Psychopharmacology

Part 1

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WHAT IS PSYCHOPHARMACOLOGY?

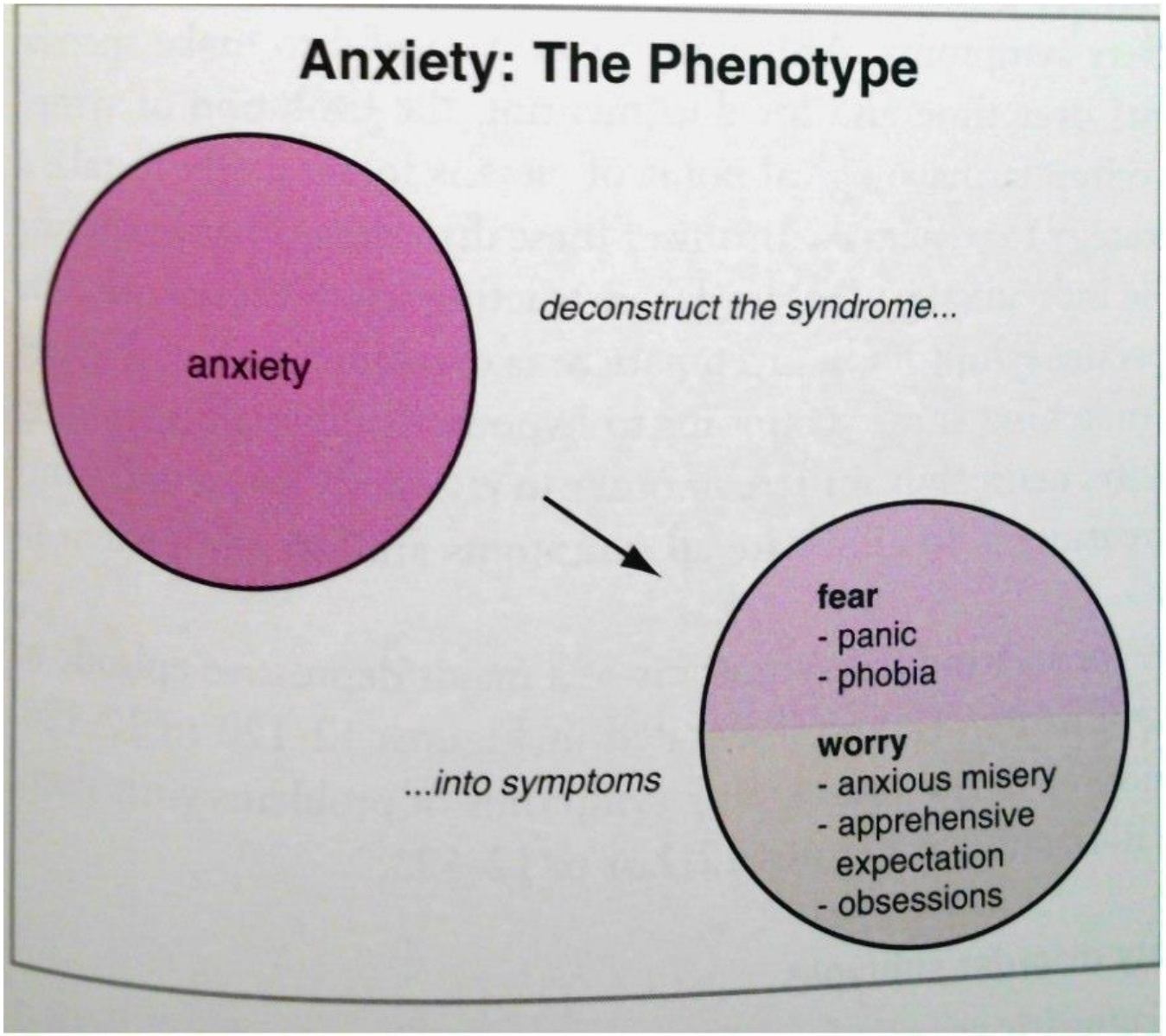
Definition

1. The study of drugs that effect the brain.
    - Therapeutic Purposes
    - Non-Therapeutic Use
        - Short term abuse (intoxication)
        - Long term effects on neurotransmission
            - Particularly within rewards circuits

TODAY

Time	Topics
10:30-12 noon	➢ Fear and Anxiety Circuits ➢ Connections between substance abuse and anxiety ➢ Self Medication
1:15-2:45 pm	➢ Mesolimbic Reward Circuits ➢ Substance Abuse Disorders ➢ Depressants ➢ Stimulants
3:00-4:45 pm	➢ Pain Medications ➢ Polypharmacy ➢ Cannabis ➢ Hallucinogens ➢ Steroids

