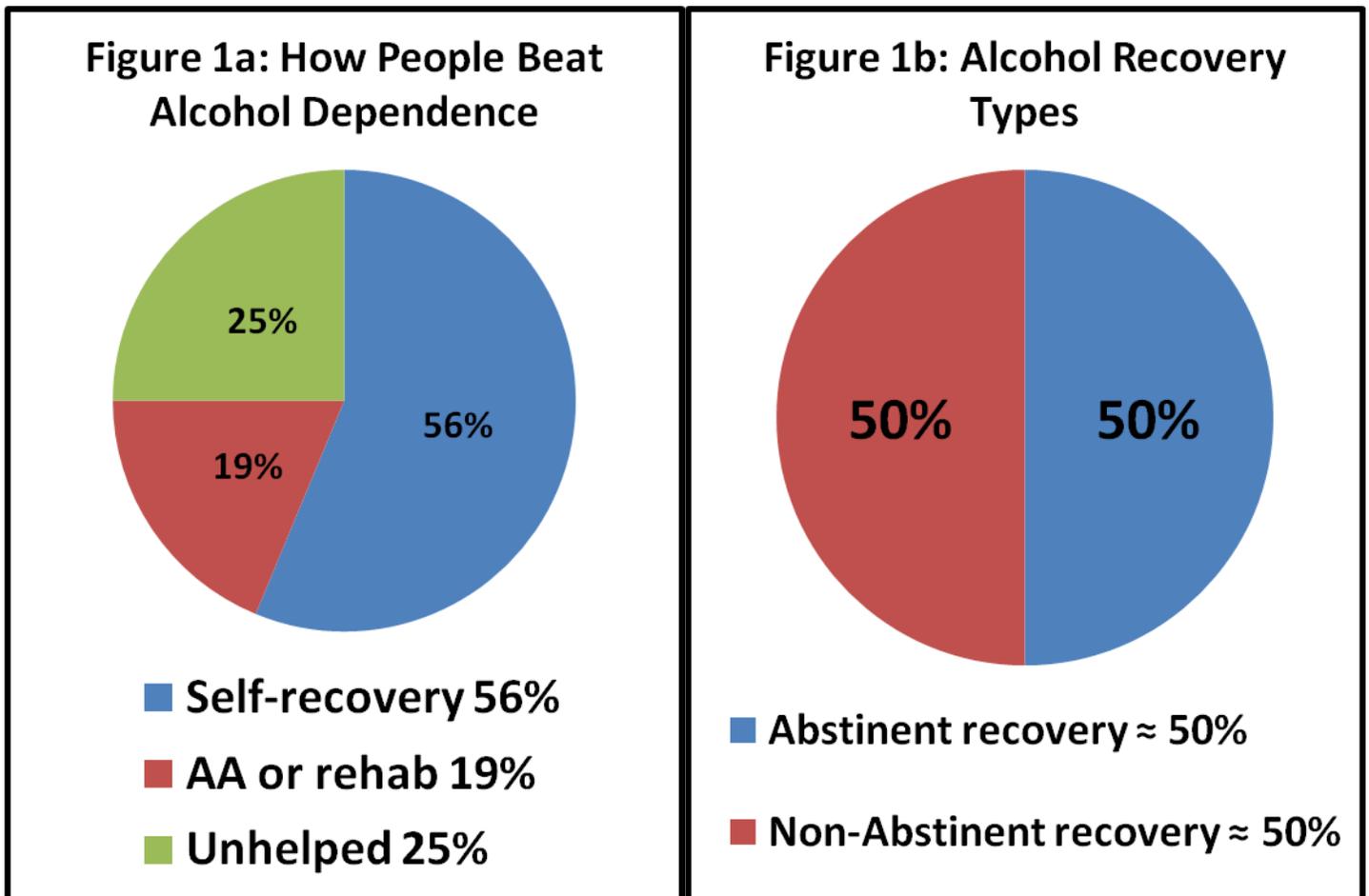
We use the following definitions of addiction and recovery in this paper:

- Addiction means that a person currently meets the DSM-IV criteria for substance dependence
- Recovery mean that the person no longer meets the DSM-IV criteria for substance dependence

Let us look at some data on addiction and recovery--including self-recovery--often referred to as "spontaneous remission."

ALCOHOL

The NIAAA's 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is the largest and most thorough investigation of Alcohol Use and Dependence ever conducted in the United States; many of the essential points revealed by this survey have been summarized in the NIAAA article titled "Alcoholism Isn't What It used To Be" (NIAAA 2009). This article gives us information about Alcohol Dependence and Recovery over a 20 year period. This article tells us that more than half of all people with Alcohol Dependence (i.e. "alcoholism") as defined by the DSM IV will recover on their own without treatment or AA. Less than 20% will recover by using AA or rehab. Twenty five percent do not recover--this includes people who have tried AA or rehab and been failed by them, although this article does not specify how many of the 25% who fail to recover have tried AA or rehab. Finally, this article tells us that about half of all people with Alcohol Dependence will recover by quitting drinking, and about half will recover by cutting back. This data is summarized in Figures 1a and 1 b.



HEROIN

We do not have as extensive survey data about heroin as we have about alcohol; however, studies suggest that the majority of heroin users will kick the habit on their own without treatment.

Robins et al (1980) studied soldiers addicted to heroin in Vietnam after their return to the United States. She found that only one in eight soldiers addicted to heroin in Vietnam became readdicted after returning to the US. Seven out of eight soldiers addicted to heroin in Vietnam recovered on their own without treatment. A large number of these veterans used heroin non-addictively after their return.

Winick estimates that two thirds of heroin addicts kick the habit without treatment over their lifetimes and posits that this may be a factor of age and "maturing out" (cited in White 1996).

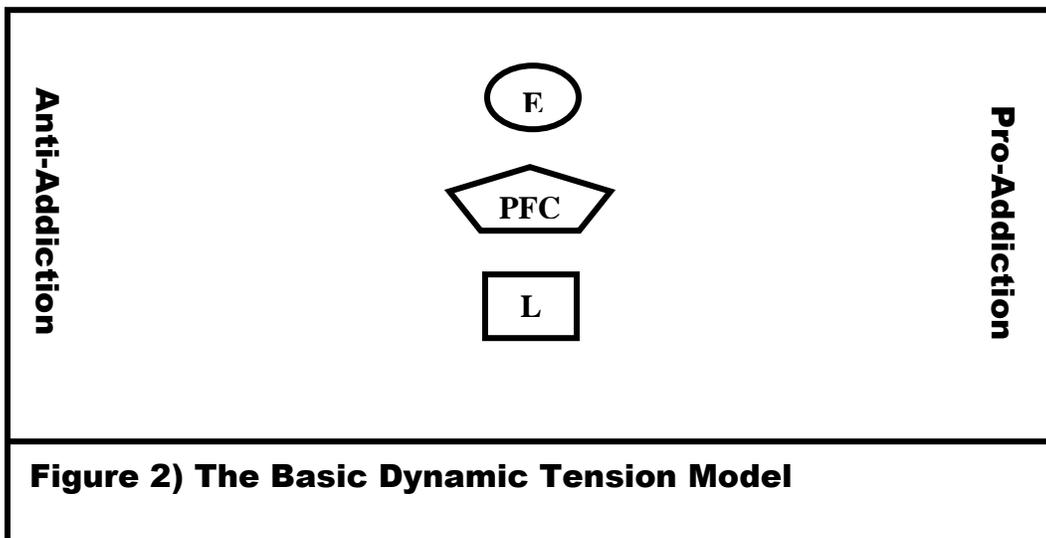
CIGARETTES

Many experts believe that cigarettes are the most difficult addiction to quit. Henningfield and Benowitz (New York Times, 1994) rated cigarettes as having higher dependence than any other drugs surveyed including heroin and alcohol. Dependence was taken to mean difficulty in quitting. Yet the CDC (CDC 2004) reports that as of the year 2002 there were more former smokers than current smokers. Moreover, a Gallup poll (2008) shows that among those 50 to 64, the ratio of former smokers to current smokers is nearly 2-to-1, while among those 65 and older it swells to more than 5-to-1.

