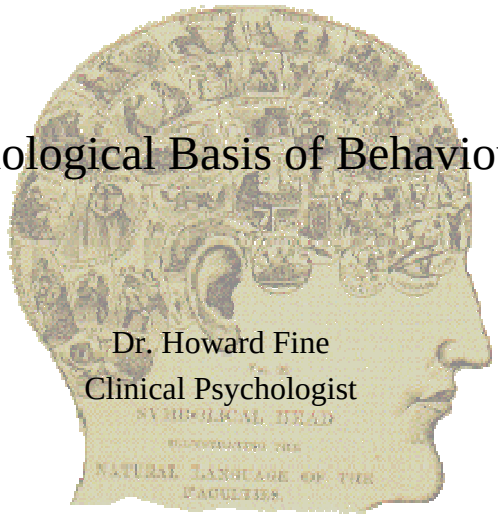
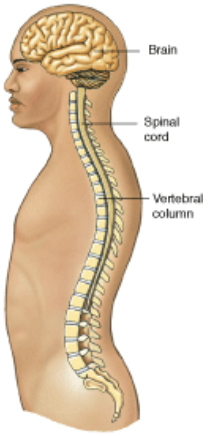
The Biological Basis of Behaviour 2



Dr. Howard Fine
Clinical Psychologist

1

The Spinal Cord



2

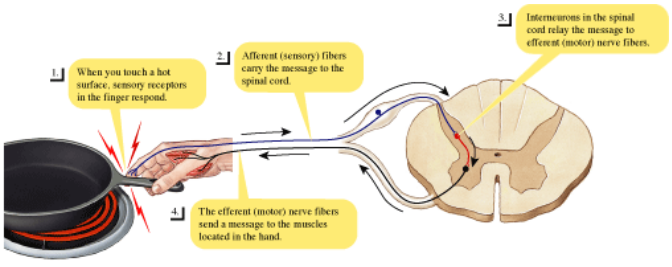
The Spinal Cord

- Complex cable of nerves that connects brain to rest of the body
- Carries motor impulses from the brain to internal organs and muscles
- Carries sensory information from extremities and internal organs to the brain

3

The Spinal Cord

- The spinal cord controls some protective reflex movements without any input from the brain



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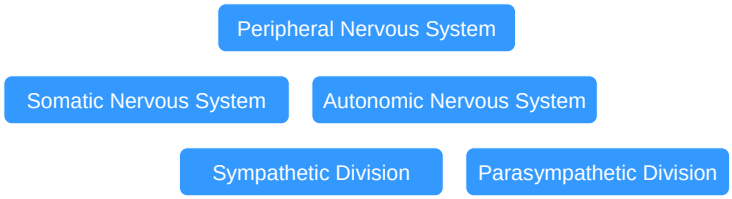
The Peripheral Nervous System



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The Somatic Nervous System

- Consists of neurons that communicate between the body and the brain
- Afferent neurons
  - Neurons that carry messages from sense organs to spinal cord
- Efferent neurons
  - Neurons that carry messages from the spinal cord or brain to muscles and glands

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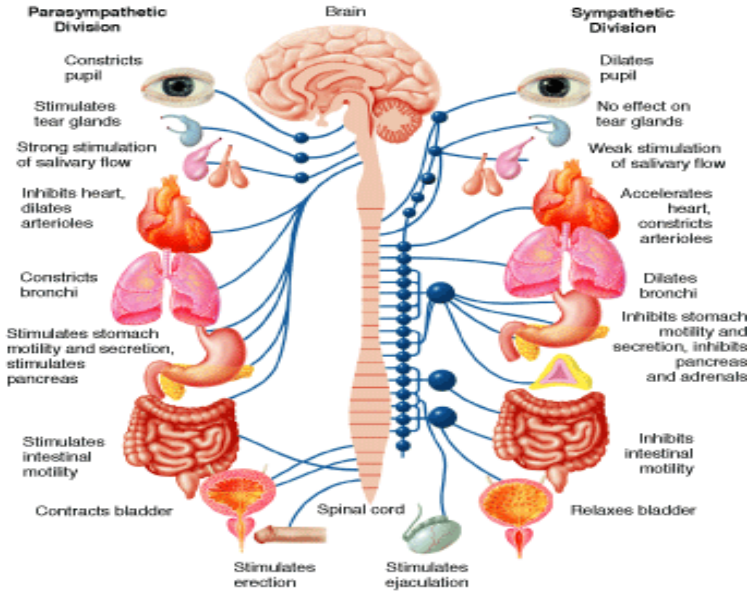
The Autonomic Nervous System