FEAR AND ANXIETY CIRCUITS



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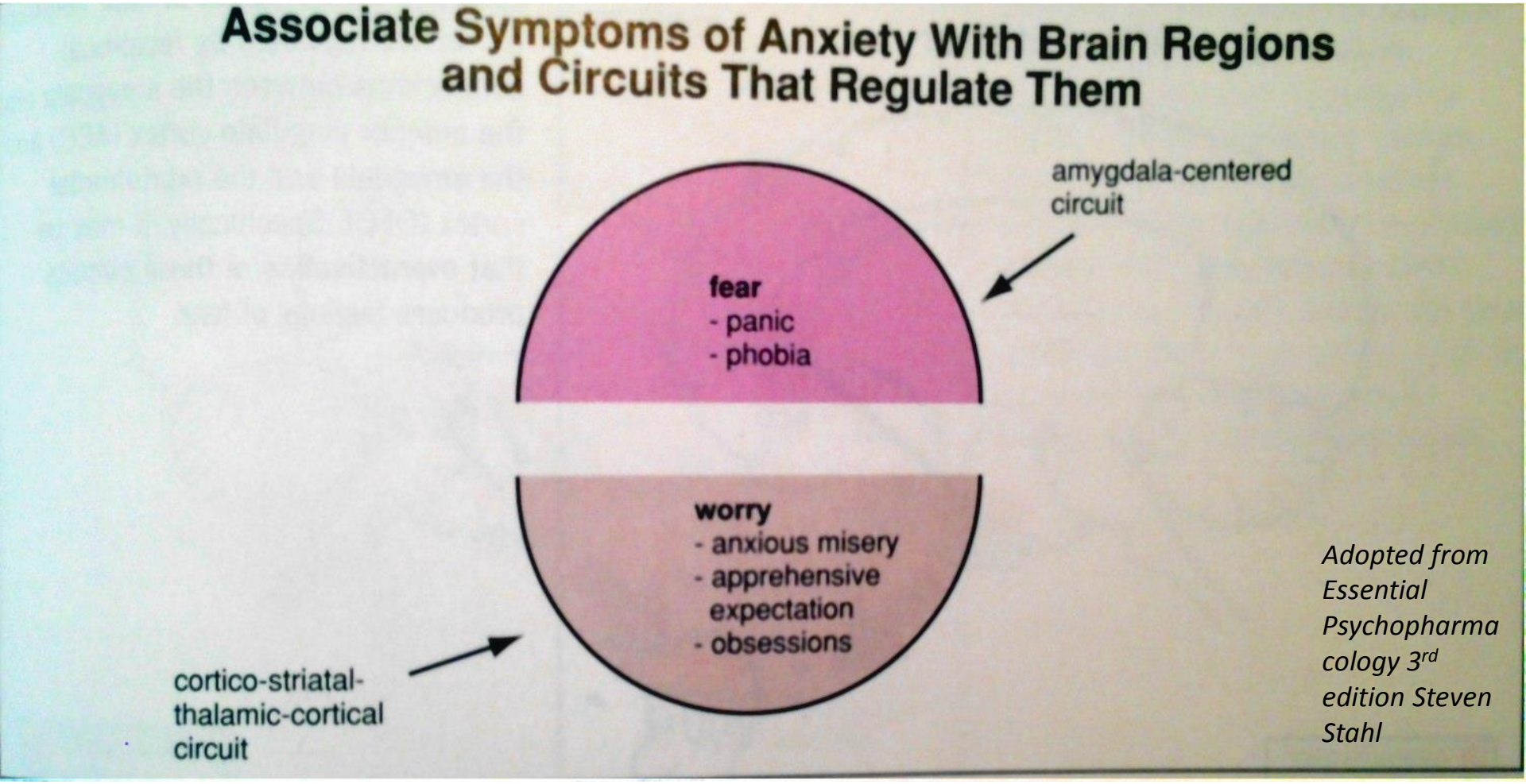
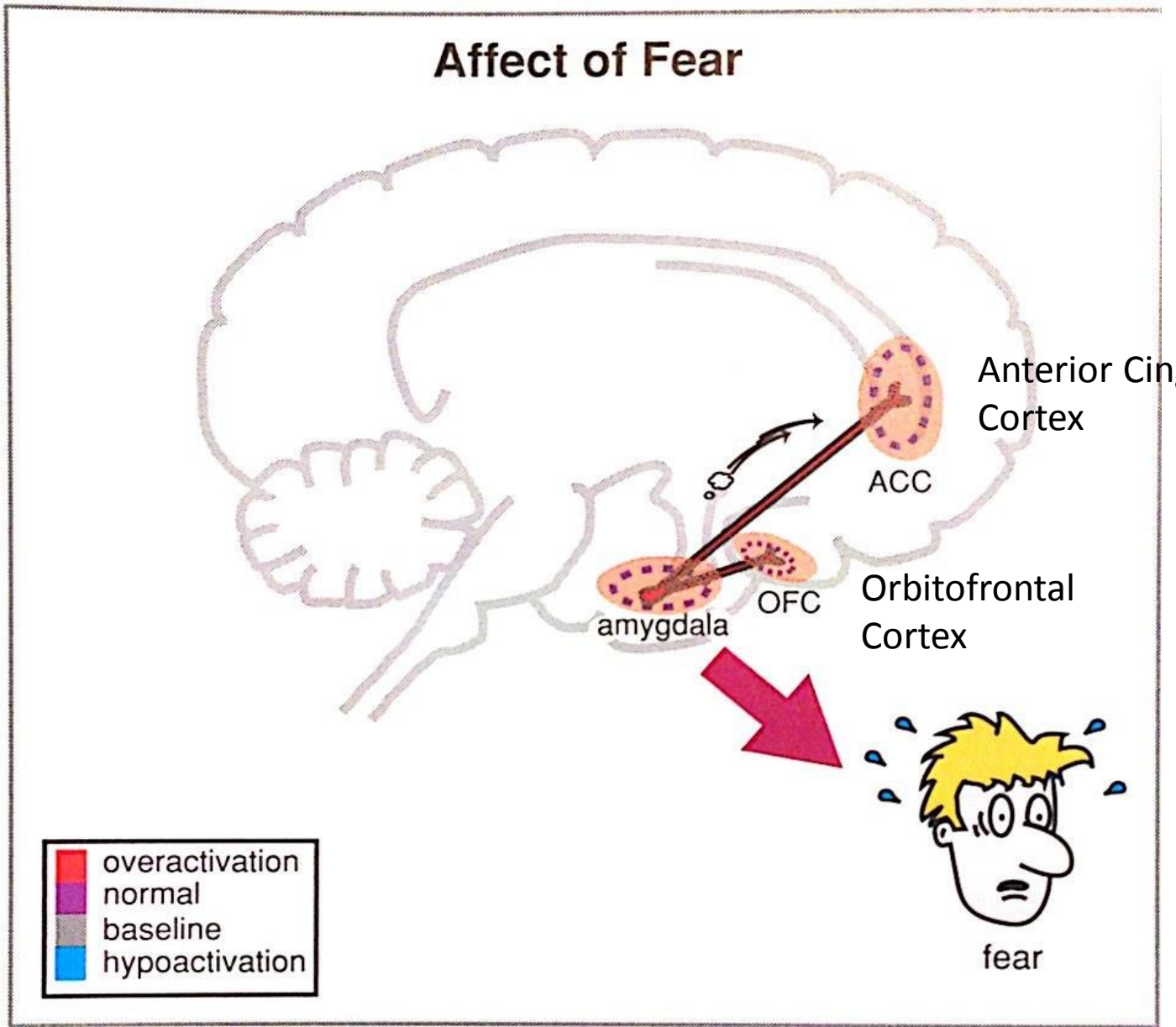
ANXIETY AND FEAR



BRAIN REGULATION OF FEAR



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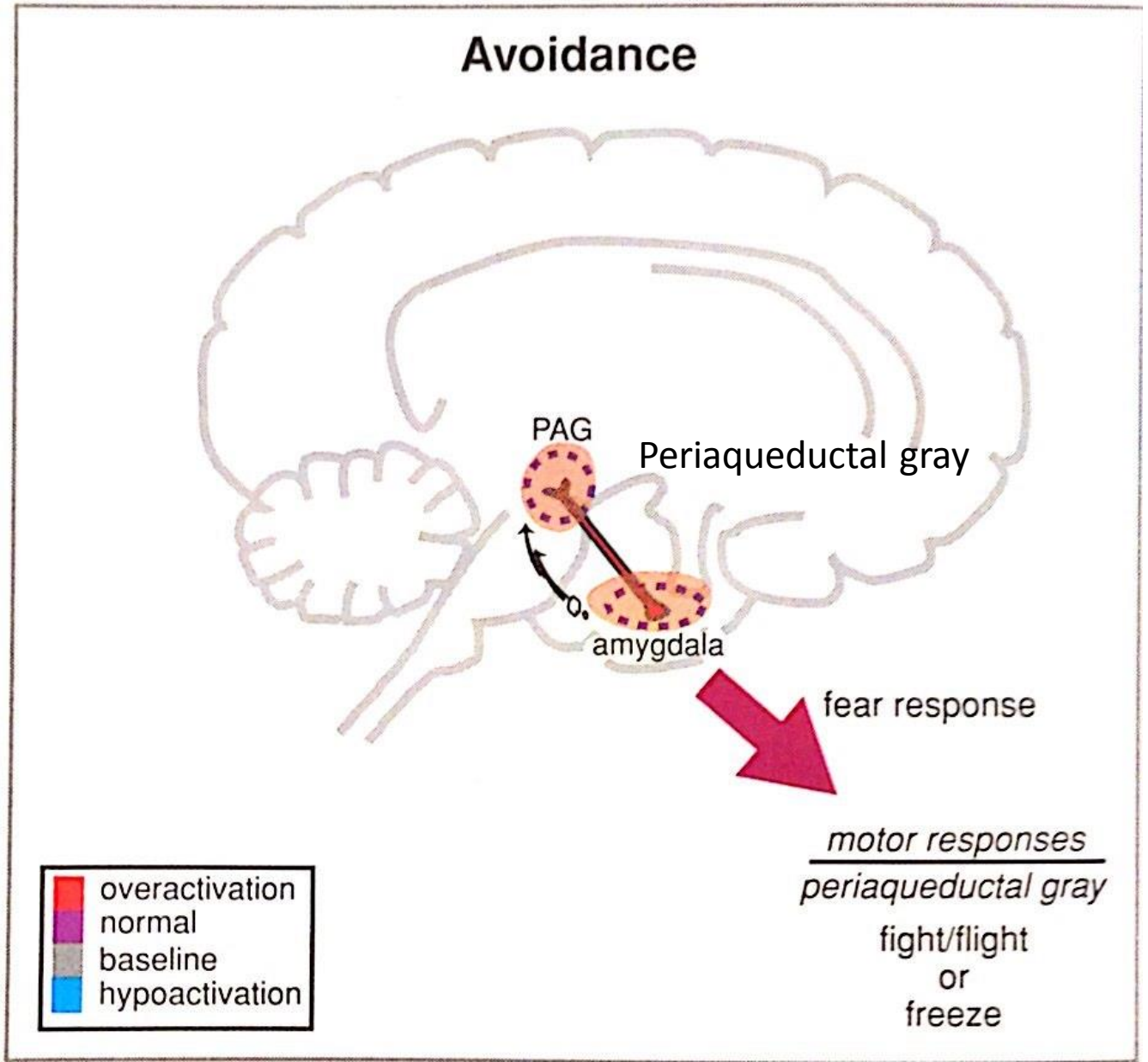
FEAR AND ANXIETY CIRCUITS