In the current day and age, quitting cigarette smoking is becoming the norm, rather than the exception.

The Basic Dynamic Tension Model

The Dynamic Tension Theory of Drug Use and Addiction states that the Prefrontal Cortex, the Limbic System, and the Environment are all dynamic and ever changing systems which interact with each other in varying ways, sometimes in concert with each other and sometimes pulling in opposite directions. Figure 2 gives the basic Dynamic Tension Model; E stands for environment, PFC stands for the Prefrontal Cortex, and L stands for the Limbic System. We assign a simple one dimensional vector to each of these three factors: E, PFC, and L. We assign a negative value to Pro-Addiction vectors and a positive value to Anti-Addiction vectors. The magnitude (i.e. the numerical value) of the vector is assigned impressionistically in this paper. The SUM of the three vectors gives the tendency towards addiction or recovery, a negative SUM indicates a tendency to addiction and a positive SUM indicates a tendency towards recovery. This will be clarified as we look through the following examples.



Stages Of Change And Dynamic Tension

We are going to initiate this section by looking at how a person might choose to initiate an addiction--in this case smoking cigarettes--and then we will proceed to looking at the canonical stages of change in terms of the dynamic tension model.

Figure 3 shows how the dynamic tension model represents a teenager initiating cigarette smoking. This teenager is choosing to start smoking because all his/her friends are doing it (an environmental factor E which has a weight of -4 for this person) and because they hate those uncool government anti-smoking ads (a rational factor

PFC which has a weight of -3 for this person). This person has just smoked their first cigarette, gotten nauseous, and vomited--at this point the limbic system is opposed to the addiction, L has a weigh of 1. However, rational and environmental factors outweigh the limbic system (SUM = -6) and the person continues to choose to smoke until addiction is established.

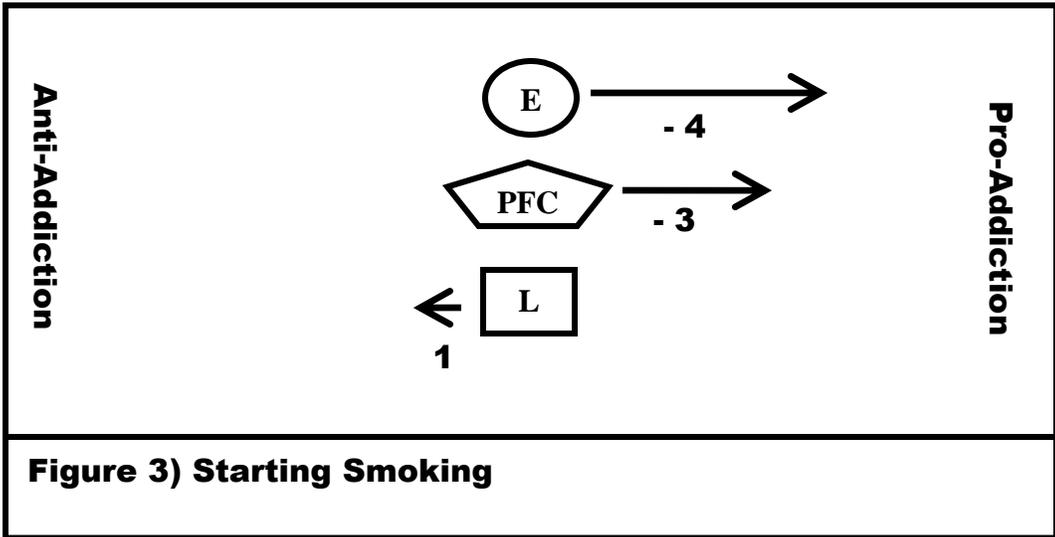
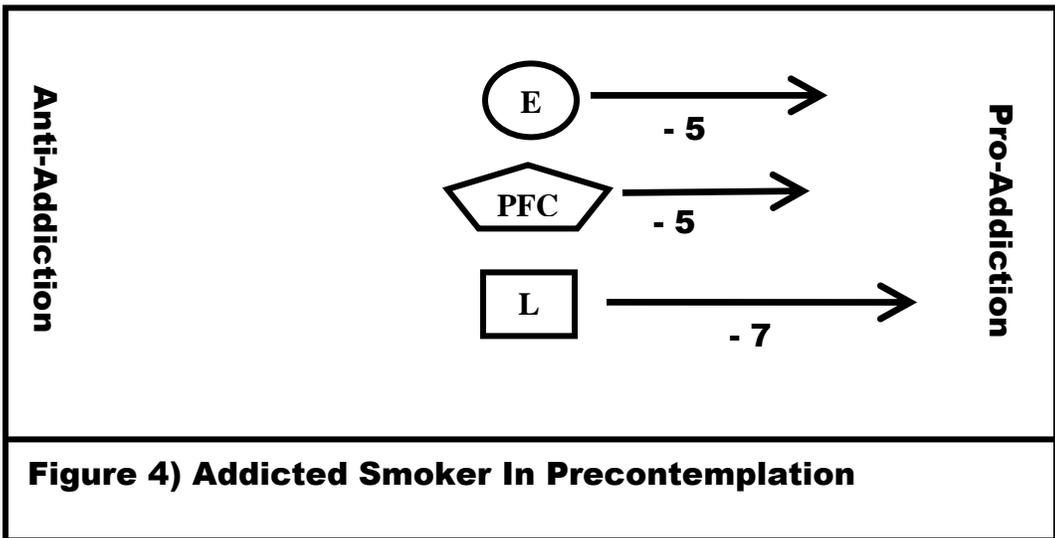


Figure 4 shows us a person with a full blown smoking addiction (L = -7) which is supported both by the person's environment (E = -5) and the person's beliefs (PFC = - 5)



Both Figure 4 and Figure 5 are models of addicted smokers in precontemplation. The difference is that the smoker in Figure 4 has an environment which supports the smoking addiction as well as rational beliefs which support the smoking addiction (SUM = - 17). In Figure 5 we have a smoker whose environment is unsupportive of the cigarette habit (E = 3) and whose rational beliefs about the nicotine addiction are neutral (PFC = 0, SUM = - 4). It will be easier to move the smoker in Figure 5 into the Contemplation Stage than the smoker in Figure 4. Not all addicted person in Precontemplation Stage are equal--this is an important point for therapists to acknowledge.

