
LESSON 01**INTRODUCTION TO HEALTH PSYCHOLOGY****Prologue**

“Wide load” the boys shouted as they pressed themselves against the walls of the hallway at school. They were ‘making room for a very overweight girl named Sara to pass through. Lunch time in the cafeteria was even more degrading for Sara because when she sat down to eat; her schoolmates would stop eating, stare at her every move, and make pig noises. “Kids can be cruel.” her parents would say to console her. One of Sara’s aunts told her that she inherited a glandular problem, and you can’t do anything about it.” and another aunt said, “You’ll lose weight easily in a couple of years when you start getting interested in boys.” Is either aunt right?

Sara’s parents are concerned about her weight because they know that overweight people often have social problems and face special health risks, particularly for high blood pressure and heart disease. But her parents are not sure why she is so heavy or how to help her. Although her father is a bit overweight, her mother is very heavy; was heavy as a child, and did not lose weight when she became interested in boys. This could support the idea of an inherited cause of her being overweight. On the other hand, they know Sara eats a lot of fattening foods and gets very little exercise, a combination that often causes weight gains. As part of their effort to change these two behaviors, they encouraged her to join a recreation program, where she will be involved in many physical activities.

This story about Sara illustrates important issues related to health. For instance, being overweight is associated with the development of specific health problems and may affect the individual’s social relations. Also, weight problems can result from a person’s inheritance and his or her behavior.

What is Health?

What is health? How do you know when you are healthy? To answer these questions, let’s first consider what illness is. We define a disease as a characteristic grouping of physical signs and symptoms; it is given a specific name and can often be traced to a specific causal agent. Illness, however, is a broader term that involves people’s beliefs about the state of their physical well-being and the resulting behaviors they engage in.

Illness beliefs may be the result of a specific disease or just the way we feel when we say we are ill (even when there is no evidence of a disease).

Illness is important because it is what motivates people to seek out a physician. A disease is what the physician recognizes as a specific disorder based on known signs and symptoms. Therefore, a physician is likely to define health as the absence of disease, while the average person might define health more broadly; as the absence of any ill feelings.

In both of these definitions, however, health is described in terms of what it is not—as the absence of disease or illness.

We commonly think about health in terms of an absence of

- (1) Objective signs that the body is not functioning properly, such as measured high blood pressure, or
- (2) Subjective *symptoms* of disease or injury, such as pain or nausea.

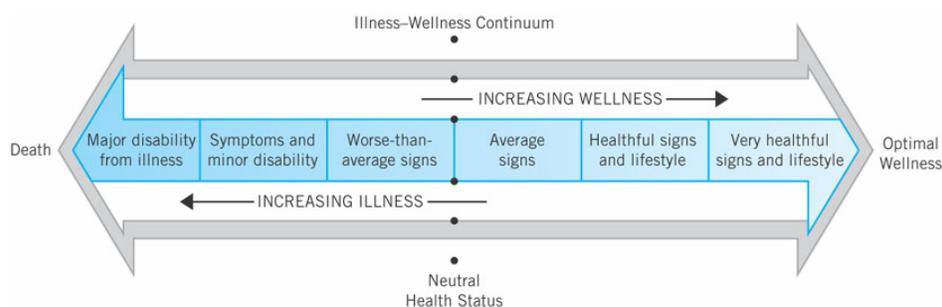
Dictionaries define health in this way, too. But there is a problem with this definition of health. Let’s see why.

Consider Sara, the overweight girl in the opening story. You’ve surely heard people say. “It’s not healthy to be overweight,” Is Sara healthy? What about someone who feels fine but whose lungs are being damaged from smoking cigarettes or whose arteries are becoming clogged from eating foods which are high in

saturated fats? These are all signs of improper body functioning. Are people with these signs healthy? We probably would say they are not “sick”—they are just less healthy than they would be without the unhealthful conditions.

This means health and sickness are not entirely separate concepts—they overlap. There are degrees of wellness and of illness. Medical sociologist Aaron Antonovsky (1979, 1987) has suggested that we consider these concepts as ends of a continuum, noting that “We are all terminal cases. And we all are, so long as there is a breath of life in us, in some measure healthy”. He also proposed that we revise our focus, giving more attention to what enables people to stay well than to what causes people to become ill.

The Illness-wellness Continuum



In this way, health refers to a positive state of physical, mental, and social wellbeing—not simply the absence of injury or disease—that varies over time along a continuum. At the wellness end of the continuum, health is the dominant state. At the other end of the continuum, the dominant state is illness or injury, in which destructive processes produce characteristic signs, symptoms, or disabilities.

Health and Wellness Defined

In 1947, the World Health Organization (WHO) defined health as “the state of complete mental, physical, and social well-being, not merely the absence of disease” (WHO, 1947). WHO’s definition was the first globally accepted conceptualization of health and stood the test of time for more than a decade.

Although multifaceted, this definition of health was flawed, according to members of a new movement called holistic health. The holistic health movement came into being in the 1960s as an attempt to expand the view of health that WHO had spread.

One of the early pioneers in the field, Halbert Dunn (1962), believed that WHO’S vision of health characterized it as a static state. Rather than call health a state of well-being, Dunn preferred to view it as a continuum. Developing and maintaining a high level of health means moving toward high-level functioning along a continuum that starts with low-level wellbeing and ends with optimal functioning. Health is a conscious and deliberate approach to life and being, rather than something to be abdicated to doctors and the healthcare system. Optimal health is a result of your decisions and behavior.

In addition, Dunn recast the notion of wellbeing to revolve around how well a person functions. That is, he viewed functioning as evidence of well-being. Although people will have setbacks in their quest for optimal functioning, the direction in which their lives are moving becomes an important criterion for evaluating their wellbeing. In this movement, daily habits and behaviors, as well as overall lifestyle, assume primary importance.

Originally, the scope of well-being was limited to three dimensions: physical, social, and mental. Adherents of holistic health argued that the mental dimension has two components—the intellectual (rational thought processes) and the emotional (feelings and emotions). Each of these domains deals with a different aspect of psychological well-being. An additional dimension, the spiritual, was added because it was thought that

humans could not function optimally in a spiritual vacuum. Therefore, the holistic definition of health has five dimensions: physical, social, emotional, intellectual, and spiritual.

In the 1970s and 1980s, the definition of health was expanded once again by the wellness movement (Ardell, 1985). Wellness is an approach to health that focuses on balancing the many aspects or dimensions (physical, social, spiritual, emotional, intellectual, and environmental/occupational) of a person's life by increasing the adoption of health-enhancing conditions and behaviors rather than by attempting to minimize conditions of illness (AAHE, 2001).

A key element of the wellness model is striving for balance. When all of the six dimensions are at high levels and in balance, we have optimal health and well-being. When the dimensions are out of balance or one is severely lacking, we have lower levels of health and well-being.

Another important part of wellness is the process of becoming healthier. The journey (becoming the best one can be) is more important than the ending. The process of wellness involves becoming increasingly more aware of health and making healthy choices.

The Six Dimensions of Wellness

Physical

The first dimension, physical well-being, is reflected in how well the body performs its intended functions. Absence of disease—although an important influence—is not the sole criterion for health. The physical domain is influenced by your genetic inheritance, nutritional status, fitness level, body composition, and immune status, to name just a few factors.

Intellectual

Intellectual well-being is the ability to process information effectively. It involves the capability to use information in a rational way to solve problems and grow. This dimension includes issues such as creativity, spontaneity, and openness to new ways of viewing situations. To maintain a high level of intellectual well-being, you must seek knowledge and learn from your experiences. Ideally, your college experiences will have added to your intellectual well-being (Figure 1.4).

Emotional

Emotional well-being means being in touch with your feelings, having the ability to express them, and being able to control them when necessary. Optimal functioning involves the understanding that emotions are the mirror of the soul. Emotions help us get in touch with what is important in our lives. Our emotions make us feel alive and provide us with a richness of experience that is uniquely human.

Social

Social well-being involves being connected to others through various types of relationships. Individuals who function optimally in this domain are able to form friendships, have intimate relationships, give and receive love and affection, and accept others unconditionally. They are able to give of themselves and share in the Joys and sorrows of being part of a community. This community includes both formal and informal networks. Formal networks include organizations such as churches, professional organizations, fraternities, sororities, and campus groups requiring official membership, dues, and standards. Informal networks, such as an intramural sports team, do not have rigid rules for membership. In a sense, your social networks are a major part of your environment.

Spiritual

Spirituality is a belief in or relationship with some higher power, creative force, divine being, or infinite source of energy (Fowle; 1986). This belief is manifested in a sense of interconnectedness, a feeling that somehow, some way, we are all in this together. For people whose spirituality is religion-based, it is ecumenical in scope. It is part of but transcends individual religions. Those whose spirituality is religion-

based believe in a supreme being or higher supernatural force and subscribe to a formalized code of conduct. For individuals whose spirituality is secular, it is universal or even extraterrestrial. In a secular sense, spirituality could manifest itself through connection to something greater than oneself. Whether it is being part of a community, working to save the environment, helping to feed the needy, or being committed to world peace, the underlying feeling is a perception of life as having meaning beyond the self (Richards & Bergin, 1997).

Spirituality is a two-dimensional concept. The first dimension relates to one's relationship with the transcendent (a connection with a higher being or power). The second dimension is connected to one's relationship with the self, others, and the environment. A continual interrelationship links the two dimensions. Feeling connected with a higher power or being gives us faith and hope and helps us believe we can do things to make life meaningful. Believing in oneself and feeling connected with others and one's community empowers us to act. Those with a high level of spiritual health behave in an interconnected way (Harris et al., 1999). They take part in church and/or community activities. They help others. They get involved in causes and groups that are proactive, whether it involves cleaning up a vacant lot or a beach with an environmental group or visiting the sick and infirm who are hospital bound. It is in the "doing" that some of the greatest benefits of spirituality are derived (Harris et al., 1999; Richards & Bergin, 1997).

Environmental

Environmental well-being involves high-level functioning on two levels. The most immediate environment, the micro-environment, consists of your school, home, neighborhood, and work site. The people with whom you interact in those places link the environment to the social aspects of your health. This environment greatly affects your overall health and personal safety by influencing whether you are at risk for and fear issues such as theft, crime, and violence. The quality of air and water, noise pollution, crowding, and other issues that affect your stress level are also included.

Your social support system is also part of this environment. The macro-environment, the level of wellbeing at a larger level—state, country, and the world at large—also affects wellness. The wars in Iraq and Afghanistan, the terrorist attacks of September 11, 2001, and other issues such as violence, international disputes, racism, sexism, heterosexism, and ageism—all influence us daily to some extent. When this book's authors were in college, the Vietnam War was going on. College-age men started each day by reading the newspaper to see which draft numbers were being called up (all draft-eligible men were issued draft numbers) and if any of their friends were killed or missing in action. Decisions that our political leaders make, such as engaging in wars or determining where we store radioactive wastes, affect the way we think and live our lives. Our ability to stay focused and whole is constantly challenged by the media, which bring the entire world and its problems into our living rooms each night. We need to learn to think globally, act locally, and be happy despite the myriad of problems in the world.

Occupational/Vocational

Occupational/vocational well-being involves issues related to job wellness. It encompasses everything from the safety of your particular work site to the nature of your career. Work-site well-being includes both physical (e.g., air, water, physical plant, machinery) and social (e.g., relationships with coworkers, management, health and wellness facilities and activities) factors. Your personal wellness is affected by the health of your work site. Employers and work sites vary tremendously in relation to health. Some strive for optimal levels, encouraging employees to take advantage of a myriad of health-enhancing programs and services. Others merely meet the minimum acceptable standards for health and safety set by the government.

Besides the specific health of the workplace, different jobs pose varying threats to individuals' wellbeing as a result of the nature of the work. Some jobs, such as police and military service, are risky because of possible exposure to hostile combatants. Other occupations, such as those of firefighters, emergency medical service workers, coal miners, arid oil rig operators, are risky because they place employees in dangerous environments. Still other occupations are characterized by high stress due to deadlines, competition, or other factors.

LESSON 02**INTRODUCTION TO HEALTH PSYCHOLOGY****Changing Patterns of Illness Today and In The Past**

People in the United States and other developed, industrialized nations live longer, on the average, than they did in the past, and they suffer from a different pattern of illness. During the 17th, 18th, and 19th centuries, people in North America suffered and died chiefly from two types of illness: dietary and infectious.

Dietary diseases result from malnutrition—for example, beriberi is caused by a lack of vitamin t31 and is characterized by anemia, paralysis, and wasting away.

Infectious diseases are acute illnesses caused by harmful matter or microorganisms, such as bacteria or viruses, in the body. In most of the world today, infectious diseases continue to be the main causes of death (WHO, 1999c).

A good example of the way illness patterns have changed in developed nations comes from the history of diseases in the United States. From the early colonial days in America through the 18th century, colonists experienced periodic epidemics of many infectious diseases, especially smallpox, diphtheria, yellow fever, measles, and influenza. It was not unusual for hundreds, and sometimes thousands, of people to die in a single epidemic. Children were particularly hard hit. Two other infectious diseases, malaria and dysentery, were widespread and presented an even greater threat. Although these two diseases generally did not kill people directly, they weakened their victims and reduced the ability to resist other fatal diseases. Most, if not all, of these diseases did not exist in North America before the European settlers arrived—the settlers brought the infections with them—and the death toll among Native Americans was extremely high. This high death rate occurred for two reasons. First, the native population had never been exposed to these new microorganisms, and thus lacked the natural immunity that our bodies develop after lengthy exposure to most diseases (Grob, 1983). Second, Native Americans' immune functions were probably limited by a low degree of genetic variation among these people (Black, 1992).

In 19th century infectious diseases were still the greatest threat to the health of Americans, The illnesses of the colonial era continued to claim many lives, but new diseases began to appear. The most significant of these diseases was tuberculosis, or “consumption as it was often called. In 1842, for example consumption was listed as the cause for 22% of all deaths in the state of Massachusetts (Grob, 1983). But by the end of the 19th century deaths from infectious diseases had decreased sharply. For instance, the death rate from tuberculosis declined by about 60% in a 25’year period around the turn of the century.

Did this decrease result mostly from advances in medical treatment? Although medical advances helped to some degree, the decrease occurred long before effective vaccines and medications were introduced. This was the case for most of the major diseases we’ve discussed, including tuberculosis, diphtheria, measles, and influenza.

It appears that the decline resulted chiefly from *preventive* measures such as improved personal hygiene, greater resistance to diseases (owing to better nutrition), and public health innovations, such as building water purification and sewage treatment facilities. Fewer deaths occurred from diseases because fewer people contracted them.

The 20th century has seen great changes in the patterns of illness afflicting people, particularly in developed nations where advances in preventive measures and medical care have reduced the death rate from life-threatening infectious diseases (WHO, 1999c). At the same time, the average life expectancy of people has increased dramatically. At the turn of the century in the United States, the life expectancy of babies at birth was about 48 years (USDHHS, 1987); today it is 76 years (USBC, 1999).

Babies who survived their first year in 1900 could be expected to live to about 56 years of age. Surviving that first year added seven years to their expected total life span. Moreover, people in 1900 who had reached the age of 20 years could expect to live to almost 63 years of age. Today the death rate for American children is much lower, and only a small difference exists in the expected total life span for newborns and 20-year-olds.

Death is still inevitable, of course, but people die at later ages now and from different causes. The main health problems and causes of death in developed countries today are chronic diseases—that is, degenerative illnesses that develop or persist over a long period of time. About two-thirds of all deaths in developed nations are caused by three chronic diseases: heart disease, cancer, and stroke (WHO, 1999c). These diseases are not new, but they were responsible for a much smaller proportion of deaths before the 20th century. Why? One reason is that people's lives are different today. For example, the growth of industrialization increased people's stress and exposure to harmful chemicals. In addition, more people today survive to old age, and chronic diseases are more likely to afflict the elderly than younger individuals. Thus, another reason for the current prominence of chronic diseases is that more people are living to the age when they are at high risk for contracting them.

Are the main causes of death in childhood and adolescence different from those in adulthood? Yes. In the United States, for example, the leading cause of death in children and adolescents, by far, is not an illness, but accidental injury (USBC, 1999). Nearly 40% of child and adolescent deaths result from accidents, frequently involving automobiles. In childhood, the next two most frequent causes of death are cancer and congenital abnormalities; in adolescence, they are homicide and suicide (USBC, 1999). Clearly the role of disease in death differs greatly at different points in the life span.

Viewpoints from History:

Physiology, Disease Processes and the Mind

Is illness a purely physical condition? Does a person's mind play a role in becoming ill and getting well? People have wondered about these questions for thousands of years, and the answers they have arrived at have changed over time.

Early Cultures

Although we do not know for certain, it appears that the best educated people thousands of years ago believed physical and mental illness were caused by mystical forces, such as evil spirits (Stone, 1979). Why do we think this? Researchers found ancient skulls in several areas of the world with coin-size circular holes in them that could not have been battle wounds. These holes were probably made with sharp stone tools in a procedure called *trephination*. This procedure was done presumably for superstitious reasons—for instance, to allow illness-causing demons to leave the head. Unfortunately, we can only speculate about the reasons for these holes because there are no written records from those times.

Ancient Greece and Rome

The philosophers of ancient Greece produced the earliest written ideas about physiology, disease processes, and the mind between 500 and 300 B.C. Hippocrates, often called the Father of Medicine, proposed a *humoral theory* to explain why people get sick. According to this theory, the body contains four fluids called *humors* (in biology, the term humor refers to any plant or animal fluid). When the mixture of these humors is harmonious or balanced, we are in a state of health. Disease occurs when the mixture is faulty (Stone, 1979). Hippocrates recommended eating a good diet and avoiding excesses to help achieve humoral balance.

Greek philosophers, especially Plato, were among the first to propose that the mind and the body are separate entities. This view is reflected in the humoral theory: people get sick because of an imbalance in body fluids. The mind was considered to have little or no relationship to the body and its state of health. This remained the dominant view of writers and philosophers for more than a thousand years.

Many people today still speak about the body and the mind as if they were separate. The *body* refers to our physical being, including our skin, muscles, bones, heart, and brain. The *mind* refers to an abstract process that includes our thoughts, perceptions, and feelings. Although we can distinguish between the mind and the body conceptually, an important Issue is whether they also function independently. The question of their relationship is called the mind/body problem.

Galen was a famous and highly respected physician and writer of the 2nd century A.D. who was born in Greece and practiced in Rome. Although he believed generally in the humoral theory and the mind/body split, he made many innovations. For example, he dissected animals of many species (but probably never a human), and made important discoveries about the brain, circulatory system, and kidneys' (Stone, 1979, p. 4). From this work, he became aware that illnesses can be localized, with pathology in specific parts of the body, and that different diseases have different effects. Galen's ideas became widely accepted.

The Middle Ages

After the collapse of the Roman Empire In the 5th century A.D., much of the Western world was in disarray. The advancement of knowledge and culture slowed sharply in Europe and remained stunted during the Middle Ages, which lasted almost a thousand years. Galen's views dominated Ideas about physiology and disease processes for most of this time.

The influence of the Church in slowing the development of medical knowledge during the Middle Ages was enormous. According to historians, in the eyes of the Church the human being was regarded as a creature with a soul, possessed of a free will which set him apart from ordinary natural laws, subject only to his own willfulness and perhaps the will of God. Such a creature, being free-willed, could not be an object of scientific investigation. Even the body of man was regarded as sacrosanct, and dissection was dangerous for the dissector. These strictures against observation hindered the development of anatomy and medicine for centuries.

The prohibition against dissection extended to animals as well, since they were thought to have souls, too. People's ideas about the cause of illness took on pronounced religious overtones, and the belief in demons became strong again. Sickness was seen as God's punishment for doing evil things. As a result, the Church came to control the practice of medicine, and priests became increasingly involved in treating the III, often by torturing the body to drive out evil spirits.

It was not until the 13th century that new ideas about the mind/body problem began to emerge. The Italian philosopher St. Thomas Aquinas rejected the view that the mind and body are separate. He saw them as an interrelated unit that forms the whole person. Although his position did not have as great an impact as others had had, it renewed interest in the issue and influenced later philosophers.

-The Renaissance and After

The word *renaissance* means rebirth—a fitting name for the 14th and 15th centuries. During this period in history, Europe saw a rebirth of inquiry, culture, and politics. Scholars became more human-centered than God-centered in their search for truth and believed that truth can be seen In many ways, from many individual perspectives (Leahy, 1987, p. 80). These ideas set the stage for important changes in philosophy once the scientific revolution began after 1600.

The 17th-century French philosopher and mathematician Rene Descartes probably had the greatest influence on scientific thought of any philosopher in history. Like the Greeks, he regarded the mind and body as separate entities, but he introduced three important innovations.

First, he conceived of the body as a machine and described the mechanics of how action and sensation occurred. Second, he proposed that the mind and body, although separate, could *communicate* through the pineal gland, an organ in the brain. Third, he believed that animals have no soul and that the soul in humans

leaves the body at death. This belief meant that dissection could be an acceptable method of study—a point the Church was now ready to concede.

In the 18th and 19th centuries, knowledge in science and medicine grew quickly, helped greatly by the development of the microscope and the use of dissection in autopsies. Once scientists learned the basics of how the body functioned and discovered that microorganisms cause certain diseases, they were able to reject the humoral theory of illness and propose new theories. The field of surgery flourished after antiseptic techniques and anesthesia were introduced in the mid-19th century (Stone, 1979). Before that time, hospitals were notorious places, more likely to spread diseases than cure them (Easterbrook, 1987, p. 42). Overtime, the reputation of physicians and hospitals began to improve, and people's trust in the ability of doctors to heal increased.

These advances, coupled with the continuing belief that the mind and body are separate, laid the foundation for a new approach, or model, for conceptualizing health and illness. This approach—called the biomedical model—proposes that all diseases or physical disorders can be explained by disturbances in physiological processes, which result from injury, biochemical imbalances, bacterial or viral infection, and the like. The biomedical model assumes that disease is an affliction of the body and is separate from the psychological and social processes of the mind. This viewpoint became widely accepted during the 19th and 20th centuries and still represents the dominant view in medicine today.

The biomedical model has been very useful. Using it as a guide, researchers have made enormous achievements. They conquered many infectious diseases, such as polio and measles, through the development of vaccines. They also developed antibiotics, which made it possible to cure illnesses caused by bacterial infection. Despite these great advances, the biomedical model needs improvement. Let's see why.

The biomedical model does not take the person's psychological and social factors in view. Have you ever noticed how some people are always sick—they get illnesses more frequently than most people do and get well more slowly? These differences between people can result from biomedical sources, such as variations in physiological processes and exposure to harmful microorganisms.

But psychological and social factors also play a role. And we just can not ignore such factors while dealing with the health of a person. And this leads us to our next point of discussion: what is the role of psychology in health?

Psychology's Involvement in Health

Although chronic diseases have many causes, no one seriously disputes the evidence that individual behavior and lifestyle are strongly implicated in their development. Because most chronic diseases stem at least partly from individual behavior, psychology—the science of behavior—has become involved in health care.

A large part of psychology's involvement in health care is a commitment to keep people healthy rather than waiting to treat them after they become ill. Psychology shares this role with medicine and other health care disciplines, but unlike medicine (which tends to study specific diseases), psychology contributes certain broad principles of behavior that cut across specific diseases and specific issues of health. Among psychology's contributions to health care are techniques for changing behaviors that have been implicated in chronic diseases. In addition to changing unhealthy behaviors, psychologists have also used their skills to relieve pain and reduce stress, improve compliance with medical advice, and help patients and family members live with chronic illnesses.

In summary, the role of psychologists in medical settings has expanded beyond traditional mental health problems to include procedures and programs to help people stop smoking, eat a healthy diet, exercise, adhere to medical advice, reduce stress, control pain, live with chronic disease, and avoid unintentional injuries.

LESSON 03**INTRODUCTION TO HEALTH PSYCHOLOGY****How the Role of Psychology Emerged**

The idea that medicine and psychology are somehow connected has a long history, dating back at least to ancient Greece. It became somewhat more formalized early in the 20th century in the work of Sigmund Freud, who was trained as a physician. He noticed that some patients showed symptoms of physical illness without any organic disorder. Using principles from his *psychoanalytic theory*, Freud proposed that these symptoms were converted from unconscious emotional conflicts. He called this condition *conversion hysteria*.

Psychosomatic Medicine

The term *psychosomatic* does not mean a person's symptoms are imaginary; it means that the mind and body are both involved. Until the 1960s or so, research in psychosomatic medicine focused on psychoanalytic interpretations for specific, real health problems including ulcers, high blood pressure, asthma, migraine headaches, and rheumatoid arthritis.

Freud's methods relied on clinical experience and intuitive hunches that were largely unverified by laboratory research. The research base for psychosomatic medicine began with Walter Cannon's observation in 1932 that physiological changes accompany emotion.

Cannon's research demonstrated that emotion can cause physiological changes that might be related to the development of physical disease; that is, emotion can cause changes, which in turn, may cause disease. From this finding, Flanders Dunbar (1943) developed the notion that habitual responses, which people exhibit as part of their personalities, are related to specific diseases. In other words, Dunbar hypothesized a relationship between personality type and disease. A little later, Franz Alexander (1950), a one-time follower of Freud, began to see emotional conflicts as a precursor to certain diseases.

Unfortunately, these views led others to begin seeing specific illnesses as "psychosomatic." These illnesses included such disorders as peptic ulcer, rheumatoid arthritis, hypertension, asthma, hyperthyroidism, and ulcerative colitis. Many lay people began to look at these psychosomatic disorders as not being "real" but merely "all in the head."

Coupled with this oversimplified belief were the modern medical advances that led many in the health care field to neglect the mind—body continuum and to concentrate on powerful remedies for specific diseases. These remedies included penicillin, antibiotics, insulin, and vaccines (Fritz, 2000). With such effective medical procedures available, many physicians and other health care providers began to lose sight of the psychological and social concomitants of disease.

The Emergence of Behavioral Medicine

From the remnants of the old psychosomatic medicine emerged two new and interrelated disciplines—behavioral medicine and health psychology.

A 1977 conference at Yale University led to the definition of a new field, behavioral medicine, defined as "the interdisciplinary field concerned with the development and integration of behavioral and biomedical science knowledge and techniques relevant to health and illness and the application of this knowledge and these techniques to prevention, diagnosis, treatment and rehabilitation".

This definition indicates that behavioral medicine is designed to integrate medicine and the various behavioral sciences, especially psychology. The goals of behavioral medicine are similar to those in other areas of health care: improved prevention, diagnosis, treatment, and rehabilitation. Behavioral medicine,

then, attempts to use psychology and the behavioral sciences in conjunction with medicine to promote health and treat disease.

The Emergence of Health Psychology

At about the same time that behavioral medicine was given life, a new discipline called behavioral health began to emerge. Behavioral health emphasizes the enhancement of health and the prevention of disease in healthy people rather than the diagnosis and treatment of disorders in sick people. Behavioral health includes such concerns as injury prevention, cigarette smoking, alcohol use, diet, and exercise.

Behavioral health has not continued to develop as a strong, formal discipline, and its goals have largely been incorporated by a new field called health psychology, the branch of psychology that concerns individual behaviors and lifestyles affecting a person's physical health.

Health psychology includes psychology's contributions to the enhancement of health, the prevention and treatment of disease, the identification of health risk factors, the improvement of the health care system, and the shaping of public opinion with regard to health.

More specifically, it involves the application of psychological principles to such physical health areas as lowering high blood pressure, controlling cholesterol, managing stress, alleviating pain, stopping smoking, and moderating other risky behaviors, as well as encouraging regular exercise, medical and dental checkups, and safer behaviors.

In addition, health psychology helps identify conditions that affect health, diagnose and treat certain chronic diseases, and modify the behavioral factors involved in physiological and psychological rehabilitation. As such, health psychology interacts with both biology and sociology to produce health- and disease-related outcomes. Note that neither psychology nor sociology contribute directly to outcomes; only biological factors contribute directly to physical health and disease.

A Brief History of Health Psychology

As an identifiable area, health psychology received its first important impetus in 1973, when the Board of Scientific Affairs of the American Psychological Association (APA) appointed a task force to study the potential for psychology's role in health research. Three years later, this task force (APA, 1976) reported that few psychologists were involved in health research and that research conducted by psychologists in the area of health was not often reported in the psychology journals. However, the report envisioned a future in which health psychology might help to enhance health and prevent disease. In 1978, the American Psychological Association established Division 38, Health Psychology, as "a scientific, educational, and professional organization for psychologists interested in (or working in) areas at one or another of the interfaces of medicine and psychology" (Matarazzo, 1994, p. 31).

Four years later, in 1982, the journal *Health Psychology* began publication as the official journal of Division 38. Currently, health psychology is not only a well-established division within the American Psychological Association but is also recognized by the American Psychological Society, another powerful professional organization, one that emphasizes research over clinical practice.

Health Psychology's Position within Psychology

In 2001, the APA membership voted to change its bylaws and to include the term "health" in its mission statement. This statement now reads: "The objects of the American Psychological Association shall be to advance psychology as a science and profession and as a means of promoting health and human welfare."

Health psychologists are first and foremost psychologists, with the same basic training as any other psychologists. This training core was determined by the landmark Boulder Conference of 1949, which established psychology as both a scientific discipline and a practicing profession. From that time, every doctoral program within a department of psychology has offered nearly the same core of generic course work for psychologists.