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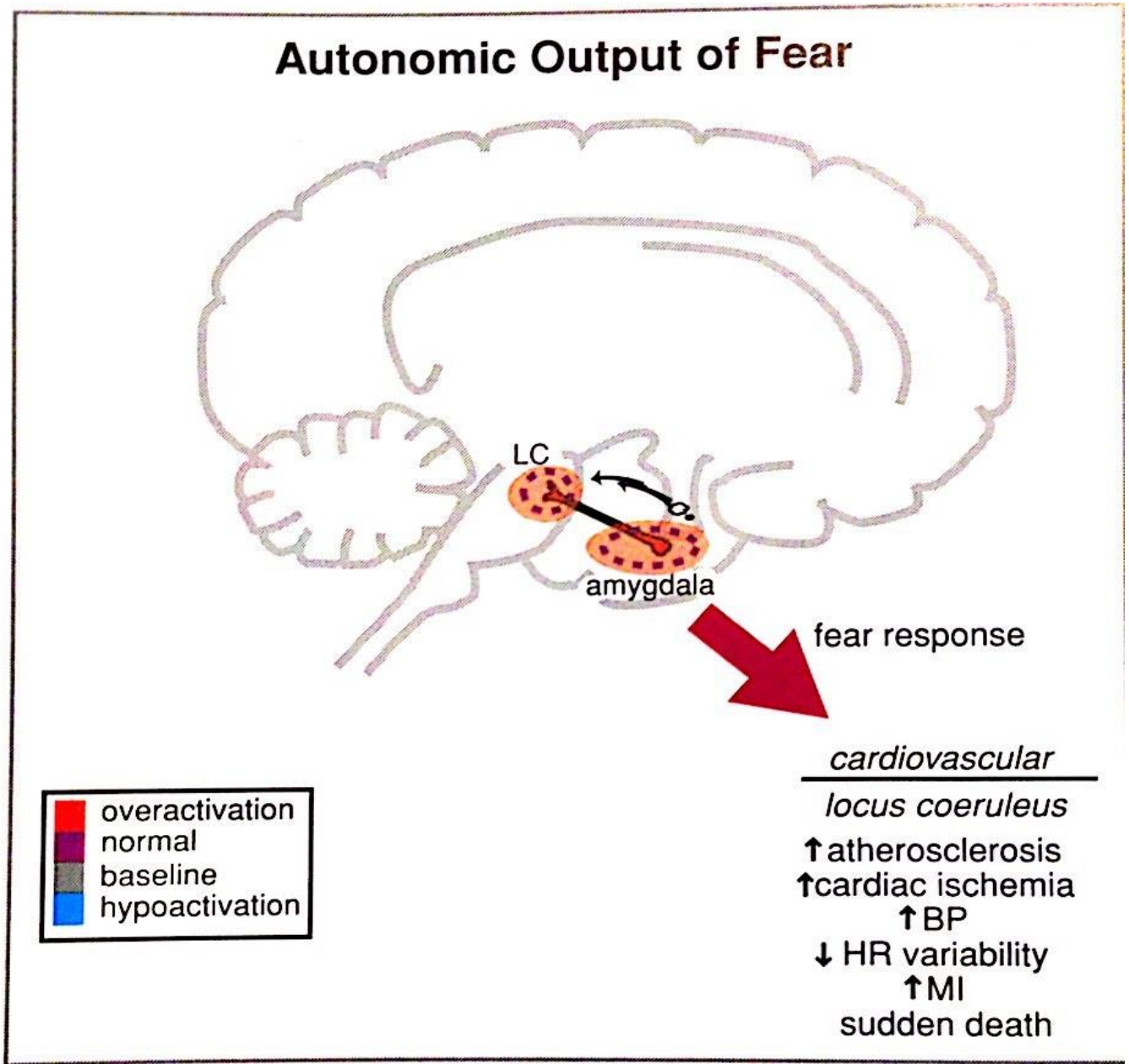
BRAIN OUTPUT AND FEAR



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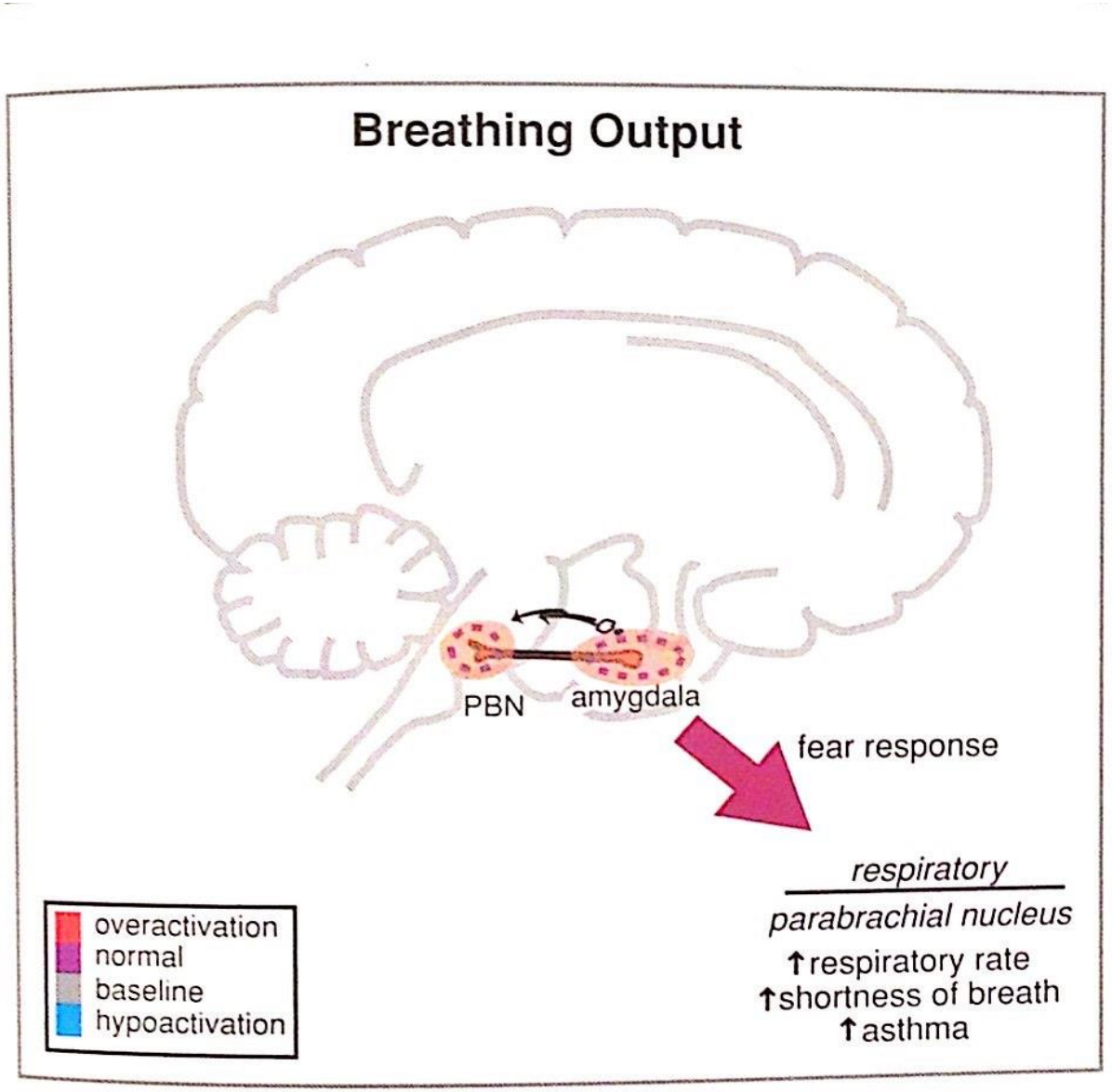
BREATHING AND FEAR