7

The Autonomic Nervous System

- The ANS controls the internal organs and glands of the body over which we have little voluntary control.
- Comprises of two branches :
  - Sympathetic – takes over whenever the body needs to use energy
  - Parasympathetic – Dominant when the body is at rest
- The ANS produces its affects in two ways :
  - Direct neural stimulation of body organs
  - Stimulating the release of hormones from the endocrine glands.
    - Both controlled by the *hypothalamus*

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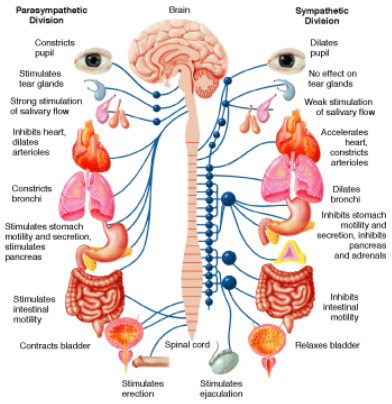
The Autonomic Nervous System



- Sympathetic division
  - Most active when you are angry, afraid, or aroused
  - Fight-or-flight response
  - Increases heart rate and breathing
  - Stops digestion

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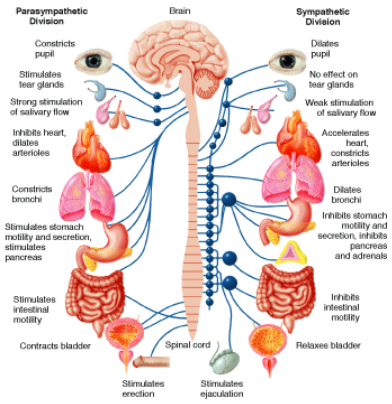
The Autonomic Nervous System

- Parasympathetic division
  - Calms body
  - Produces effects opposite to those of the sympathetic division
  - Reduces heart rate and breathing
  - Restores digestion



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The Endocrine System

- The bodily reactions which result from the ANS are produced by its effects on the *endocrine* glands, which secrete *hormones*.
- Helps coordinate and integrate complex psychological reactions
- Endocrine glands secrete dozens of hormones into the bloodstream by the glands
- A gland may secrete several different types of hormones and each hormone may have an immediate or long lasting effect on several target tissues and organs throughout the body.
- Hormones serve to organize the nervous system and body
- Hormones also activate behaviour, such as sexual behaviour
- The nervous system and the endocrine system are in constant communication and work together to regulate the many psychological and behavioural functions.

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The Endocrine System

- ***Hormones*** – Chemical messengers which, unlike neurotransmitters, are released directly into the bloodstream and are carried throughout the body.
- Effect slower than neurotransmitter electrochemical impulse – several seconds may be required for the stimulation, release, and arrival of a needed hormone at its destination.
  - ⇒ Immediate behavioural reaction (reflex action) – NS major role
  - ⇒ Communicating steady messages over prolonged period (puberty) – hormones.

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Major Endocrine Glands

- ***Pituitary Gland*** – Structurally part of the brain situated just below the hypothalamus.
  - Comprises two independently functioning parts :
    - *Posterior* – Hormones manufactured by the hypothalamus
    - *Anterior* – Stimulated by the hypothalamus to produce its own hormones
- ***Adrenals*** – Structurally situated just above the kidneys. Important in coping with stress.
- ***Thymus*** – Situated in the chest, functions are unknown but thought to involve production of antibodies.
- ***Pancreas*** – Secretes *insulin*, controlling the body's ability to absorb and use glucose and fats.
- ***Pineal body/gland*** – Situated near the corpus callosum, function unknown but may play a role in sleep-waking cycle.