Along with the core courses required of all psychologists, health psychologists take courses in such fields as biostatistics, epidemiology, physiology, biochemistry, and cardiology. Like other psychologists, health psychologists rely on and contribute to the basic core of psychological research and then apply this knowledge to a particular field of specialization.

In other words, health psychologists are psychologists first and specialists in health second. According to Matarazzo (1987b), “psychology” is the noun that identifies the subject matter; and “health” is the adjective that describes the client, problem, or setting to which psychology is applied. Like other fields of psychology health psychology applies the principles of generic psychology to a particular area.

Health psychology does not exist as a profession separate from generic psychology; rather it applies both research knowledge and clinical experience to the science and profession of generic psychology, Health psychology has clearly emerged as a unique profession, having met six criteria for a separate profession.

First, it has founded its own national and international associations;

Second, it has established a number of its own journals in addition to health Psychology;

Third, it has received acknowledgment from professionals in other fields of psychology that its subject matter, methods, and applications are different from theirs;

Fourth, health psychology has set up postdoctoral training specific to health psychology and distinct from other fields of psychology;

Fifth, it has received recognition from the American Board of Professional Psychology; and

Sixth, it has been recognized by the American Psychological Association Commission on the Recognition of Specialties and Proficiencies in Professional Psychology.

In addition, health psychology is becoming recognized within medical schools, schools of public health, universities, and hospitals. Health psychology strives to enhance health, prevent and treat disease, identify risk factors, improve the health care system, and shape public opinion regarding health issues.

Areas of Special Focus of health psychology:

Health psychology is concerned with all aspects of health and illness across the life span of individuals. Health psychologists focus on health promotion and maintenance, which includes such issues as how to get children to develop good health habits, how to promote regular exercise, and how to design a media campaign to get people to improve their diets.

Health psychologists also study the psychological aspects of the prevention and treatment of illness. A health psychologist might teach people in a high-stress occupation how to manage stress effectively so that it will not adversely affect their health. A health psychologist might work with people who are already ill to help them adjust more successfully to their illness or to learn to follow their treatment regimen.

Health psychologists also focus on the etiology and correlations of health, illness and dysfunction. Etiology refers to the origins or causes of illness, and health psychologists are especially interested in behavioral and social factors that contribute to health or illness and dysfunction. Such factors can include health habits such as alcohol consumption, smoking, exercise, the wearing of seat belts, and ways of coping with stress.

Finally, health psychologists analyze and attempt to improve the health care system and the formulation of health policy. They study the impact of health institutions and health professionals on people's behavior and develop recommendations for improving health care.

Putting it all together, health psychology represents the educational, scientific, and professional contributions of psychology to the promotion and maintenance of health, the prevention and treatment of illness, the identification of the causes and correlates of health, illness, and related dysfunction, the improvement of health care system, and health policy formation.

LESSON 04**INTRODUCTION TO HEALTH PSYCHOLOGY****Current Perspectives on Health and Illness**

Once we add the person to the biomedical model, we have a different and broader picture of how health and illness come about. This new perspective, called the Biopsychosocial model, expands the biomedical view by adding to *biological* factors the influence of *psychological* and *social* factors (Engel, 1977, 1980; Schwartz, 1982). This new model proposes that all three factors *affect* and *are affected by* the person's health. Before we describe in detail the biopsychosocial model, let us first clarify what exactly the **biomedical** model is.

The Background to Biomedical Model:

During the nineteenth century, modern medicine was established. Man (the nineteenth century term) was studied using dissection, physical investigations and medical examinations. Darwin's thesis, *The Origin of Species*, was published in 1859 and described the theory of evolution. This revolutionary theory identified a place for Man within Nature and suggested that we were part of nature, that we developed from nature and that we were biological beings.

This was in accord with the biomedical model of medicine, which studied Man in the same way that other members of the natural world had been studied in earlier years. This model described human beings as having a biological identity in common with all other biological beings.

What is the Biomedical Model?

The biomedical model of medicine can be understood in terms of its answers to the following questions:

What Causes Illness?

According to the biomedical model of medicine, diseases either come from outside the body, or originate as internal involuntary physical changes. Such diseases may be caused by several factors such as chemical imbalances, bacteria, viruses and genetic predisposition.

Who is Responsible for Illness?

Because illness is seen as arising from biological changes beyond their control, individuals are not seen as responsible for their illness. They are regarded as victims of some external force causing internal changes.

How should Illness be Treated?

The biomedical model regards treatment in terms of vaccination, surgery, chemotherapy, and radiotherapy, all of which aim to change the physical state of the body.

Who is Responsible for Treatment?

The responsibility for treatment rests with the medical profession. The professionals are considered to be experts whose recommendations must be followed in order for the treatment to be successful.

What is the Relationship between Health and Illness?

Within the biomedical model, health and illness are seen as qualitatively different - you are either healthy or ill, there is no continuum between the two.

What is the Relationship between Mind and Body?

According to the biomedical model of medicine, the mind and body are separate entities; they function independently of each other. This is comparable to a traditional dualistic model of the mind-body split.

From this perspective, the mind is incapable of influencing physical matter. The mind is seen as abstract and relating to feelings and thoughts, and the body is seen in terms of physical matter such as skin, muscles, bones, brain and organs. Changes in the physical matter are regarded as independent of changes in the state of mind.

What is the role of Psychology in Health and Illness?

Within traditional biomedicine, illness may have psychological consequences, but not psychological causes. For example, cancer may cause unhappiness but mood is not seen as related to either the onset or progression of the cancer.

Health psychology and its focus on the Biopsychosocial Model:

Health psychology challenges the mind-body split by suggesting a role for the mind in both the cause and treatment of illness. Health psychology is the only field that completely adheres to the biopsychosocial model.

Health psychology and the biopsychosocial model can be understood in terms of the same questions that were asked of the biomedical model:

What Causes Illness?

Health psychology suggests that human beings should be seen as complex systems and that illness is caused by a multitude of factors and not by a single causal factor.

Health psychology therefore attempts to move away from a simple linear model of health and claims that illness can be caused by a combination of biological (e.g., a virus), psychological (e.g., behaviors, beliefs) and social (e.g., employment) factors.

Who is Responsible for Illness?

Because illness is regarded as a result of a combination of factors, the individual is no longer simply seen as a passive victim. For example, the recognition of a role for behavior in the cause of illness means that the individual may be held responsible for their health and illness.

How should Illness be Treated?

According to health psychology, the whole person should be treated, not just the physical changes that have taken place. This can take the form of behavior change, encouraging changes in beliefs and coping strategies and compliance with medical recommendations.

Who is Responsible for Treatment?

Because the whole person is treated, not just their physical illness, the patient is therefore in part responsible for their treatment. This may take the form of responsibility to take medicine, responsibility to change beliefs and behaviors. Patients are not seen as victims.

What is the relationship between Health and Illness?

From a biopsychosocial perspective, health and illness are not qualitatively different, but exist on a continuum. Rather than being either healthy or ill, individuals progress along this continuum from healthiness to illness and back again.

What is the Relationship between Mind and Body?

The twentieth century has seen a challenge to the traditional separation of mind and body suggested by the dualistic model of health and illness, with an increasing focus on an interaction between the mind and the body. This shift in perspective is reflected in the development of a holistic or a whole-person approach to health. Health psychology therefore maintains that the mind and body interact.

However, although this represents a departure from the traditional medical perspective, in that these two entities are seen as influencing each other, they are still categorized as separate - the existence of two different terms (the mind and the body) suggests a degree of separation and "interaction" can only occur between distinct structures.

What is the role of Psychology in Health and Illness?

Health psychology regards psychological factors not only as possible consequences of illness, but as contributing to its etiology as well.

The Biopsychosocial Perspective

We can see elements of the Biopsychosocial perspective in the story about Sara told in our first lecture. A possible biological contribution to her becoming overweight might be her inheritance, since her mother is overweight and was heavy as a child. Psychological factors are probably important, as shown in Sara's behavior—she eats too much fattening food and gets little exercise. And, although the story did not describe how social factors play a role in her weight problem, they are probably there—for example, if she imitates her mother's dietary and exercise habits. But we *did* see social factors relating to Sara's condition when her schoolmates taunted her and her parents expressed concern and urged her to join a recreation program. Let's look at the elements of the Biopsychosocial model in more detail.

The Role of Biological Factors

What is included in the term *biological factors*? This term includes the genetic materials and processes by which we inherit characteristics from our parents. It also includes aspects of the person's physiological functioning—for example, whether the body (1) contains structural defects, such as a malformed heart valve or some damage in the brain, that impair the operation of these organs; (2) responds effectively in protecting itself, such as by fighting infection; and (3) overreacts sometimes in the protective function, as happens in many allergic reactions to harmless substances, such as pollen or dust.

The body is made up of enormously complex physical systems. For instance, it has organs, bones, and nerves, and these are composed of tissues, which in turn consist of cells, molecules, and atoms. The efficient, effective, and healthful functioning of these systems depends on the way these components operate and interact with each other.

The Role of Psychological Factors

When we discussed the role of lifestyle and personality in health and illness earlier, we were describing behavior and mental processes, in other words, psychological factors. Behavior and mental processes are the focus of psychology, and they involve cognition, emotion, and motivation.

Cognition is a mental activity that encompasses perceiving, learning, remembering, thinking, interpreting, believing, and problem solving. How do these cognitive factors affect health and illness? Suppose, for instance, you strongly believe, "life is not worth living without the things I enjoy." If you enjoy smoking cigarettes, would you quit reducing your risk of getting cancer or heart disease? Probably not. Or suppose you develop a pain in your abdomen and you remember having had a similar symptom in the past that disappeared in a couple of days. Would you seek treatment? Again, probably not. These examples are just two of the countless ways cognition plays a role in health and illness.

Emotion is a subjective feeling that affects and is affected by our thoughts, behavior, and physiology. Some emotions are positive or pleasant, such as joy and affection, and others are negative, such as anger, fear, and sadness. Emotions relate to health and illness in many ways. For Instance, people whose emotions are relatively positive are less disease-prone and more likely to take good care of their health and to recover quickly from an illness than are people whose emotions are relatively negative. We considered these relationships when we discussed the role of personality in illness. Emotions can also be important in people's decisions about seeking treatment. People who are frightened of doctors and dentists may avoid getting the health care they need.

Motivation is a term applied to explanations of why people behave the way they do---why they start some activity, choose its direction, and persist in it. A person who is motivated to feel and look better might begin an exercise program, choose the goals to be reached, and stick with it. Many people are motivated to do what important people in their lives want them to do. Parents who quit smoking because their children plead with them to protect their health are an example.

The Role of Social Factors

People live in a social world. We have relationships with individual people—an acquaintance, a friend, or a family member—and with groups. As we interact with people, we affect them and they affect us. But our social world is larger than just the people we know or meet, and it contains levels of social spheres, such as our community and our family, and each level affects the others.

On a fairly broad level, our *society* affects the health of individuals by promoting certain values of our culture. One of these values is that being fit and healthy is good. Often the mass media—television, newspapers, and so on—reflect these values by setting good examples and urging us to eat well, not to use drugs, and not to drink and drive. The mass media can do much to promote health. But sometimes these media encourage unhealthful behavior, such as when we observe celebrities on television smoking cigarettes or drinking excessively. Can individuals affect society's values? Yes. As part of the society, we can affect its values by writing our opinions to the mass media, selecting which television shows and movies to watch, and buying healthful products, for example.

Our community consists of individuals who live fairly near one another, such as in the same town or county. These people influence and are influenced by each other. This influence can be seen in the research finding that communities differ in the extent to which their members practice certain health-related behaviors, such as smoking cigarettes or consuming fatty diets. These differences may develop in many ways. For instance, adolescents often start smoking cigarettes and drinking alcohol as a result of peer pressure. Sometimes simply observing other teenagers engaged in these behaviors can encourage adolescents to smoke and drink. They want very much to be popular and to look cool or tough to others in their community. These examples involve clear and powerful motivational elements that are social in nature.

The closest and most continuous social relationships for most people occur within the *family*, which can include non-relatives who live together and share a strong emotional bond. As individuals grow and develop in early childhood, the family has an especially strong influence. Children learn many health-related behaviors, attitudes, and beliefs from their parents, brothers, and sisters. For instance, parents can set good examples for healthful behavior by using seat belts, serving and eating nutritious meals, exercising, not smoking, and so on.

Families can also encourage children to perform healthful behaviors and praise them when they do. Moreover, as we have said, an individual can influence the larger social unit. A family may stop eating certain nutritious foods, such as sprouts or fish, because one of the children has a tantrum when these foods are served.

The role of biological, psychological, and social factors in health and illness is not hard to see. What is more

difficult to understand is how health is affected by the *interplay* of these components, as the Biopsychosocial model proposes.

LESSON 05**INTRODUCTION TO HEALTH PSYCHOLOGY****The Concept of “Systems”**

The whole person—as in the sentence, we need to understand the whole person—is a phrase we often hear. It reflects our recognition that people and the reasons for their behavior are very complex. Many health professionals strive to consider the impact of all aspects of a person’s life as a total entity in understanding health and illness. This approach uses the Biopsychosocial model and is sometimes called holistic.

This term is derived from the Greek word *holis*, which means whole. But many people today use the term *holistic* to include a broad range of alternative approaches to promote health, such as treatments that use aromas and herbs to heal.

How can we conceptualize the whole person? George Engel (1980) has proposed that we can do this by applying the biological concept of “Systems”. A system is a dynamic entity with components that are continuously interrelated. By this definition, your body qualifies as a system— and it includes the immune and nervous systems, which consist of tissues and cells. Your family is a system too, and so are your community and society. As systems, they are entities that are dynamic—or constantly changing—and they have components that interrelate, such as by exchanging energy, substances, and information.

The systems concept places smaller, simpler systems within larger, more complex ones. There are levels of systems. Cells are within the person who is within a society, for instance. Earlier we saw that a system at one level, such as a person, is affected by and can affect a system at another level, such as the family. Similarly, if we look at levels within the person, illness in one part of the body can have far reaching effects. If you fell and seriously injured your leg, your internal systems would be automatically mobilized to help protect the body from further damage.

In addition, the discomfort and disability you might experience for days or weeks might affect your social relations with your family and community.

To illustrate how the systems concept can be useful, let’s use it to explain how Sara’s weight problem might have come about. Let’s assume that she did inherit some factor that affects her weight. The nature of this factor might involve a preference for sweet foods, for instance (Rozi, 1989). When she was a toddler, her parents quieted her tantrums by giving her candy, which almost always calmed her. Sara’s parents were not concerned that she was getting heavy because they believed a popular misconception: “A chubby baby is a healthy baby.” The meals the family ate usually contained lots of high-fat, high-calorie foods and a sweet dessert. Because Sara was heavy, she was less agile and tired more easily than children who were not overweight. So she usually preferred to engage in sedentary activities, such as playing with dolls or watching television, rather than sports. She and her friends snacked on cookies while watching television. The commercials on most children’s television shows made her weight problem worse, promoting high-fat, sweet breakfast and snack foods, which she got her parents to buy. This hypothetical account shows how different but interacting Biopsychosocial systems can contribute to a person’s weight problem.

Using the Biopsychosocial model as a guide, researchers have discovered new and important findings and ways to promote people’s health and recovery from illness. For example, consider the following discoveries:

- Using psychological methods to reduce anxiety of patients who are awaiting surgery enables them to recover more quickly and leave the hospital sooner.
- Programs that teach safer sex practices have dramatically reduced risky sexual behavior and the spread of HIV infection.

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- People who have a high degree of social support from family and Friends are healthier and live longer than people who do not.
 - Stress impairs the functioning of the immune system.
 - Applying psychological and educational programs for cancer patients reduces their feelings of depression, improves their immune system functioning, and enables them to live longer.
 - Biofeedback and other psychological techniques can reduce the pain of people who suffer from chronic, severe headaches.

THE LIFE-SPAN PERSPECTIVE

People change over time through the process called development. As people develop, each portion of the life span is affected by happenings in earlier years. And each affects the happenings in years that will come. Throughout people's lives, health, illness, and the role of different biopsychosocial systems change. This is why it is important to keep the life-span perspective in mind when we examine health psychology.

In the life-span perspective, characteristics of a person are considered with respect to their prior development, current level, and likely development in the future. How do characteristics relating to health and illness vary with development? One way is that the kinds of illnesses people have tend to change with age. Compared with older individuals, children suffer from relatively few chronic diseases (USBC. 1999). Illnesses that keep children out of school tend to be short-term infectious diseases, such as colds or the flu. In contrast, many people in late adulthood and old age suffer from heart disease, cancer, and stroke.

How do the roles of different bio-psychosocial systems change as we develop?

Biological systems change in many ways. Virtually all systems of the body grow in size, strength, and efficiency during childhood and decline in old age. The decline can be seen in the slowing down that older people notice in their physical abilities. They have less stamina because the heart and lungs function less efficiently and the muscles are weaker. They also recover from illness and injury more slowly.

Changes occur in psychological systems, too— for example, in cognitive processes. Children's knowledge and ability to think are limited during the preschool years but grow rapidly during later childhood. Before children can assume responsibility for their health, they need to understand how their behavior can affect it. As children get older and their cognitive skills improve, they are more likely to engage in behaviors that promote their health and safety. They also become better able to understand the implications of their own illness when they are sick.

How do people's social relationships and social systems change with development? For one thing, there are some usual progressions: children usually become parents of their own families in adulthood and grandparents in old age. As people develop, they progress through levels of education and employment, and retire in old age. Changes in social relationships also relate to health and illness. Children's health is largely the responsibility of adult caregivers—parents and teachers. During the teenage years, adolescents take on more and more of these responsibilities. At the same time, social relationships with age-mates in the community start to have a very powerful influence on adolescents. The strong need to be accepted by peers sometimes leads teens toward unhealthful or unsafe behavior. For example, an adolescent who has a chronic illness that can be controlled—as diabetes can—may neglect his or her medical care to avoid looking and feeling different from other adolescents.

The life-span perspective adds an important dimension to the biopsychosocial perspective in our effort to understand how people deal with issues of health and illness.

Definition of Health psychology:

Matarazzo, in 1980, defined health psychology as "the aggregate of the specific educational, scientific, and professional contribution of the discipline of psychology to the promotion and maintenance of health, the promotion and treatment of illness and related dysfunction".

The Aims of Health Psychology

Health psychology emphasizes the role of psychological factors in the cause, progression and consequences of health and illness. The aims of health psychology can be divided into (1) understanding, explaining, developing and testing theory; and (2) putting this theory into practice.

1. Health psychology aims to understand, explain, develop and test theory by:

(a) Evaluating the role of behavior in the etiology of illness. For example:

Coronary heart disease is related to behaviors such as smoking, cholesterol level, lack of exercise, high blood pressure and stress.

Many cancers are related to behaviors such as diet, smoking, alcohol and failure to attend for screening or health check-ups.

A stroke is related to smoking, cholesterol and high blood pressure.

An often overlooked cause of death is accidents. These may be related to alcohol consumption, drugs and careless driving.

(b) Predicting unhealthy behaviors. For example:

Smoking, alcohol consumption and high fat diets are related to beliefs.

Beliefs about health and illness can be used to predict behavior.

(c) Understanding the role of psychological consequences of illness could help to alleviate physical symptoms such as pain, nausea and vomiting.

Understanding the psychological consequences of illness could help to alleviate psychological symptoms such as anxiety and depression.

(d) Evaluating the role of psychology in the treatment of illness. For example:

If psychological factors are important in the cause of illness, they may have a role in its treatment.

Treatment of the psychological consequences of illness may have an impact on longevity.

2. Health psychology also aims to put theory into practice. This can be implemented by:

(a) Promoting healthy behavior. For example:

Understanding the role of behavior in illness can allow unhealthy behaviors to be targeted.

Understanding the beliefs that predict behaviors can allow these beliefs to be targeted.

Understanding the beliefs can help these beliefs to be changed.

(b) Preventing illness. For example:

Changing beliefs and behavior could prevent illness onset.

Behavioral interventions during illness (e.g., stopping smoking after a heart attack) may prevent future illness.

Training health professionals to improve their communication skills and to carry out interventions may help to prevent illness.

RELATING HEALTH PSYCHOLOGY TO OTHER SCIENCE FIELDS

Knowledge in health psychology is greatly enriched by information from many other disciplines, including some disciplines within *psychology*, such as the clinical and social areas; *medicine*, including psychiatry and pediatrics; and *allied fields*, such as nursing, nutrition, pharmacology, biology, and social work. We will look at four fields that are especially important because they provide both information and a context for health psychology.

Related Fields

To understand health psychology fully, we need to know the context in which health and illness exist. The field of *epidemiology*—the scientific study of the distribution and frequency of disease and injury—provides part of this context. Researchers in this field determine the occurrence of illness in a given population and organize these data in terms of when the disease or injury occurred, where, and to which age, gender, and racial or cultural groups. Then they attempt to discover why specific illnesses are distributed as they are. You have probably seen the results of epidemiologists' work in the mass media. For example, news reports have described areas of the United States where Lyme disease, a tick-borne illness, occurs at high levels and where certain forms of cancer are linked to high levels of toxic substances in the environment.

Another discipline of importance to health psychology is *public health*, the field concerned with protecting, maintaining, and improving health through organized effort in the community. People who work in public health do research and set up programs dealing with immunizations, sanitation, health education and awareness, and ways to provide community health services. This field studies health and illness in the context of the community as a social system. The success of public health programs and the way individual people react to them are of interest to health psychologists.

Two other related fields are sociology and anthropology. *Sociology* focuses on human social life; it examines groups or communities of people and evaluates the impact of various social factors, such as the mass media, population growth, epidemics, and institutions. *Medical sociology* is a subfield that studies a wide range of issues related to health, including the impact of social relationships on the distribution of illness, social reactions to illness, socioeconomic factors of health care use, and the way hospital services and medical practices are organized.

Anthropology includes the study of human cultures. Its subfield, *medical anthropology*, examines differences in health and health care across cultures: How do the nature and definition of illness vary across different cultures? How do people in these cultures react to illness, and what methods do they use to treat disease or

injury? How do they structure health care systems? Without the knowledge from sociology and anthropology, health psychologists would have a very narrow view. Knowledge from sociology and anthropology gives us a broad social and cultural view of medical Issues and allows us to consider different ways to interpret and treat illness.

The combined information health psychologists obtain from epidemiology, public health, sociology, and anthropology paints a broad picture for us. It describes the social systems in which health, illness, and the person exist and develop.

LESSON 06**HEALTH RELATED CAREERS****Health-related careers outside of Psychology**

The process of providing care for a patient who is suffering from a chronic illness, serious injury or disability involves a variety of professionals working together with physicians as a team. Each professional has specific training for a special role in the treatment or rehabilitation process. Most of them have some education in psychology. We've already seen how health psychologists can play a role. Let's look at some careers outside of psychology and the training they require in the United States.

Nurses and Physician Assistants

There are two overall categories of nurses *registered nurses* (RNs) and *licensed practical nurses* (LPNs). RNs work in hospitals, community health clinics, physicians' offices, and industrial settings. They assess and record patients' symptoms and progress, conduct tests, administer medications, assist in rehabilitation, provide instructions for self-treatment, and instruct patients and their Families in ways to improve or maintain their health. RNs often deal with mental and emotional aspects of the patient as well. All RNs throughout the United States must be licensed to practice, have graduated from an approved training program in nursing, and have passed a national examination. RN training programs vary in structure and length; college and university programs take 4 or 5 years and lead to a baccalaureate degree.

LPNs work in hospitals, clinics, physicians' offices, and patients' homes. They perform nursing activities that require less training than those performed by RNs. For example, they take and record temperatures and blood pressures, administer certain medications, change dressings, assist physicians or RNs, and help patients with personal hygiene. Like RNs, all LPNs in the United States must be licensed to practice, have graduated from an approved practical nursing program, and have passed a national examination. Training programs for LPNs take about a year to complete and are offered through various types of institutions, such as trade and vocational schools, community and junior colleges, and hospitals.

Physicians' assistants and *nurse practitioners* usually work closely with medical doctors, performing routine tasks that physicians ordinarily did in the past, such as examining patients with symptoms that do not appear serious and explaining treatment details (AANP, 2000; AAPA, 2000). Training involves a program of about 2 years of study; admission often requires that applicants have a relevant bachelors degree, such as in nursing, and prior health care experience.

Dietitians

Dietitians study and apply knowledge about food and its effect on the body. They do this in a variety of settings, such as hospitals, clinics, nursing homes, colleges, and schools. Some dietitians are administrators; other work directly with patients in assessing nutritional needs, implementing and evaluating dietary plans, and instructing patients and their families on ways to adhere to needed diets after discharge from the hospital. Some dietitians work for social service agencies in the community, where they counsel people on nutritional practices to help maintain health and speed recovery when they are ill.

Becoming a dietitian requires a bachelor's or masters degree specializing in nutrition sciences or institutional management. To become a Registered Dietitian, the Individual must complete a supervised internship and pass an exam.

Physical Therapists

Many patients need help in restoring functional movement to parts of their body and relieving pain. If they have suffered a disabling injury or disease, treatment may be needed to prevent or limit permanent disability. Physical *therapists* plan and apply treatment for these goals in rehabilitation (APTA, 2000). To plan the treatment, physical therapists review the patient's records and perform tests or measure- merits of muscle strength, motor coordination, endurance, and range of motion of the injured body part.

Treatment is designed to increase the strength and function of the injured part and aid in the patient's adaptation to have reduced physical abilities, which may be quite drastic. People who have suffered severe strokes are sometimes left partially paralyzed, for instance.

The most universal technique used in physical therapy involves exercise, generally requiring little effort initially and becoming more and more challenging. Another technique involves electrical stimulation to move paralyzed muscles or reduce pain. Physical therapists also give instructions for carrying out everyday tasks, such as tying shoelaces or cooking meals. If the patient needs to use adaptive devices, such as crutches or prosthesis (replacement limb), the therapist provides training.

All physical therapists throughout the United States must have a degree or certificate from an approved training program and be licensed by passing an exam. A bachelor's degree has been the minimum educational requirement to enter the profession, but a master's degree in physical therapy will be the minimum as of January 2002.

Occupational Therapists

Occupational therapists help physically, mentally, and emotionally disabled individuals gain skills needed for daily activities in a work setting, at school, in the community, and at home. Their patients are often people who had these skills at one time, but lost them because of a spinal cord injury or a disease. These professionals usually specialize in working with a particular age group, such as the elderly, and a type of disability— physical, for example. Based on the patient's age and the type and degree of disability, a program of educational, vocational, and recreational activities is designed and implemented. The program for a child, for instance, might involve academic tasks and crafts; for an adult, it might involve typing, driving a vehicle, and using hand and power tools.

Occupational therapists in the United States must have a degree or certificate from an approved training program and be licensed by passing an exam. Training requires completing a baccalaureate program plus either a certificate program or a master's degree in occupational therapy.

Social Workers

The field of *social work* is quite broad. Probably most social workers are employed in mental health programs, but many others work in hospitals, nursing homes, rehabilitation centers, and public health programs. When working with people who are physically ill or disabled, social workers help patients and their families make psychological and social adjustments to the illness and obtain needed community services, including income maintenance. Thus, social workers may arrange for needed nursing care at home after a patient leaves the hospital or refer a patient for vocational counseling and occupational therapy if the illness or disability requires a career change. These professionals are usually called medical social workers.

Training requires a bachelor's degree in a social science field, usually social work, but often a degree in psychology or sociology is sufficient. Most states mandate some form of licensing or certification. Many positions require an advanced degree, typically a master's in social work, the MSW degree.

Why is the field of Health Psychology needed?

A number of trends within medicine, psychology, and other health care systems have combined to make the emergence of health psychology inevitable. It is safe to say that health psychology is one of the most important developments within the field of psychology in the last 50 years. What factors have led to the development of health psychology?

Changing Patterns of Illness

The most important factor giving rise to health psychology has been the change in illness patterns that has occurred in the United States and other technologically advanced societies.

As we discussed in our earlier lecture, until the 20th century, the major causes of illness and death in the United States were acute disorders—especially tuberculosis, pneumonia, and other infectious diseases. Acute disorders are short-term medical illnesses, often the result of a viral or bacterial invader and usually

amenable to cure. Now, however, chronic illnesses— especially heart disease, cancer, and diabetes—are the main contributors to disability and death. Chronic illnesses are slowly developing diseases with which people live for a long time. Often, chronic illnesses cannot be cured but rather only managed by the patient and provider working together.

Why have chronic illnesses helped spawn the field of health psychology? First, these are diseases in which psychological and social factors are implicated as causes. For example, personal health habits such as diet and smoking are implicated in the development of heart disease and cancer, and sexual activity is critically important in the likelihood of developing AIDS (acquired immune deficiency syndrome). Consequently, health psychology has evolved, in part, to explore these causes and develop ways to modify them.

Second, because people may live with chronic diseases for many years, psychological issues arise in connection with them. Health psychologists help the chronically ill adjust psychologically and socially to their changing health state.

They help those with chronic illness develop treatment regimens, many of which involve self-care. Chronic illnesses affect family functioning, including relationships with a partner and / or children, and health psychologists both explore these changes and help ease the problems in family functioning that may result.

Many people with chronic illnesses use unconventional therapies outside formal medicine. Understanding what leads people to seek unconventional treatments and evaluating their effectiveness are also issues on which health psychologists can shed light.

The field of health psychology is changing almost daily because new issues arise that require the input of psychologists. For example, new technologies now make it possible to identify the genes that contribute to many disorders. Just in the past five years, genes contributing to many diseases, including breast cancer, have been uncovered.