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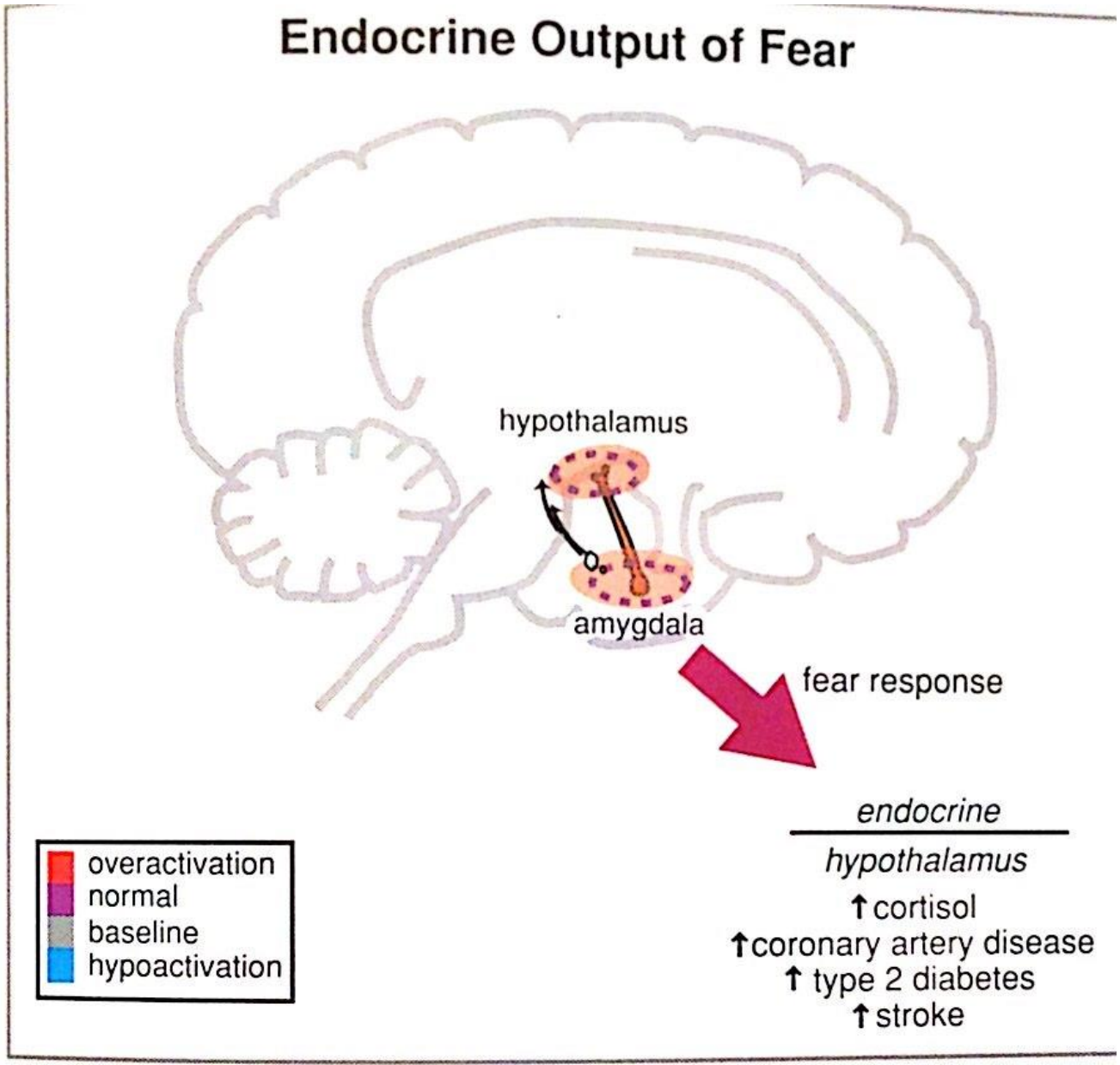
ENDOCRINE OUTPUT AND FEAR



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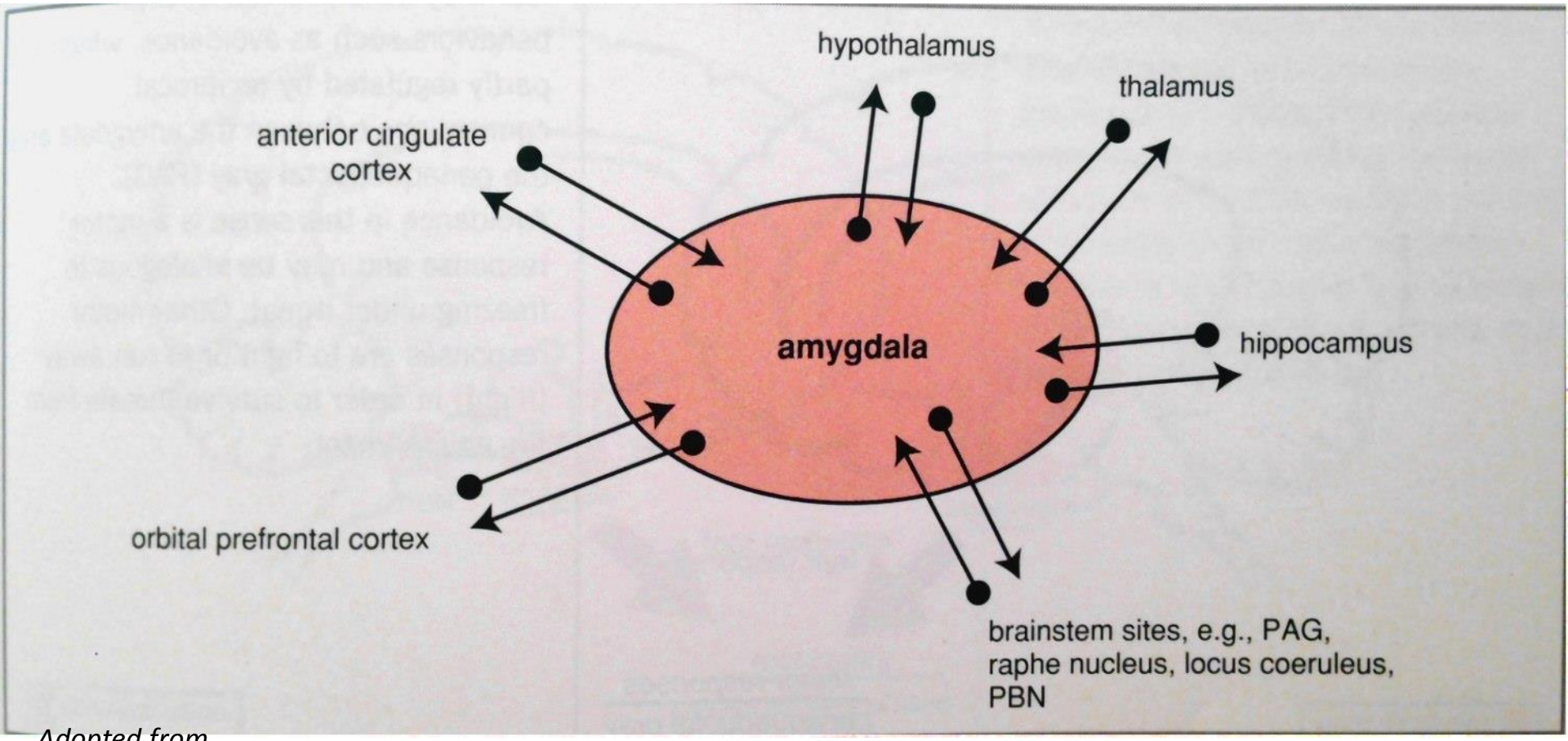
AMYGDALA AND FEAR