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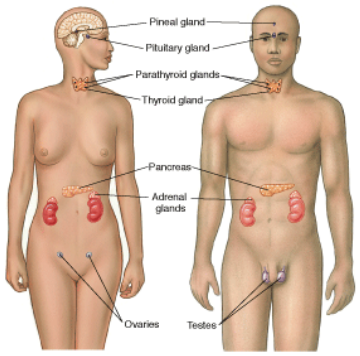
The Endocrine System

- Pineal gland
  - Secretes melatonin which regulates the sleep-wake cycle
- Pituitary gland
  - Referred to as the "master gland" because it regulates many other glands



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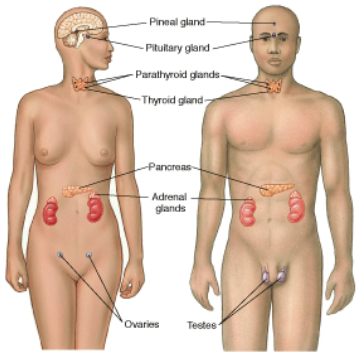
The Endocrine System

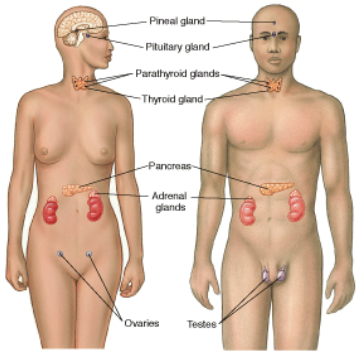
- Parathyroid glands
  - Control levels of calcium and phosphate which in turn controls levels of excitability
- Thyroid gland
  - Secretes hormones (primarily thyroxin) that control metabolism



15

The Endocrine System

- Pancreas
  - Regulates blood-sugar levels
  - Secretes insulin and glucagon
- Adrenal glands
  - Secretes hormones in reaction to stress
- Gonads
  - Ovaries and testes secrete estrogens and androgens



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The Stress Response

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Stress

- Stress is the response to events that threaten and tax an individual's coping abilities.
- Allegedly stress is a major contributor to six of the leading causes of death in the UK
  - CHD, cancer, lung disease, accidental injuries, cirrhosis of the liver, suicide

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Health problems that may be linked to stress 1

- AIDS (Ironson et al., 1994)
- Appendicitis (Creed, 1989)
- Asthma (Sriram & Silverman, 1998)
- Cancer (Holland & Lewis, 1993)
- Chronic pain (Lampe et al., 1998)
- Common Cold (Stone et al., 1992)
- CHD (Orth-Gomer et al., 2000)
- Diabetes (Riazi & Bradley, 2000)
- Epileptic seizures (Kelly & Schranke, 2000)
- Haemophilia (Buxton et al., 1981)

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Health problems that may be linked to stress 2

- Herpes (Padgett & Sheridan, 2000)
- Hypertension (Pickering et al., 1996)
- Hyperthyroidism (Yang, Liu & Zang, 2000)
- IBS (Searle & Bennett, 2001)
- Migranes (Ramadan, 2000)
- MS (Grant et al., 1989)
- PMS (Wu-Holt & Boutte, 1994)
- Rheumatoid Arthritis (Huyser & Parker, 1998)

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Health problems that may be linked to stress 3

- Skin disorders (Arnold, 2000)
- Stroke (Harmsen et al., 1990)
- Ulcers (Murison, 2001)
- Vaginal infections (Williams & Deffenbacher, 1983)

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Stressor

- Disruptive forces operating within or on any system

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Stress in the UK

- Stress related absence from work accounts for half of all sickness rates at an estimated cost of £4 billion
- Early retirement due to stress burnout is increasing, particularly in the public sector
  - The HSE are now planning to included stress at work in risk assessment and legislation
- 75% of GP visits present with at least one form of psycho-social problem

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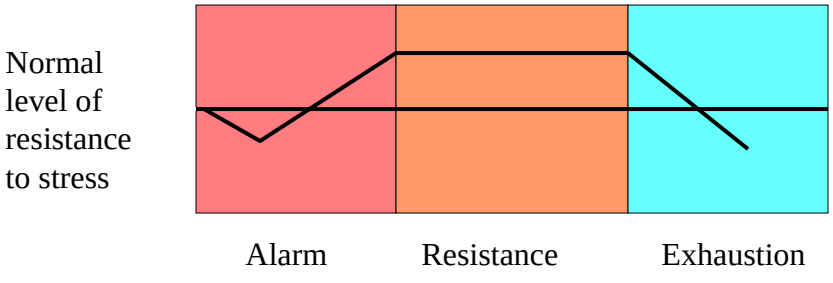
Stress: General Adaptation Syndrome



Hans Seyle

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Stress: General Adaptation Syndrome

- General Adaptation Syndrome (GAS) Seyle's term for the common effects on the body when demands are placed on it. The GAS consists of three stages: 1) alarm, 2) resistance, and 3) exhaustion.
- In the first phase, the organism becomes mobilized to meet the threat. In the second stage, the organism tries to cope with the threat, and in the third stage, the organism has depleted its physiological resources from trying to cope with the stressor.
- Hans Selye - exposed rats to prolonged stressors cold, fatigue, etc.. and found that all stressors, of whatever type, produced the same pattern of responding….
- He therefore surmised that an organism, when confronted with a stressor, responds in a way that is nonspecific. Overtime, if the person is continually confronted with stressors, there will be wear and tear on the system.