How can we help a college student whose mother has just been diagnosed with breast cancer? Now that we have a better understanding of the genetic causes of breast cancer, we can evaluate the student's own risk factor of contracting the same disease. We can have different tests that may tell us about the student's risk of breast cancer. And if the results tell us that she is indeed vulnerable to the same disease, we can design early prevention plans for her to reduce the risk. We can also enhance her psychological coping abilities so that her risk is further reduced to a minimum.

Health psychologists also conduct research that identifies the risk factors for a disease, such as a high-fat diet, and also help people learn to change their diet and stick to their resolution. Helping people make informed, appropriate decisions is fundamentally a psychological task. Advances in genetic research have made it possible to identify carriers of illness and to test the fetus for the presence of particular life-threatening or severely debilitating illnesses. This places some parents in the position of having to decide whether to abort a pregnancy, a wrenching, difficult decision to make.

Certain treatments that may prolong life have the effect of severely compromising quality of life. Increasingly, patients are asked their preferences regarding life-sustaining measures, and they may require counseling in these matters. These are just a few examples of the increasing role that patients play in fundamental decisions regarding their health and illness and its management and of the help health psychologists can provide in this process.

Changing patterns of illness have been charted and followed by the field of epidemiology, a discipline closely related to health psychology in its goals and interests.

Expanded Health Care Services

Another set of factors that has contributed to the rise of health psychology relates to the expansion of health care services. Health care is the largest service industry in the United States, and it is still growing rapidly. Americans spend more than \$1,000 billion annually on health—more than 14 % of their total income. In recent years, the health care industry has come under increasing scrutiny as we have realized that massive increases in health care costs have not brought with them improvement in basic indicators of quality of health.

Moreover, huge disparities exist in the United States, such that some individuals enjoy the very best health care available in the world and others receive little health care except in emergencies. As of 1994, 37 million Americans had no health insurance at all, placing basic preventive care and treatment for common illnesses out of financial reach. These are among the developments that have fueled recent efforts to reform the health care system to provide all Americans with a basic health care package; similar to what already exists in most European countries.

Health psychology represents an important perspective on these issues for several reasons. First, because cost containment is so important, health psychology's main emphasis on prevention—namely, modifying people risky health behaviors before they ever become ill—has the potential to reduce the number of dollars devoted to the management of illness. Second, health psychologists have done substantial research on what makes people satisfied or dissatisfied with their health care. Thus, they can help in the design of user-friendly health care systems.

Finally, the health care industry employs many millions of individuals in a variety of jobs. Nearly every individual in the country has direct contact with the health care system as a recipient of services. Thus, its impact on people is enormous. For all these reasons, then, health has a substantial social and psychological impact on people, an impact that is addressed by health psychologists.

Increased Medical Acceptance

Another reason for the development of health psychology is the increasing acceptance of health psychologists within the medical community. Although health psychologists have been employed in health settings for many years, their value is increasingly recognized by physicians and other health care professionals. At one time, the role of health psychologists in health care was largely confined to the task of administering tests and interpreting the test results of individuals who were suspected of being psychologically disturbed. Like psychiatrists in health settings, psychologists usually saw only the 'problem patients' who were difficult for medical staff to manage or whose physical complaints were believed to be entirely psychological in origin.

Now, however, caregivers are increasingly recognizing that psychological and social factors are always important in health and illness. Accordingly, the role of the psychologist in changing patient's health habits and contributing to treatment is increasingly acknowledged.

Demonstrated Contributions to Health

Health psychology has already demonstrated that it can make substantial contributions to health. Although these contributions form the substance of later lectures in this course, a few brief examples here can illustrate this point.

As previously noted, health psychologists have developed a variety of short-term behavioral interventions to address a wide variety of health-related problems including managing pain, modifying bad health habits, such as smoking, and managing the side effects or treatment effects associated with a range of chronic diseases.

Techniques that often take a mere few hours to teach often produce years of benefit. Such interventions, particularly those that target risk factors like diet or smoking, have contributed to the actual decline in the incidence of some diseases, especially coronary heart disease.

To take another example, psychologists learned many years ago that informing patients fully about the procedures and sensations involved in unpleasant medical procedures, such as surgery, improves their adjustment to those procedures. As a consequence of these studies, many hospitals and other treatment centers now routinely prepare patients for such procedures. Ultimately, if a discipline is to flourish, it must demonstrate a strong track record, and health psychology has done precisely that.

Methodological Contributions

Health psychologists make important methodological contributions to issues of health and illness. Many of the issues that arise in medical settings demand rigorous research investigation. Although physicians and nurses receive some methodological and statistical education, their training may be inadequate to conduct research on the issues they wish to address unless they make research their specialty. The health psychologist can be a valuable member of the research team by providing the methodological and statistical expertise that is the hallmark of good training in psychology.

We will not go into the details of the different research methods used in health psychology. Suffice it to say at this point that the research training that health psychologists receive in their undergraduate and graduate school experiences makes them valuable parts of the research teams that attempt to understand how we stay healthy and why we get ill.

LESSON 07**THE FUNCTION OF NERVOUS SYSTEM****Prologue**

When Tom was born 20 years ago, his parents were thrilled. Here was their first child— a delightful baby with such promise for the future. He seemed to be healthy. His parents were pleased that he began to consume large amounts of milk, often without becoming satiated. They took this as a good sign. But, in this case, it wasn't.

As the weeks went by, Tom's parents noticed that he wasn't gaining as much weight as he should, especially since he was still consuming lots of milk. He started to cough and wheeze often and developed one respiratory infection after another. They became concerned, and so did his pediatrician. After a series of tests, the devastating diagnosis was clear: Tom had *Cystic Fibrosis*, a chronic, progressive, and eventually fatal disease. Cystic fibrosis is an inherited disease of the respiratory system for which there is no cure and no effective treatment.

Tom has had a difficult life, and so has his family. The respiratory infections he had in infancy were just the beginning. His disease causes thick, sticky secretions that constantly block airways, trap air in the lungs, and help bacteria to thrive. Other body systems also become affected, causing additional problems, such as insufficient absorption of food and vitamins. As a result, he was sick often and remained short, underweight, and weak compared with other children. His social relationships have always been limited and strained, and the burden of his illness has taken its toll on his parents.

When Tom was younger and people asked him, "what do you want to be when you grow up?" he would answer, "I'm going to be an angel when I grow up." What other plans could he have had, realistically? At 20, he has reached the age by which half of the victims of cystic fibrosis die. Physical complications, such as heart damage, that generally afflict several body systems in the last stages of this disease have begun to appear.

We can see in Tom's story that biological factors, such as heredity, can affect health; illness can alter social relationships; and all interrelated physiological systems of the body can be affected.

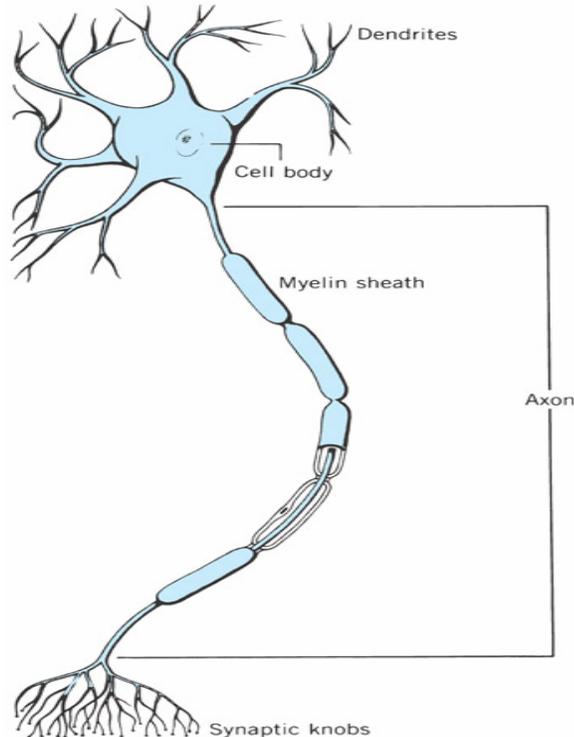
An understanding of health requires that we have a working knowledge of human physiology. This knowledge makes it possible to understand, among others, such issues as how good health habits make illness less likely, how genetic or environmental factors influence the physical body of human beings etc.

In this lecture we will talk about the nervous system. In our coming lectures we will outline the other major physical systems of the body. Our discussions will focus on the normal functions of these systems, but we will consider some important problems, too. For example, what determines the degree of paralysis a person suffers after injury to the spine? How does stress affect our body systems? What is a heart attack, and what causes it?

THE NERVOUS SYSTEM**How the Nervous System Works**

We all know that the nervous system, particularly the brain, in human beings and other animals controls the way we initiate behavior and respond to events in our world. The nervous system receives information about changes in the environment from sensory organs, including the eyes, ears, and nose, and it transmits directions that tell our muscles and other internal organs how to react. The brain also stores information—being a repository for our memory of past events—and provides our capability for thinking, reasoning, and creating.

The nervous system is constantly integrating the actions of our internal organs—although we are not generally aware of it. Many of these organs, such as the heart and digestive tract, are made of muscle tissues that respond to commands. The nervous system provides these commands through an intricate network of billions of specialized nerve cells, called neurons.



Although neurons in different parts of the nervous system have a variety of shapes and sizes, the diagram on your screen shows their general features. Projecting from the *cell body* are clusters of branches called *dendrites*. Generally, dendrites function as receivers for messages from adjacent neurons. These messages then travel through a long, slender projection called the *axon*, which splits into branches at the far end. The tips of these branches have small swellings called *synaptic knobs* that connect to the dendrites of other neurons, usually through a fluid-filled gap. This junction is called a *synapse*.

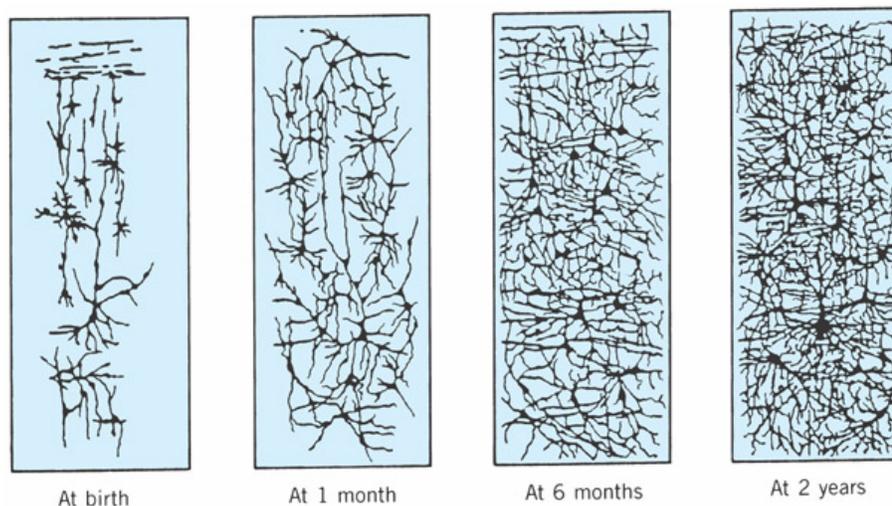
Messages from the knobs cross the gap to adjacent neurons and in this way eventually reach their destination.

What changes occur in the nervous system as a person develops? By the time the typical baby is born, a basic structure has been formed for almost all the neurons this person will have. But the nervous system is still quite immature—For instance, the brain weighs only about 25% of the weight it will have when the child reaches adulthood. Most of the growth in brain size after birth results from an increase in the number of *glial cells* and the presence of a white fatty substance called *myelin*. The glial cells are thought to service and maintain the neurons.

A myelin sheath surrounds the axons of most, but not all, neurons. This sheath is responsible for increasing the speed of nerve impulses and preventing them from being interfered with by adjacent nerve impulses, much the way insulation is used on electrical wiring. The importance of myelin can be seen in the disease called *multiple sclerosis*, which results when the myelin sheath degenerates and nerves become severed (Trapp, 1998). People afflicted with this disease have weak muscles that lack coordination and move

spastically (AMA, 1989).

As the infant grows, the network of dendrites and synaptic knobs to carry messages to and from other neurons expands dramatically, as you can see in the diagram.



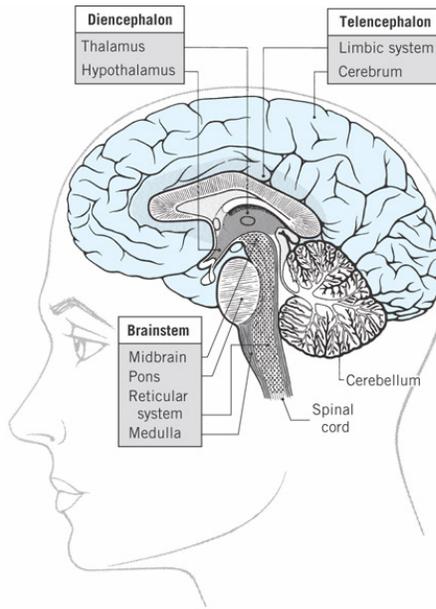
The myelin sheath covering the neurons is better developed initially in the upper regions of the body than in the lower regions. During the first years of life, the progress in myelin growth spreads down the body—from the head to shoulders, to the arms and hands, to the upper chest and abdomen, and then the legs and feet. This sequence is reflected in the individual’s motor development: the upper parts of the body are brought under control at earlier ages than the lower parts. Studies with animals have found that chronic poor nutrition early in life impairs brain growth by retarding the development of myelin, Glial cells, and dendrites. Such impairment can produce long-lasting deficits in a child’s motor and intellectual. Although researchers had thought that the brain forms few, if any, new neurons after birth, it is now known that new cells do form in some areas of the brain, but it is not yet clear how extensive this growth is.

Beginning in early adulthood, the brain slowly loses weight with age. Although the number of brain cells does not change very much, the synapses do, leading to a decline in ability to send nerve impulses. These alterations in the brain are associated with the declines people often notice in their mental and physical functions after they reach 50 or 60 years of age.

The nervous system is enormously complex and basically has two major divisions—the central nervous system and the peripheral nervous system—that connect to each other. The central nervous system consists of the brain and spinal cord. The *peripheral nervous* system is composed of the remaining network of neurons throughout the body. Each of these major divisions consists of interconnected lower-order divisions or structures. We will examine the nervous system, beginning at the top and working our way down.

The Central Nervous System

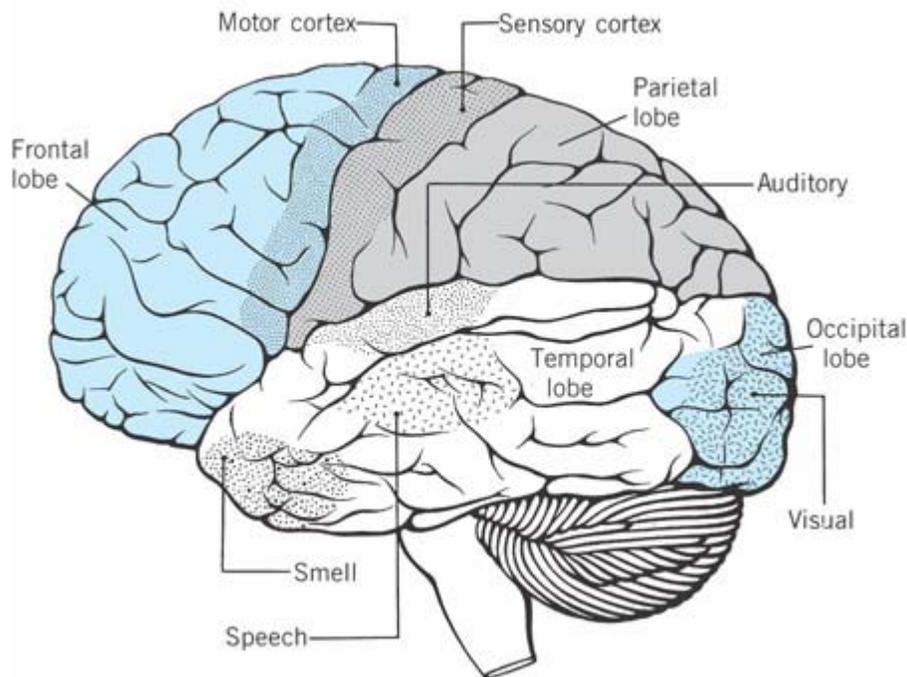
People's brain and spinal cord race toward maturity early in life. For example, the brain weighs 75% of its adult weight at about 2 years of age, 90% at 5 years, and 95% at 10 years (Tanner, 1970, 1978). The brain may be divided into three parts: the *forebrain*, the *cerebellum*, and the *brainstem*. Each of these parts has special functions.



The Forebrain

The forebrain is the uppermost part of the brain. As you can see the diagram on the screen, the forebrain has two main subdivisions: the *telencephalon*, which consists of the cerebrum and the limbic system, and the *diencephalon*, which includes the thalamus and hypothalamus. As a general rule, areas toward the top and outer regions of the brain are involved in our perceptual, motor, learning, and conceptual activities. Regions toward the center and bottom of the brain are involved mainly in controlling internal and automatic body functions and in transmitting information to and from the telencephalon.

The cerebrum is the upper and largest portion of the human brain and includes the *cerebral cortex*, its outermost layer. The cerebrum controls complex motor and mental activity. It develops rapidly in the first few years of life, becoming larger, thicker, and more convoluted. The cerebrum has two halves—the *left hemisphere* and the *right hemisphere*—each of which looks like the left hemispheres shown here.



Although the left and right hemispheres are physically alike, they control different types of processes. For one thing, the motor cortex of each hemisphere controls motor movements on the opposite side of the body. (You can see the next diagram of brain showing the motor cortex on your screen now). This is why damage to the motor cortex on, say, the right side of the brain may leave part of the left side of the body paralyzed. The two hemispheres also control different aspects of cognitive and language processes. In most people, the left hemisphere contains the areas that handle language processes, including speech and writing. The right hemisphere usually processes such things as visual imagery, emotions, and the perception of patterns, such as melodies (Tortora & Grabowski, 2000).

You probably noticed in our previous diagram that each hemisphere is divided into a front part, called the frontal lobe, and three back parts: the temporal, occipital, and parietal lobes. The *frontal lobe* is involved in a variety of functions, one of which is motor activity. The back part of the frontal lobe contains the motor cortex, which controls the skeletal muscles of the body. If a patient, who is undergoing brain surgery, receives stimulation to the motor cortex, some part of the body will move. The frontal lobe is also involved in important mental activities, such as the association of ideas, planning, self-awareness, and emotion. As a result, injury to areas of this lobe can produce personality and emotional reactions.

The *temporal lobe* is chiefly involved in hearing, but also in vision and memory. Damage to this region can impair the person's comprehension of speech and ability to determine the direction from which a sound is coming.

The *occipital lobe* contains the principal visual area of the brain. Damage to the occipital lobe can produce blindness or the inability to recognize an object by sight.

The *parietal lobe* is involved mainly in body sensations, such as of pain, cold, heat, touch, and body movement.

The second part of the telencephalon—called the limbic system—lies along the innermost edge of the cerebrum, and adjacent to the diencephalon (refer back to diagram 3). The limbic system is not well understood yet. It consists of several structures that seem to be important in the expression of emotions, such as fear, anger, and excitement. To the extent that heredity affects a person's emotions, it may do so by determining the structure and function of the limbic system.

The diencephalon includes two structures—the thalamus and hypothalamus—that lie below and are partially encircled by the limbic system. The thalamus is a truly pivotal structure in the flow of information in the nervous system. It functions as the chief relay station for directing sensory messages, such as of pain or visual images, to appropriate points in the cerebrum, such as the occipital or parietal lobe. The thalamus also relays commands going out to the skeletal muscles from the motor cortex of the cerebrum.

The hypothalamus, a small structure just below the thalamus, plays an important role in people's emotions and motivation.

Its function affects eating, drinking, and sexual activity, for instance (Tortora & Grabowski, 2000). For example, when the body lacks water or nutrients, the hypothalamus detects this and arouses the sensation of thirst or hunger, which is relieved when we consume water or food. Research with animals has shown that stimulation of specific areas of this structure can cause them to eat when they are full and stop eating when they are hungry. A rare disease that affects this structure can cause people to become overweight. Another important function of the hypothalamus is to maintain *homeostasis*—a state of balance or normal function among our body systems.

Our normal body temperature and heart rate, which are characteristic of healthy individuals, are examples of homeostasis. When our bodies are cold, for instance, we shiver, thus producing heat. When we are very warm, we perspire, thus cooling the body. The hypothalamus controls these adjustments. We will see later that the hypothalamus also plays an important role in our reaction to stress.

The Cerebellum

The cerebellum lies at the back of the brain, below the cerebrum. The main function of the cerebellum is in maintaining body balance and coordinating movement. This structure has nerve connections to the motor cortex of the cerebrum and most sense organs of the body. When areas of the cerebrum initiate specific movements, the cerebellum makes our actions precise and well coordinated.

How does the cerebellum do this? There are at least two ways. First, it continuously compares our intent with our performance, ensuring that a movement goes in the right direction, at the proper rate, and with appropriate force. Second, it smoothes our movements. Because of the forces involved in movement, there is an underlying tendency for our motions to go quickly back and forth, like a tremor. The cerebellum damps this tendency. When injury occurs to the cerebellum, the person's actions become jerky and uncoordinated—a condition called *ataxia*. Simple movements, such as walking or touching an object, become difficult and unsteady.

Diagram 3 (above) shows the location of the cerebellum relative to the brainstem, which is the next section of the brain we will discuss.

The Brainstem

The lowest portion of the brain—called the brainstem—has the form of an oddly shaped knob at the top of the spinal cord. The brainstem consists of four parts: midbrain, pons, reticular system, and medulla.

The midbrain lies at the top of the brainstem. It connects directly to the thalamus above it, which relays messages to various parts of the forebrain. The midbrain receives information from the visual and auditory systems and is especially important in muscle movement. The disorder called Parkinson's *disease* results from degeneration of an area of the midbrain (Tortora & Grabowski, 2000). People severely afflicted with this

disease have noticeable motor tremors, and their neck and trunk postures become rigid, so that they walk in a crouch. Sometimes the tremors are so continuous and vigorous that the victim becomes crippled.

The reticular system is a network of neurons that extends from the bottom to the top of the brainstem and into the thalamus. The reticular system plays an important role in controlling our states of sleep, arousal, and attention. When people suffer a coma, often it is this system that is injured or disordered. *Epilepsy* a condition in which a victim may become unconscious and begin to convulse seems to involve an abnormality in the reticular system. One type of epileptic seizure called *grand mal* may result from reverberating cycles” in the reticular system:

That is, one portion of the system stimulates another portion, which stimulates a third portion, and this in turn re-stimulates the first portion, causing a cycle that continues for 2 to 3 minutes, until the neurons of the system fatigue so greatly that the reverberation ceases. Following a grand mal seizure, the person often sleeps at least a few minutes and sometimes for hours.

The pons forms a large bulge at the front of the brainstem and is involved in eye movements, facial expressions, and chewing. At the bottom of the brain- stem is the medulla, which contains vital centers that control breathing, heartbeat rate, and the diameter of blood vessels (which affects blood pressure). Because of the many vital functions it controls, damage to the medulla can be life threatening. *Polio*, a crippling disease that was once epidemic, sometimes damaged the center that controls breathing. Patients suffering such damage needed constant artificial respiration to breathe (McClintic, 1985).

The Spinal Cord

Extending down the spine from the brainstem is the spinal cord, a major neural pathway that transmits messages between the brain and various parts of the body. It contains neurons that carry impulses away from (the *efferent* direction) and toward (*afferent*) the brain. Efferent commands travel down the cord on their way to produce muscle action; afferent impulses come to the spinal cord from sense organs in all parts of the body.

The organization of the spinal cord parallels that of the body—that is, the higher the region of the cord, the higher the parts of the body to which it connects. Damage to the spinal cord results in impaired motor function or paralysis: the duration and extent of the impairment depends on the amount and location of damage. If the damage does not sever the cord, the impairment is less severe, and may be temporary. If the lower portion of the cord is severed, the lower areas of the body are paralyzed—a condition called *paraplegia*. If the upper portion of the spinal cord is severed, paralysis is more extensive. Paralysis of the legs and arms is called *quadriplegia*.

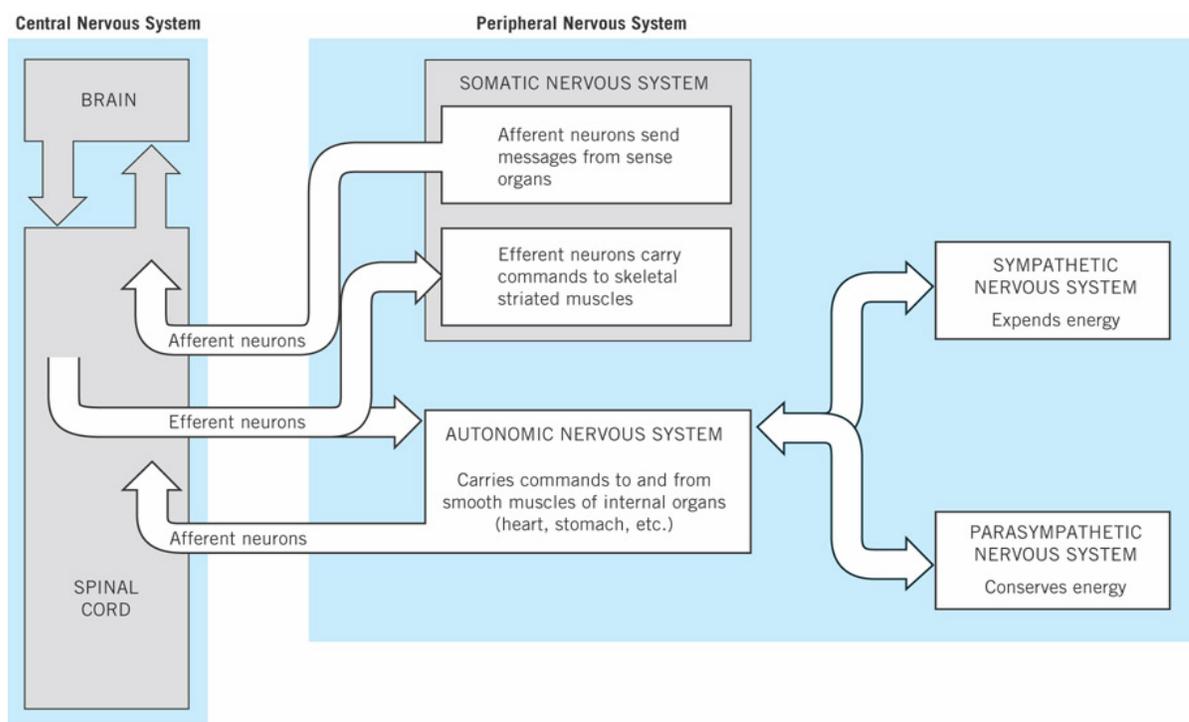
LESSON 08**THE FUNCTION OF NERVOUS SYSTEM AND ENDOCRINE GLANDS****The Peripheral Nervous System**

As you can see in the diagram, the **peripheral nervous system** has two parts:

a- Somatic Nervous System

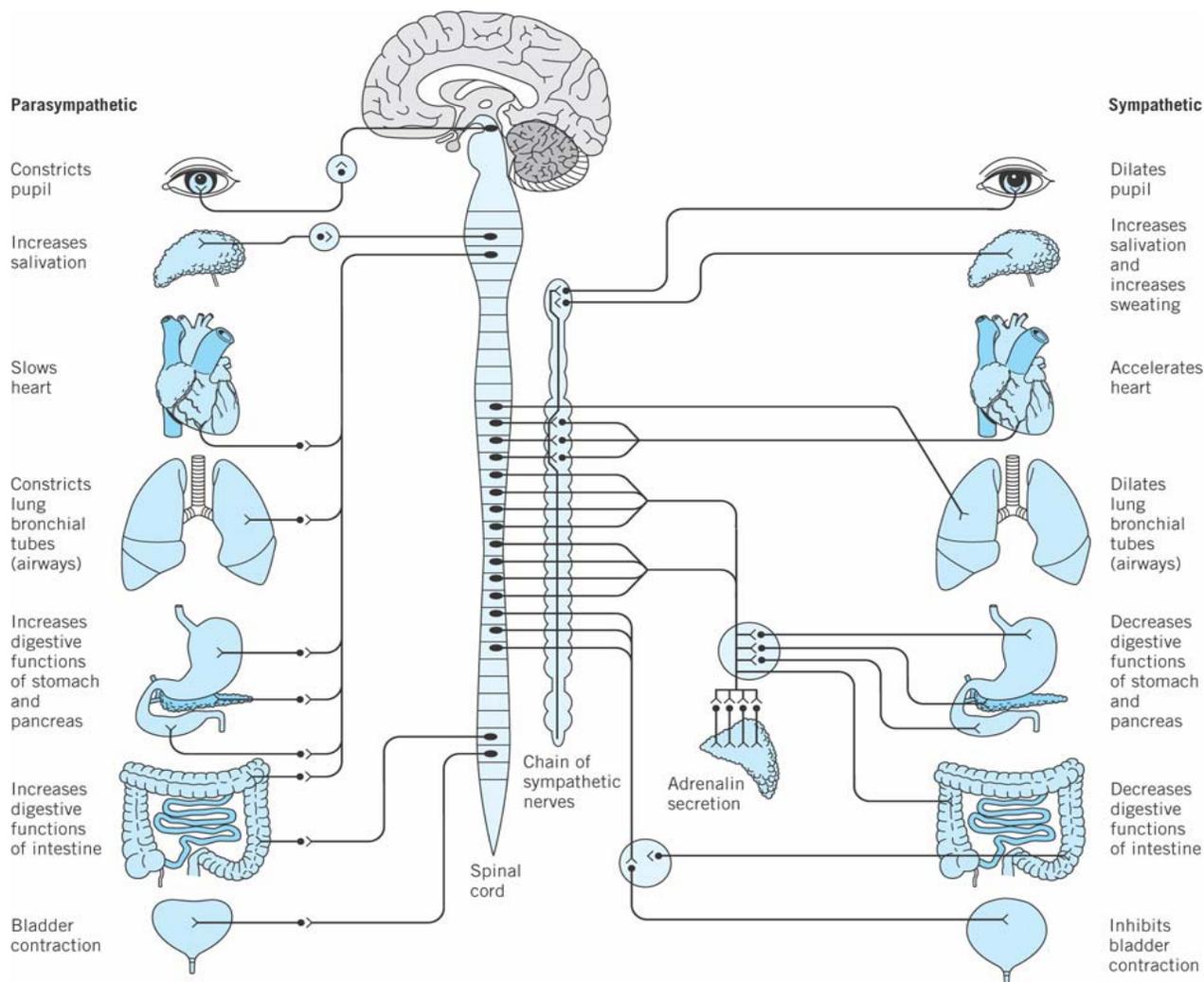
b- Autonomic Nervous System.