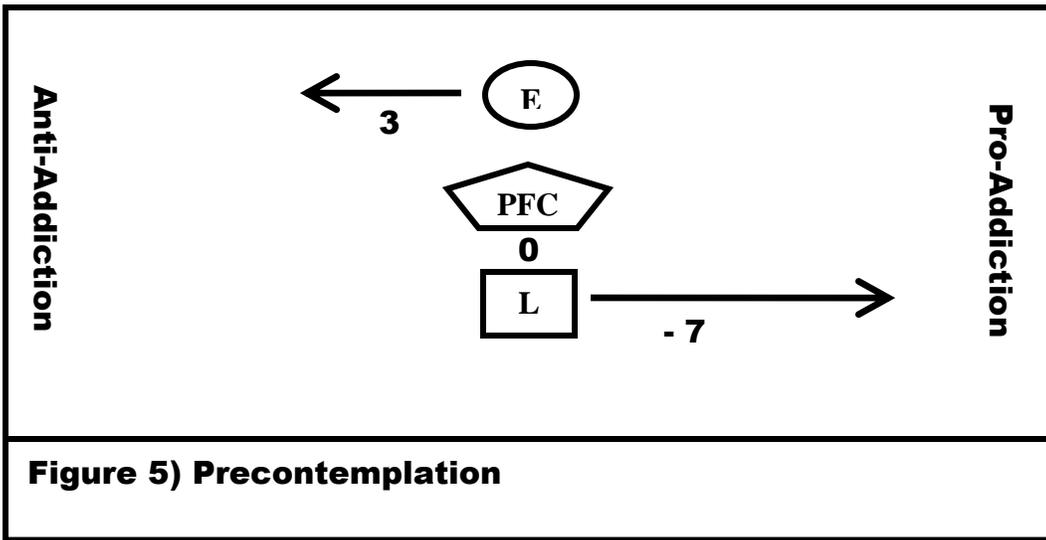


Figure 6 represents the Contemplation Stage of change. The rational part of the brain is beginning to put together reasons to quit the addiction (PFC = 3 in this example) Once the motivations (reasons) for change are in place the PFC will enter Preparation Stage. During the Preparation Stage the PFC puts into place plans and strategies to fight the addiction. In our model we will posit that the combination of environment, motivations, strategies, and plans can outweigh the pro-addiction forces of the Limbic System in the Preparation Stage; however, these forces do not enter into combat against the addiction until the decision to quit is made and the subject enters the action stage. In other words, the subject enters the action stage when the decision to quit is made and the subject then brings to bear on the addiction all the strengths that were gathered during the preparation stage.

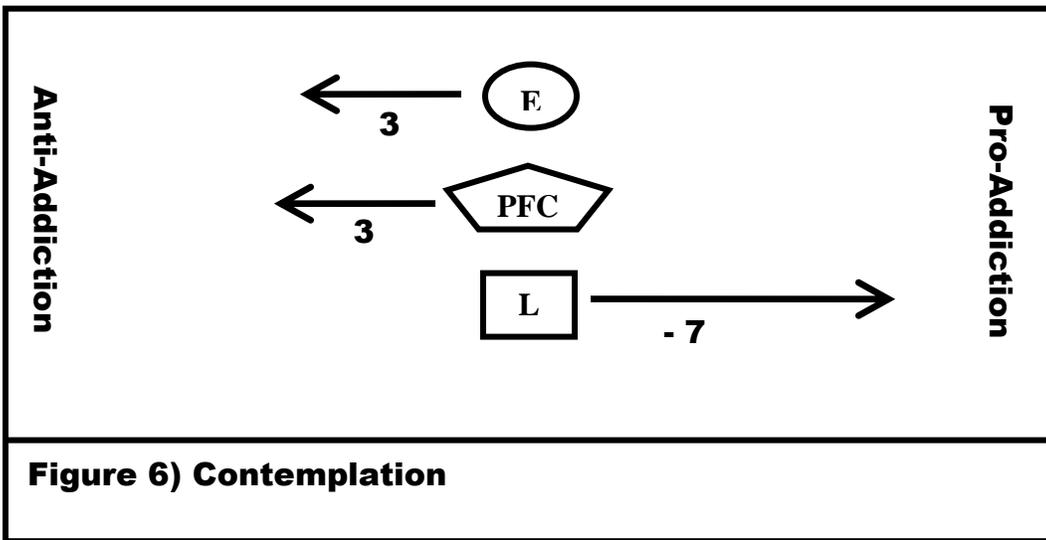


Figure 7 shows the forces that are gathered in the preparation stage (SUM = 3). When the decision to change is made, the dotted line which separates the anti-addiction forces from the pro-addiction forces is erased, the Action Stage is entered, and the battle begins

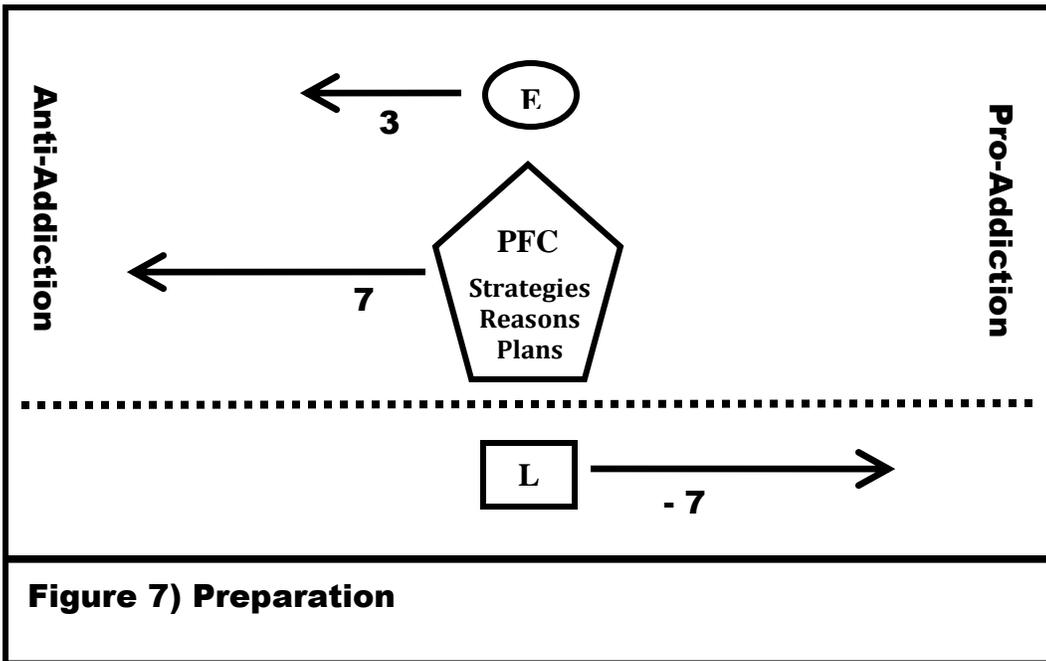


Figure 8 represents the Action Stage. When the PFC attacks the Limbic System, the Limbic System fights back by clinging to the addiction even stronger than before--in our representation the magnitude of the limbic system's pro-addiction vector has increased from $L = -7$ in Preparation to $L = -10$ in Action Stage. The PFC counters by increasing the strength of its Anti-Addiction vector (PFC = 12) as well as making changes in the environment to foster quitting ($E = 5$) (SUM = 7).

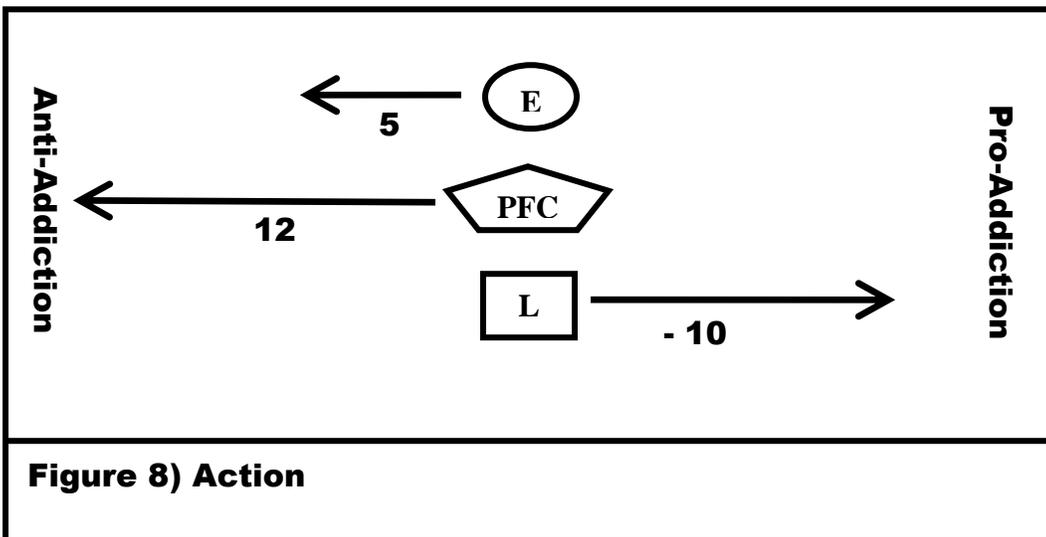


Figure 9 represents the Maintenance Stage. The battle has calmed down quite a bit but there is still a moderate pull towards the addiction from the Limbic System ($L = -5$). However, the pitched battle seen in the Action Stage has ended and the PFC does not need to exert nearly as much force (PFC = 5) in fighting the Limbic System. With the aid of the environment ($E = 5$) the SUM = 5.