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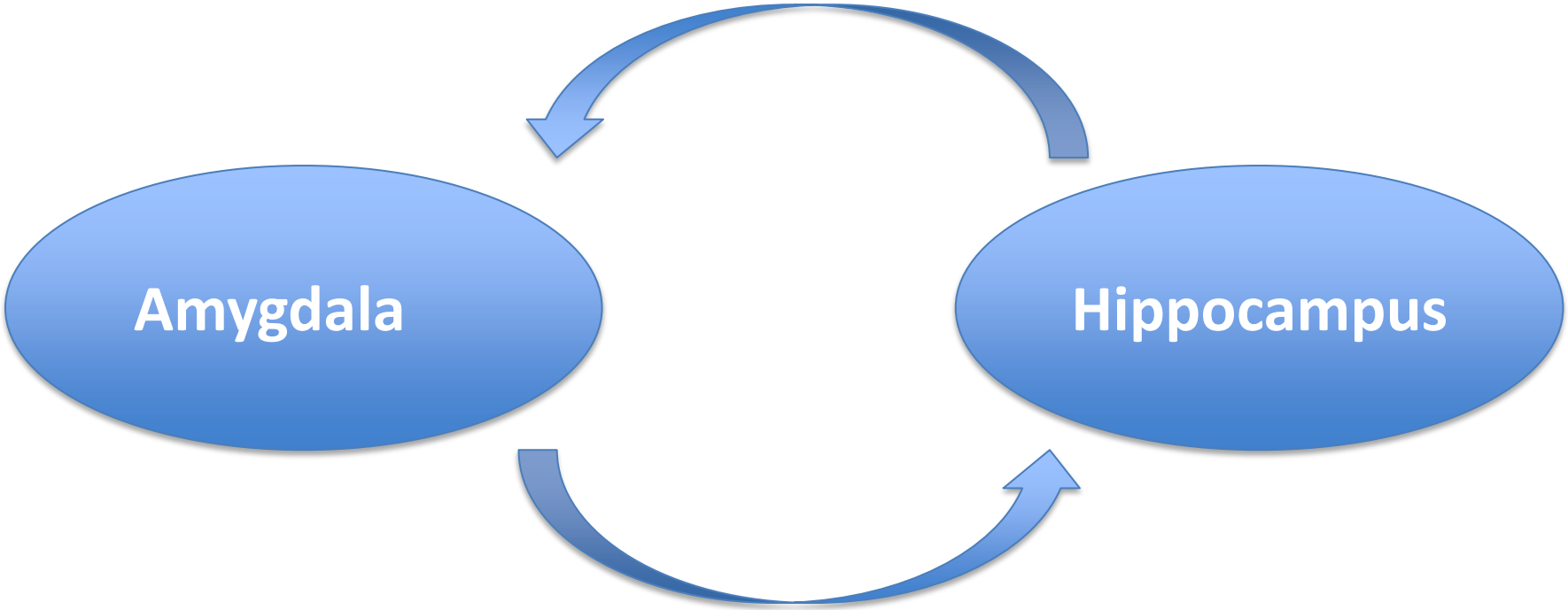
RE EXPERIENCING FEAR

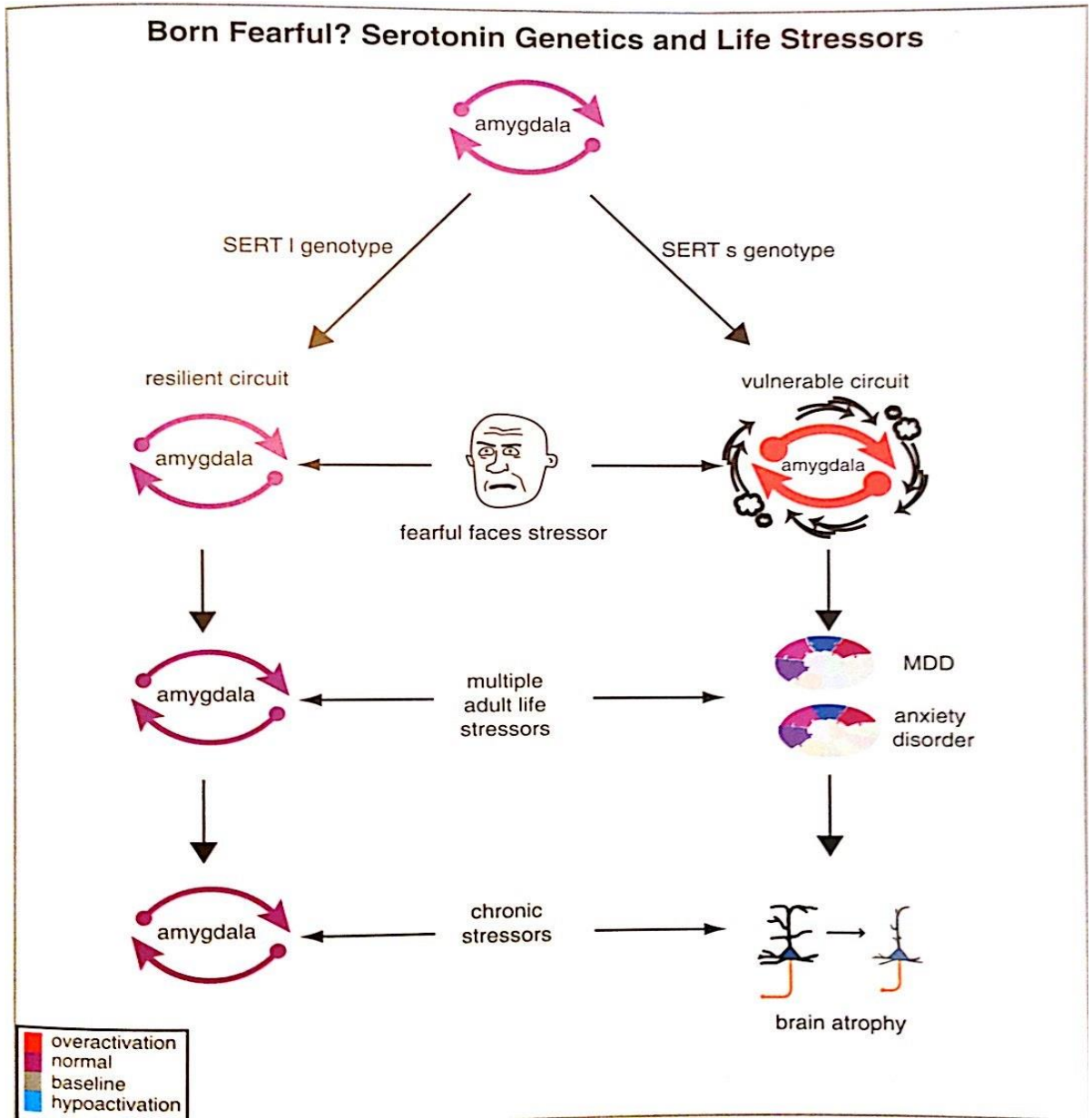
Anxiety can be triggered by memories (as well as outside stimuli): traumatic memories stored in the hippocampus can active the amygdala which can in turn activate other brain regions causing fear response.



IS FEARFULNESS GENETIC?