The somatic nervous system is involved in both sensory and motor functions, serving mainly the skin and skeletal muscles. **The autonomic nervous system** activates internal organs, such as the lungs and intestines, and reports to the brain the current state of activity of these organs.



In the **somatic nervous system**, afferent neurons carry messages from sense organs to the spinal cord, as you can see the diagram. Efferent neurons carry messages to, and activate, *striated* (grooved) skeletal muscles, such as those in the face, arms, and legs, that we can move voluntarily. A disorder called *myasthenia gravis* can develop at the junction of these muscles and neurons, weakening muscle function of the head and neck. This produces characteristic symptoms— such as drooping eyelids, blurred vision, and difficulty swallowing and breathing—and can lead to paralysis and death. Although medical treatment is effective in restoring muscle function, some symptoms may recur when the person is under stress (AMA, 1989).

The diagram also shows that in the autonomic nervous system, neurons carry messages between the spinal cord and the *smooth* muscles of the internal organs, such as the heart, stomach, lungs, blood vessels, and glands. This system itself has two divisions, the **sympathetic** and **parasympathetic**, which often act in opposite ways, as you will see in this next diagram.



The sympathetic nervous system helps us mobilize and expend energy in responding to emergencies, expressing strong emotions, and performing strenuous activity. For instance, suppose you are crossing a street, notice a speeding car barreling toward you, and hear its brakes start to squeal. The sympathetic nervous system instantly moves into action, producing several simultaneous changes—for example, it speeds up the heart, dilates certain arteries to increase blood flow to the heart and skeletal muscles, constricts other arteries to decrease blood flow to the skin and digestive organs, decreases salivation, and increases perspiration. These changes, in general, enable you to mobilize energy, and you leap to safety out of the car's path. This system is called “sympathetic” because it acts in agreement with your current emotional state.

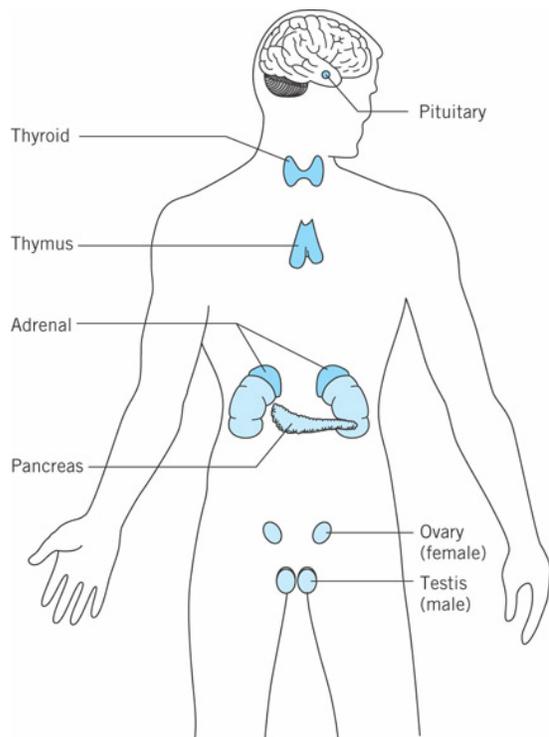
What does the parasympathetic division do? The prefix “*Para*” means “alongside of”—this division acts alongside of, and often in opposition to the sympathetic division. The parasympathetic nervous system regulates “quiet” or calming processes, helping our individual organ systems conserve and store energy. One example of parasympathetic activity can be seen in the digestion of food. When you eat a meal, the parasympathetic nervous system carries messages to regulate each step in the digestive process, such as by increasing salivation and stomach contractions. Another example can be seen in the course of emotional or

emergency reactions—when an emergency has passed, the parasympathetic division helps restore your normal body state.

Communication within the peripheral nervous system is handled by 12 sets of *cranial nerves*, most of which originate in the brainstem. The *Vagus nerve* extends from there to muscles of most major body organs, such as the airways, lungs, heart, and intestines, and is directly involved in the regulation of sympathetic and parasympathetic activity. Efferent messages from the brain can target specific organs to increase or decrease their function. As you now realize, the nervous system is connected to and regulates all of our other body systems; and the brain is the control center.

THE ENDOCRINE SYSTEM

The endocrine system consists of a set of glands that often work in close association with the autonomic nervous system. These systems share an important function: they communicate with various parts of the body. But they do this in somewhat different ways. Whereas the nervous system uses both electrical and chemical messages, the endocrine system communicates only with chemical substances, which are called hormones. Each endocrine gland secretes specific hormones directly into the bloodstream, which carries these chemicals to various parts of the body.



The diagram shows where several important endocrine glands are located. Certain chemicals are produced by both the endocrine and nervous systems and function as both hormones and neurotransmitters.

THE ENDOCRINE AND NERVOUS SYSTEMS WORKING TOGETHER

How are the endocrine and nervous systems associated? The nervous system is linked to the endocrine system by connections between the hypothalamus (in the forebrain) and a gland that lies just below it— the pituitary gland. The hypothalamus sends chemical messages directly to the pituitary gland, causing it to

release pituitary hormones into the blood. In turn, most of these hormones selectively stimulate the other endocrine glands to secrete chemicals. Because the pituitary gland controls the secretion of other endocrine glands, it is called the “master gland”.

Researchers have identified dozens of different hormones that course through our veins and arteries. Each hormone has its own specific effects on cells and organs of the body, thereby directly or indirectly affecting psychological and physical functions.

Some hormones, such as estrogens and testosterone, are produced mainly in females’ ovaries (where egg cells develop) and males’ testes (where sperm develop). These hormones are especially important in the development and functioning of female and male reproductive systems. Other hormones affect blood pressure, general body growth, and the balance of various chemicals, such as calcium, in the body. Still other hormones help us react to specific situations we encounter in our lives.

We saw earlier that the autonomic nervous system plays an important role in our reaction to an emergency. So does the endocrine system through a process called the hypothalamus—pituitary—adrenal axis (Sternberg & Gold. 1997).

Let’s see how by returning to the incident in which you leaped out of the path of a speeding car. When the sympathetic nervous system reacts to your emergency, the hypothalamus immediately sends a hormone called **Cortico-tropin-releasing factor** to the pituitary gland. This causes the pituitary to release **ACTH** (adreno-cortico-tropic hormone) into the blood. The ACTH then travels throughout the body and stimulates the release of a variety of hormones—especially those of the adrenal glands—that affect your reaction to the emergency.

Adrenal Glands

The adrenal glands are located on top of the kidneys (see the diagram). These glands release several important hormones in response to emergencies and stress. One of these hormones, **Cortisol**, helps control swelling when we are injured. If when you leaped to avoid being hit by the car you sprained your ankle, this hormone would help reduce swelling. But continued high levels of cortisol and similar hormones over a long time can be harmful to the body. They can lead to high blood pressure and the formation of ulcers, for example.

Two other important adrenal hormones are **epinephrine** and **nor-epinephrine** (also called adrenalin and noradrenalin). These hormones work in conjunction with the sympathetic nervous system to produce such bodily reactions as speeding up heart and respiration rates and increasing the liver’s sugar output for quick energy. After the emergency has passed and sympathetic activity has subsided, some impact of the hormones may continue for a while because they are still in the bloodstream.

The impact of the nervous and endocrine systems’ activities in emergency situations differs in the speed and persistence of their effect. The nervous system responds by sending messages that move instantly to specific locations: once they reach their destination, they become deactivated or dissipated. For example, the nervous system also produces and uses epinephrine and nor-epinephrine, but these chemicals function as neurotransmitters, relaying their commands from neuron to neuron and having a localized effect. The impact of the message stops quickly, and persists only if additional messages are sent. Hormones from the endocrine system move more slowly and broadly through the bloodstream, and their effects can be delayed and long-lasting.

Other Glands

Several other endocrine glands are also important. The **thyroid** gland, located in the neck, produces hormones, such as **thyroxine**, that regulate the body’s general activity level and growth. Disorders in thyroid production are of two types: **hypothyroidism**, or insufficient secretion of thyroid hormones, and **hyperthyroidism**, or excessive thyroid secretion (AMA. 1989).

Hypothyroidism leads to low activity levels and to weight gain. If the condition is congenital and untreated, dwarfism and mental retardation often result. The condition can be treated medically by having the person take hormone supplements orally. Hyperthyroidism leads to high activity levels, short attention spans, tremors, insomnia, and weight loss. Untreated people with a common form of this condition, called Graves' disease, act in a highly restless, irritable, and confused manner.

The **thymus** gland, which is located in the chest, is quite large in infancy and childhood but diminishes in size and efficiency after puberty. The thymus plays an important role early in life in the development of antibodies and immunities against diseases. We will discuss the immune system in one of our later lectures.

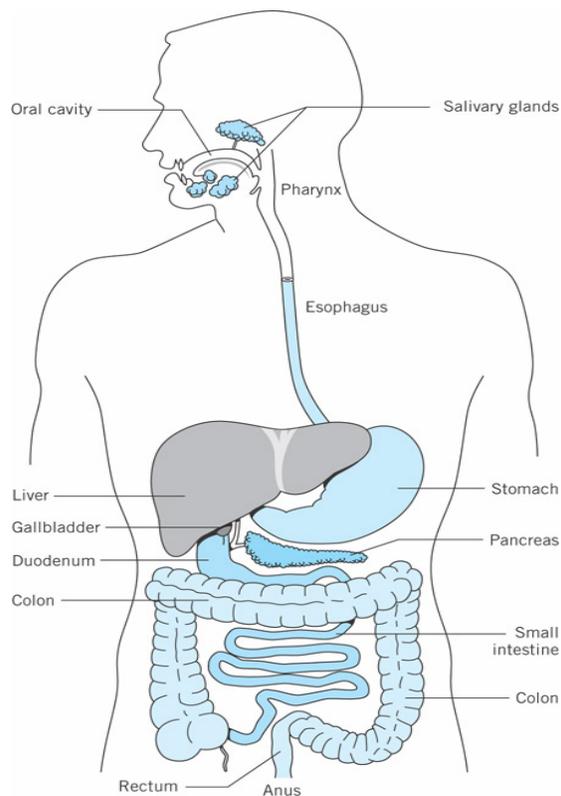
Another endocrine gland is the **pancreas**, which is located below the stomach. Its main function is to regulate the level of blood sugar, or glucose. The pancreas does this by producing two hormones, **glucagon** and **insulin**, that act in opposition. Glucagon raises the concentration of glucose in the blood, and insulin lowers it. The disorder called **diabetes mellitus** results when the pancreas does not produce sufficient insulin to balance the action of glucagon. This imbalance produces excess blood sugar levels—a condition called **hyperglycemia**. If this condition persists and is untreated, it may cause coma and death. Diabetes can be medically controlled, generally through diet and either medication or daily insulin injections.

LESSON 09**DIGESTIVE AND RENAL SYSTEMS****THE DIGESTIVE SYSTEM**

Whether we eat an apple, drink some milk, or swallow a pill, our bodies respond in the same general way. The digestive system breaks down what we have ingested, converts much of it to chemicals the body can use, and excretes the rest. The chemicals the body uses are absorbed into the bloodstream, which transports them to all of our body cells. Chemical nutrients in the foods we eat provide energy to fuel our activity, body growth, and repair.

Food's Journey through Digestive Organs

Think of the digestive system as a long hose— about 20 feet long—with stations along the way. The journey of food through this hose begins in the mouth and ends at the rectum. These digestive organs and the major organs in between are shown in the diagram.

**Digesting Food**

How does this system break down food? One way is mechanical: for example, we grind food up when we chew it. Another way is chemical: by the action of enzymes, substances that act as catalysts in speeding up chemical reactions in cells. How do enzymes work? You can see the effect of an enzyme by doing the following experiment. Place a bit of liver in some hydrogen peroxide and watch what happens:

An enzyme in liver called **catalase** causes the peroxide to decompose, frothing as oxygen is given off as a gas. This is the same reaction you see when you use peroxide to disinfect a wound.

In most cases, the names for enzymes end in the letters **-ase**, and the remainder of each name reflects the substance on which it acts. The following list gives some examples:

- Carbohyrase acts on carbohydrates.
- Lactase acts on lactose (milk).
- Phosphatase acts on phosphate compounds.
- Sucrase acts on sucrose (sugar).

As food is broken down into smaller and smaller units in the digestive tract, water molecules become attached to these units. When food is in the mouth, there is more digestive action going on than just chewing. Saliva moistens food and contains an enzyme that starts the process of breaking down starches. The salivary glands release saliva in response to commands from the brainstem, which responds primarily to sensory information from taste buds. Simply seeing, smelling, or even thinking about food can produce neural impulses that cause the mouth to water.

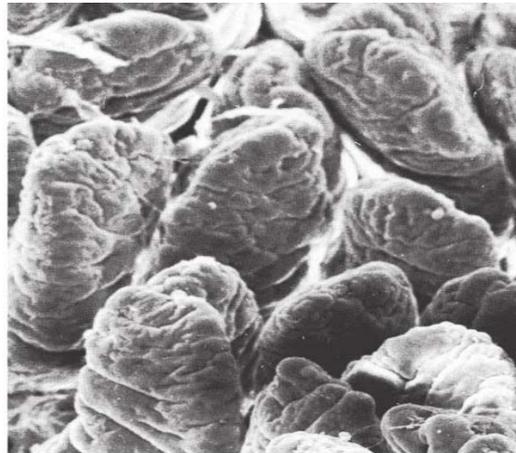
The journey of food advances to the esophagus, a tube that is normally flattened when food is not passing through it. The esophagus pushes the food down to the stomach by wavelike muscle contractions called **peristalsis**. By the time food enters the esophagus, the stomach has already begun digestive activities by releasing small amounts of gastric juice even before food reaches it. Tasting, smelling, seeing, or thinking about food can initiate this process. Once food reaches the stomach, this organ amasses large amounts of gastric juices, including hydrochloric acid and pepsin, an enzyme that breaks down proteins. The stomach also produces a sticky mucus substance to protect its lining from the highly acidic gastric juices.

The muscular stomach walls produce a churning motion—that we are generally not aware of—which mixes the food particles with the gastric juices. This mixing continues for 3 or 4 hours, producing a semi-liquid mixture. Peristalsis in the stomach then moves this mixture on, a little at a time, to the initial section of the small intestine called the **duodenum**.

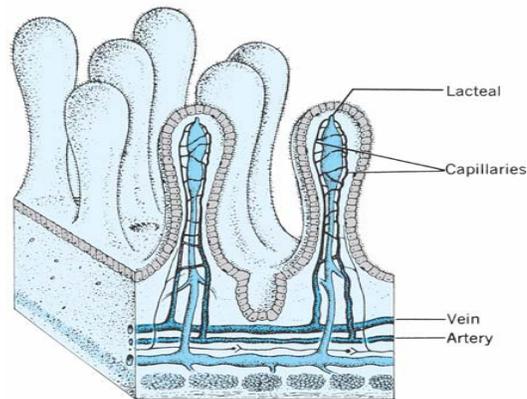
Important digestive processes occur in the small intestine. First, the highly acidic food mixture becomes chemically alkaline as a result of substances added from the pancreas, gallbladder, and wall of the small intestine. This is important because the linings of the small intestine and remainder of the digestive tract are not protected from high acidity, as the stomach is. Second, enzymes secreted by the pancreas into the duodenum break down carbohydrates, proteins, and fats further. Third, absorption increases. Because the stomach lining can absorb only a few substances, such as alcohol and aspirin, most materials we ingest are absorbed into the bloodstream through the lining of the small intestine. If alcohol is consumed along with fatty foods, very little alcohol is absorbed until it reaches the small intestine. By the time food is ready to be absorbed through the intestine wall, nutrients have been broken down into molecules—carbohydrates are broken down into simple sugars, fats into glycerol and fatty acids, and proteins into amino acids.

How does Absorption Occur?

The inside of the small intestine is made of a membrane that will allow molecules to pass through. To increase the absorbing surface, the intestine wall has many folds that contain projections, as pictured in the diagram.



(a)



(b)

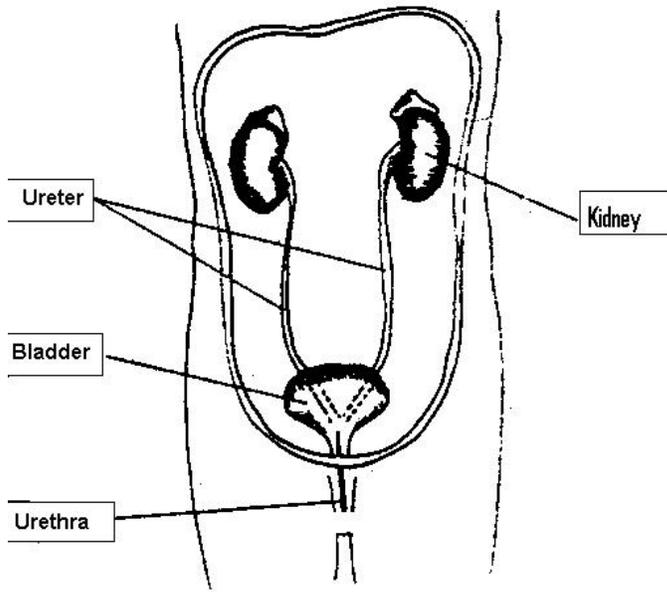
Each of the many thousands of projections contains a network of structures that will accept the molecules and transport them away to other parts of the body. These structures include tiny blood vessels called **capillaries** and a tube called a **lacteal**.

Capillaries absorb amino acids, simple sugars, and water; they also absorb some fatty acids, vitamins, and minerals. Lacteals accept glycerol and the remaining fatty acids and vitamins.

The remaining food material continues its journey to the large intestine, most of which is called the colon. Absorption, mainly of water, continues in the first half of the colon, and the remaining material is transported on. Bacterial action converts the material into feces, which eventually reach the rectum, where they are stored until defecation occurs.

Disorders of the Digestive System

Judging from the many media advertisements for stomach and “irregularity” remedies, it seems that people have a good deal of trouble with their digestive processes. We will consider a few digestive problems. One disorder of the digestive system is peptic ulcers.



The Renal System

through contaminated food, water, and utensils. Hepatitis B and C infections occur through sexual contact, transfusion of infected blood, and sharing of contaminated needles by drug addicts, but the modes of transmission may be broader. Some forms of hepatitis can lead to permanent liver damage.

Peptic Ulcers are open sores in the lining of the stomach or intestine, usually in the duodenum. These sores appear to result from excess gastric juices chronically eroding the lining when there is little or no food in the stomach, but bacterial infection can play a role, too. Abdominal pain is the chief symptom of the disorder. Although the victims of ulcers are mostly adults, the disorder also occurs in children, particularly boys. People who experience high levels of stress seem to be more susceptible to ulcers than people who do not.

Hepatitis is a class of several viral diseases in which the liver becomes inflamed and unable to function well. The first symptoms often are like those of flu. But the symptoms persist, and jaundice, a yellowing of the skin, generally follows. Hepatitis A appears to be transmitted

Cirrhosis is another disease of the liver. In this disease, liver cells die off and are replaced by nonfunctional fibrous scar tissue. The scar tissue is permanent, and when it becomes extensive, the liver's normal functions are greatly impaired. As we will see later, the liver is not only important in the digestive process; it also cleanses and regulates the composition of the blood. Cirrhosis can result from several causes, including hepatitis infection and, particularly, alcohol abuse (AMA, 1989).

Cancer may occur in any part of the digestive tract, especially in the colon and rectum. People over 40 years of age have a higher prevalence for cancers of the digestive tract than do younger individuals. Early detection for many of these cancers is possible and greatly improves the person's chances of recovery.

THE RENAL SYSTEM

Overview

The renal system—consisting of the kidneys, ureters, urinary bladder, and urethra—is also critically important in metabolism. The kidneys are chiefly responsible for the regulation of the bodily fluids; their principal function is to produce urine. The ureters contain smooth muscle tissue that contracts, causing peristaltic waves to move urine to the bladder, a muscular bag that acts as a reservoir for urine. The urethra then conducts urine from the bladder out of the body.

Urine contains surplus water, surplus electrolytes; waste products from the metabolism of food, and surplus acids or alkalis. By carrying these products out of the body, it maintains water balance, electrolyte balance, and blood pH. Of the electrolytes, sodium and potassium are the most important because they are involved in the normal chemical reactions of the body, muscular contractions, and the conduction of nerve impulses. Thus, an important function of the kidneys is to maintain an adequate balance of sodium and potassium ions. In the case of certain diseases, the urine will also contain abnormal amounts of some constituents; therefore, urinalysis offers important diagnostic clues to many disorders. For example, an excess of glucose

may indicate diabetes, an excess of red blood cells may indicate a kidney disorder, and so on. This is one of the reasons why a medical checkup often includes a urinalysis.

As noted, one of the chief functions of the kidneys is to control the water balance in the body. For example, on a hot day when a person has been active and has perspired profusely, relatively little urine will be produced so that the body may retain more water. This is because much water has already been lost through the skin. On the other hand, on a cold day when a person is relatively inactive and a good deal of liquid has been consumed, urine output will be higher so as to prevent over-hydration.

To summarize, then, the urinary system regulates bodily fluids by removing surplus water, surplus electrolytes, and the waste products generated by the metabolism of food.

Disorders of the Renal System

The renal system is vulnerable to a number of disorders. Among the most common are urinary tract infections, to which women are especially vulnerable and which can result in considerable pain, especially upon urination. If untreated, they can lead to more serious infection.

AGN (Acute Glomerular Nephritis) is a disease that results from an antigen-antibody reaction in which the inner tissues of the kidneys become markedly inflamed. These inflammatory reactions can cause total or partial blockage in the kidneys. In severe cases, total renal shutdown occurs. Acute glomerular nephritis is usually caused by a kind of streptococcus infection.

Another common cause of acute renal shutdown is **tubular necrosis**, which involves destruction of the epithelial cells in the tubules of the kidneys. Poisons that destroy the tubular epithelial cells or severe circulatory shock are most common causes of tubular necrosis.

Kidney Failure is a severe disorder because the inability to produce an adequate amount of urine will cause the waste products of metabolism as well as surplus inorganic salts and water to be retained in the body. An artificial kidney, a kidney transplant, or kidney dialysis may be required in order to rid the body of its wastes. Although these technologies can cleanse the blood to remove the excess salts, water, and metabolites, they are highly stressful medical procedures. Kidney transplants carry many health risks, and kidney dialysis can be extremely uncomfortable for patients. Consequently, health psychologists have been involved in addressing the problems of the kidney patient.

LECTURE 10**THE RESPIRATORY SYSTEM**

Breathing supplies the body with oxygen—but why do we need oxygen? The chemical reactions in metabolism require oxygen, some of which joins with carbon atoms from food to form carbon dioxide (CO₂) as a waste product. So breathing has another function— it lets us get rid of this waste product. We will begin our examination of the respiratory system by looking at its structures.

The Respiratory Tract

After air enters the body through the nose or mouth, it travels past the **larynx**, down the **trachea** and **bronchial tubes**, and into the **lungs**. These organs are depicted on your TV screen. The bronchial tubes divide into smaller and smaller branches called **bronchioles** inside the lungs. These branches finally end in millions of tiny air sacs called **alveoli**. Each alveolus looks like a minute bubble made of a membrane that is thin enough to allow oxygen, CO₂, and other gases to pass through. Alveoli are enmeshed in beds of capillaries so that gases can be transferred to and from the bloodstream quickly and efficiently.

When we breathe, what makes the air go in and out? When we inhale, the rib muscles draw the ribs up and outward and the diaphragm—a horizontal sheet of muscle below the lungs, contracts, pulling downward on the bottom of the lungs. These actions pull air in and enlarge the lung chambers. When we exhale, these muscles relax, and the elasticity of the lungs forces the air out, like a balloon.

Respiratory Function and Disorders

How do the muscles “know” when it’s time to inhale and exhale? Our blood vessels contain sensors that monitor blood gases and send this information to the medulla of the brain, which directs actions of the muscles to cause us to inhale and exhale. When the CO₂ level is high, the medulla increases the breathing rate; when the level is low, breathing rate is decreased.

Foreign matter, such as airborne particles and microorganisms, can readily enter the respiratory tract. The respiratory system therefore needs protective mechanisms to prevent foreign matter from reaching the lungs and entering the bloodstream. Two protective mechanisms are reflexes: (1) sneezing in response to irritation in nasal passages and (2) coughing in response to irritation in lower portions of the system. Another protective mechanism is the mucociliary escalator. How does this mechanism work? Most of the lining of the respiratory system is coated with sticky mucus that traps foreign matter. Furthermore, the air passages leading from the mouth to the lungs are lined with tiny hair-like structures called cilia that move in such a way as to force the mucus coating up toward the mouth, hence the name “mucociliary escalator.”

When the mucus reaches the back of the mouth, it is usually swallowed. In this way, the respiratory system cleanses itself and protects the body from harmful matter that we inhale.

The opening story of one of our earlier lectures was about a young man named Tom who was a victim of cystic fibrosis, a fatal disease of the respiratory system. We will look at several of the many other disorders that attack this system. Some of these disorders mainly affect the alveoli of the lungs, thereby impairing the normal exchange of CO₂ and oxygen.

For instance, there are several types of **pneumonia**, which can be caused by either bacterial or viral infection (AMA, 1989). Although this disease often affects the bronchial tubes, the most serious types of pneumonia cause the alveoli to become inflamed and filled with fluid.

In another respiratory disease called **emphysema** the walls between alveoli are destroyed. This decreases the lungs’ surface area for exchanging gases and their elasticity for exhaling CO₂.

Pneumoconiosis is a disease that afflicts people who chronically inhale air containing high concentrations of dust—generally at their workplaces. The black lung disease of coal miners provides an example. Dust

that is not removed by protective mechanisms accumulates as thick sheets around the alveoli and bronchioles, damaging these structures and blocking air exchange.

Other disorders of the respiratory system primarily affect the bronchial tubes, usually by narrowing the tubes and reducing airflow.

Asthma is a disorder in which the bronchial airways narrow, because they become inflamed, develop spasms, and secrete too much mucus. Attacks usually are temporary and occur in response to an irritant, such as an infection or something to which the victim is allergic. Breathing becomes difficult and, in very serious attacks, portions of the lungs may collapse temporarily.

In **chronic bronchitis**, inflammation and excess mucus occur in the bronchial tubes for an extended period. This condition may be permanent or occur several times a year, lasting 2 weeks or more each episode (Haas & Hass, 1990).

Lung cancer involves an unrestrained growth of cells that crowd out cells that aid respiration. This process usually begins in the bronchial tubes and spreads to the lungs. In its final stages, the diseased cells enter the bloodstream through the capillaries and spread throughout the body. At this point death is almost always near. Many of the respiratory diseases we have discussed can be caused or worsened by smoking cigarettes. This risk factor is also important in diseases of the cardiovascular system.

The Cardiovascular System

The physical design of every complex organism has to deal with a basic problem: How can the body service its cells—supplying the substances they need to function properly and removing the wastes that metabolism produces? In humans and many other animals, this problem is solved by having a cardiovascular system to transport these materials. The blood circulates through blood vessels—capillaries, arteries, and veins—within a closed system, one in which the blood does not directly contact the cells and tissues it services. All transfers of oxygen, nutrients, waste products, and other substances occur through membranes that are separated by fluid-filled spaces. The heart is the center of the cardiovascular system.

The Heart and Blood Vessels

The heart is a fist-sized pump made of muscle that circulates the blood throughout the body. It “beats,” or pumps, about 100,000 times a day (AHA, 1994). The muscular portion of the heart wall is called the **myocardium**. The interior of the heart has four chambers, as the drawing on your TV screen illustrates. The two upper chambers are called atriums, and the two lower ones are called ventricles; the left and right sides are labeled from the body’s perspective, not from ours. Looking at the drawing, we see several blood vessels that connect to the heart. How are arteries and veins different? Arteries carry blood from the heart, and veins carry blood to it. You will also notice in the drawing that the shading of some blood vessels is light, and in others the shading is dark. The vessels with light shading carry blood that is laden with CO₂ toward the lungs; the dark vessels carry blood away from the lungs after it has expelled CO₂ and received oxygen.