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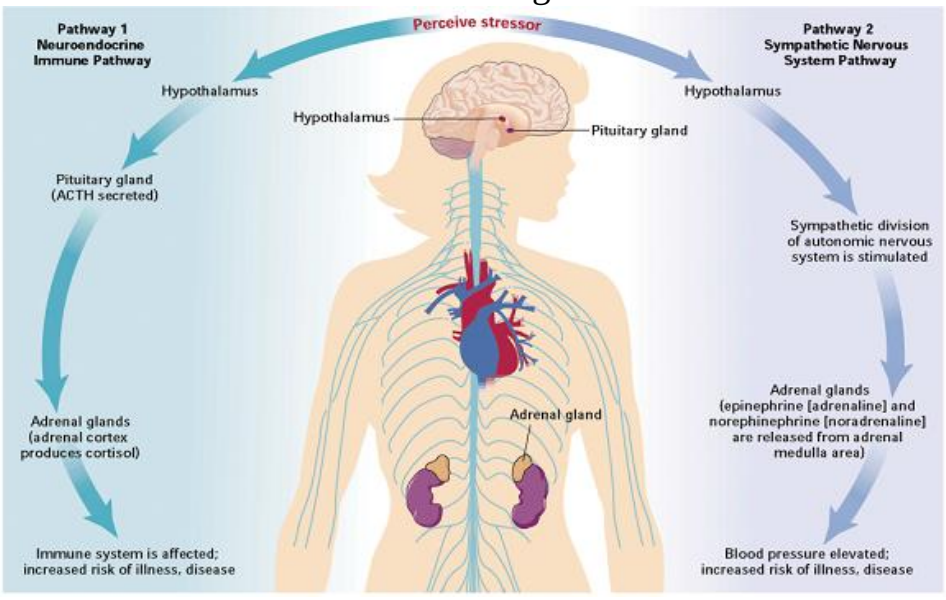
Biological Pathways to Stress
Alarm Stage



Stress Responses

- Alarm stage
  - Fight or flight (Cannon, 1932)
  - Tend and befriend (Taylor, 2000)
    - Protect self and their young, form alliances

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Stress Responses

- Cognitive appraisal (Lazarus, 2000)
  - Primary appraisal
    - Do I perceive the event as
      - Harmful?
      - Threatening?
      - Challenging?
  - Secondary appraisal
    - What coping responses do I have available?

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Examples of cognitive traps

- All or nothing thinking
- Overgeneralisation
- Discounting the positive
- Jumping to conclusions
- Magnification
- Emotional reasoning
- “Should” and must statements
- Personalisation and blame

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Stress and Illness

- Immune System
  - Psychoneuroimmunology
  - Research that indicates immune system and stress are linked
    - Acute stressors: immunological changes
    - Chronic stressors: decreased immune system responsiveness
    - Positive social circumstances and low stress: increased ability to fight cancer

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Stress and illness

- Life events
  - Social Readjustment Scale
    - Holmes and Rahe (1967)
    - Note whether stressful events occurred during the past 12 months
    - Predict likelihood of serious illness based on total life events score

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Stressful Life Events

1. Death of spouse	100
2. Jail sentence	80
=5. Death of close family member	63
=5. Final year at University	63
6. Severe personal injury or illness	60
7. Marriage	50
8. Losing job	47
9. Financial difficulties	45
12. Pregnancy	40
25. Outstanding personal achievement	28
32. Change in residence	20
31. Change in working hours or conditions	20
42. Christmas	12

Homes & Rahe, 1967

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Stress – Daily hassles

- Daily hassles
  - Can create a highly stressful life
    - Example: tense job and living in poverty
  - Not on scales of major life events

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Daily Hassles / Stress

1. May have cumulative effect.
2. May influence major live events - illness connection by:
   a. Increasing stressfulness because of major life event.
   b. Major life event may create increase in daily hassles.