- SERT1 genotype
- SERT S genotype
  - Serotonin Transporter gene (s type)
  - Amygdala over reacts to fearful situations
  - Determines how well you respond to stress
  - Vulnerability or resilience of fear

SEROTONIN GENETICS



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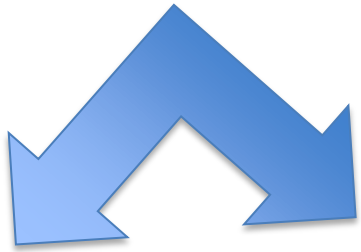
SENSITIZATION TO STRESS

Stress Diathesis Hypothesis of Psychiatric Disorders



SERT Genotype

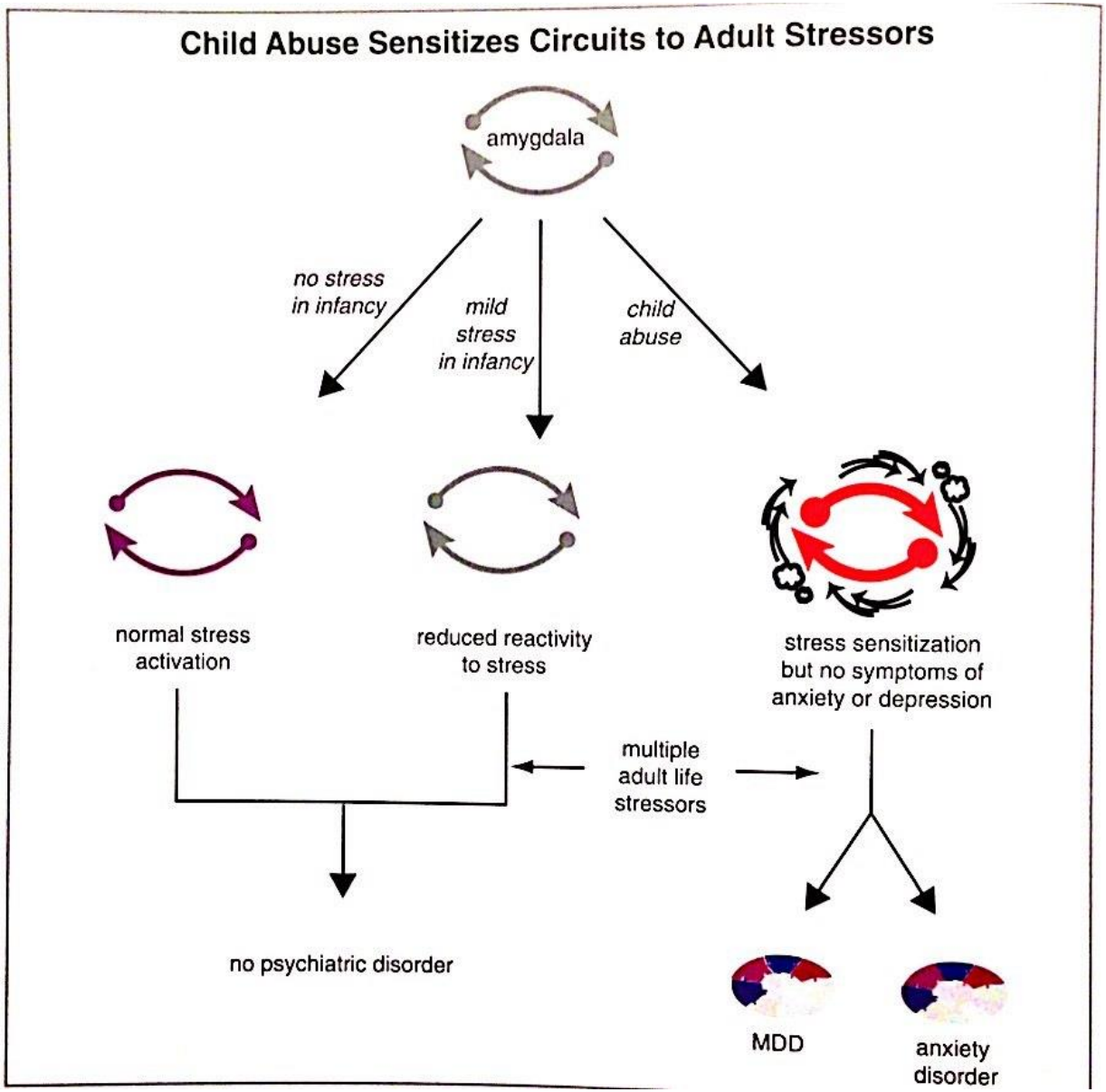
Environment

All stress in childhood may not be bad.

In animal models, exposure to mild stress in infancy can render an animal less reactive to stress later in life than animals not exposed to stress in infancy.

Mild stress may actually desensitize circuits to subsequent stress and produce a type of experience based resilience.

STRESS IN EARLY YEARS



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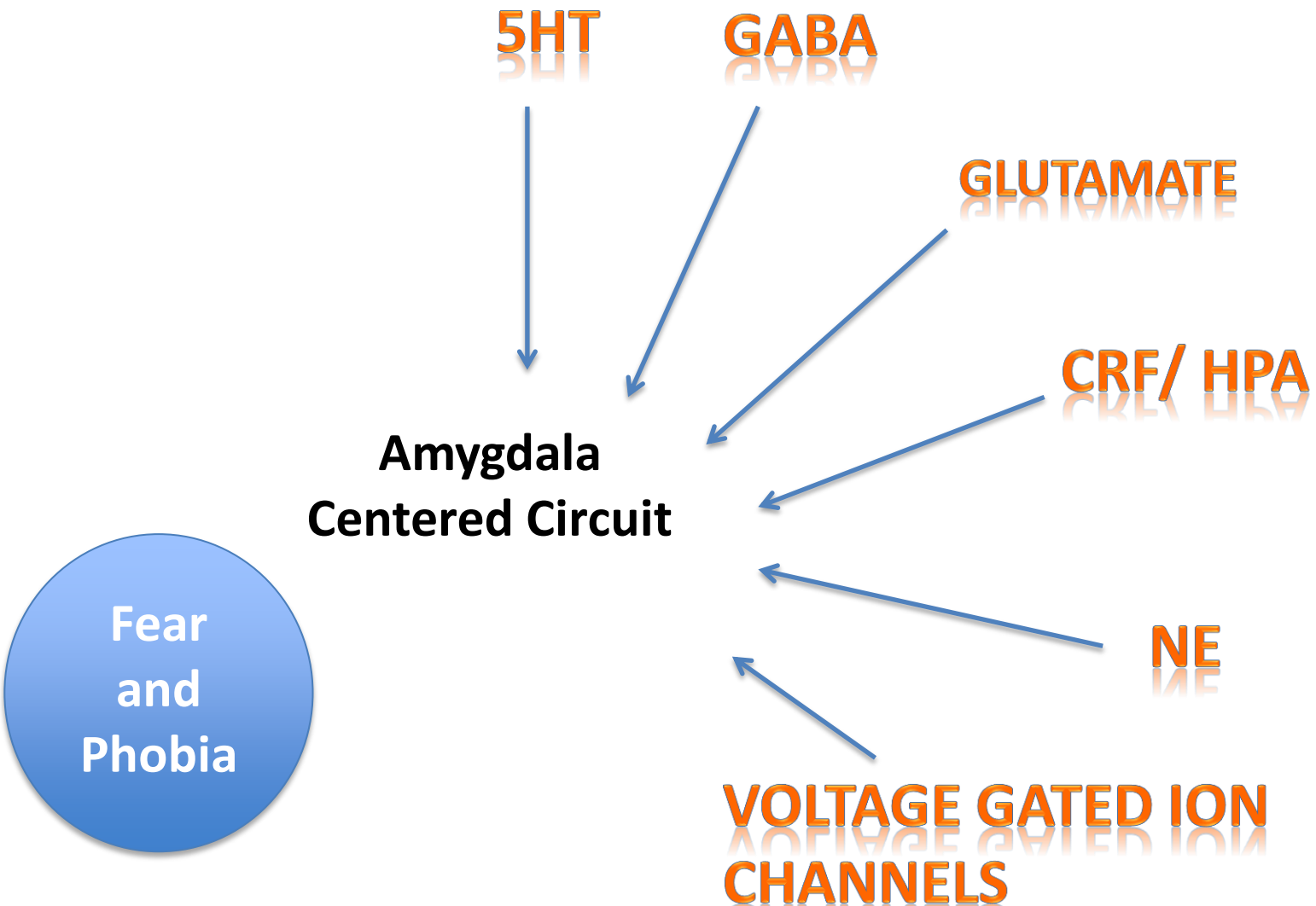
AMYGDALA AND NEUROTRANSMITTERS



WHAT ABOUT THOSE NEUROTRANSMITTERS?