Now, let’s follow the route of blood through the body. The blood that enters the right atrium of the heart is laden with waste products, such as CO₂, from our cells and is deficient in oxygen, which makes the blood bluish in color. After the atrium is filled, the blood passes through a valve to the right ventricle. The ventricles provide the main pumping force for circulation as the heart muscle contracts, and their valves prevent the blood from going back up to the atriums. From the right ventricle, the blood enters pulmonary circulation to the lungs, where it becomes oxygenated and, consequently, red in color. The oxygenated blood travels to the left atrium of the heart and is passed to the left ventricle, which pumps it out through the aorta into systemic circulation. It then goes to various parts of the body before returning to the heart and beginning the cycle again. The complete cycle takes about 1 minute in the resting person.

Portions of each quantity of blood pumped by the heart travel through the liver and kidneys, where important functions take place. The kidneys receive blood from the general circulatory system, cleanse it of waste products, and pass these wastes on to be eliminated in the urine. The liver receives blood from two sources: most of the blood comes from the intestinal tract, and the remainder comes from systemic circulation. What does the liver do to the blood? First, it cleanses the blood of harmful debris, such as bacteria. In fact, it is “so effective in removing bacteria that probably not one in a thousand escapes through the liver into the general circulation” (Guyton, 1985, p. 467).

Second, the liver removes nutrients and stores them. The blood that comes from the intestinal tract after we consume a meal is rich in nutrients, such as simple sugars and amino acids. Large portions of these nutrients are retained in the liver until the body needs them. In this way, the ebbs and flows of nutrients in the blood are kept relatively even over time.

Blood Pressure

Imagine you are holding a long balloon that is filled with air. Its end is tied off. If you squeeze it in the middle, the rest of it expands. This is what happens when pressure is applied to a closed system. The cardiovascular system is also closed, and the myocardium does the squeezing when it pumps blood from the heart. Like the balloon, the cardiovascular system always has some pressure in it. The squeezing increases the pressure.

Our arteries are elastic—they expand when pressure is applied. Blood pressure is the force exerted by blood on the artery walls. The heart is at rest between myocardial contractions, while it fills with blood. The resting force in the arteries that occurs at this time is called diastolic pressure. When the heart pumps, each contraction produces a maximum force in the arteries, which is called systolic pressure. A person’s blood pressure is expressed with two numbers: a larger number, representing systolic pressure, followed by a smaller number, representing diastolic pressure. Your physician might tell you that your blood pressure is “120 over 80,” for example.

Blood pressure varies. It changes from one moment to the next, it is higher in one part of the body than in another, and different people have different blood pressures. What determines blood pressure? We can answer this question in two ways—one involves the laws of fluid dynamics and the other involves factors in people’s lives that affect these dynamics. We will start with the first approach and examine five aspects of fluid dynamics that affect blood pressure.

1. Cardiac output is the volume of fluid being pumped per minute. Blood pressure increases as cardiac output rises.
2. Blood volume refers to the total amount of blood circulating in the system. The greater the volume, the higher the blood pressure needed to move it.
3. Peripheral resistance refers to the difficulty fluid encounters in passing through narrow tubes or openings. When you put a nozzle on a hose and turn on the water, the pressure is greater at the nozzle than in the hose. Arteries vary in diameter. Arterioles are small arteries that connect larger arteries to capillaries. Peripheral resistance is generally greater in arterioles than in larger arteries. Normally arterioles are highly elastic and can expand or contract readily in response to messages from the nervous and endocrine systems. After we eat a meal, extra blood is needed around the small intestine for the absorption of nutrients. Messages to the arterioles in that region cause them to expand and accept more blood.
4. Elasticity, as we have seen, describes the ease in expanding and contracting. When blood vessels become less elastic, blood pressure—especially systolic pressure—rises.
5. Viscosity refers to the thickness of the fluid. The viscosity of blood depends on its composition, such as whether it contains high levels of red blood cells. Thicker blood flows less easily than thinner blood—and requires more blood pressure for it to circulate through the cardiovascular system.

What factors in people's lives affect these dynamics? In our everyday lives we experience a variety of states that affect blood pressure. The temperature of our environment defines one of these states. When the temperature is high, the blood vessels in our skin enlarge and our cardiac output and diastolic pressure fall, which makes us feel drowsy. Low temperatures have the opposite effect. Another factor is activity. For example, exercise increases blood pressure during and after the activity. Simply changing posture can also affect blood pressure. When we go from a lying position to standing, blood flow in the veins that feed the heart, slows down because of gravity. This causes a drop in cardiac output and blood pressure. As a result, blood flow to the brain drops, sometimes making us feel dizzy. A third factor is emotional experience. When we experience stress, anger, or anxiety, the sympathetic nervous system is activated. This causes a variety of cardiovascular reactions, such as increased cardiac output. Both systolic and diastolic pressures increase when people are emotionally aroused.

High blood pressure strains the heart and arteries. Some people have high blood pressure consistently over a period of several weeks or more. This condition is called hypertension. How high is "high" blood pressure? People whose pressure is at or above 140 (systolic) over 90 (diastolic) are classified as hypertensive (AHA, 2000). When systolic pressure reaches 200, the danger is high that a rupture may occur in a blood vessel, particularly in the brain. This is one way by which strokes occur. High diastolic pressure is troubling because the arteries are constantly being strained, even between heartbeats, when they should encounter little pressure.

As adults get older, they tend to get heavier, at least in industrialized countries. In a number of primitive societies where adults do not show an increase in body weight as they get older, blood pressure does not seem to increase with age.

LECTURE 11**BLOOD COMPOSITION**

Blood is sometimes thought of as a “liquid tissue” because it consists of cells that are suspended in a liquid. The average adult’s body contains about 5 liters of blood. Because our bodies can replace blood quickly, we can donate half a liter of blood with no ill effects.

Blood composition can affect blood pressure. As we saw earlier, the thicker the blood, the more pressure is needed to circulate it. What is blood made of, and how does its composition change its thickness? Blood has two components, formed elements and plasma. We will look at formed elements first.

Formed Elements

Formed elements are the cells and cell-like structures in the blood that constitute about 45% of our blood volume. There are three types of formed elements:

1. Red blood cells are the most abundant cells in the blood—there are about 5 million of them per cubic millimeter of blood. They are formed in the bone marrow and have a lifetime of about 3 months. Red blood cells are important mainly because they contain Hemoglobin, a protein substance that attaches to oxygen and transports this element to body cells and tissues. Anemia is a condition in which the level of red blood cells or hemoglobin is below normal (AMA, 1989).

2. Leukocytes are white blood cells. Each of several types of leukocytes serves a special protective function—for example, some engulf or destroy bacteria. White blood cells are produced in the bone marrow and various organs in the body. Although there normally are several thousand leukocytes per cubic millimeter of an adult’s blood, they are the least abundant type of formed element. Leukemia is a malignant disease in which abnormal white blood cells are produced in extremely high quantities, crowding out normal leukocytes, which fight infection, and red blood cells, which prevent anemia.

3. Platelets are granular fragments, produced by the bone marrow, that enable the body to prevent blood loss. They do this by plugging tiny wounds or helping the blood to clot when the wound is larger. Hemophilia is a disease in which the platelets do not function properly, thereby impairing clotting, because the blood lacks a critical protein.

How do formed elements affect the viscosity of blood? The higher the concentration of formed elements suspended in the plasma, the thicker the blood.

Plasma

Plasma is a liquid substance that comprises about 55% of our blood. About 90% of plasma is water, and the remainder consists of plasma protein and various other organic and inorganic elements. Plasma protein consists of large molecules that are needed within the blood to help other substances pass through capillary walls. Plasma protein increases the thickness of the blood.

Although the remaining elements in plasma constitute only a small percentage of its volume, they are extremely important substances. They include hormones, enzymes, and waste products. They also include the nutrients we derive from digestion— vitamins, minerals, simple sugars, amino acids, and fatty materials.

Fatty materials make up the broad class of substances in the blood called lipids. Two of these fatty materials are triglycerides and cholesterol. Triglycerides are the material we commonly think of as fat. Made of glycerol and fatty acids, they are the most abundant lipid in the body. Some of the fatty acids in triglycerides are fully hydrogenated—they cannot take up any more hydrogen—and are called saturated for that reason. They are usually solid at room temperature and are mostly derived from animal fat. Other fatty acids are unsaturated or polyunsaturated. They can take up more hydrogen, are usually liquid at room temperature, and are derived from plants.

Cholesterol is a fatty substance that builds up in patches on artery walls over time and narrows the artery. Although the body manufactures most of the cholesterol in the blood, the rest comes from the foods we eat. Eating fats that are highly saturated tends to increase blood cholesterol levels. Let's see why it is a problem.

CARDIOVASCULAR DISORDERS

The accumulation of fatty patches, or plaques, on artery walls is called atherosclerosis. These plaques tend to harden. This is a common process by which the diameter and elasticity of arteries is reduced—a condition called **arteriosclerosis**. The narrowing and hardening of arteries increase blood pressure. Although arteriosclerosis becomes an increasing problem as adults get older, plaque begins to form early in life. Autopsies on thousands of 15- to 34-year-old American males and females who died of other causes showed that arteriosclerosis had begun in all subjects and worsened with age.

Of the many diseases of the heart and blood vessels, we will describe just a few. One of them is **myocardial infarction**, or “heart attack.” Infarction refers to the death of tissue caused by an obstruction in the supply of blood to it. Thus, a myocardial infarction is the death of heart muscle (myocardium) tissue as a result of arterial blockage, usually resulting from atherosclerosis.

Other diseases of the heart include **congestive heart failure**, **aneurysm**, and **stroke**. We will discuss them in detail in our later lectures when we will talk about the biopsychosocial implications of the Cardiovascular disorders.

THE IMMUNE SYSTEM

I can remember reading for the first time many years ago about a child who had to live in a large plastic “bubble” because he was born with virtually no major immune defenses. The condition he had is very rare and is called **severe combined immunodeficiency disease**. He lived in the bubble because it was germ free—exposure to microorganisms in the general environment would have been fatal. Transplants of healthy bone marrow tissue early in the child's life can cure this disorder. More common inborn immune deficiencies involve the absence of only part of the system and can sometimes be treated with injections.

What is the immune system anyway? Let's take a detailed look.

The Immune System

You may not realize it, but wars are raging inside your body. They happen continuously, every day. Most of the time they are minor skirmishes, and you are unaware of them. When they become major battles, however, you are usually aware something's going on. The “good guys” are the organs and cells that make up your immune system. This system fights to defend the body against foreign” invaders, such as bacteria and viruses.

The immune system is quite remarkable. Scientists knew little about this intricate and enormously important system until the 1970s. But it is now the subject of major research efforts, and new information about how the immune system functions is emerging rapidly. We know, for instance, that this system is highly sensitive to invasions by foreign matter and is able to distinguish between “self,” or normal body constituents, and “not self—friend and foe.

Antigens

When the body recognizes something as a “not self” invader, the immune system mobilizes body resources and attacks. Any substance that can trigger an immune response is called an antigen. Bacteria and viruses are recognized as invaders by tell-tale aspects of their protein coats and DNA.

What triggers an immune response? Some of the first antigens that come to mind are bacteria, fungi, protozoa, and viruses. Bacteria are microorganisms that exist in vast numbers throughout the environment—in rivers and oceans, in the air, on and in plants and animals, and in decaying organic matter. Billions of them may populate just one pound of rotting garbage. Because they help in breaking down organic matter into simpler units, their activities are essential to the life and growth of all living things. Some bacteria cause illnesses, such as tuberculosis, scarlet fever, and food poisoning. They do this by growing rapidly and competing with our cells for nutrients and by excreting toxic, or poisonous, substances that destroy our cells or impair their metabolic processes.

Although treatment with antibiotics kills bacteria, these drugs are becoming less effective because they have been overused and bacteria are developing drug-resistant strains.

Fungi are organisms, such as molds and yeasts, which attach to an organic host and absorb nutrients from the host. Some of them can cause skin diseases through direct contact, as occurs in ringworm and athlete's foot, and internal diseases through inhalation of contaminated air. Other fungi are very beneficial—for example, penicillin is derived from molds (AMA, 1989). Protozoa are one-celled organisms, such as amoebas, that live primarily in water and insects. Drinking water contaminated with protozoa can cause amoebic dysentery, an intestinal illness, and being bitten by an infected mosquito can cause malaria.

The tiniest antigens are viruses, particles of protein and nucleic acid that are smaller than cells and, strictly speaking, may not even be alive. They consist of genetic information that allows them to reproduce. A virus functions by attaching to a cell, slipping inside, and taking over by issuing its own genetic instructions. The invaded cell abandons its own metabolic activities and becomes a “factory” for making viruses. In short order, enough viruses can be produced to rupture the cell and spread to infect other cells. Viruses can be quite devious, too, developing new strains and lying dormant in the body for periods of time before becoming infectious. They are responsible for a variety of diseases, including flu, herpes, measles, and polio.

The immune system also tends to recognize the tissue of an organ transplant as “not self” and treat it as an antigen. This is what physicians mean when they say that the body “rejected” a transplant. There are two basic ways to encourage transplant acceptance. The first is to select the transplant carefully so that the tissues of the donor and the recipient are closely matched. The closer the genetic relationship between the two people, the better the match is likely to be. Identical twins provide the best match, of course. The second approach uses drugs to suppress the immune system so it won't mobilize and reject the organ. A drawback to this approach is that long-term suppression of immune function leaves the patient susceptible to disease.

For many people, the immune system mounts an attack against normally harmless substances, such as pollen, tree molds, poison ivy, animal dander, and particular foods. These people suffer from allergies; the specific substances that trigger their allergic reactions, such as sneezing and skin rashes, are called allergens. Most allergic people react to some, but not all, of the known allergens—someone with hay fever may not be allergic to poison ivy, for instance. Being allergic is partly determined by heredity. Some allergies can be reduced by administering regular, small doses of the allergen, usually by injection.

The Organs of the Immune System

The organs of the immune system are located throughout the body. These organs are generally referred to as lymphatic or lymphoid organs because they have a primary role in the development and deployment of lymphocytes, specific white blood cells that are the key functionaries or “soldiers” in our body's defense against invasion by foreign matter. The main lymphatic organs include the bone marrow, thymus, lymph nodes and vessels, and spleen.

Lymphocytes originate in bone marrow, the soft tissue in the core of all bones in the body. Some of these cells migrate to one of two organs where they mature. One of these organs is the thymus, which, as we saw earlier, is a gland that lies in the chest. The other organ is not known for certain, but it is thought to have the same function in maturing human lymphocytes that a structure called the “bursa” has in birds. Most of this processing of lymphocytes occurs before birth and in infancy.

The lymph nodes are bean-shaped masses of spongy tissue that are distributed throughout the body. Large clusters of them are found in the neck, armpits, abdomen, and groin. What do they do? Each lymph node contains filters that capture antigens and compartments that provide a home base for lymphocytes and other white blood cells.

Although the lymph nodes and vessels play an important role in cleansing body cells of antigens, they can become a liability in some forms of cancer either by becoming infected with cancer or by distributing cancer cells to other parts of the body through the lymph and blood.

Lymphocytes and antigens that enter the blood are carried to the spleen, an organ in the upper left side of the person’s abdomen.

LECTURE 12

SOLDIERS OF THE IMMUNE SYSTEM

White blood cells play a key role in the immune system—they serve as soldiers in our counterattack against invading substances in the body. There are two types of white blood cells. Lymphocytes, as we have seen, are one type; phagocytes are the other.

Phagocytes are scavengers that patrol the body and engulf and ingest antigens. They are not choosy. They will eat anything suspicious that they find in the blood stream, tissues, or lymphatic system. In the lungs, for instance, they consume particles of dust and other pollutants that enter with each breath. They can cleanse lungs that have been blackened with the contaminants of cigarette smoke, provided the smoking stops. Too much cigarette smoking, over too long a time, destroys phagocytes faster than they can be replenished.

There are two types of phagocytes: **Macrophages** become attached to tissues and remain there, and **Monocytes** circulate in the blood. The fact that phagocytes “are not choosy” means that they are involved in nonspecific immunity—they respond to any kind of antigen.

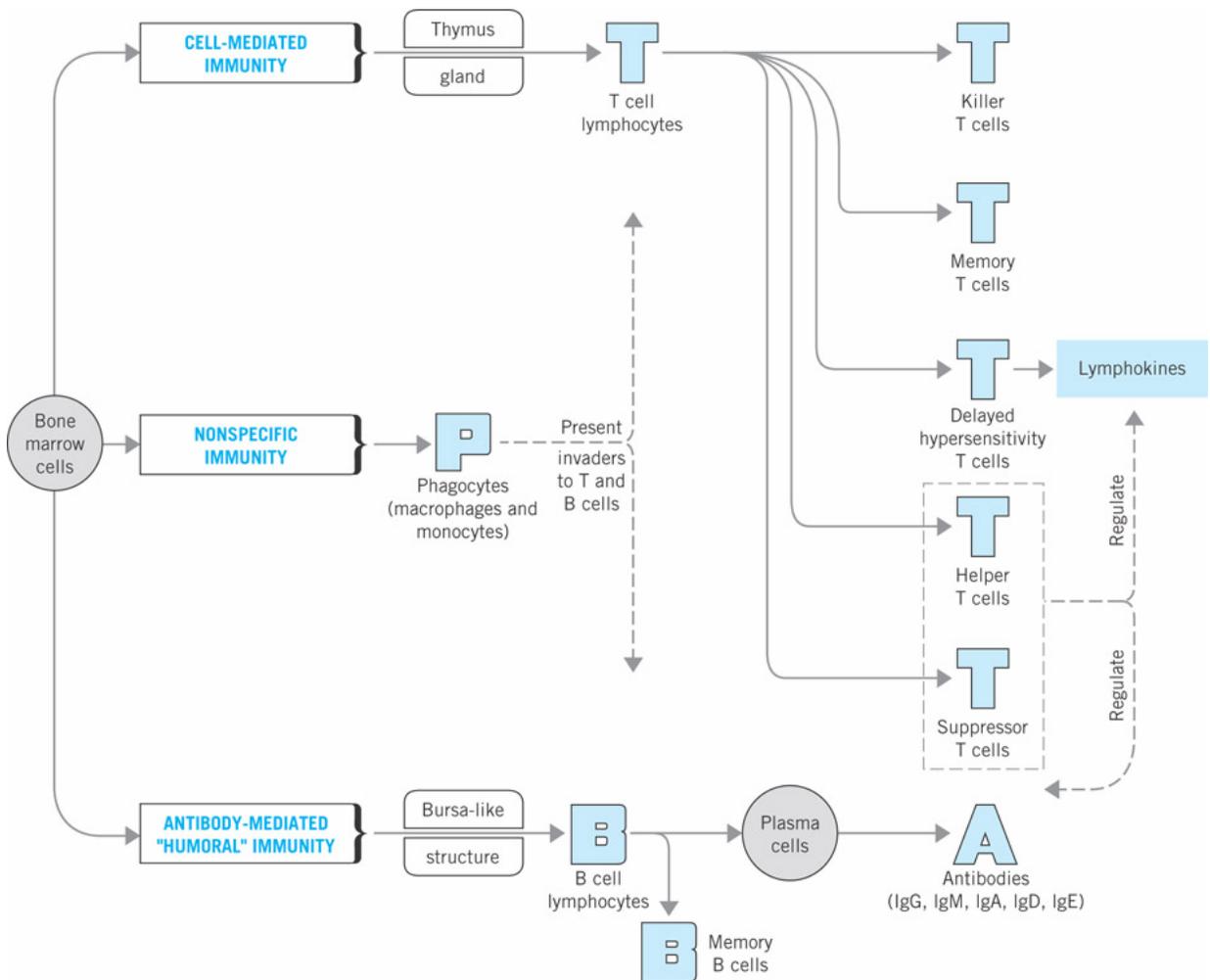


diagram shows that, in addition to the process of nonspecific immunity, there are two types of specific immune processes: cell-mediated immunity and antibody-mediated “humoral” immunity. Let’s examine these two specific immune processes and how they interrelate.

Cell-mediated immunity operates at the level of the cell. The soldiers in this process are lymphocytes called T cell—the name of these white blood cells reflects their having matured in the thymus. T cells are divided into several groups, each with its own important function:

- Killer T cells (also called CD8 cells) directly attack and destroy three main targets: transplanted tissue that is recognized as foreign, cancerous cells, and cells of the body that have already been invaded by antigens, such as viruses.
- Memory T cells “remember” previous invaders. At the time of an initial infection, such as with mumps, some T cells are imprinted with information for recognizing that specific kind of invader—the virus that causes mumps—in the future. Memory T cells and their offspring circulate in the blood or lymph for long periods of time—sometimes for decades—and enable the body to defend against subsequent invasions more quickly.
- Delayed-hypersensitivity T cells have two functions. They are involved in delayed immune reactions, particularly in allergies such as of poison ivy, in which tissue becomes inflamed. They also produce protein substances called lymphokines that stimulate other T cells to grow, reproduce, and attack an invader.
- Helper T cells (also called CD4 cells) receive reports of invasions from other white blood cells that patrol the body, rush to the spleen and lymph nodes, and stimulate lymphocytes to reproduce and attack. The lymphocytes they stimulate are from both the cell-mediated and the antibody-mediated immunity (also called “humoral” immunity) processes.
- Suppressor T cells operate in slowing down or stopping cell-mediated and antibody-mediated immunity processes as an infection diminishes or is conquered. Suppressor and helper T cells serve to regulate cell-mediated and antibody-mediated immune processes.

What is antibody-mediated immunity, and how is it different from the cell-mediated process? Antibody-mediated immunity attacks bacteria, fungi, protozoa, and viruses while they are still in body fluids and before they have invaded body cells. Unlike the cell-mediated process of attacking infected cells of the body, the antibody-mediated approach focuses on the antigens directly. The soldiers in this approach are lymphocytes called B cells. The diagram shows that B cells give rise to plasma cells that produce antibodies. This process is often induced by helper T cells or inhibited by suppressor T cells.

How are antibodies involved? Antibodies are protein molecules called immunoglobulins (“Ig”) that attach to the surface of invaders and accomplish three results. First, they slow down the invader, making it an easier and more attractive target for phagocytes to destroy. Second, they recruit other protein substances that puncture the membrane of an invading microorganism, causing it to burst. Third, they find new invaders and form memory B cells that operate in the future like memory T cells. As you can see, antibodies are like sophisticated weapons in immune system wars. Researchers have identified five classes of antibodies—IgG, IgM, IgA, IgD, and IgE—each with its own special function and “territory” in the body. For example, IgA guards the entrances of the body in fluids, such as saliva, tears, and secretions of the respiratory tract.

DEFENDING THE BODY WITH AN IMMUNE RESPONSE

Now that we have seen the soldiers and weaponry of the immune system, let’s see how all of this is orchestrated in defending your body. Protection from disease actually involves a series of defenses. We will start at the beginning, as the invader tries to enter the body.

Your body's first line of defense is the skin and the mucous membranes that line the respiratory and digestive tracts. The skin serves as a barrier to entry, and mucous membranes are coated with fluids that contain antibodies and other antimicrobial substances. Even though these defenses are highly effective, large numbers of antigens get through, either by eluding the antibodies or by entering a wound in the skin or the mucous membrane.

Once an antigen penetrates this barrier, it encounters the second line of defense, which includes nonspecific and specific immune processes. Phagocytes in your blood and tissues attack and consume invading substances of all types.

They also have another important function: They present the antigen to B cells and helper T cells, as if to say, "Here's the enemy, Go get 'em!" The B cells respond to this message and to stimulation from helper T cells by giving rise to plasma cells that produce the needed antibodies. The role of the phagocytes is especially important if the antigen is new and the body has no memory B cells for this substance. Antibodies in body fluids attach to microorganisms, thereby aiding the phagocytes and other protein substances that can kill the invaders.

Antigens that manage to get through and invade body cells encounter the third line of defense in which killer T cells destroy the invaded cells. Phagocytes often initiate this process by presenting antigens to T cells, as we have seen. Once again, this is especially important if the antigen is new to the cell-mediated system and the body has no memory T cells for the substance. As the invasion subsides, suppressor T cells slow down the cell-mediated and antibody-mediated immune responses. Memory B and T cells are left in the blood and lymph, ready to initiate the immune response if the same antigen invades the body again.

Less-Than-Optimal Defenses

If our immune systems always functioned optimally, we would become sick much less often. Why and in what ways do our defenses function less than optimally?

The effectiveness of the immune system changes over the life span, becoming increasingly effective throughout childhood and declining in old age. Newborns come into the world with relatively little immune defense. They have only one type of antibody (IgG), for example, which they receive prior to birth from their mothers through the placenta (the filter-like organ that permits the exchange of nutrients and certain other substances between the bloodstreams of the mother and baby). Infants who are nursed receive antibodies, particularly IgA, in their mothers' milk.

In early infancy, children in technological societies generally begin a regular schedule of immunization through the use of vaccines. Most vaccines contain dead or disabled disease microorganisms that get the body to initiate an immune response and produce memory lymphocytes but do not produce the full-blown disease. The efficiency and complexity of the immune system develop very rapidly in childhood. As a result, the incidence of illness serious enough to keep children home from school declines with age.

Throughout adolescence and much of adulthood, the immune system generally functions at a high level. Then, as people approach old age, the effectiveness of the system tends to decline. Although the overall numbers of T cells, B cells, and antibodies circulating in the blood do not decrease their potency diminishes in old age. Compared with the T cells and B cells of younger adults, those of elderly people respond weakly to antigens and are less likely to generate the needed supply of lymphocytes and antibodies to fight an invasion.

Unhealthy lifestyles, such as smoking cigarettes and being sedentary, have been associated with impaired immune function. Poor nutrition can also lead to less- than-optimal immune function. Diets deficient in vitamins seem to diminish the production of lymphocytes and antibodies, for example.

When your immune system functions optimally, it attacks foreign matter and protects the body. Sometimes this process goes awry, and the immune response is directed at parts of the body it was designed to protect.

Several disorders result from this condition—they are called autoimmune diseases. One of these diseases is rheumatoid arthritis, in which the immune response is directed against tissues and bones at the joints. This causes swelling and pain and can leave the bones pitted. In rheumatic fever, the muscles of the heart are the target. This disease can damage the heart valves permanently. Multiple sclerosis, a disease we considered earlier, results when the immune system attacks the myelin sheath of neurons.

Many people believe stress and illness often are related—and they are right. Research has confirmed this belief, showing, for instance, that the incidence of respiratory illnesses increases when people experience high levels of stress. Why is this so? One likely answer is that stress suppresses immune functions in some way, leaving the person open to infection. The phenomenon of stress is very important in the understanding of health and wellness. We have devoted many upcoming lectures to cover this area.

GENETIC PROCESSES IN DEVELOPMENT AND HEALTH

Genetic Materials and Transmission

What did this search yield? By the early 20th century, researchers discovered threadlike structures called chromosomes and proposed that these structures contained units called genes. Soon they determined the basic substance common to all genetic material— deoxyribonucleic acid, or DNA for short—and described its structure. Today we know that DNA determines our growth patterns and physical structures, We also know that genes are discrete particles of DNA and that strings of genes are organized into chromosomes.

The Impact of Genetics on Development and Health

Researchers have determined that every human cell contains 30,000—40,000 genes and have identified and mapped almost all of the human system of genes. Genes control a vast number of traits, including more than 3,000 diseases. For some diseases, researchers have even pinpointed the exact gene locations.

A biopsychosocial perspective in our examination of heredity is important. One way is to study the patients of different diseases and find out if they have some clues in their lifestyles or behaviors. For example, disease and genetic mutation can result from engaging in certain behaviors, such as smoking cigarettes and eating diets that are high in fats and low in fiber.

Having this knowledge, we can also identify other similar behaviors that can lead to diseases, and find ways to eliminate or modify them.

The biopsychosocial perspective of heredity is important in another way. Many researchers believe that we often inherit a predisposition or susceptibility—rather than a certainty—for developing a disease. This might account in part for the observation that not everyone who is exposed to harmful substances and microorganisms in their environments become sick. People who inherit a high degree of susceptibility to a form of cancer and have relatively little exposure to relevant antigens may be just as likely to develop the illness as someone who has little genetic susceptibility but high antigen exposure. If physicians could determine whether a patient has a genetic predisposition to a specific disease, they could provide the person with instructions for taking early preventive action.

LECTURE 13**THE PHENOMENON OF STRESS****Prologue**

Tell me what's been happening in your life in the past several months. Sonia, the college counselor probed in the student's first visit to his office. A nurse suggested that Sonia talk to a counselor because she has been physically run down for the past few months, has been sleeping poorly, and has had several viral infections. During this visit, she described many problems she has experienced. For one thing, this is her first year in college and, although she goes home most weekends, she has never been away from her family, high school friends, and fiancé Chris so long before— and she misses them.

Her relationship with Chris is a special problem. He decided to go to a college closer to home so that he could commute. They've been going together for 2 years, and he says he loves her, but Sonia isn't convinced. She feels a lot of jealousy, often imagining that he is seeing others on the side even though she has no evidence that he is. She calls him several times a week, saying she wants to hear his voice, but they both know deep down that she's calling to check up on him. They argue about her suspicions at least once a week. She says he's seeing others because, "He's so good looking and I'm so fat." Keeping her weight down is a constant struggle that, in her view, she always loses. Actually, her weight is within the recommended healthful range for her height.