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Typical responses to chronic (negative) stress

- Physical responses – racing pulse
  - vague complaints, weight gain or loss, stooped posture, chronic fatigue, foot tapping, etc.
- Emotional responses – annoyance, anger
  - unexplained sadness or anger, easily distracted, daydreaming, frequent mood changes
- Behavioural responses – yelling, avoidance
  - explosive outbursts, impulsive actions, negative statements, cynical or hostile, self critical, chronic abuse of drugs, alcohol or tobacco

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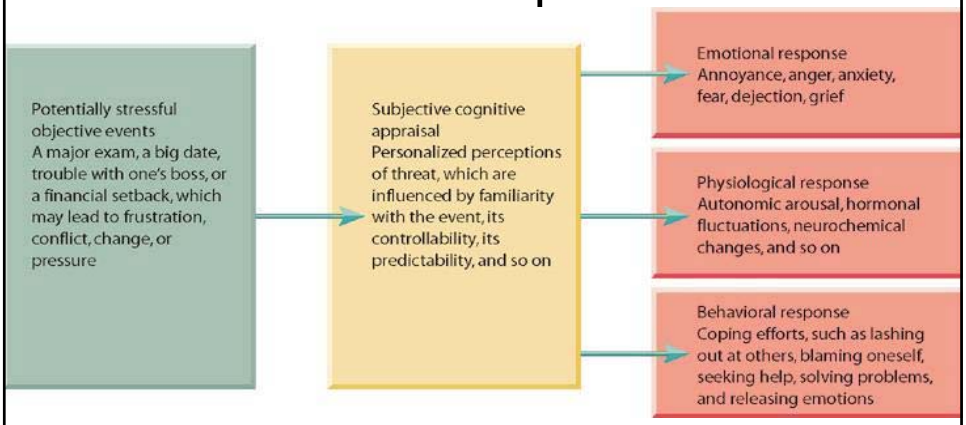
The stress process



A potentially stressful event, such as a major exam, elicits a subjective appraisal of how threatening the event is. If the event is viewed with alarm, the stress may trigger emotional, psychological, and behavioural reactions, as people's response to stress is multidimensional.

Emotional Responses

- More likely unpleasant than pleasant
- Associated with negative mood
- Dependent on cognitive appraisal
- Emotional response may be motivating (reinforcing, punishing)
- Extreme emotional arousal can interfere with coping and performance
- Common reactions include: annoyance, anger, rage, apprehension, anxiety, fear, dejection, sadness, grief, shame, envy, disgust, jealousy

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Responding to Stress Physiologically

- Fight-or-flight response
  - Physiological reaction to threat – a response to stress
  - Sympathetic nervous system (SNS) is aroused in preparation for action (attack or escape)
  - Holds evolutionary value but, today's value??
- Selye's General Adaptation Syndrome
  - A 3-stage reaction to stress:
    - Alarm
    - Resistance
    - Exhaustion

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General Adaptation Syndrome

- Hans Seyle
  - noticed that animal physiological responses to stress were similar regardless of stressor
  - stress reactions are *non-specific*
  - coined the term *stress*

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Behavioural Responses

- *Coping:* Active efforts to master, reduce, or tolerate demands created by stress
- may be positive or negative
- Individuals exhibit styles of coping that are consistent across situations

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Coping - Aggression

- *Frustration-aggression hypothesis*
  - not inevitable
  - context specific
  - displacement
  - catharsis

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Coping - Self Indulgence

- Excessive consummatory behavior
  - shopping, smoking, drinking, eating, internet

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Defensive Coping

- *Defense mechanisms*: unconscious reactions that protect individual from adverse emotions (eg, anxiety, guilt)
  - shield from stress-eliciting events
  - self-deception, distortion of reality
  - Commonly unhealthy - avoidant

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Adaptive/Constructive Coping

Relatively healthy efforts that people make to deal with stressors

1. Confronting problems directly
   - task relevant
   - action oriented
   - rational consideration of options
2. Based on realistic appraisal of stress & coping resources
3. Recognising and inhibiting potentially disruptive emotional reactions

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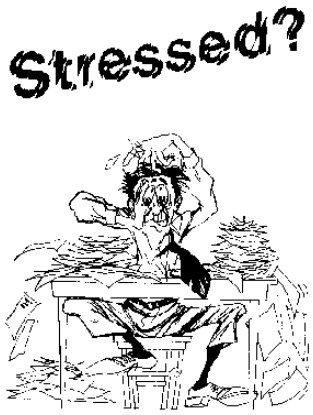
Impact of Stress on Psychology



- Work-related stress
- *Burnout* - physical, mental, emotional exhaustion attributable to longer-term exposure to stressful situations
  - fatigue, weakness, low energy
  - negative attitudes towards self, others, work
  - hopeless, helpless

Stress in the workplace

46

Stress in the Workplace

Occupational stress has been related to psychological distress and adverse health outcomes.