DOPAMINE	→	Pleasure, Appetite Suppression
NOREPINEPHRINE	→	Arousal, Appetite Suppression
ACETYLCHOLINE	→	Arousal, Cognitive Enhancement
GLUTAMATE	→	Learning, Memory Enhancement
SEROTONIN	→	Mood Modulation, Appetite Suppression
BETA-ENDORPHIN	→	Reduction of Anxiety and Tension
GABA	→	Reduction of Anxiety and Tension

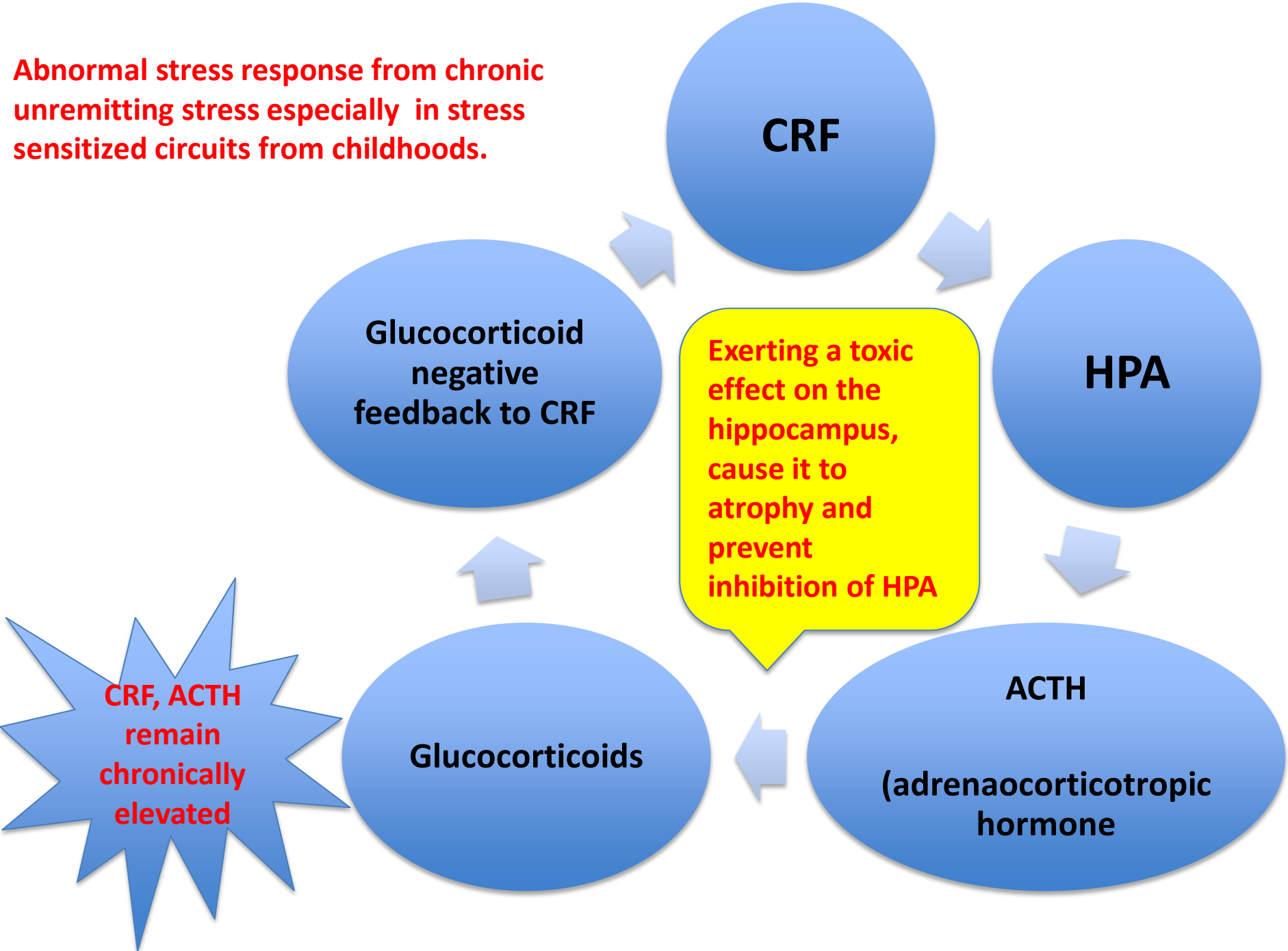
SEROTONIN & DOPAMINE

Technically, the only two things you enjoy

WHAT ABOUT CRF/HPA?

- CRF is Corticotrophin releasing factor
- HPA stands for Hypothalamic-Pituitary-Adrenal Axis.
- Regulation of “steroids” or glucocorticoids to react to stress
  - Cortisol
  - Dopamine
  - Epinephrine
  - Norepinephrine

Abnormal stress response from chronic unremitting stress especially in stress sensitized circuits from childhoods.



ANXIETY AND SUBSTANCE ABUSE

- Substance Abuse
  - Self medicating
    - Initially, a way to alleviate unpleasant symptoms of un-manageable stress.
    - Reward circuitry can overpower the use of substances and turn it into the abuse of substances.
      - Potent behavior reinforcing properties of some psychoactive drugs sustain the need and ability of drug to ameliorate underlying psycholocial symptoms.
      - *we will discuss this topic next
  - Comorbid psychiatric disorders
    - 78 % of men and 86% of women also have at least one other psychiatric disorder.

Piazza PV, Le Moal M. "The Role of Stress in Drug Self-Administration" Trends in Pharmacological Sciences 19 (1998): 67-74.

THEORETICAL FRAMEWORK FOR AN EARLY RISK ASSESSMENT PROFILE

A study to identify the ADHD predictors of risk that were present in a cohort of school- aged children when a drug or alcohol event was first reported.

Banks, Anne C., PhD. An early risk assessment model for alcohol and substance abuse using ADHD predictors of risk. Dissertation, University of Louisville Kent School of Social Work, May 2005.

THEORETICAL FRAMEWORK FOR AN EARLY RISK ASSESSMENT PROFILE

Family Domain

Risk Factors		
ADHD	**Both**	**Substance Abuse**
Genetics Coercive parenting Lack of parental supervision Ineffective parenting Lack of mutual attachment & nurturing Mother with depression Familial oppositional defiant disorder Familial conduct disorder Low socioeconomic status (Poverty) Education level of caregiver Type of family Parental stress Marital discord	Genetics Parental alcoholism Mother with Depression Familial Oppositional Defiant Disorder Familial Conduct Disorder Coercive Parenting Lack of Parental Supervision Ineffective Parenting Lack of Mutual Attachment & Nurturing Low Social Economic Status (Poverty) Chaotic home environment Education level of caregiver Type of family Parental stress Marital discord	Genetics Coercive parenting Lack of parental supervision Ineffective parenting Lack of mutual attachment & nurturing Chaotic home environment Caregiver is a substance abuser Caregiver with a mental disorder Caregiver with a history of criminal behavior Low socioeconomic status (Poverty) Education level of caregiver Occupation of Caregiver Type of Neighborhood Type of family Parental stress Marital discord
Protective Factors		
ADHD	**Both**	**Substance Abuse**
Communication Clear and consistent discipline Strong bond between child and family Parental involvement in child's life Supportive parenting (a) financially (b) emotionally (c) cognitively (d) socially (e) involvement with prosocial institutions Age-appropriate parental monitoring of social events (a) establish curfews (b) supervision of activities (c) know child's friends (d) enforce house rules Problem solving and communication training Volunteering at school Demanding services from the school system	Communication Clear and consistent discipline Strong bond between child and family Parental involvement in child's life Supportive parenting (a) financially (b) emotionally (c) cognitively (d) socially (e) involvement with prosocial institutions Age-appropriate parental monitoring of social events (a) establish curfews (b) supervision of activities (c) know child's friends (d) enforce house rules Problem solving and communication training Volunteering at school	Communication Clear and consistent discipline Strong bond between child and family Parental involvement in child's life Supportive parenting (a) financially (b) emotionally (c) cognitively (d) socially (e) involvement with prosocial institutions Age-appropriate parental monitoring of social events (a) establish curfews (b) supervision of activities (c) know child's friends (d) enforce house rules Problem solving and communication training Volunteering at school Acceptance of conventional norms against drug use

Banks, Anne C., PhD. An early risk assessment model for alcohol and substance abuse using ADHD predictors of risk. Dissertation, University of Louisville Kent School of Social Work, May 2005.