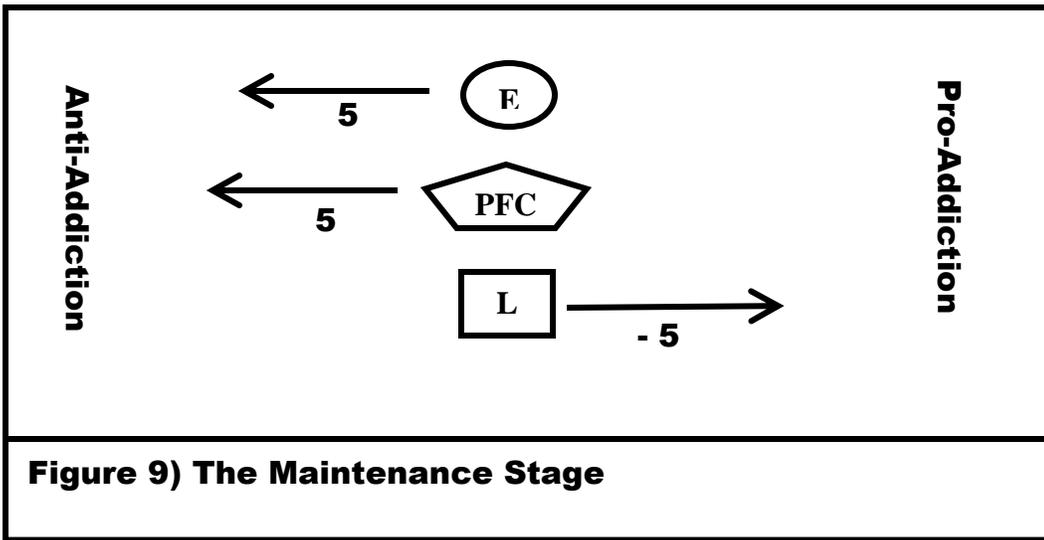
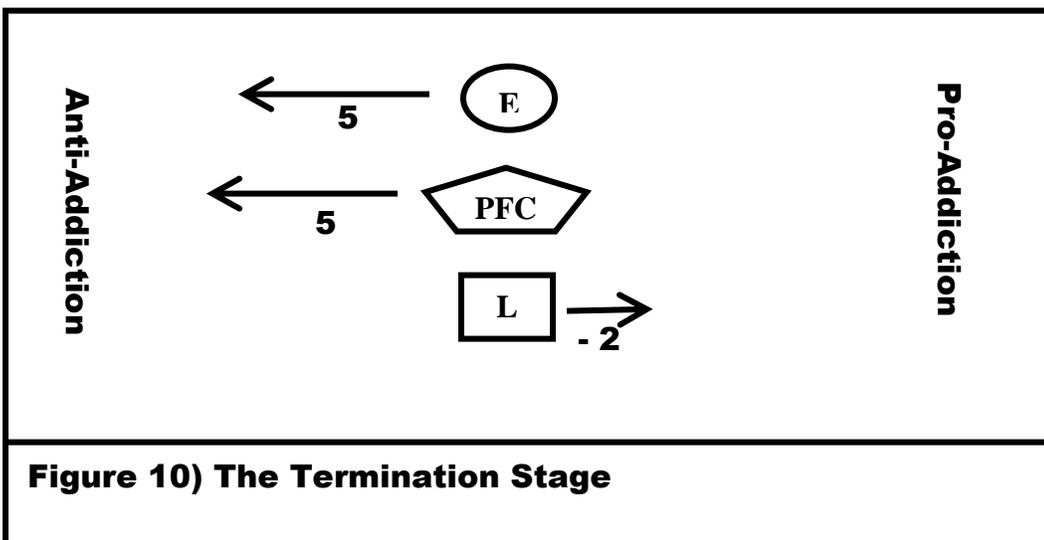


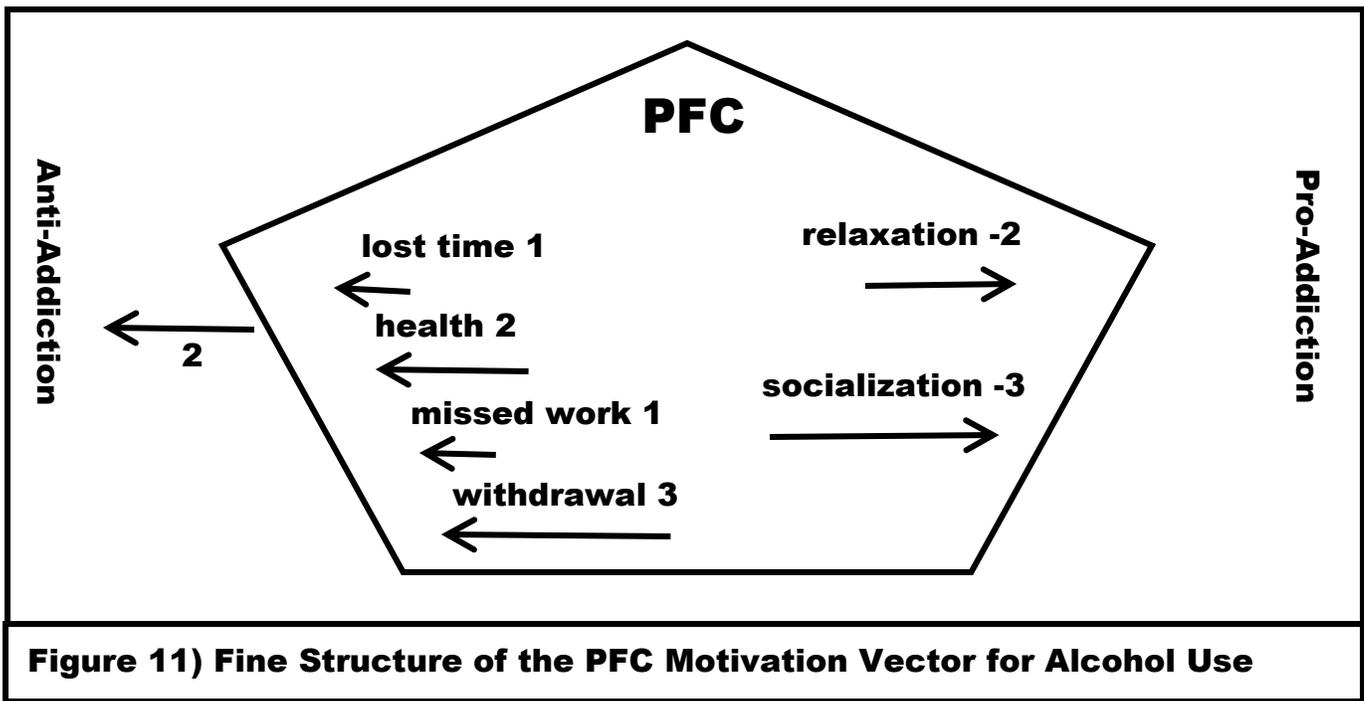
Figure 10 represents the Termination Stage. The farther removed the subject is in time from the addiction, the weaker the pro-addictive vector in the Limbic System ($L = -2$). Cravings grow faint and hardly noticeable. Strong anti-addictive forces are in play in the PFC and the environment and the odds of relapse are minimal and decrease by the day. In essence the subject has forgotten about the addiction.