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Stressful Job Factors

1. Physical, chemical & biological hazards.
2. Work overload
3. Work pressure
4. Responsibility for people
5. Role conflict & role ambiguity
6. Inability to develop satisfying social relationships at work
7. Perceived inadequate career development
8. Lack of control over work

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Unemployment

- Also related to poorer health!
- Financial Strain
- Instability

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Ways to Reduce Occupational Stress

1. Reduce physical stressors
2. Minimize unpredictability and ambiguity.
3. Involve workers in decision-making.
4. Make jobs as interesting as possible.
5. Promote social relationships.
6. Reward workers for good work.
7. Watch for signs of stress, boredom, hostility, and intervene.

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Work Stress and Families

Factors protecting women from multiple role strain.

1. Having control and flexibility over the work environment.
2. Having good income.
3. Having someone to help with the housework.
4. Having adequate child care
5. Getting help from one's husband.

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Multiple Roles for Men

- Combined roles can be good for men's well-being too.
- There are risks of transmission of stress from workplace to home for men.

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Stress Moderators

- Social Support
  - students reporting greater social support had higher levels of antibody re: combat respiratory infections
  - strength of relationship rivals cigarette-cancer relationship

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Stress Moderators

- *Optimism* - expectance of positive outcome
  - related to lower incidence of illness and more effective immune functioning
  - cope in more adaptive ways

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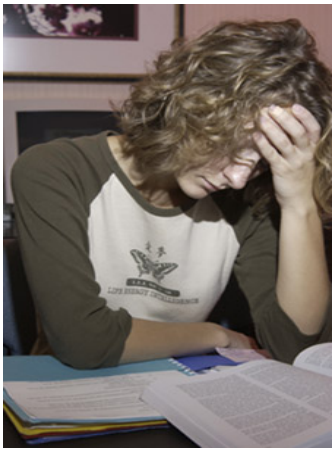
Coping Strategies

- Problem-focused coping
- Emotion-focused coping
  - May be either adaptive or maladaptive



55

Coping Strategies

- Optimism and positive thinking
  - Cognitive restructuring
  - Positive self-talk
  - Self-efficacy
  - Positive self-illusion

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Coping Strategies

- Social Support
  - Tangible assistance
  - Information (and knowing is less stressful than ignorance)
  - Emotional support

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Coping Strategies

- Four main ways to deal with conflict
  - Act aggressively
  - Act manipulatively
  - Act passively
  - Act assertively

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Coping Strategies

- Strategies for becoming more assertive
  - Set up a time for discussing what you want to discuss
  - State the problem in terms of its consequences for you
  - Express your feelings
  - Make your request

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Coping Strategies

- Why is religious commitment associated with better health?
  - Some provide health-related services
  - May promote healthier life style
  - Help people cope effectively with stress
  - Sponsor social connections

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Coping Strategies

- Stress management techniques
  - Meditation
  - Relaxation
  - Biofeedback

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Genes, Evolution, and Behaviour

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Genetics

- Heredity - transmission of trait from one generation to next
- Chromosomes
  - Pairs of thread like bodies that contain genes
- Deoxyribonucleic acid (DNA)
  - Organic molecule arranged in a double-helix
  - Contains the “code of life”

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Behavior Genetics

- Study of behavior from a genetic perspective
- Animal behavior genetic studies include:
  - Strain studies
  - Selection studies

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Human Behavior Genetics

- Family studies
  - Assume that close family members share more of a trait than non-relatives
  - Used to assess the heritability of psychological disorders or traits
- Twin studies
  - Used to determine how heritable a trait or disorder may be
  - Identical twins would have highest heritability

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Human Behavior Genetics

- Adoption studies
  - Used to assess the influence of environment
- Molecular genetics
  - Direct study of the genetic code

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Review Questions

- Describe some psychological evidence that is relevant to our understanding of the sources and causes of stress. Evaluate this evidence. Based on the above evidence, suggest a psychological programme to reduce the stress of examinations. Give reasons for your answer.
- How can stress causes illness? Discuss both behavioural and physiological routes.
- Discuss and evaluate the impact of the main physiological and psychological reactions to stress.
- Discuss the main physiological and psychological reactions to stress. Are there any interactions between them?

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