THEORETICAL FRAMEWORK FOR AN EARLY RISK ASSESSMENT PROFILE

Peer Domain

Risk Factors		
ADHD	**Both**	**Substance Abuse**
Major Transitions in Life Puberty (Physical Development) Parental Divorce Elementary School Somewhat socially excluded Bad reputation in school Elementary to Middle School Wider peer group Greater academic expectations First time likely to encounter drug use Peers' and peers' parents discourage interaction Excluded from peer social events Middle to High School Additional social, psychological, and educational challenges Peer exclusion Association with Peers with problem behaviors Association with peers using alcohol & drugs General Association with peers with problem behaviors Association with peers using alcohol & drugs Misperceptions of the extent and acceptability of drug-abusing behaviors Adolescent delinquency	Major Transitions in Life Puberty (physical development) Parental Divorce Elementary to Middle School Wider peer group Greater academic expectations First time likely to encounter drug use Middle to High School Additional social, psychological, and educational challenges General Peer exclusion Association with peers with problem behaviors Association with peers using alcohol & drugs Misperceptions of the extent and acceptability of drug-abusing behaviors Adolescent delinquency	Major Transitions in Life Puberty (physical development) Parental Divorce Elementary to Middle School Wider peer group Greater academic expectations First time likely to encounter drug use Middle to High School Additional social, psychological, and educational challenges General Peer exclusion Association with peers with problem behaviors Association with peers using alcohol & drugs Adolescent delinquency Misperceptions of the extent and acceptability of drug-abusing behaviors
Protective Factors		
ADHD	**Both**	**Substance Abuse**
Development social competence skills	Development social competence skills	Development social competence skills

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THEORETICAL FRAMEWORK FOR AN EARLY RISK ASSESSMENT PROFILE

Community Domain

Risk Factors		
ADHD	**Both**	**Substance Abuse**
Criminal behavior Substance use and abuse	Criminal behavior	Criminal behavior Poverty Misperceptions of the Extent & Acceptance of Substance Abusing Behavior
Protective Factors		
ADHD	**Both**	**Substance Abuse**
Development and coordination of services and resources Develop short-term goals relevant to implementation of research-based prevention programs Incorporate ongoing assessments to evaluate the effectiveness of prevention strategies	Development and coordination of services and resources Develop short-term goals relevant to implementation of research-based prevention programs Incorporate ongoing assessments to evaluate the effectiveness of prevention strategies	Development and coordination of services and resources Develop short-term goals relevant to implementation of research-based prevention programs Incorporate ongoing assessments to evaluate the effectiveness of prevention strategies Identify the specific drugs and other child and adolescent problems in the community Organize a community group to develop a community prevention plan, coordinate resources and activities, and support research-based prevention in all sectors of the community Leaders address gaps in SES levels

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THEORETICAL FRAMEWORK FOR AN EARLY RISK ASSESSMENT PROFILE

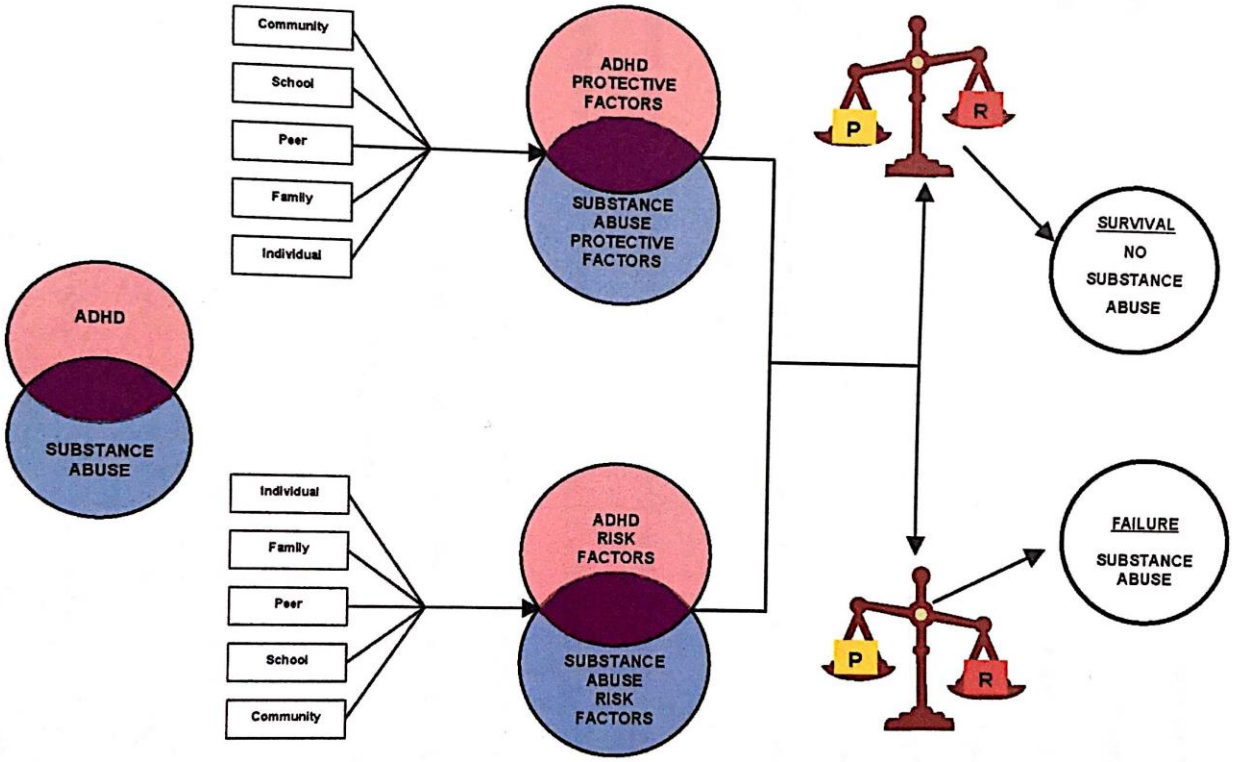

Figure 4. **Theoretical framework for an early risk assessment model for substance use disorder.**

Banks, Anne C., PhD. An early risk assessment model for alcohol and substance abuse using ADHD predictors of risk. Dissertation, University of Louisville Kent School of Social Work, May 2005.

END PART 1

- Questions?
- Comments?
- Connect the Dots?
  - How do substances of abuse act on circuits of fear and stress?

CHALLENGE QUESTION:

- Ethanol, the second most widely used psychoactive drug in the world, is used as a sedative and intoxicant.
  - **Name a neurotransmitter that EtOH effects to alleviate the effects of stress and anxiety?**

    - A potent inhibitor of glutamate receptors (NMDA subtype receptor inhibitor) which disrupts glutamatergic neurotransmission.
    - Glutamate system is excitatory.