The Fine Structure Of The PFC Vector

- **The Fine Structure Of The Motivation Aspect Of The PFC Vector**

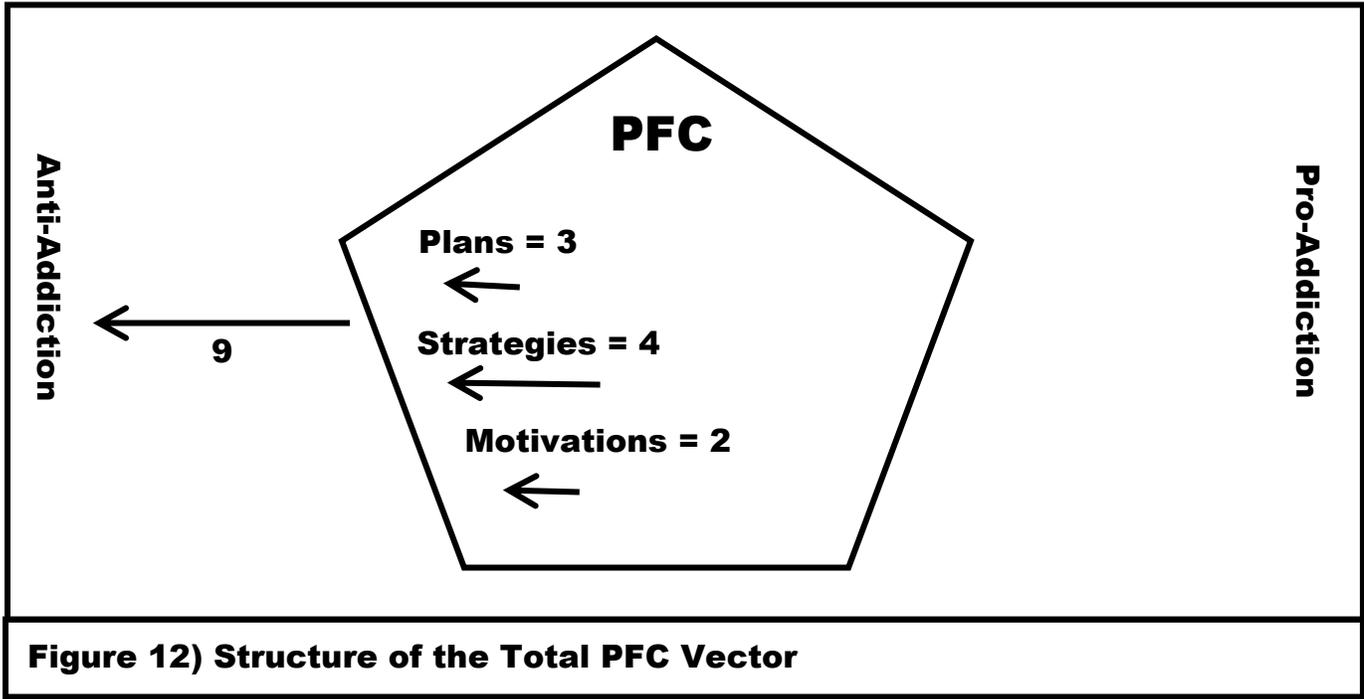
Figure 11 gives us the fine structure of the motivation vector for alcohol use for one individual. We can assign a number to each of this individual's reasons for and against using alcohol. We assign positive numbers to the reasons against using alcohol and negative numbers to the reasons in favor of using alcohol. We assign weights according to how strongly this individual feels about each of these reasons. For example, this person feels that withdrawal is a very strong reason to abstain from alcohol therefore we give it a weight of 3. This person thinks that lost time is only a slightly important reason to abstain from alcohol therefore we give it a weight of 1. Likewise, socialization is a very strong reason for this person to use alcohol so we give it a weight of 3 and relaxation is a moderate reason to drink so we give it a 2. When we sum the positive numbers (the reasons for abstaining) and the negative numbers (the reasons for using) we get a total weigh of positive 2; the Prefrontal Cortex of this individual has a modest pull in the direction of not drinking (or at least not drinking addictively).



The cost benefit analysis (also known as a decisional balance sheet) is a good tool to help a client clarify his/her reasons for and against drinking or drug use--a clarification of reasons helps to strengthen the pull of the vector.

- **The Fine Structure Of The Total PFC Vector**

In addition to the **Motivation Vector** illustrated in Figure 11, the Prefrontal Cortex also contains Plans and Strategies. We take the **Total PFC Vector** to consist of the sum of the **Plans Vector**, the **Strategies Vector**, and the **Motivations Vector** as illustrated in Figure 12.



Relapse

The Dynamic Tension Model also gives us an excellent way to describe why relapse is a common occurrence on the way to recovery and why some people succeed on quitting on the first try.

In the Dynamic Tension Model the strengths of the various vectors are in a perpetual state of change from moment to moment. One moment the PFC vector for non-addiction may be strong and the next moment it may be weak. Likewise the Limbic System vector pulling towards addiction can be strong at one moment and weak the next moment. Relapse happens when the pro-addiction vectors are stronger than the anti-addiction vectors.

Prochaska tells us that about one in 20 smokers quits on the first try, the other 19 require multiple tries. We postulate that the smoker who succeeds on the first try starts off with very strong anti-addiction vectors. Likely this is because this person has made a very thorough plan with many strategies to quit smoking. The other smokers who quit are likely to learn something from each relapse until after enough tries their anti-smoking vectors are strong enough to prevail over the pro-smoking vectors.

Why Soldiers Addicted To Heroin In Vietnam Dropped Their Addiction Without Treatment After Return To The US

The Hijacked Brain Theory makes completely wrong predictions about what happened to soldiers addicted to heroin in Vietnam when they returned to the US. According to the Hijacked Brain Theory, **only** people with a genetic predisposition to addiction can become addicted when exposed to the drug and they are on a course of progressive addiction unto death without treatment. The reality is that 7 out of 8 soldiers addicted to heroin in Vietnam recovered without treatment when they returned to the US (Robins 1980).

In Vietnam not only did the environment strongly motivate heroin use, but even the rational mind could see heroin use as a rational response to an insane situation. Figure 13 represents the heroin addicted soldier in Vietnam.