Sonia has also had other difficulties. She worries that she's preparing for the wrong career, argues often with other students about the noise on her dormitory floor, and is overcommitted with schoolwork, club activities on campus, and a part-time 'ob. On top of all this, her car keeps breaking down, she's running out of money to fix it, and her illnesses are compounding her problems.

Sonia's situation is not uncommon. We all experience stress in our everyday lives, probably more than we would like. It occurs in a wide variety of situations and settings—in the family, in school, and on the job, for example. Sometimes the stress experience is brief, and sometimes it continues for a long time. Sometimes it is intense, and sometimes it is mild. It varies across time in a particular person, and it varies between individuals. An experience that is stressful for one person—such as taking a difficult examination—may not be stressful for another, and may even be exciting or challenging for still another person.

In this and coming lectures, we will discuss what stress is, where it comes from, and the impact it has. As we do, you will find answers to questions you may have about Stress. What makes an event stressful? Why does a particular event produce more stress in one person than in another? How does stress affect our bodies and our behavior? Does the experience of stress change across the life span?

Experiencing Stress in our Lives

When you hear people say they are "under a lot of stress, you have some idea of what they mean. Usually the statement means they feel unable to deal with the demands of their environment, and they feel tense and uncomfortable. You understand the meaning because you have had similar experiences, which you labeled stress: Because of the pervasiveness and commonality of these experiences in our lives, you might expect that defining the concept of stress would be simple. But it isn't. Let's see how psychologists have conceptualized stress and what the prevailing definition is today.

What is Stress?

The condition of stress has two components: physical, involving direct material or bodily challenge, and psychological, involving how individuals perceive circumstances in their lives. These components can be examined in three ways. One approach focuses on the environment, describing stress as a stimulus. We see this in people's reference to the source or cause of their tension as being an event or set of circumstances—such as having "a high-stress job." Physically or psychologically challenging events or circumstances are called stressors. Researchers who follow this approach study the impact of a wide range of stressors, including (1) catastrophic events, such as tornadoes and earthquakes. (2) major life events, such as the loss of a loved one or a job, and (3) chronic circumstances, such as living with severe pain from arthritis.

The second approach treats stress as a response, focusing on people's reaction to stressors. We see an example of this approach when people use the word stress to refer to their state of tension, and when someone says, "I feel a lot of stress when I have to give a speech." Our responses can take two interrelated forms. Psychological responses involve behavior, thought patterns, and emotions, as when you feel nervous. Physiological responses involve heightened bodily arousal—your heart pounds, your mouth goes dry, your stomach feels tight, and you perspire. The person's psychological and physiological response to a stressor is called strain.

The third approach describes stress as a process that includes stressors and strains, but adds an important dimension: the relationship between the person and the environment. This process involves continuous interactions and adjustments—called transactions—with the person and environment each affecting and being affected by the other. According to this view, stress is not just a stimulus or a response, but rather a process in which the person is an active agent who can influence the impact of a stressor through behavioral, cognitive, and emotional strategies. People differ in the amount of strain they experience from the same stressor, such as being stuck in traffic or losing a job. One person who is stuck in traffic and late for an important appointment keeps looking at his watch, honking his horn, and getting angrier by the minute; another person in the same circumstances stays calm, turns on the radio, and listens to music.

We will define stress as "the condition in which person—environment transactions lead to a perceived discrepancy between the physical or psychological demands of a situation and the resources of the individual's biological, psychological, or social systems" (Lazarus et al. 1986). Let's look at the four components of this definition, starting at the end.

1 - Stress taxes the person's biopsychosocial resources for coping with difficult events or circumstances. These resources are limited, as we saw when Sonia had depleted her ability to cope with her problems, became ill, and sought counseling. Sometimes the impact is focused mainly on our biological system—for instance, when we tax our physical strength to lift something heavy. More typically, however, the strain has an impact on all three systems; in Sonia's stressful experience, her physical, psychological, and social resources were strained and became exhausted. Other stressful encounters that strain our biopsychosocial resources include participating in a competitive athletic event, being injured in an accident, or becoming nauseated before performing in a play.

2. The phrase "demands of a situation" refers to the amount of our resources the stressor appears to require. For instance, Sonia thought achieving the body weight she would need to keep Chris required tremendous willpower.

3. When there is a poor fit, or a mismatch, between the demands of the situation and the resources of the person, a discrepancy exists. This generally takes the form of the demands taxing or exceeding the resources, as in Sonia's belief that she did not have the willpower to keep her weight down. But the opposite discrepancy also occurs—that is, our resources may be underutilized—and this can be stressful, too. A worker who is bored by a lack of challenge in a job may find this situation stressful. An important point to keep in mind is that the discrepancy may be either real or just believed to exist. Suppose you had to take an exam and wanted to do well, but worried greatly that you would not. If you had procrastinated and did not prepare for the test, the discrepancy you see between the demands and your resources might be real. But if you had previously done well on similar exams, prepared thoroughly for this one, and scored well on a pretest in a study guide yet still thought you would not do well, the discrepancy you see would not reflect the true state of affairs. Stress often results from inaccurate perceptions of discrepancies between environmental demands and the actual resources. Stress is in the eye of the beholder.

4. In our transactions with the environment, we assess demands, resources, and discrepancies between them—as Sonia might do if she notices Chris looking at an attractive woman. These transactions are affected by many factors, including our prior experiences and aspects of the current situation. Suppose you are on a track team and are running in a race. Relevant transactions for this race actually began long before the race started, such as during your previous wins and losses, your recent training and fitness, and your knowledge of and experience with your competitors. In the race, these prior transactions have an impact on

the continuous transactions that occur you assess your strength and energy reserves, the position you are in relative to the other runners, and the likelihood that another runner will show a surge of speed toward the end of the race.

Appraising Events as Stressful

Transactions in stress generally involve an assessment process that Richard Lazarus and his coworkers call cognitive appraisal. Cognitive appraisal is a mental process by which people assess two factors: (1) whether a demand threatens their physical or psychological well-being and (2) the resources available for meeting the demand. These two factors distinguish two types of appraisal—primary and secondary.

Primary Appraisal

When we encounter a potentially stressful event—for example, feeling symptoms of pain or nausea—we first try to assess the meaning of the situation for our well-being. This assessment process is called primary appraisal. In effect this appraisal seeks answers to such questions as, “What does this mean to me?” and “Will I be okay or in trouble?” Your primary appraisal regarding the pain or nausea could yield one of three judgments:

1. It is irrelevant—as you might decide if you had had similar symptoms before that lasted only a short while and were not followed by illness.
2. It is good (called “benign-positive”)—which might be your appraisal if you wanted very much to skip work or have a college exam postponed.
3. It is stressful—as you might judge if you feared the symptoms were of a serious illness, such as botulism (a life-threatening type of food poisoning).

Events that we appraise as stressful receive further appraisal for three implications: harm-loss, threat, and challenge.

Harm-loss refers to the amount of damage that has already occurred, as when someone is incapacitated and in pain following a serious injury. Sometimes people who experience a relatively minor stressor think of it as a “disaster”, thereby exaggerating its personal impact and increasing their feelings of stress (Ellis, 1987). Threat involves the expectation of future harm—for example, when hospitalized patients contemplate their medical bills, difficult rehabilitation, and loss of income. Stress appraisals seem to depend heavily on harm-loss and threat. Challenge is the opportunity to achieve growth, mastery, or profit by using more than routine resources to meet a demand. For instance, a worker might view an offer of a higher-level job as stressful, but see it as an opportunity to expand her skills, demonstrate her ability, and make more money.

Sometimes we experience stress even when the stressor does not relate to us directly—that is, the transaction is vicarious. If we see other people in stressful circumstances, such as suffering from pain or a life-threatening illness, we may empathize with their feelings and feel vulnerable ourselves. A classic experiment demonstrated empathic appraisal by showing college-student subjects a film called “Subincision. (Speisman, Lazarus, Mordkoff, & Davison, 1964).

The film contained stressful scenes of people of a primitive tribe having surgery. Before seeing the film, the subjects were divided into four groups, so that each group would see the film a different way. One of the groups saw the film with no sound track. Another group heard a sound track with a “trauma” narrative that emphasized the pain, danger, and stressfulness of the surgery. A third group heard a denial narration that denied the pain and potential harm depicted in the film, describing them as willing participants in a joyful occasion who “look forward to the happy conclusion of the ceremony.” The fourth group heard a “scientific” narration that encouraged the viewers to watch in a detached manner—for example, the narrator commented, as you can see, the operation is formal and the surgical technique, while crude, is very carefully followed.”

Did the different sound tracks affect the subjects’ appraisals of stress? To evaluate this, the researchers used both physiological and self-report measures of stress. The physiological measures, such as heart rate, were

taken continuously during the viewing of the film. The self-report measures were questionnaires that evaluated feelings of stress immediately after the film presentation.

The results showed that, compared with the subjects who saw the film with no sound track, those who heard the trauma narration reacted with more stress, particularly during the film; those who heard the denial and scientific narration reacted with less stress. These results show that people can experience stress vicariously and that their reactions depend on the process of primary appraisal.

Secondary Appraisal

Secondary Appraisal refers to our ongoing assessment of the resources we have available for coping. Although we generally engage in an assessment of our resources after we appraise an event as stressful, secondary appraisal does not necessarily follow primary appraisal in time. Nevertheless, we are probably more aware of secondary appraisal when we judge a situation as potentially stressful and try to determine whether our resources are sufficient to meet the harm, threat, or challenge we face. Examples of secondary appraisal judgments include;

- I can't do it—I know I'll fail.
- I'll try, but my chances are slim.
- I can do it if Ginny will help.
- If this method fails, I can try a few others.
- I can do it if I work hard.
- No problem—I can do it.

The condition of stress that we experience often depends on the outcome of the appraisals we make in our transactions with the environment. When we judge the fit between demands and resources to be close, we may experience little or no stress; but when our appraisals indicate a discrepancy, particularly if we appraise greater demands than resources, we may feel a great deal of stress.

Can stress occur without cognitive appraisals? According to some researchers, it can, particularly in emergency situations. Suppose you are in your car, stopped at a red light. In a split second you hear the squealing of brakes; your body tenses as you say, “Oh my God”; and a car smashes yours in the rear. Your saying, “Oh my God!” is not really a cognitive appraisal—it's a reflexive response. But a stress reaction has already begun, as the tensing of your body indicates, and this is “followed by ‘feelings’ and appraisals”.

Often in serious emergencies the stress reaction includes a state of shock in which the person is stunned, dazed, or disoriented. This state may last for minutes or hours, or much longer. Because cognitive functioning is impaired during shock, it is unlikely that appraisal processes play an important role in the stress experienced while in that state. In non-emergency situations, cognitive appraisals appear to precede stress reactions.

LECTURE 14**FACTORS THAT LEAD TO STRESSFUL APPRAISALS**

Appraising events as stressful depends on two types of factors—those that relate to the person and those that relate to the situation. Let's begin by looking at how personal factors can affect appraisals of stress.

Personal factors include intellectual, motivational, and personality characteristics. One example is self-esteem: people who have high self-esteem are likely to believe they have the resources to meet demands that require the strengths they possess. If they perceive an event as stressful, they may interpret it as a challenge rather than a threat.

Another example relates to motivation: the more important a threatened goal, the more stress the person is likely to perceive. One other example involves the person's belief system: as the psychologist Albert Ellis has noted, many people have irrational beliefs that increase their stress, for instance: "Because I strongly desire to have a safe, comfortable, and satisfying life, the conditions under which I live absolutely must be easy, convenient and gratifying (and it is awful and I can't bear it and can't be happy at all when they are unsafe and frustrating)".

A person who has such a belief is likely to appraise almost any sort of inconvenience as harmful or threatening.

What is it about situations that make them stressful? First, events that involve very strong demands and are imminent tend to be seen as stressful. Thus, patients who expect to undergo a physically uncomfortable or painful medical procedure, such as surgery, tomorrow are likely to view their situation as being more stressful than, say, expecting to have a blood pressure test next week.

Also, life transitions tend to be stressful. Life has many major events that mark the passing from one condition or phase to another, and they produce substantial changes and new demands in our lives. These events are called transitions, and include starting day care or school, moving to a new community, entering a career, getting married, becoming a parent, losing a spouse through divorce or death, and retiring from a career. Becoming a parent, for instance, can be stressful before and after the birth. The stressors before birth may include the physiological burden of pregnancy on the mother's body and concerns about the baby's and mother's health. After birth, the parents' stressors may involve being tied down, having a less orderly and predictable lifestyle, and having sleep interrupted often.

The timing of a life transition can affect the stress it produces. People expect some events, such as marriage or retirement, to occur at certain times in the life span.

Deviations from the expected timetable are stressful. Why? For one thing, events that happen too early or too late often leave the person without the support of compatible peers, as a 40-year-old first-time mother might find. Also, the person may interpret being off schedule as a failure, and this is stressful. People who are "late" graduating college or advancing on the job may feel as if they have failed.

Ambiguity—a lack of clarity in a situation—can have an effect on stress appraisals. But the effect seems to depend on the type of ambiguity that exists. Role ambiguity occurs when the information about a person's function or task is unclear or confusing. In the workplace, for instance, this is reflected in unclear guidelines, standards for performance, and consequences for job-related activities. Role ambiguity often increases people's stress because they are uncertain about their actions and decisions. Harm ambiguity occurs when the likelihood of harm or the availability of resources to meet situational demands is unclear. With harm ambiguity, the effect of stress is variable and depends heavily on the person's personality, beliefs, and

general experience. One person who is seriously ill and has unclear information about the chances of recovery may draw hope from this ambiguity; another person in the same situation may believe people are deliberately giving ambiguous information because the prognosis is so poor.

Another factor that influences stress appraisals is the desirability of the situation. Some events are typically undesirable to a person in most or all respects—losing your house in a fire is an example.

Other events, such as selling a house, are usually viewed as desirable. But either selling a house or losing it in a fire can be stressful because each produces demands that may tax or exceed the individual's resources. Stress can involve a wide variety of both desirable and undesirable situations, including the transitions we saw earlier, as well as less momentous circumstances, such as preparing to throw a party and getting a traffic ticket.

In general, people are more likely to appraise undesirable events more stressful than desirable ones.

One other aspect of the situation that affects stress appraisal is its controllability—that is, whether the person has the real or perceived ability to modify or terminate the stressor. People tend to appraise an uncontrollable event as being more stressful than a controllable event, even if they don't actually do anything to affect it.

There are at least two types of control, behavioral and cognitive. In the case of behavioral control, we can affect the impact of the event by performing some action. Suppose, for example, you are experiencing intense pain from a headache. If you have the ability to reduce the pain, you are less likely to be stressed by the headache than if you do not have this ability. In the case of cognitive control, we can affect the impact of the event by using some mental strategy, such as by distracting our attention from the stressor or developing a plan to overcome a problem.

Dimensions of Stress

Psychologists who study stress or perform therapy to help people manage it assume that the amount of stress a person experiences increases with stressor frequency, intensity, and duration. Evidence supports this assumption. Research has shown that stronger stressors produce greater physiological strain. Many people experience chronic stress—that is, their stressors occur extremely often or last a long time. Being under chronic stress makes people more susceptible to catching cold when exposed to infection.

Biopsychosocial Aspects of Stress

We've seen that stressors can produce strain in the person's biological, psychological, and social systems. Let's examine biopsychosocial reactions to stress more closely.

Biological Aspects of Stress

Anyone who has experienced a very frightening event, such as a near accident or other emergency, knows that there are physiological reactions to stress—for instance, our heartbeat and breathing rates increase immediately and, a little later, our skeletal muscles may tremble, especially in the arms and legs. The body is aroused and motivated to defend itself. As we saw earlier, the sympathetic nervous system and the endocrine system cause this arousal to happen. After the emergency has passed, the arousal subsides. The physiological portion of the response to a stressor—or strain—is called reactivity, which researchers measure by comparison against a baseline, or resting, level of arousal. People who are under chronic stress show heightened reactivity when a stressor occurs, and their arousal takes more time to return to baseline levels.

Many years ago the distinguished physiologist Walter Cannon (1929) provided a basic description of how the body reacts to emergencies. He was interested in the physiological reaction people and animals make in response to a perceived danger. This reaction has been called the fight-or-flight response because it prepares

the organism to attack the threat or to flee. In the fight-or-flight response, the perception of danger causes the sympathetic nervous system to stimulate the adrenal glands of the endocrine system to secrete epinephrine, which arouses the body. Cannon proposed that this arousal could have both positive and negative effects: the fight-or-flight response is adaptive because it mobilizes the organism to respond quickly to danger, but the state of high arousal can be harmful to health if it is prolonged.

General Adaptation Syndrome

What happens to the body when high stress levels are prolonged? Hans Selye studied this issue by subjecting laboratory animals to a variety of stressors— such as very high or low environmental temperatures, X rays, insulin injections, and exercise—over a long period of time. He also observed people who experienced stress from being ill. Through this research, he discovered that the fight-or-flight response is only the first in a series of reactions the body makes when stress is long-lasting. Selye called this series of physiological reactions the general adaptation syndrome (GAS). As the diagram shows, the GAS consists of three stages:

1. Alarm Reaction.

The first stage of the GAS is like the fight-or-flight response to an emergency— its function is to mobilize the body's resources. At the very beginning of the alarm reaction, arousal— as measured by blood pressure, for example—drops below normal for a moment, but then rapidly rises to above normal. This last-increasing arousal results from activation of the hypothalamus—pituitary—adrenal axis: the hypothalamus triggers the pituitary gland to secrete ACTH, which causes the adrenal glands to release epinephrine, nor-epinephrine, and cortisol into the bloodstream. By the end of this stage in the GAS, the body is fully mobilized to resist the stressor strongly. But the body cannot maintain this intense arousal for very long. Some organisms that have experienced a continuous and unrelieved alarm reaction to an extremely intense stressor have died within hours or days.

2. Stage of Resistance.

If a strong stressor continues but is not severe enough to cause death, the physiological reaction enters the stage of resistance. In this stage, the body tries to adapt to the stressor. Physiological arousal declines somewhat but remains higher than normal, and the body replenishes the hormones released by the adrenal glands. Despite this continuous physiological arousal, the organism may show few outward signs of stress. But the ability to resist new stressors may be impaired for long periods of time. According to Selye, one outcome of this impairment is that the organism becomes increasingly vulnerable to health problems he called diseases of adaptation. These health problems include ulcers, high blood pressure, asthma, and illnesses that result from impaired immune function.

3. Stage of Exhaustion.

Prolonged physiological arousal produced by severe long-term or repeated stress is costly. It weakens the immune system and depletes the body's energy reserves until resistance is very limited. At this point, the stage of exhaustion begins. If the stress continues, disease and damage to internal organs are likely, and death may occur.

Two lines of evidence support the long-term effects the GAS describes. First, people who experience chronically high levels of stress show greater reactivity to stressors they encounter: compared with other people, individuals under chronic stress respond to a stressor with greater increases in blood pressure and decrements in immune function.

Second, having to adapt repeatedly to intense stressors may take a high physiologic toll that accumulates over time in a process called allostatic load. Studies of chronic stress have confirmed that high levels of allostatic load are related to poor health in children and the elderly.

Do All Stressors Produce the Same Physical Reactions?

Many studies have demonstrated that stressors of various types increase the secretion of hormones by the adrenal glands. These stressors include cold temperatures, noise, pain, athletic competitions, failure, taking examinations, flying in an airplane, and being in crowded situations.

Selye (1956) believed that the GAS is nonspecific with regard to the type of stressor. That is, the series of physiological reactions the GAS describes will occur regardless of whether the stress results from very cold temperature, physical exercise, illness, or the death of a loved one. However, although various stressors increase the secretion of adrenal hormones, the notion of non-specificity does not take important psychosocial processes into account. There are at least two reasons why this is a problem.

One reason is that some stressors elicit a stronger emotional response than others do. This is important because the amount of hormone released in reaction to a stressor that involves a strong emotional response, as a sudden increase in environmental temperature might produce, appears to be different from the amount released with a less emotional stressor, such as a gradual increase in temperature.

After conducting extensive studies of various stressors and hormones, John Mason concluded that he and his colleagues have not found evidence that any single hormone responds to all stimuli in absolutely nonspecific fashion. For instance, some stressors led to increases in epinephrine, nor-epinephrine, and cortisol, but other stressors increased only two of these hormones. He also pointed out that research conducted since Selye first described the GAS has shown that stressors are most likely to trigger the release of large amounts of all three of these hormones if the individual's response includes a strong element of emotion.

The second reason is that cognitive appraisal processes appear to play a role in people's physiological reaction to stressors. This role is suggested by the results of a study by Katherine Tennes and Maria Kreye (1985). The researchers assessed elementary school children's cortisol levels in urine samples taken on regular school days and on days when achievement tests were given. The expected increase in cortisol on test days was found, but not for all children—their intelligence was an important factor. Intelligence test scores were obtained from school records.

Cortisol levels increased on test days for children with above-average intelligence, but not for children with low to average intelligence. The influence of intelligence suggests that the brighter children were more concerned about academic achievement and, as a result, appraised the tests as more threatening than did the other children.

To summarize, the basic structure of the GAS appears to be valid, but it incorrectly assumes that all stressors produce the same physiological reactions and fails to include the role of psychosocial factors in stress.

LECTURE 15**PSYCHOSOCIAL ASPECTS OF STRESS**

At this juncture, we can begin to see how interwoven our biological, psychological, and social systems are in the experience of stress. Stressors produce physiological changes, but psychosocial factors also play a role. To give a more complete picture of the interplay among these systems, we will now examine the impact of stress on people's cognitive, emotional, and social systems.

Cognition and Stress

Many students have had this experience. While taking a particularly stressful exam in school, they may neglect or misinterpret important information in a question or have difficulty remembering an answer they had studied well the night before. It is infuriating to know that an answer is on the tip of your tongue; especially since you will probably remember it after the test is over. High levels of stress affect people's memory and attention. Let's see how.

Stress can impair cognitive functioning, often by distracting our attention. Noise can be a stressor, which can be chronic for people who live in noisy environments, such as next to train tracks or highways. How does chronic noise affect people's cognitive performance? Many people try to deal with this kind of stress by changing the focus of their attention from the noise to relevant aspects of a cognitive task—they “tune out” the noise. Research evidence suggests that children who try to tune out chronic noise may develop generalized cognitive deficits because they have difficulty knowing which sounds to attend to and which to tune out.

But stress can also enhance our attention, particularly toward the stressor. For instance, researchers had people watch a series of pictures while listening to a story about a boy and his mother who go to a hospital. For some subjects, the story was emotional: the boy had a terrible accident, his feet were severed, and surgeons reattached the feet. For other subjects, the story was neutral: the boy went to the hospital to watch activities there. Before this experience, the subjects with each type of story received an injection of either a placebo or a drug that stops the action of epinephrine and nor-epinephrine. When tested a week later, the subjects who heard the emotional story remembered more details of it if they had gotten the placebo rather than the drug. But the drug had no effect on subjects' memory of the neutral story. These findings suggest that epinephrine and nor-epinephrine enhance the memory of stressors we experience.

Not only can stress affect cognition, but the reverse is true too, in the opening story about Sonia, she kept imagining that her fiancé was seeing other women, which was very distressing for her. Her thinking was making the stress chronic. Andrew Baum (1990) has studied this kind of thinking in individuals who were living near the Three Mile Island nuclear power plant in Pennsylvania when a major nuclear accident occurred. He found that some of these people still experienced stress from the incident years later, but others did not. One of the main factors differentiating these people was that those who continued to feel this stress had trouble keeping thoughts about the accident and their fears out of their minds. It seems likely that these thoughts perpetuated their stress and made it chronic.

Emotions and Stress

Long before infants can talk, they display what they feel by their motor, vocal, and facial expressions. You can test this with a little experiment: place a bit of a bitter food, such as unsweetened chocolate, in a newborn's mouth and watch the baby's face—the eyes squint, brows drop and draw together, the mouth opens, and tongue juts out. This is the facial expression for the emotion of disgust. Each emotion has a specific facial pattern.

According to researcher Carroll Izard (1979), newborn babies do not display all the emotional expressions they will develop, but they do express several emotions, such as disgust, distress, and interest. Using procedures like the one with bitter food, he and his colleagues studied 2- to 19-month-old infants'

emotional reactions to the stress of receiving their regular inoculations. The facial expressions following needle penetration were mainly of distress and anger, but the younger infants' principal emotion was distress, and the older infants' immediate and dominant emotion was anger. As babies develop, they become more able to try to act for themselves, such as by pushing at the nurse's hand, Anger spurs this kind of defensive action; distress merely signals the need for help.

Emotions tend to accompany stress, and people often use their emotional states to evaluate their stress. Cognitive appraisal processes can influence both the stress and the emotional experience (Lazarus, 1999; Schachter & Singer, 1962; Scherer, 1986). For example, you might experience stress and fear if you came across a snake while walking in the woods, particularly if you recognized it as poisonous. Your emotion would not be joy or excitement, unless you were studying snakes and were looking for this particular type. Both situations would involve stress, but you might experience fear if your appraisal was one of threat, and excitement if your appraisal was one of challenge.

Fear is a common emotional reaction that includes psychological discomfort and physical arousal when we feel threatened. Of the various types and intensities of fears people experience in everyday life, psychologists classify many into two categories: **phobias** and **anxiety**. Phobias are intense and irrational fears that are directly associated with specific events and situations. Some people are afraid of being enclosed in small rooms, for instance, and are described as claustrophobic. Anxiety is a vague feeling of uneasiness or apprehension—a gloomy anticipation of impending doom—that often involves a relatively uncertain or unspecific threat. That is, the person may not be aware either of the situations that seem to arouse anxiety or of exactly what the “doom entails. Patients awaiting surgery or the outcome of diagnostic tests generally experience high levels of anxiety. In other situations, anxiety may result from appraisals of low self-worth and the anticipation of a loss of either self-esteem or the esteem of others.

The things children fear tend to become less concrete or tangible and more abstract and social as they get older. In early childhood, many children develop fears of concrete things, such as animals, doctors, and dentists, often because of negative experiences with these things. Cognition can also play a role in these fears. A study of children's fears of dental treatment found that the most fearful children were those who had not experienced invasive procedures, such as having a tooth pulled, during the prior few years. Not having had these experiences probably allowed the children to imagine that invasive procedures are worse than they are. Later in childhood, concrete fears tend to decline while anxieties relating to school, individual competence, and social relations become pronounced. Children who see themselves as less able than their age-mates are likely to appraise their own resources as insufficient to meet the demands of stressors.

Stress can also lead to feelings of sadness or depression. We all feel depressed at times, although we may call the feeling something else, like sad, or blue,” or unhappy.’ These feelings are a normal part of life for children and adults. The difference between normal depression and depression as a serious disorder is a matter of degree. Depression becomes a psychological disorder when it is severe, frequent, and long-lasting. People with this disorder tend to:

- Have a mostly sad mood nearly every day
- Appear listless, with loss of energy, pleasure, and interest
- Show poor appetite and sleeping habits
- Have thoughts of suicide, feeling hopeless about the future
- Have low self-esteem, often blaming themselves for their troubles.

Having long-term disabling health problems, such as being paralyzed by a stroke, often leads to depressive disorders.

Another common emotional reaction to stress is anger, particularly when the person perceives the situation as harmful or frustrating. You can see this in the angry response often shown by children whose favorite toy

was taken away and by adults who are stuck in a traffic jam. Anger has important social ramifications—it can produce aggressive behavior, for instance.

Social Behavior and Stress

Stress changes people's behavior toward one another. In some stressful situations, such as train crashes, earthquakes, and other disasters, many people may work together to help each other survive. Perhaps they do this because they have a common goal that requires cooperative effort. In other stressful situations, people may become less sociable or caring and more hostile and insensitive toward other individuals.

When stress and anger join, negative social behaviors often increase. Research has shown that stress-produced anger increases aggressive behavior and these negative effects continue after the stressful event is over. This increased aggressive behavior has important implications in real life, outside the laboratory. Child abuse is a major social problem that poses a serious threat to children's health, physical development, and psychological adjustment. Studies have found a connection between parental stress and child abuse. Prior to an act of battering, frequently the parent has experienced a stressful crisis, such as the loss of a job. A parent under high levels of stress is at risk of losing control. For example, the child runs around the house making a racket, a stressed parent may become very angry, lose control, and start beating the child.

Stress also affects helping behavior. This was shown in an experiment conducted in a shopping center. After each subject completed either a difficult shopping task or an easy one in either a crowded or uncrowded shopping center, he or she walked through a deserted hallway to meet with the researcher. In the hallway, the subject encountered a woman who feigned dropping a contact lens—a situation in which the subject could provide help. Those subjects who had just experienced the most stress, having completed the difficult shopping task in crowded conditions, helped less often and for less time than those who had completed the easy task in un-crowded conditions.

Gender and Socio-cultural Differences in Stress

Does the experience of stress depend on a person's gender and socio-cultural group membership? Apparently it does. Women generally report having experienced a greater number of major and minor stressors than men do. Although this difference may result partly from women's greater willingness to say they experienced stress, it probably also reflects real variations in experiences. Because in today's two-income households, mothers still do most of the chores at home, they often have heavier daily workloads than men and greater physiological strain than women without children.