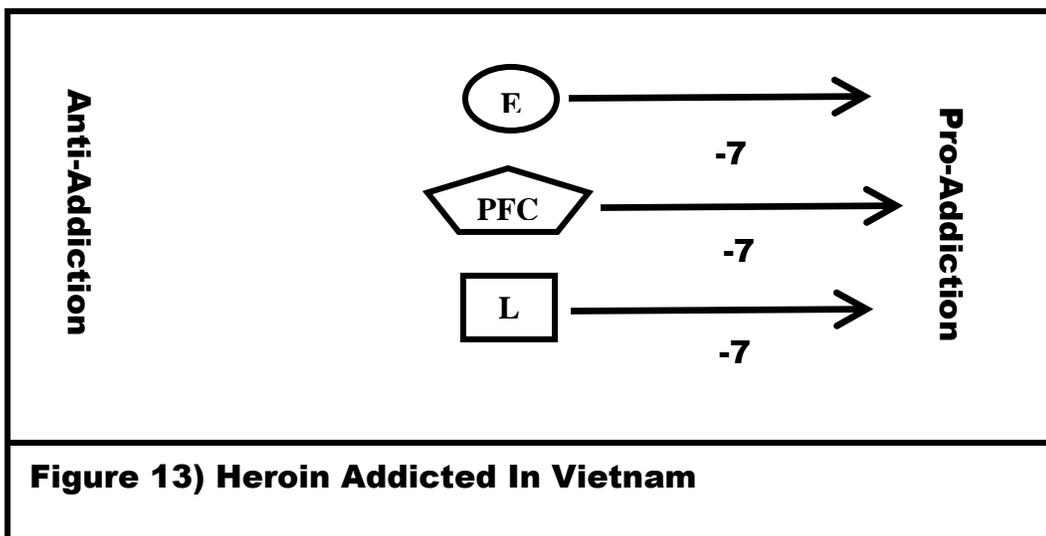
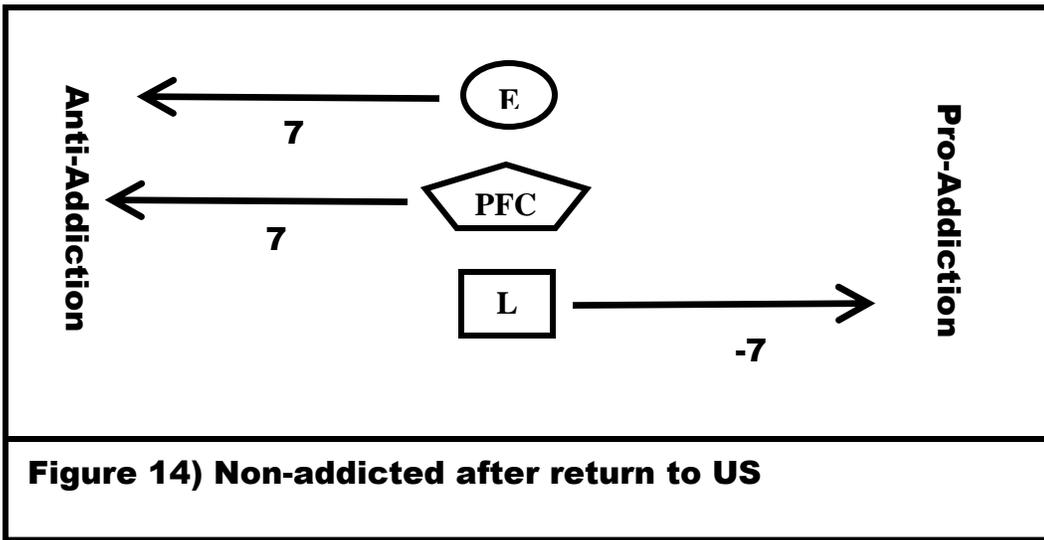


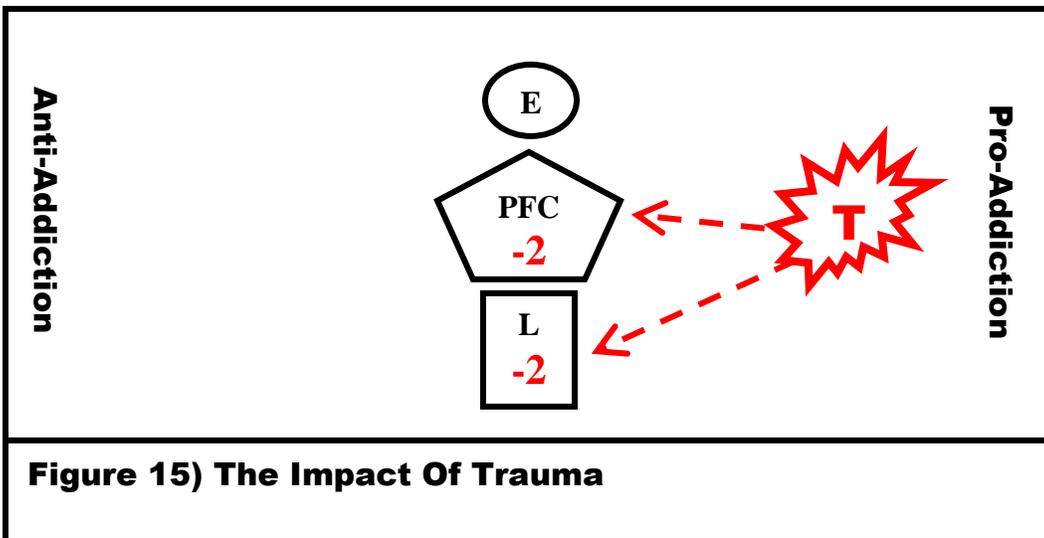
Figure 14 represents this same soldier after return to the US. Both the Environment and the Rational Mind are opposed to addiction and the result is that the soldier kicks the heroin habit.



This can also help us to account for Winick's (1962) observation about heroin addicts "maturing out" of their addictions. The PFC gains more reasons to quit the addiction as the person matures and eventually the Anti-Addiction Vectors grow stronger than the Pro-Addiction Vectors and the person kicks the heroin habit.

Trauma

Under our model Trauma weakens both the PFC and the Limbic System as illustrated in Figure 15. T indicates trauma. Hijacked Brain Theory has no way of accounting for the impact of trauma since all is due to genes and the drug only.



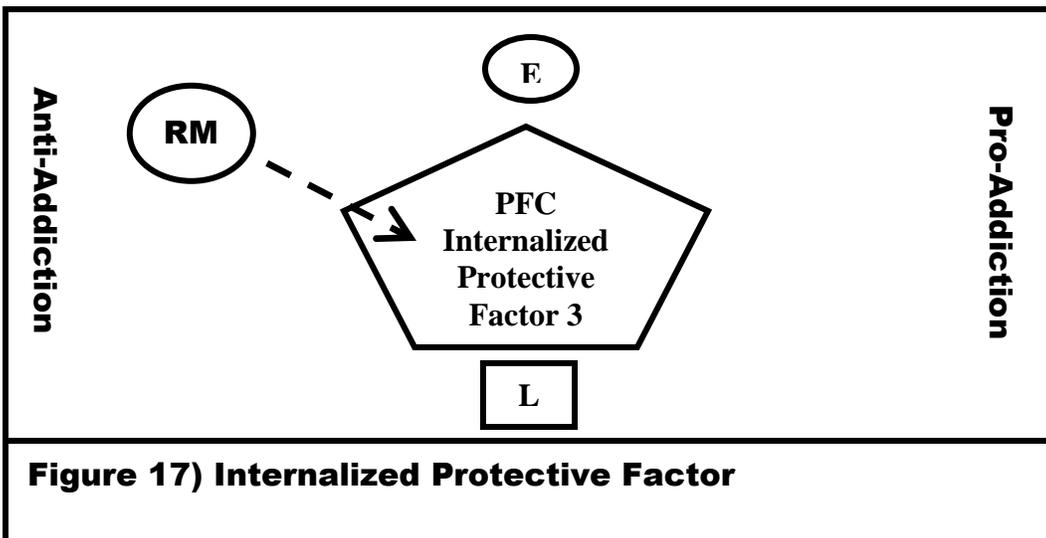
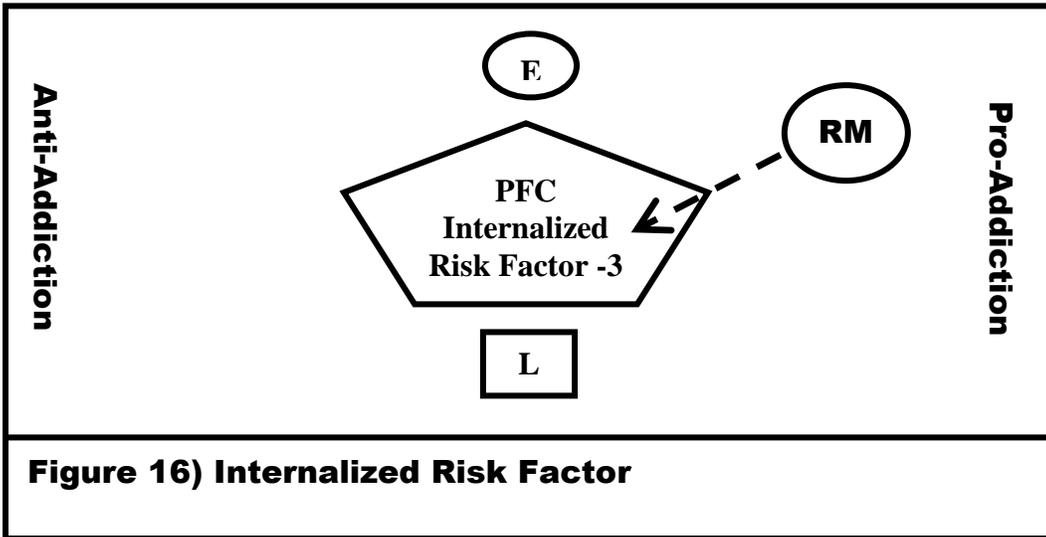
As we see in Figure 15, trauma introduces negative vectors into both the Prefrontal Cortex and the Limbic System which will sum together with the other vectors to increase the likelihood of addiction.

Nurture Vs. Nature

Vaillant (1995) and Cahalan and Room (1974) have found factors such as religious upbringing and ethnic identity can have a major impact on the prevalence of alcoholism in adults. For example, Vaillant's cohort study found that among adults raised in an Italian neighborhood where Mediterranean drinking patterns held sway only 4% developed Alcohol Dependence. In contrast, 28% of those raised in an Irish neighborhood developed alcohol Dependence. Similarly, Cahalan and Room (1974) found that 16% of men raised as Catholics had high

alcohol related consequences whereas on 3% of men with a Jewish upbringing developed high alcohol related consequences.

This strongly suggests that upbringing can carry with it either risk factors for Alcohol Dependence or protective factors against Alcohol Dependence. It is not all in the genes--nurture plays at least as important part as nature. We refer to these as Internalized Risk and Protective Factors and we illustrate them in Figures 16 and 17. Risk factors are assigned negative numbers and protective factors are assigned positive numbers. RM stands for Role Models--we view Role Models as implanting the protective or risk factors.



Note that we place these risk and protective factors in the Prefrontal Cortex rather than in the Environment. This is because these factors existed in the Environment during childhood, but in the adult they have been internalized and now exist in the PFC.

These factors sum up with all the other vectors which lead to lack of substance problems, addiction, or recovery.

The Difference Between The AA Approach And Other Approaches To Recovery

Many self-changers as well as programs like RR, SMART, or HAMS make very strong use of the Prefrontal Cortex, i.e. the rational part of the human mind, as their foundation for overcoming addictions. Successful

rational behavior changers don't just use willpower alone, they make use of plans, strategies, and rational motivations all of which reside in the Prefrontal Cortex.

AA, on the other hand, tends to reject the rational mind as a tool for behavioral change. This can be seen in such slogans as "your best thinking got you here" "your thinking is stinking" "no one is too dumb to get the AA program but a lot of people are too smart to get it" and "we have a thinking problem, not a drinking problem." Rather than using reason, AA uses the Environment and the Limbic System as change agents. AA meetings are the most obvious way that AA uses the environment--and other programs use groups this way as well. AA also makes very strong use of the Limbic System as a change agent by fostering an addiction to AA meetings as a substitute for an addiction to substances. AA also uses the Limbic System by fostering fear in its members--this is exemplified in sayings and slogans such as "if you don't go to meetings you will drink and die" " Unless each A.A. member follows to the best of his ability our suggested Twelve Steps to recovery, he almost certainly signs his own death warrant" etc.

Although many people find that the AA program is a good fit, it is also the case that some people in AA have been known to relapse after even 20 years of abstinence. We posit that whereas many people who use the PFC as a change agent enter a termination phase where the pull of the Limbic System fades to almost nothing, for at least some AA members there can continue to be a major battle between the forces of the Limbic System which can lead to relapse even after long periods of abstinence.

We posit the differences in The Fine Structure Of The Limbic System Vector illustrated in Figures 18 and 19 to account for these differences.

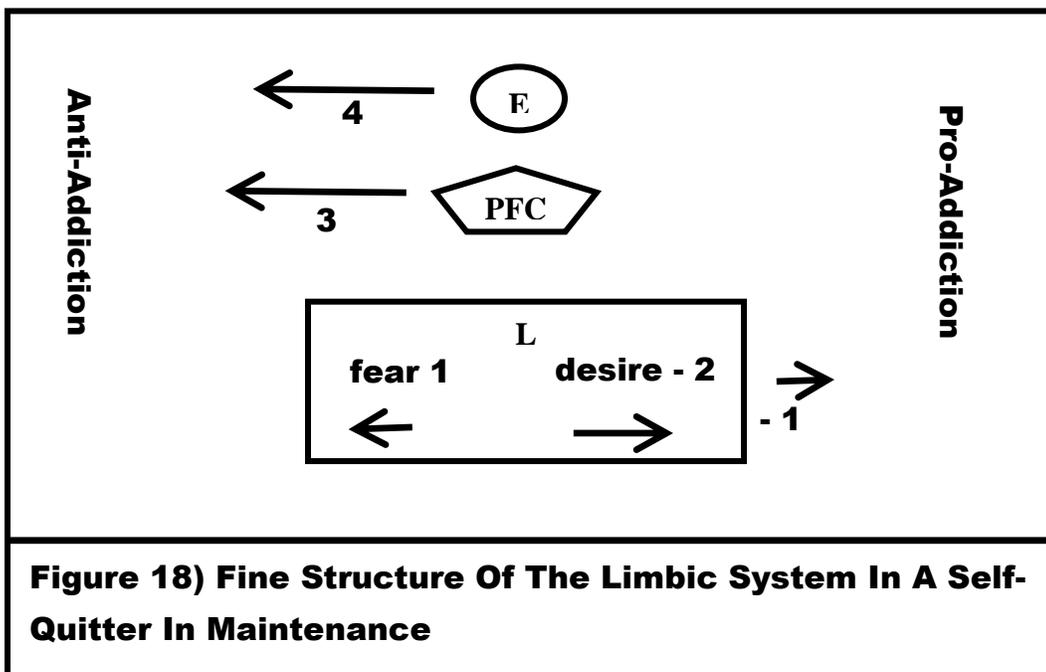
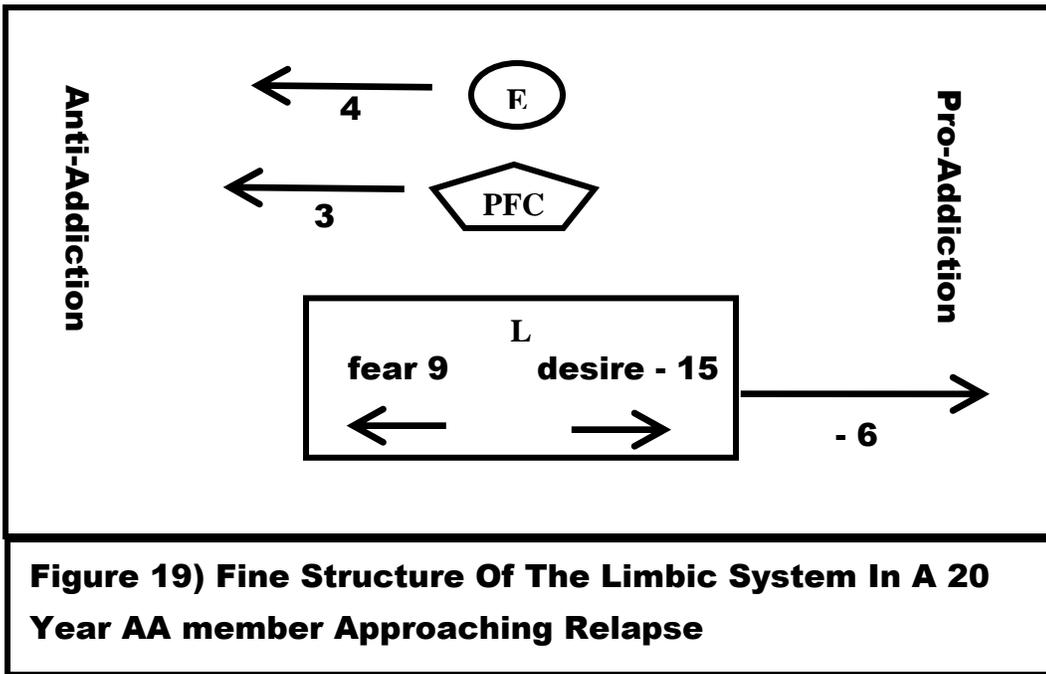