Being a member of a minority group or being poor appears to increase the stressors people experience. Research in the United States has shown that individuals with these socio-cultural statuses report having experienced a disproportionately large number of major stressors. For example, black Americans report far more stressors than Hispanics, who report more stressors than do non-minority people.

We have seen that the effects of stress are wide ranging and involve interplay among our biological, psychological, and social systems. Even when the stressor is no longer present, the impact of the stress experience can continue. Some people experience more stress than others do, but we all find stress somewhere in our lives. Stress arises from a countless variety of sources.

Sources of Stress throughout Life

Babies, children, and adults all experience stress. The sources of stress may change as people develop, but the condition of stress can occur at any time throughout life. Where does stress come from, and what are its sources? To answer this question, we will examine sources that arise within the person, in the family, and in the community and society.

Sources within the Person

Sometimes the source of stress is within the person. Illness is one way stress arises from within the individual. Being ill creates physical and psychological demands on the person, and the degree of stress these demands produce depends on the seriousness of the illness and the age of the individual, among other things. Why is the person's age important? For one thing, the ability of the body to fight disease normally improves in childhood and declines in old age. Another reason is that the meaning of a serious illness for the individual changes with age. For example, young children have a limited understanding of disease and death. Because of this, their appraisal of stress that arises from their illness is likely to focus on current, rather than future, concerns—such as how well they feel at the moment and whether their activities are impaired.

Stress appraisals by ill adults typically include both current difficulties and concerns for the future, such as whether they may be disabled or may die.

Another way stress arises within the person is through the appraisal of opposing motivational forces, when a state of conflict exists. Suppose you are registering for next semester and find that two courses that you need meet at the same time. You can take only one. Which will you choose? You have a conflict—you are being pushed and pulled in two directions. Many conflicts are more momentous than this one. We may need to choose between two or more job offers, or different medical treatments, or houses we are thinking of buying, for instance. Conflict is a major source of stress.

The pushes and pulls of conflict produce two opposing tendencies: approach and avoidance. These two tendencies characterize three basic types of conflict:

1. Approach/approach conflict arises when we are attracted toward two appealing goals that are incompatible. For example, people who are trying to lose weight to improve either their health or their appearance experience frequent conflicts when delicious, fattening foods are available. Although individuals generally resolve an approach/approach conflict fairly easily, the more important they perceive the decision to be, the greater the stress it is likely to produce.

2. Avoidance/avoidance conflict occurs when we are faced with a choice between two undesirable situations. For example, patients with serious illnesses may be faced with a choice between two treatments that will control or cure the disease, but have very undesirable side effects. People in avoidance/avoidance conflicts usually try to postpone or escape from the decision. A patient might delay or discontinue treatment or change physicians in the hope of getting choices that are more appealing. When delaying or escaping is not possible, people often vacillate between the two alternatives, changing their minds repeatedly. Sometimes they get someone else to make the decision for them. People generally find avoidance/avoidance conflicts difficult to resolve and very stressful.

3. Approach/avoidance conflict arises when we see attractive and unattractive features in a single goal or situation. This type of conflict can be stressful and difficult to resolve. Consider, for instance, individuals who smoke cigarettes and want to quit. They may be torn between wanting to improve their health and wanting to avoid the weight gain and cravings they believe will occur.

As you may realize, conflicts can be more complicated than the examples we have considered. People often have to choose between two or more alternatives, recognizing that each has multiple attractive and unattractive features, as in buying a new house or car. In general, people are likely to find conflict stressful when the choices involve many features, when opposing motivational forces have fairly equal strength, and when the “wrong” choice can lead to very negative and permanent consequences. These conditions often apply when people face major decisions about their health.

LESSON 16**SOURCES OF STRESS****Sources in the Family**

The behavior, needs, and personality of each member of a family have an impact on and interact with those of the other members of the family system, sometimes producing stress. Interpersonal conflict can arise from financial problems, from inconsiderate behavior, or from opposing goals, such as which television program to watch. Living in an overcrowded household increases conflict over privacy and the use of family resources such as the bathroom. Of the many sources of stress in the family, we will focus on three: adding a new family member, divorce, and illness and death in the family.

An Addition to the Family

A new child in the family is a joyful event, but it also brings stress—particularly to the mother, of course, during pregnancy and after the birth. But an addition to the family is stressful to other family members, too. For instance, the father may worry about the health of his wife and baby or fear that his relationship with his wife may deteriorate, and both parents may feel the need to earn more money.

After the baby is born, parents experience stress from their new responsibilities in caring for the child. An important factor in parental stress relates to the child's personality. Each baby comes into the world with certain personality dispositions, which are called temperaments. Pediatric nurses and physicians, well aware of the unique combinations of temperaments that babies show right from birth, describe infants broadly as "easy" babies and "difficult" ones. These terms do, in fact, capture the general dispositions of most infants fairly accurately on the basis of differences in the way babies react to feeding, cuddling, bathing, and dressing and undressing.

Temperamentally difficult babies tend to cry a great deal—often very loudly—and efforts to soothe them do not seem to work very well. They resist being introduced to new foods, routines, and people, and their patterns of sleep, hunger, and bowel movements are hard to predict from day to day. Although only about 10% of babies are classified as difficult, displaying most or all of these traits fairly consistently, many others show some of these traits at least occasionally. A child who reacts in a very negative manner to minor irritations is very stressful to parents. Although children's temperaments are fairly stable across time, with aspects of these traits continuing for many years, many difficult children show changes toward the development of easy traits.

The arrival of a new baby can also be stressful to other children in the family. This stress seems to be particularly strong among children who are very young, say, 2 or 3 years old, and who may not want to share their parents with the new brother or sister.

After the baby arrives, these children may show increased clinging to the mother, as well as increased sleeping and toileting problems. If the children are older, they are less likely to view the baby as a rival for their parents' attention, and their stress seems to relate to changes in family behavior and rules, such as not making noise when the baby is asleep.

Divorce

A divorce produces many stressful transitions for all members of the family as they deal with changes in their social, residential, and financial circumstances. In the case of the children, they may move to a new neighborhood, be left with new sitters, or have to take on new chores at home. The custodial parent may not be very available to the children because of work or other preoccupations. According to psychologist Judith Wallerstein (1983, 1986), the way children react to the stress of divorce depends in part on their age. Very young children may feel responsible for the divorce, worry that the custodial parent will also leave, and develop sleep disturbances.

Older children and adolescents tend to react with anger, often siding with one parent and blaming the other. Adapting to divorce usually takes several years, and some family members may never adjust fully. Parents can do several things to enhance their children's adjustment to a divorce. They can maintain a loving secure home life and:

- Tell the children in advance of the impending separation.
- Encourage open communication and answer the children's questions truthfully, but sensitively.
- Gear information to the children's levels of understanding, with concrete and accurate explanations of what will happen to all members of the family.
- Recruit help and advice from others, such as relatives, parent organizations, counselors, and the children's school personnel.
- Encourage the children to have contact with both parents.

Family Illness, Disability, and Death

The following is a familiar story to many parents: In the middle of a frantic day at work, the parent receives a call from the school nurse, who says, "Your child is sick. You'll have to come and pick him up." Having a sick child adds to the stress in an already stressful day.

When children have a serious chronic illness, their families must adapt to unique and long-term stresses. Part of the stress stems from the amount of time needed to care for the child and from the reduced freedom family members have in their schedules. For example, children with the respiratory disease called cystic fibrosis generally need physiotherapy two or three times a day to reduce the mucus that collects in their lungs. The family also faces many difficult decisions and must learn about the illness and how to care for the child. The medical needs of chronically ill children are expensive, and this burden adds to the family's stress.

Relationships between family members may also suffer. The parents are likely to feel that having a chronically ill child reduces the time they have to devote to each other. In addition, other children in the family may feel isolated and deprived of parental attention.

Adult illness or disability is another source of family stress. The strain on their financial resources is especially severe if the sick adult is a principal breadwinner. Having a physically ill or disabled adult in the family restricts the family's time and personal freedom and produces very important changes in interpersonal relationships. For example, suppose a man has a heart attack. His spouse may experience stress from fears that he may have another attack and changes in his behavior, such as being more irritable and dependent.

Although the couple may show increased affection for one another during convalescence, their sexual relations are generally curtailed—often because of fears that sex could induce another attack. And the roles of family members change: the healthy spouse and the children who are old enough take on many of the responsibilities and tasks of the recovering spouse. As the convalescing adult begins to show good physical recovery, the stress generally diminishes in the family.

Does the stress a family experiences when an adult is seriously ill depend on the sick person's age? Often it does. For instance, advanced cancer in an elderly person has a very different meaning than the same illness in someone at 30 years of age, especially if the young adult has one or more children. In the latter case, the disease is inconsistent with the person's roles and threatens the family unit. Chronic illness is likely to produce intense frustration, distress, and anger if it is out of step with expectations and needs for the future. But if an elderly person who is ill or disabled must live with and be cared for by relatives, the stress for all those in the household can be severe, especially if the person requires constant care and shows mental deterioration. Elderly spouses who provide care for such individuals are often emotionally distressed and show heightened physiological strain, making them more susceptible to infectious disease.

Age is also an important factor in the experience of stress when a family member dies. Some children suffer the loss of a parent during the child-hood years—one of the most traumatic events a child can face. Children under about 5 years of age seem to grieve for the lost parent less strongly and for a shorter time than older children and adolescents do. This age difference probably results from their different levels of understanding about the nature of death. Children’s concept of death changes between 4 and 8 years of age. Young children often think death is reversible: the person is simply living somewhere else—such as underground—and can come back.

By about 8 years of age, most children understand that death is final and involves an absence of bodily functions.

An adult whose child or spouse dies suffers a tremendous loss. Losing a child creates other losses—for example, bereaved mothers reported that they had lost important hopes and expectations for the future (Edelstein, 1984). Parents who lose their only child lose their identity and role as mothers and fathers, too. When a spouse dies, the surviving spouse also loses important hopes, expectations, and roles— as well as the one companion who made him or her feel loved, wanted, special, and safe. Although the loss of a spouse is difficult at any age, it appears to be especially stressful in early adulthood.

Sources in the Community and Society

Interpersonal contacts people make outside the family provide many sources of stress. For instance, children experience stress at school and in competitive events, such as in sports and band performances (Passer, 1982; Sears & Milburn, 1990). Much of the stress adults experience is associated with their occupations, and a variety of environmental situations can be stressful. We will focus on how people’s jobs and environments can be sources of stress.

Jobs and Stress

Almost all people at some time in their lives experience stress that relates to their occupations. Often these stressful situations are minor and brief and have little impact on the person. But for many people, the stress is intense and continues for long periods of time. What factors make jobs stressful?

The demands of the task can produce stress in two ways. First, the workload may be too high. Some people work very hard for long hours over long periods of time because they feel required to do so—for example, if they need the money or think their bosses would be unhappy if they did not. Studies have found that excessive workloads are associated with increased rates of accidents and health problems.

Second, some kinds of job activities are more stressful than others. For example, repetitive manual action, as in cashier work, can be stressful and is linked to physical symptoms, such as neck and shoulder pain. Also, jobs that under-utilize the worker’s abilities can produce stress.

Another kind of activity that can produce stress is the evaluation of an employee’s job performance—a process that can be difficult for both the supervisor and the employee.

Jobs that involve a responsibility for people’s lives can be very stressful. Medical personnel have heavy workloads and must deal with life or death situations frequently. Making a mistake can have dire consequences. In an intensive care unit of a hospital, emergency situations are common; decisions must be made instantly and carried out immediately and accurately. As part of the job, the nurse must reassure and comfort the man who is dying of cancer; she must change the dressings of a decomposing, gangrenous limb; she must calm the awakening disturbed overdose patient.

It is hard to imagine any other situation that involves such intimacy with the frightening, repulsive, and forbidden. To all this is added the repetitive contact with death.

These and other conditions of jobs in the health professions take their toll, often leading to feelings of emotional exhaustion. Similar stressors exist in the jobs of police and fire personnel. Several other aspects of jobs can increase workers' stress. We will discuss them in our next lecture.

LESSON 17**MEASURING STRESS**

In our previous lecture, we talked about the various sources of stress.

Of the many sources of stress in the family, we focused on three: adding a new family member, divorce, and illness and death in the family. Then we talked about the job-related stress. How the demands of the task can produce stress; and how the job-responsibilities such as those of medical professionals, fire-fighters, and police etc. can produce stress.

Factors Which Increase Worker's Stress

Several other Factors of jobs can increase workers' stress. For example, stress can result from:

- The physical environment of the job. Stress increases when the job involves extreme levels of noise, temperature, humidity, or illumination.
- Perceived insufficient control over aspects of the job. People experience stress when they have little influence over work procedures or the pace of the work, such as when a machine feeds work to them at a predetermined speed.
- Poor interpersonal relationships. People's stress on the job increases when their boss or a co-worker is socially abrasive, being insensitive to the needs of others or condescending and overly critical of the work other individuals do.
- Perceived inadequate recognition or advancement. Workers feel stress when they do not get the recognition or promotions they believe they deserve.
- Job loss. People experience stress when they lose their jobs or think their jobs are threatened. Workers who believe they are likely to be fired or laid off feel a sense of job insecurity—and this is stressful, particularly if they have little prospect of finding another job. Studies have, shown that unemployment is associated with psychological and physiological signs of stress, such as in people's loss of self-esteem and heightened blood pressure.
- Retirement. Many elderly people approach retirement with expectations of blissful freedom and leisure. But it does not always turn out that way. Retirees often find that they have lost opportunities for social interaction and an important part of their identity. They may miss the power and influence they once had, the structure and routines of a job, and the feeling of being useful and competent. The stress from these circumstances can affect not only the retirees, but their spouses, too. What's more, many retirees have the added problem that their income is not sufficient for their needs.

Environmental Stress

Have you ever been at a big noisy event with thousands of people jammed into an arena and felt physiologically aroused, tense, and uncomfortable? Events like these can be stressful because of the noise and the crowded conditions. Crowded conditions reduce your control over interpersonal interaction and restrict your ability to move about freely or obtain resources, such as seats. Also, you may feel that other people are physically closer than you usually prefer people to be— they are intruding into your personal space.

Some environmental conditions are intensely stressful—imagine how you would react to learning that a hazardous substance has seeped into the water supply where you live.

How much of it have you and your family already drunk? Has it damaged your bodies already? Will you develop serious illnesses because of it in the future? Can the substance be removed? And after it is, will you believe there is no more danger? Can you sell your house now without suffering a great financial loss? Many people who are exposed to hazardous substances or other continuous threats in their environment worry for years about what will happen to them. Natural disasters, such as earthquakes, have the added difficulty of long-term disruptions in social relationships, which worsen the stress.

In the late 1970s, attention was focused on this type of situation at Love Canal in New York State, where a chemical dump site had contaminated a residential community. In many ways this situation is more stressful than a natural disaster—at least a tornado ends quickly, its damage can be assessed, and much of the damage can be repaired in time. At Love Canal, however, “the nightmare goes on and on”.

Another example of the psychological effects of living in a hazardous environment comes from the nuclear accident at the Three Mile Island power plant in Pennsylvania. More than a year after the accident, researchers compared the stress of nearby residents to that of people who lived near a different nuclear facility that had not had an accident. This comparison revealed greater psychological and physiological evidence of stress among the residents around Three Mile Island than among those near the other facility.

So far, we have seen that stress involves Biopsychosocial reactions, and that all sorts of events or circumstances can be stressors, including extreme temperatures, noise, taking an exam, being stuck in a traffic jam, having a painful medical test, getting married, and losing a job. The possible stimuli and reactions, and the appraisal processes that link them, make for an interesting question: If you were doing research and needed to know whether different people had experienced different amounts of stress, how could you assess this variable?

MEASURING STRESS

Researchers have used several different approaches for measuring stress. The three most commonly used approaches involve assessing people’s physiological arousal, life events, and daily hassles.

Physiological Arousal

Stress produces physiological arousal, which is reflected in the functioning of many of our body systems. One way to assess arousal is to use electrical/mechanical equipment to take measurements of blood pressure, heart rate, respiration rate, or galvanic skin response (GSR). Each of these indexes of arousal can be measured separately, or they can all be measured and recorded simultaneously by one apparatus called the polygraph.

Miniaturized versions of these devices are available with recording units that can fit in a pocket, thereby allowing assessments during the person’s daily life at home, at work, or in a stressful situation, such as while flying in an airplane or receiving dental treatment. Using one of these devices, researchers have shown that paramedics’ blood pressure is higher during ambulance runs and at the hospital than during other work situations or at home.

Another way to measure arousal is to do biochemical analyses of blood, urine, or saliva samples to assess the level of hormones that the adrenal glands secrete profusely during stress. Using this approach, researchers can test for two classes of hormones: corticosteroids, the most important of which is cortisol, and catecholamines, which include epinephrine and nor-epinephrine. A chemist does the analysis using special procedures and equipment.

There are several advantages to use measures of physiological arousal in assessing stress. Physiological measures are reasonably direct and objective, quite reliable, and easily quantified. But there are disadvantages as well. Assessing physiological arousal can be expensive, and the measurement technique may itself be stressful for some people, as may occur when blood is drawn or when electrical devices are attached to the body. Lastly, measures of physiological arousal are affected by the person’s gender, body weight, activity prior to or during measurement, and consumption of various substances, such as caffeine.

Life Events

If you wanted to know whether people were feeling stress, you might simply ask them. Using a self-report method is easy to do. But in doing research, you would probably want to get a more precise answer than, “Yes, I am,” or even, “Yes, I’m under a lot of stress. For this reason, a number of different scales have been developed to measure people’s stress and assign it a numerical value.

The Social Readjustment Rating Scale

One approach many scales have used is to develop a list of life events—major happenings that can occur in a person’s life that require some degree of psychological adjustment. The scale assigns each event a value that reflects its stressfulness. The most widely used scale of life events has been the Social Readjustment Rating Scale (SRRS) developed by Thomas Holmes and Richard Rahe (1967). To develop this scale, these researchers constructed a list of events they derived from clinical experience. Then they had hundreds of men and women of various ages and backgrounds rate the amount of adjustment each event would require, using the following instructions:

Use all of your experience in arriving at your answer. This means personal experience where it applies as well as what you have learned to be the case for others. Some persons accommodate to change more readily than others; some persons adjust with particular ease or difficulty to only certain events. Therefore, strive to give your opinion of the average degree of readjustment necessary for each event rather than the extreme. The researchers used these ratings to assign values to each event and construct the scale.

The values for the life events in the SRRS range from 100 points for death of a spouse to 11 points for minor violations of the law. To measure the amount of stress people have experienced, respondents are given a survey form listing these life events and asked to check off the ones that happened to them during a given period of time, usually not more than the past 24 months. The researcher sums the values of the checked items to get a total stress score.

How commonly do life events like those in the SRRS occur? A study of nearly 2,800 adults used a modified version of the SRRS and found that the three most frequent events reported were took a vacation (43%), “death of a loved one or other important person” (22%), and illness or injury (21%). The number of life events the subjects reported decreased with age from early adulthood to old age and increased with the number of years of schooling. Single, separated, and divorced people reported larger numbers of events than did married and widowed individuals.

Strengths and Weaknesses of the SRRS

If we examine the list of life events included in the SRRS, we can see that many of the events are ones we have already discussed as stressors, such as the death of a spouse, divorce, pregnancy, and occupational problems. One of the strengths of the SRRS is that the items it includes represent a fairly wide range of events that most people do, in fact, find stressful. Also, the values assigned to the events were carefully determined from the ratings of a broad sample of adults.

These values provide an estimate of the relative impact of the events, distinguishing fairly well between such stressors as death of a close family member” and “death of a close friend”. Another strength of the SRRS is that the survey form can be filled out easily and quickly.

One of the main uses of the SRRS has been to relate stress and illness. Many studies have found that people’s illness and accident rates tend to increase following increases in stress. But the correlation between subjects’ scores on the SRRS and illness is only about 0.30—which means that the relationship is not very strong. One reason that the relationship is not stronger is that people get sick and have accidents for many reasons other than stress. But another factor is that the SRRS has several weaknesses.

Some researchers have criticized items in the SRRS as being vague or ambiguous. For example, “change in responsibilities at work” fails to indicate how much change and whether it involves more or less responsibility. As a result, someone whose responsibility has decreased a little gets the same score as someone whose responsibility has increased sharply. Similarly, “personal injury or illness” does not indicate the seriousness of the illness—someone who had the flu gets the same score as someone who became paralyzed. Vague or ambiguous items reduce the precision of an instrument and the correlation it is likely to have with other variables.

Another criticism is that the scale does not consider the meaning or impact of an event for the individual. For example, two people who each had a mortgage for \$50,000 would get the same score for “mortgage over \$10, 000” even though one of them made ten times the income of the other. Similarly, the score people get for “death of spouse” is the same regardless of their age, dependence on the spouse, and the length and happiness of the marriage. These items do not take the person’s subjective appraisal into account, and this may also reduce the precision of the instrument.

One other problem with the SRRS is that it does not distinguish between desirable and undesirable events. Most people view some events, such as “marriage” or “outstanding personal achievement.” as desirable; but “sex difficulties” and “jail term” are undesirable. Other items could be either desirable or undesirable, for example, “change in financial state”; the score people get is the same regardless of whether their finances improved or worsened. This is important because studies have found that undesirable life events are correlated with illness, but desirable events are not.

Despite its weaknesses, the overall approach SRRS uses to measure stress is clearly useful, and following this approach, researchers have constructed other life event scales in an effort to develop more precise instruments.

Other Life Events Scales

Among the several life events scales that have attempted to improve on the method of the SRRS are the following:

1. The life Experiences Survey (LES)
2. The PERI Life-Events Scale
3. The Life Events Record

Daily Hassles

Not all of the stress we experience comes from major life events. Lesser events can also be stressful, as when we give a speech, misplace our keys during a busy day, or have our quiet disrupted by a loud party next door. These are called daily hassles. Some people experience more daily hassles than others do.

Richard Lazarus and his associates developed a scale to measure people’s experiences with day-to-day unpleasant or potentially harmful events. This instrument— called the Hassles Scale—lists 117 of these events that range from minor annoyances, such as “silly practical mistakes,” to major problems or difficulties, such as “not enough money for food”. Respondents indicate which hassles occurred in the past month and rate each event as “somewhat severe,” “moderately severe,” or “extremely severe”. These researchers tested 100 middle- aged adults monthly over a 9-month period. The half- dozen most frequent hassles reported were concerns about weight,” “health of a family member,” “rising prices of common goods; “home maintenance,” “too many things to do,” and “misplacing or losing things.”

Because the researchers felt that having desirable experiences may make hassles more bearable and reduce their impact on health, they also developed the Uplifts Scale, which lists 135 events that bring peace, satisfaction, or joy. The respondents who filled out the Hassles Scale completed this scale, too.

Can Stress be good for you?

Is it possible that some types or amounts of stress are neutral or, perhaps, good for you? There is reason to believe that this is the case. How much stress may be good for people? Some theories of motivation and arousal propose that people function best, and feel best, at what are, for them, an optimal level of arousal. People differ in the amount of arousal that is optimal, but too much or too little arousal impairs their functioning.

Let's consider an example of how different levels of stress affect functioning. Imagine that you are in class one day and your instructor passes around a surprise test. If the test would not be collected or count toward your final grade, you might be under-aroused and answer the questions carelessly or not at all. But if it were to count as 10% of your grade, you might be under enough stress to perform well. And if it counted a lot, you might be overwhelmed by the stress and do poorly.

Finally, in discussing whether stress is harmful, one other point should be made: individuals seem to differ in their susceptibility to the effects of stress. John Mason (1975) has proposed that these differences are like those that people show to the effects of viruses and bacteria. That is, not all people who are exposed to a disease-causing antigen, such as a flu virus, develop the illness—some individuals are more susceptible than others.

Susceptibility to the effects of antigens and to stress varies from one person to the next and within the same individual across time. These differences result from biological variations within and between individuals, and from psychosocial variations, as we will see in our coming lectures.

LECTURE 18**PSYCHOSOCIAL FACTORS THAT CAN MODIFY THE IMPACT OF STRESS ON HEALTH**

Another story...

They were best friends, Joan and Sally, on their way to an art museum a year ago when a car accident ended their lives. Their husbands, Bob and Walt, were devastated, not only by their individual losses but also for each other's. These men were also friends—both worked as engineers for the same company and shared hobbies and other interests. The four of them used to party often, leaving the kids with one babysitter. How did the terrible loss of their wives affect these men?

The initial impact of their loss was similar, but the amounts of stress that followed were different, Bob's stress was not as severe as Walt's. One thing that helped Bob was that he had an extended family that lived nearby. They provided consolation for his grief, a place to go to get out of the house and to socialize, and help in caring for his children. After school, the kids would go to either Bob's or Joan's parents' house and Bob would pick them up on his way home from work. Sometimes he and the children would stay there for dinner. This helped save him time and money—both of which were in short supply. How was Bob doing a year later? He had made a good adjustment, had a good relationship with his children, was starting to date, and was in good health.

Walt was not so fortunate. For one thing, he had no nearby family to rely on. Compared to Bob, Walt had little emotional support in his grief, and being a single parent made his workload and financial situation very difficult. Walt had little time or money for socializing, and virtually all of his adult contacts were at work. Although he and Bob often had lunch together, their interests were drifting apart. Unlike Bob, Walt had never been very outgoing, and he felt awkward and insecure in meeting women. A year after Sally died, he was isolated and lonely. His relationship with his children was deteriorating, and so was his health. He had developed migraine headaches, neck problems, and high blood pressure. The stress in Walt's life was taking its toll.

In this lecture we will be looking at psychosocial factors that can modify the stress people experience. And we will address some questions about stress and illness that are of great concern today. Why can some people experience one traumatic event after another without ill effects, but others cannot? Why the same stressful situation affects some people far more than some others who seem to have received little or no effect?

Psychosocial Modifiers of Stress

People's reactions to stress vary from one person to the next and from time to time for the same person. These variations often result from psychological and social factors that seem to modify the impact of stressors on the individual. Let's look at some of these modifiers, beginning with the role of social support.

Social Support

We saw in the bereavement experiences of Bob and Walt how important social ties and relationships can be during troubled times. The social support Bob got from his family tempered the impact of his stressful loss and probably helped him adjust. Social support refers to the perceived comfort, caring, esteem, or help a person receives from other people or groups. This support can come from many different sources—the person's spouse or lover, family, friends, coworkers, physician, or community organizations. According to researcher Sidney Cobb (1976), people with social support believe they are loved and cared for, esteemed and valued, and part of a social network such as a family or community organization, that can provide goods, services, and mutual defense in times of need or danger.

Types of Social Support

What specifically does social support provide to the person? To answer this question, researchers have tried to classify various types of support. These classifications suggest that there are five basic types of social support:

1. Emotional support involves the expression of empathy, caring, and concern toward the person. It provides the person with a sense of comfort, reassurance, belongingness, and being loved in times of stress. We saw earlier how Bob's family gave him emotional support after the death of his wife.
2. Esteem support occurs through people's expression of positive regard for the person, encouragement or agreement with the individual's ideas or feelings, and positive comparison of the person with others, such as people who are less able or worse off. This kind of support serves to build the individual's feeling of self-worth, competence, and being valued. Esteem support is especially useful during the appraisal of stress, such as when the person assesses whether the demands exceed his or her personal resources.
3. Tangible or instrumental support involves direct assistance, as when people give or lend the person money or help out with chores in times of stress. Bob's family helped with childcare, for example, which reduced the demands on his time and finances.
4. Informational support includes giving advice, directions, suggestions, or feedback about how the person is doing. For example, a person who is ill might get information from family or a physician on how to treat the illness. Or someone who is faced with a very difficult decision on the job might receive suggestions or feedback about his or her ideas from coworkers.
5. Network support provides a feeling of membership in a group of people who share interests and social activities.

How May Social Support Affect Health?

We have seen that prolonged exposure to high levels of stress can lead to illness. According to the psychologists, social support affects health by protecting the person against these negative effects of high stress. It provides a buffer against stress.

How does buffering work?

There are at least two ways. First, when people encounter a strong stressor, such as a major financial crisis, those who have high levels of social support may be less likely to appraise the situation more stressful than those with low levels of support. Individuals with high social support may expect that someone they know will help them, such as by lending money or giving advice on how to get it. As a result, they judge that they can meet the demands and decide that the situation is not very stressful.

Second, social support may modify people's response to a stressor after the initial appraisal. For instance, people with high social support might have someone provide a solution to the problem, convince them that the problem is not very important, or cheer them on to look on the "bright side" or "count their blessings". People with little social support are much less likely to have any of these advantages—so the negative impact of the stress is greater for them than for those with high levels of support.

A Sense of Personal Control

Another psychosocial factor that modifies the stress people experience is the degree of control people feel they have in their lives. People generally like the feeling of having some measure of control over the things that happen to them, and they take individual action when they want to influence events directly. In doing

these things, people strive for a sense of personal control—the feelings that they can make decisions and take effective action to produce desirable outcomes and avoid undesirable ones.

Studies have found that people who have a strong sense of personal control report experiencing less strain from stressors.

Types of Control

How can feelings of personal control reduce the stress people experience? Let's see by considering the process of giving birth—a stressful event. Women who attend natural childbirth classes learn many techniques that enhance their personal control in the birth process. They, like other people in stressful situations, can influence events in their lives and reduce the stress they experience in many ways. These ways include four types of control:

1. Behavioral control involves the ability to take concrete action to reduce the impact of a stressor. This action might reduce the intensity of the event or shorten its duration. During childbirth, for example, the mother can use special breathing techniques that reduce the pain of labor.