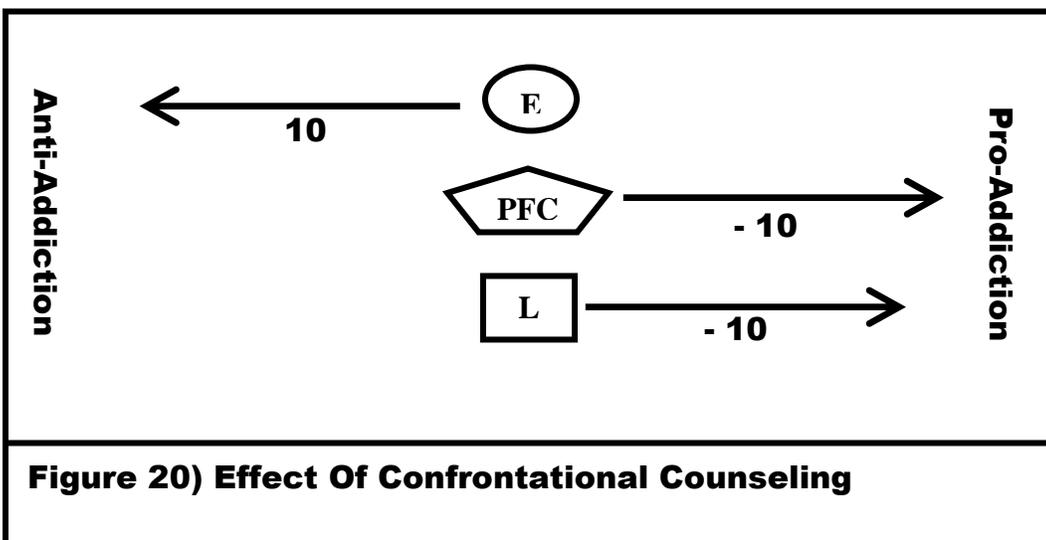
Figure 18) Fine Structure Of The Limbic System In A Self-Quitter In Maintenance



There is a great deal of difference between the fine structures of the vectors of the Limbic System in Figure 18 and Figure 19. There is very little activation of the Limbic System in Figure 18, whereas there are great forces in opposition in the limbic system in Figure 19. In Figure 19 small changes in dynamic tension can trigger a relapse because of these great forces in opposition.

Confrontational Counseling

Confrontational Counseling fails because it creates giant reactions in both the Limbic System and the PFC against the counseling as in Figure 20. Forcing people who hate AA to attend AA can have the same effect and lead them to increase their drinking as a result. AA works best for those who like it and should not be coerced.



Conclusions

The hijacked brain theory severely oversimplifies the great complexity which is the human brain and human mind and this is why it fails to capture the complex and intricate set of phenomena which comprise drug and alcohol use and addiction. Drug use does not paralyze the frontal cortex nor does it stop the frontal cortex from

maturing When people are taught that they are powerless they will act like they are powerless--the hijacked brain theory interferes with natural recovery and makes it less likely that people will recover. A better approach to addictions treatment involves fostering the innate strengths of the individuals to overcome their addiction. This means teaching people that they are inherently more powerful than substances and have the power within themselves to recover. Whether they choose to recover via abstinence or via controlled use should be their own decision.

The hijacked brain theory may be beneficial for treatment centers who would like to sell you an expensive inpatient treatment program or for AA meetings trying to bring more members into their rooms, but it is very bad indeed for the person trying to overcome a drug or alcohol problem. Albert Einstein once said "Make everything as simple as possible but no simpler." The hijacked brain theory oversimplifies everything and is just plain wrong.

REFERENCES:

Cahalan D. Room, R. (1974). Problem drinking among American men. New Brunswick, NJ: Rutgers Center of Alcohol Studies.

CDC (1992). Public Health Focus: Effectiveness of Smoking-Control Strategies -- United States. MMWR Weekly 41(35);645-647,653.

<http://www.cdc.gov/mmwr/preview/mmwrhtml/00017511.htm>

CDC (2004). Cigarette Smoking Among Adults --- United States, 2002. MMWR May 28, 2004 / 53(20);427-431

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5320a2.htm>

Gallup (2008).U.S. Smoking Rate Still Coming Down

<http://www.gallup.com/poll/109048/us-smoking-rate-still-coming-down.aspx#1>

Hester R, Miller W. (2002). Handbook of Alcoholism Treatment Approaches (3rd Edition). Allyn & Bacon.

Leshner AI. (1997). Addiction is a brain disease, and it matters. Science. 278(5335), 45-7.

<http://www.ncbi.nlm.nih.gov/pubmed/9311924>

Free Full Text

<http://www.duke.edu/~asf11/articles/addiction%20is%20a%20brain%20disease,%20and%20it%20matters.pdf>

New York Times (1994). Relative Addictiveness of Drugs.

<http://www.tfy.drugsense.org/tfy/addictvn.htm>

NIAAA (2009). "Alcoholism Isn't What It Used To Be." NIAAA Spectrum. Volume 1, Issue 1. p 1-3.

<http://www.spectrum.niaaa.nih.gov/features/alcoholism.aspx>

Peele S. (2004). 7 tools to beat addiction. Three Rivers Press

Prochaska JO, Norcross JC, Diclemente CC. (1994). Changing for good. New York, Avon Books.

Robins, L. N., Helzer, J.E.Hesselbrock, M., & Wish, E. (1980). Vietnam veterans three years after Vietnam: How our study changed our view of heroin. In L. Brill & C. Winick (Eds.), Yearbook of substance use and abuse. New York: Human Science Press.

Free Full Text <http://www.rkp.wustl.edu/VESlit/RobinsChapter1980.pdf>

Vaillant, G E. (1995). The natural history of alcoholism revisited Cambridge, Mass. Harvard University Press.

Waldorf, D. & Biernacki, P. (1980) 'Natural recovery from heroin addiction: A review of the incidence literature', in, Norman E. Zinberg, M.D. and Wayne Harding, Ed.M. (eds.) Control Over Intoxicant Use: Pharmacological, Psychological and Social Considerations. Cambridge, Mass.
<http://www.umsl.edu/~keelr/180/narehead.htm>

White WL (1996). Pathways from the Culture of Addiction to the Culture of Recovery: A Travel Guide for Addiction Professionals. Hazelden Publishing; 2 Sub edition (April 30, 1996).

Winick C. (1962). "Maturing Out of Narcotic Addiction," Bulletin on Narcotics, 14, 1-7.
http://www.unodc.org/unodc/en/data-and-analysis/bulletin/bulletin_1962-01-01_1_page002.html

Zinberg, N. (1984). Drug, Set, and Setting: The Basis for Controlled Intoxicant Use. Yale University Press. New Haven, CT.
Excerpts: <http://www.druglibrary.org/schaffer/lsd/zinberg.htm>

© 2011 [The HAMS Harm Reduction Network](#)