2. Cognitive control is the ability to use thought processes or strategies to modify the impact of a stressor. These strategies can include thinking about the event differently or focusing on a pleasant or neutral thought or sensation. While giving birth, for instance, the mother might think about the event differently by going over in her mind the positive meanings the baby will give to her life. Or she could focus her attention on the sensation of the baby's movements or on an image, such as a pleasant day at the beach.

3. Decisional control is the opportunity to choose between alternative procedures or courses of action. The mother and father have many choices to make about the birth process before it occurs. For many of these decisions, the mother usually has the final word—such as in the choice of the obstetrician, whether to use conventional or natural childbirth methods, and whether the birth will occur in a hospital, at home, or at an alternative birth center. In other medical situations, the patient may be given a choice regarding which treatment procedure to use, when the treatment will occur, and so on.

4. Informational control involves the opportunity to get knowledge about a stressful event—what will happen, why, and what the consequences are likely to be. For example, a pregnant woman may get information about the sensations she will experience during labor and delivery, the procedures she can expect to happen, and the range of time the process generally takes. Informational control can help reduce stress by increasing the person's ability to predict and be prepared for what will happen and by decreasing the fear people often have of the unknown.

Each of these types of control can reduce stress, but one of them—cognitive control—seems to have the most consistently beneficial effect.

When People Lack Personal Control

What happens to people who experience high levels of stress over a long period of time and feel that nothing they do matter? They feel helpless—trapped and unable to avoid negative outcomes. A worker who cannot seem to please his boss no matter what he does, a student who cannot perform well on exams despite all the effort, or a patient who is unable to relieve his severe low back pain—each of these situations can produce apathy. As a result, these people may stop striving for these goals, come to believe they have no control over these and other events in their lives, and fail to exert control even when they could succeed. This is the condition Martin Seligman (1975) has called **learned helplessness**—which he describes as a principal characteristic of depression.

Personal Control and Health

There are two ways in which personal control and health may be related. First, people who have a strong sense of personal control may be more likely or able to maintain their health and prevent illness than those who have a weak sense of control. Second, once people become seriously ill, those who have a strong sense of control may adjust to the illness and promote their own rehabilitation better than those who have a weak sense of control.

To summarize the material on personal control, people differ in the degree to which they believe they have control over the things that happen in their lives. People who experience prolonged, high levels of stress and lack a sense of personal control tend to feel helpless. Having a strong sense of control seems to benefit people's health and help them adjust to becoming seriously ill. A sense of personal control contributes to people's hardiness, which is the next psychosocial modifier of stress we will examine.

Hardy and Resilient Personality

According to researchers, individual differences in personal control provide only part of the reason why some people who are under stress get sick whereas others do not. They have proposed that a broader array of personality characteristics—called hardiness—differentiates people who do and do not get sick under stress.

Hardiness includes three characteristics:

- (1) Control refers to people's belief that they can influence events in their lives—that is, a sense of personal control.
- (2) Commitment is people's sense of purpose or involvement in the events, activities, and people in their lives. For instance, people with a strong sense of commitment tend to look forward to starting each day's projects and enjoy getting close to people.
- (3) Challenge refers to the tendency to view changes as incentives or opportunities for growth rather than threats to security.

Another trait—resilience—seems to include high levels of three components: self-esteem, personal control, and optimism (Major et al., 1998). Resilient people appraise negative events as less stressful: they bounce back from life's adversities and recover their strength and spirit. For example, resilient children develop into competent, well-adjusted individuals despite growing up under extremely difficult conditions.

Type A Behavior

What is the Type A behavioral and emotional style? The Type A behavior pattern consists of three characteristics:

1. Competitive achievement orientation. Type A individuals tend to be very self-critical and to strive toward goals without feeling a sense of joy in their efforts or accomplishments.
2. Time urgency. Type A people seem to be in a constant struggle against the clock. Often, they quickly become impatient with delays and unproductive time, schedule commitments too tightly, and try to do more than one thing at a time, such as reading while eating or watching TV.
3. Anger/hostility. Type A individuals tend to be easily aroused to anger or hostility, which they may or may not express overtly.

In contrast, the Type B behavior pattern consists of low levels of competitiveness, time urgency, and hostility. People with the Type B pattern tend to be more easygoing and philosophical about life—they are more likely to “stop and smell the roses”.

As a summary of the role of psychosocial modifiers of stress, we have seen that social support, personal control, hardiness, and the Type A and B behavior patterns are factors that can modify the impact of stress on health. High levels of social support, personal control, and hardiness are generally associated with reduced stress and resulting illnesses; Type A behavior is associated with increased stress and illness.

LESSON 19**HOW STRESS AFFECTS HEALTH**

Researchers conducted an interesting experiment: they gave subjects nasal drops that contained a common cold virus or a placebo solution and then quarantined them to check for infection and cold symptoms. Before the nasal drops were administered, the subjects had filled out questionnaires to assess their stress. Of these subjects, 47% of those with high stress and 27% of those with low stress developed colds.

Other studies have produced two related findings. First, people who are under chronic, severe stress are especially vulnerable to infection. Second, people who show high reactivity to stress are at greater risk to respiratory infections when stressed than less reactive people. What is it about stress that leads to illness? The causal sequence between stress and illness can involve either of two routes: (1) a direct route, resulting from the changes stress produces in the body's physiology, or (2) an indirect route, affecting health through the person's behavior. Let's look first at the behavioral route.

Stress, Behavior and Illness

Stress can affect behavior, which, in turn, can lead to illness or worsen an existing condition. We can see the behavioral links between stress and illness in many stressful situations, such as when a family undergoes a divorce. In many cases during the first year following the separation, the parent who has the children is less available and responsive to them than she or he was before—a situation described as “diminished parenting”. Behavioral changes during stressful times often make conditions for all family members less healthful, with haphazard meals, less regular bedtimes, delays in getting medical attention, and failures to follow physician's recommendations, for example.

Research has shown that people who experience high levels of stress tend to perform behaviors that increase their chances of becoming ill or injured. For instance, they consume more alcohol, cigarettes, and coffee than people who experience less stress. Consumption of these substances has been associated with the development of various illnesses. In addition, behavioral factors, such as alcohol use and carelessness, probably play a role in the relatively high accident rates of people under stress. Studies have found that children and adults who experience high levels of stress are more likely to suffer accidental injuries at home, in sports activities, on the job, and while driving a car than individuals under less stress.

Stress, Physiology and Illness

Stress produces many physiological changes in the body that can affect health, especially when stress is chronic and severe. In one of our previous lectures, we discussed the concept of allostasis in which the strain involved in adapting repeatedly to intense stressors produces wear and tear on body systems that accumulate over time and lead to illness. Clear connections have been found between illness and the degree of reactivity people show in their cardiovascular, endocrine, and immune systems when stressed.

Cardiovascular System Reactivity and Illness

Cardiovascular reactivity includes any physiological change that occurs in the heart, blood vessels, and blood in response to stressors.

Research has demonstrated links between chronically high cardiovascular reactivity and the development of CHD and hypertension. For example, high levels of job stress are associated with high blood pressure and abnormally enlarged hearts, and people's laboratory reactivity to stress in early adulthood is associated with their later development of high blood pressure. The heightened blood pressure reactivity that people display in laboratory tests appears to reflect their reactivity in daily life.

Stress produces several cardiovascular changes that relate to the development of CHD. For Instance, the blood of people who are under stress contains high concentrations of activated platelets and unfavorable levels of lipids, such as cholesterol. These changes in blood composition tend to promote atherosclerosis—the growth of plaques (fatty patches) on artery walls.

As these plaques build up, they narrow and harden the arteries, thereby increasing blood pressure and the likelihood of a heart attack or stroke. Prospective studies have found that people who display high cardiovascular reactivity to stressors show faster progression of atherosclerosis than those with lower reactivity, especially if they experience chronic, severe stress in their lives.

Endocrine System Reactivity and Illness

Part of reactivity involves activation of the hypothalamus—pituitary—adrenal axis, which releases endocrine hormones—particularly catecholamines and corticosteroids—during stress. The increased endocrine reactivity that people display in these tests appears to reflect their reactivity in daily life. One way in which high levels of these hormones can lead to illness involves their effects on the cardiovascular system. For example, an intense episode of stress with extremely high levels, of these hormones can cause the heart to beat inconsistently and may lead to sudden death. In addition, chronically high levels of catecholamines and corticosteroids appear to increase atherosclerosis.

Stephen Manuck and his colleagues have demonstrated this link between stress and atherosclerosis in research with monkeys. In one study, some of the subjects were relocated periodically to different living groups, thereby requiring stressful social and psychological adjustments to retain their dominant social status: the remaining subjects stayed in stable groups. Regardless of whether the monkeys' diets had high or low levels of cholesterol, the stressed subjects who had to retain their dominant status developed greater atherosclerosis than the subjects in the low stress condition. This effect of stress is probably very similar in humans. Disruptions of soldiers' social status in boot camp affect endocrine reactivity. And as we saw earlier, people with chronically high stress are more likely to develop atherosclerosis than those with less stress. But social support may help: people with high levels of social support tend to exhibit lower endocrine reactivity than people with less support.

Immune System Reactivity and Illness

The release of catecholamines and corticosteroids during arousal affects health in another way: some of these hormones impair the functioning of the immune system. For example, increases in cortisol and epinephrine are associated with decreased activity of T cells and B cells against antigens. This decrease in lymphocyte activity appears to be important in the development and progression of a variety of infectious diseases and cancer. Among women diagnosed with breast cancer, those with high levels of killer-T-cell activity exhibit less spread of the cancer to surrounding tissue than those with low levels of lymphocyte activity.

Immune processes also protect the body against cancers that result from excessive exposure to harmful chemical or physical agents called **carcinogens**, which include radiation (nuclear, X, and ultraviolet types), tobacco tars, and asbestos (AMA, 1989). Carcinogens can damage the DNA in body cells, which may then develop into mutant cells and spread.

When mutant cells develop, the immune system attacks them with killer T cells. Actually, the body begins to defend itself against cancer even before a cell mutates by using enzymes to destroy chemical carcinogens or to repair damaged DNA. Research has shown that high levels of stress, however, reduce the production of these enzymes and the repair of damaged DNA.

Psychoneuroimmunology

We have seen earlier that psychological and biological systems are interrelated— as one system changes, the others are often affected. The recognition of this interdependence and its connection to health and illness

led researchers to form a new field of study called psychoneuroimmunology. This field focuses on the relationships between psychosocial processes and the activities of the nervous, endocrine, and immune systems. These systems form a feed back loop: the nervous and endocrine systems send chemical messages in the form of neurotransmitters and hormones that increase or decrease immune function, and cells of the immune system produce chemicals, such as ACTH, that feed information back to the brain. The brain appears to serve as a control center to maintain a balance in immune function, since too little Immune activity leaves the individual open to infection and too much activity may produce autoimmune diseases.

Emotions and Immune Function

People's emotions—both positive and negative—play a critical role in the balance of Immune functions. Research has shown that pessimism, depression, and Stress from major and minor events are related to impaired Immune function. For example, studies have compared immune variables of caregiver spouses of Alzheimer's disease patients with matched control subjects. One study found that the caregivers had lower immune function and reported more days of illness over the course of about a year. Other studies have confirmed caregivers' reduced immune function and found that men's immune systems are more vulnerable than women's to care-giving stress and that care-giving does not seem to impair immune responses when new brief stressors occur.

Positive emotions can also affect immune function, giving it a boost. In the study by Arthur Stone and his coworkers, adult men kept daily logs of positive and negative events and gave saliva samples for analyses of antibody content. Negative events were associated with reduced antibodies only for the day the events occurred, but positive events enhanced antibody content for the day of occurrence and the next two.

Some stressful situations start with a crisis, and the ensuing emotional states tend to continue and suppress immune processes over an extended period of time. This was demonstrated with healthy elderly individuals who were taking part in a longitudinal study of the aging process. The subjects were asked to contact the researchers as soon as they were able if they experienced any major crisis, such as the diagnosis of a serious illness in or the death of a spouse or child. Fifteen subjects did so. A month after the crisis, and again several months later, the researchers assessed the subjects' cortisol and lymphocyte blood concentrations, recent diets, weights, and psychological distress.

Because the subjects were already participating in the longitudinal study, comparable data were available from a time prior to the crisis. Analysis of these data revealed that lymphocyte concentrations, caloric intake, and body weight decreased, and cortisol concentrations and psychological distress increased soon after the crisis. By the time of the last assessment several months later, however, all of these measures had returned almost to the pre-crisis levels.

When people are reacting to short-term, minor events, such as doing difficult math problems under time pressure, changes in the number and activity of immune cells occur for fairly short periods of time—minutes or hours, and some measures even improve. The degree of change seems to vary with the event's intensity, duration, and type—such as whether the event is interpersonal or nonsocial. Long-lasting and intense interpersonal events seem to produce especially large immune reductions. Of course, immune system reactivity varies from one person to the next, but a person's degree of response to a type of event seems to be much the same when tested weeks apart. This suggests that an individual's reaction to specific stressors is fairly stable over time.

Psychosocial Modifiers of Immune System Reactivity

We saw earlier that psychosocial factors in people's lives may modify the stress they experience. Such factors seem to affect immune system responses, too. For instance, social support affects the immune function of people under long-term, intense stress. People who have strong social support have stronger immune systems and smaller immune impairments in response to stress than others with less support.

Research has also demonstrated that physical exercise and psychotherapy to reduce stress can enhance immune function in people infected with the AIDS virus.

A related psychosocial modifier involves describing one's feelings about stressful events. An experiment with college student subjects examined the effect of expressing such feelings on blood concentrations of antibodies against the Epstein-Barr virus, a widespread virus that causes mononucleosis in many of those who are infected. The students were randomly assigned to three conditions that met in three weekly 20-minute sessions when they either described verbally or in-writing a highly stressful event they had experienced or wrote about a trivial (non-stress-related) topic, such as the contents of their bedrooms.

The subjects in each condition had the same level of immune control against the virus before the start of the study. But analysis of blood samples taken a week after the last session revealed that immune control improved substantially in the verbal condition, moderately in the written condition, and declined slightly in the control (trivial topic) condition. The influence of optimism on immune function appears to depend on whether the stress is short- term or chronic.

Lifestyles and Immune Function

Do people's lifestyles affect the functioning of their Immune systems? Some evidence suggests that they do. People with generally healthful lifestyles— including exercising, getting enough sleep, eating balanced meals, and not smoking—show stronger immune functioning than those with less healthful lifestyles. Other studies have found that sleeping poorly impairs immune function the next day and people who smoke are more susceptible to catching colds.

In summary, stress affects health in two ways. First, stress can affect health-related behaviors, such as alcohol and cigarette use. Second, it produces changes in the body's physical systems, as when the endocrine system releases catecholamines and corticosteroids, which can cause damage to the heart and blood vessels and impair immune system functioning. The physical effects of intense stress can even lead to sudden death. Psychoneuroimmunology is a new field of study that focuses on how psychosocial processes and the nervous, endocrine, and immune systems are interrelated.

Stress also plays a role in many psychophysiological disorders, such as ulcers, asthma, tension-type and migraine headache, rheumatoid arthritis, and several skin disorders. In addition, stress is implicated in the development of hypertension, CHD, and cancer. We will study these psychophysiological disorders in detail in our later coming lectures.

LESSON 20**COPING WITH STRESS****Prologue**

One morning while taking a shower, David felt a small lump in his chest. He was sure it had not been there before. It didn't hurt, but he was momentarily alarmed— his father had had chest cancer a few years before. It could be a pimple or some other benign growth.” he thought. Still, it was very worrisome. He decided not to tell his wife or his physician about it yet because as he thought, it may not be anything” Over the next several days, he examined the lump daily. This was a very stressful time for him; and he slept poorly and seemed preoccupied. After a week without the lump changing, he decided to take action. He told his wife about the lump and made an appointment to see the physician.

Another man, Jack, had a similar experience. Finding a lump on his chest alarmed him, but he didn't deal with the stress as rationally as David did. Jack's initial fright led him to reexamine his chest just once, and in a cursory way. He told himself, “There isn't really a lump on my chest, it's just a rough spot: And he convinced himself that he should not touch it because, he thought, “That will only make it worse.” During the next few months, Jack was quite worried about the “rough spot.” He studiously avoided touching it, even while washing. He became increasingly moody, slept poorly and developed many more headaches than usual. He also told his wife that he didn't like his body to be touched. When she asked why he was acting so differently in recent weeks, he denied that anything was wrong. Jack finally mentioned the “rough spot” to a friend who convinced him to have his physician examine it.

People vary in the ways they deal with stress. Sometimes people confront a problem directly and rationally, as David did, and sometimes they do not. For these two men, the way they dealt with their stress had the potential for affecting their health. Because Jack did not face up to the reality of the lump, he delayed seeking medical attention and experienced high levels of stress for a long time. If the lump were malignant, delaying treatment would allow the cancer to progress and spread. As we have seen, prolonged stress can have adverse health effects even in healthy people.

In this lecture we will discuss the ways people can and do deal with stress. Through this discussion, you will find answers to questions you may have about the methods people use in handling stress. Are some methods for coping with stress more effective than others? In the coming lectures we will discuss how people can reduce the potential for stress in their lives. Also, when people encounter a stressor, how can they manage and reduce the strain it produces?

Coping With Stress

Individuals of all ages experience stress and try to deal with it. During childhood years, people learn ways to manage feelings of stress that arise from the many fearful situations they experience.

What is coping?

Because the emotional and physical strain that accompanies stress is uncomfortable, people are motivated to do things to reduce their stress. These things” are what is involved in coping.

What is coping? Several definitions of coping exist. We will use a definition that is consistent with the way we defined stress earlier. Earlier we saw that stress involves a perceived discrepancy between the demands of the situation and the resources of the person. Since people engage in coping in an effort to neutralize or reduce stress, coping activities are geared toward decreasing the person's appraisal of or concern for this discrepancy.

Thus, coping is the process by which people try to manage the perceived discrepancy between the demands and resources they appraise in a stressful situation.

The word manage in this definition is important. It indicates that coping efforts can be quite varied and do not necessarily lead to a solution of the problem. Coping efforts can—and, some would argue, should—be aimed at correcting or mastering the problem. But they may also simply help the person alter his or her perception of a discrepancy, tolerate or accept the harm or threat, or escape or avoid the situation.

For example, a child who faces a stressful exam in school might cope by feeling nauseated and staying home. We cope with stress through our cognitive and behavioral transactions with the environment. Suppose you are overweight and smoke cigarettes, and your physician has asked you to lose weight and stop smoking because several factors place you at very high risk for developing heart disease. You have a threat: you may become disabled or die. This is stressful, but you don't think you can change your behavior. How might you cope with this? Some people would cope by seeking information about ways to improve their ability to change. Other people would simply find another doctor who is not so directive. Others would attribute their health to fate or the will of God," and leave the problem "in His hands." Still others may try to deaden this and other worries with alcohol or other similar substances, which would add to the risk. People use many different methods to try to manage the appraised discrepancy between the demands of the situation and their resources. This is called the coping process.

The coping process is not a single event. Because coping involves ongoing transactions with the environment, the process is best viewed as a dynamic series of continuous appraisals and reappraisals of the shifting person—environment relationships. Shifts may be the result of coping efforts directed at changing the environment, or coping directed inward that changes the meaning of the event or increases understanding. They may also be the result of changes in the environment that are independent of the person and his or her coping activity. Regardless of its source, any shift in the person—environment relationship will lead to a re-evaluation of what is happening, its significance, and what can be done. The re-evaluation process, or reappraisal, in turn influences subsequent coping efforts.

And so, in coping with the threat of serious illness, people who make efforts to change their lifestyles may receive encouragement and better relationships with their physician and family. But individuals who ignore the problem are likely to experience worse and worse health and relations with these people. Each shift in one direction or the other is affected by the transactions that preceded it and affects subsequent transactions.

Functions and Methods of Coping

You have probably realized by now that people have an enormous number of ways for coping with stress. Because of this, researchers have attempted to organize coping approaches on the basis of their functions and the methods they employ.

Functions of Coping

According to Richard Lazarus and his colleagues, coping can serve two main functions. It can alter the problem causing the stress or it can regulate the emotional response to the problem.

Emotion-focused coping is aimed at controlling the emotional response to the stressful situation. People can regulate their emotional responses through **behavioral** and **cognitive** approaches. Examples of behavioral approaches include using alcohol or drugs, seeking emotional social support from friends or relatives, and engaging in activities, such as sports or watching TV, that distract one's attention from the problem.

Cognitive approaches involve how people think about the stressful situation. In one cognitive approach, people change the meaning of the situation—for example, by deciding, "There are worse things in life than having to change jobs because of my heart condition," or, "Now that my girlfriend has left me, I realize that I really didn't need her." Another cognitive approach involves denying unpleasant facts, as Jack did with the lump on his chest.

People tend to use emotion-focused approaches when they believe they can do nothing to change the stressful conditions. An example of this is when a loved one dies—in this situation, people often seek emotional support and distract themselves with funeral arrangements and chores at home or at work. Other examples can be seen in situations in which individuals believe their resources are not and cannot be adequate to meet the demands of the stressor. A child who tries very hard to be the “straight A” student his or her parents seem to want, but never succeeds, may reappraise the situation and decide, “I don’t need their love.”

Problem-focused coping is aimed at reducing the demands of the stressful situation or expanding the resources to deal with it. Everyday life provides many examples of problem-focused coping, including quitting a stressful job, negotiating an extension for paying some bills, devising a new schedule for studying (and sticking to it), choosing a different career to pursue, seeking medical or psychological treatment, and learning new skills. People tend to use problem-focused approaches when they believe their resources or the demands of the situation are changeable. For example, care-givers of terminally ill patients use problem-focused coping more in the months prior to the death than during bereavement.

Methods of Coping: Skills and Strategies

What, types of skills and strategies do people use in altering the problem or regulating their emotional response when they experience stress? The following list describes several commonly used ways of coping that Susan Folkman, Richard Lazarus, and their colleagues (1986, 1988) identified from their research. The strategies are labeled as serving problem- or emotion- focused coping functions and give examples of cognitive or behavioral efforts a hospital patient might make when using each strategy. Coping methods that focus on emotions are important because they sometimes interfere with getting medical treatment or involve unhealthful behaviors, such as using cigarettes, alcohol, and drugs to reduce tension. People often use these substances in their efforts toward emotion-focused coping.

Ways of Coping with Stressful Situations

Planful problem-solving (problem-focused): analyzing the situation to arrive at solutions and then taking direct action to correct the problem. For instance, Roy, a hospital patient who needs to choose a specialist for a serious illness, might seek and study information about different specialists before choosing.

Confrontive coping (problem-focused): taking assertive action, often involving anger or risk-taking, to change the situation. For example, if Roy’s medical insurance balks at paying for a desired treatment, he might stand his ground and fight for payment.

Seeking social support (can be problem-or emotion-focused): trying to acquire informational or emotional support. For instance, Roy might ask friends and nurses about different specialists (informational support with a problem-focused function) and describe his worries to get comfort and encouragement from people he loves (emotion-focused function).

Distancing (emotion-focused): making cognitive efforts to detach oneself from the situation or create a positive outlook. As an example, Roy might try not to think about the health-related problems he’s facing or try to make light of them.

Escape-avoidance (emotion-focused): thinking wishfully about the situation or taking action to escape or avoid it. For instance, Roy might engage in fantasies of miracles or other external happenings that would make his problems go away, or he might try to avoid dealing with the problems by sleeping or using alcohol a lot.

Self-control (emotion-focused): attempting to modulate one’s own feelings or actions in relation to the problem. Roy might hide his feelings to prevent emotional interactions with others or slow down the pace of decision making to prevent impulsive choices.

Accepting responsibility (emotion-focused): acknowledging one’s own role in the problem while also trying to put things right. For example, Roy might lecture himself for not having gotten medical attention sooner and promise to respond to symptoms more promptly in the future.

Positive reappraisal (emotion-focused): trying to create a positive meaning from the situation in terms of personal growth, sometimes with a religious tone. For instance, Roy might become a better or stronger person from the experience or feel that he has developed a stronger faith.

Each of these strategies is quite broad and can be applied in many ways and situations. To clarify how people use emotion-focused methods, we can describe some variations on the strategies described above. For instance, people may engage in a coping method called **Emotional discharge**, which involves expressing or releasing their feelings about a stressful situation. This approach usually occurs in conjunction with **seeking social support**, such as with friends or family or in support groups, and can also involve using jokes or gallows humor. For instance, a man jokingly nicknamed himself “Semicolon” after part of his cancerous colon was removed.

Cognitive redefinition is a strategy whereby people try to put a good face on a bad situation, such as by noting that things could be worse, making comparisons with individuals who are less well off, or seeing something good growing out of the problem.

People who want to redefine a stressful situation can generally find a way to do it since there is almost always some aspect of one’s life that can be viewed positively (Taylor, 1983). Optimistic individuals are more likely than pessimists to use problem-focused methods and to redefine their situation in a positive way.

LESSON 21**REDUCING THE POTENTIAL FOR STRESS**

Can people become “immune” to the impact of stress to some extent? Some aspects of people’s lives can reduce the potential for stressors to develop and help individuals cope with problems when they occur. Prevention is the first line of defense against the impact of stress. We will look at several ways people can help themselves and others prevent and cope with stress. The first approach makes use of the beneficial effects of social support.

Enhancing Social Support

We have all turned to others for help and comfort when under stress at some time in our lives, if you have ever had to endure troubled times on your own, you know how important social support can be. But social support is not only helpful after stressors appear, it also can help avert problems in the first place. Consider, for example, the tangible support newly-weds receive when they get married. The gifts they receive include many of the items they will need to set up a household, without which the couple would be saddled either with the financial burden of buying the items or with the hassles of not having them.

Although there are people in all walks of life who lack the social support they need, some segments of the population have even less social support than others. For instance:

- Although men tend to have larger social networks than women, women seem to use theirs more effectively for support.
- Many elderly individuals live in isolated conditions and have few people on whom to rely.
- Network size is related to social prestige, income, and education: the lower the prestige, income, and education level of individuals, the smaller their social networks tend to be.

Furthermore, the networks of people from lower socioeconomic classes are usually less diverse than those of people from higher classes—that is, lower- class networks contain fewer non-kin members. In contemporary American society, the traditional sources of support have shifted to include greater reliance on individuals in social and helping organizations. This is partly because extended family members today have different functions and live farther apart than they did many decades ago.

Social support is a dynamic process. People’s needs for giving of, and receipt of support change over time. Some factors within the individual determine whether he or she will receive or provide social support when it is needed. One factor is the person’s **temperament**. People differ in their need for and interest in social contact and affiliation. Those persons who tend to seek interaction with others are more likely to give and receive support than those who do not. To some extent the experiences people have determine these tendencies. Children who grow up in caring families and have good relations with peers learn the social skills needed to seek help and give it when needed. But research has found that people who experience high levels of chronic stress, such as when their health declines severely, often find that their social support resources deteriorate at the same time. These results are disheartening because they suggest that people whose need for social support is greatest may be unlikely to receive it.

Efforts to enhance people’s ability to give and receive social support can begin in early childhood, particularly at school. Teachers can enhance children’s giving social support by reading appropriate storybooks to the class and by having boys and girls engage in cooperative games that promote prolonged interactions with one another. These experiences can teach children how to talk nicely to and compliment

others, share and take turns, include individuals, who have been left out in activities, and help people who are injured or having difficulty.

In adulthood, people can enhance their ability to give and receive social support by joining community organizations, such as social, religious, special interest, and self-help groups. These organizations have the advantage of bringing together individuals with similar problems and interests, which can become the basis for sharing, helping, and friendship. In the United States, there are many widely known self-help groups, including Alcoholics Anonymous and Parents without Partners, and special-interest groups, including the American Association of Retired People and support groups for people with specific illnesses, such as arthritis or AIDS. Individuals with serious illnesses are most likely to join a support group if they have an embarrassing or stigmatizing disorder, such as AIDS or breast cancer. Isolated people of all ages—especially the elderly—with all types of difficulties should be encouraged to join suitable organizations.

Communities can play a valuable role in enhancing people's resources for social support by creating programs to help individuals develop social networks. Social support can also be encouraged in occupational settings. Employers can do this in many ways, such as by organizing workers in teams or work groups, providing facilities for recreation and fitness, arranging social events for workers and their families, and providing counseling services to help employees through troubled times. Some bosses get so caught up in the role of manager that they fail to give the personal support their employees need. A supportive boss discusses decisions and problems with employees, compliments and credits them for good work, and stands behind reasonable decisions they make. Less supportive bosses can make a conscious effort to improve these behaviors.

Although social support is generally helpful and appreciated, it isn't always. Sometimes, well-meaning efforts by friends and relatives can undermine good health habits and impair the recovery of people who are ill. Social support can also be ineffective if the recipient interprets it as a sign of inadequacy, feels uncomfortable about not being able to reciprocate, or believes his or her personal control is limited by it. Providing effective social support requires sensitivity and good judgment.

Improving One's Personal Control

When life becomes stressful, people who lack a strong sense of personal control may stop trying, thinking, "Oh, what's the use." Instead of feeling they have power and control; they feel helpless and afraid that their efforts will lead to failure and embarrassment. For instance, people with painful, disabling, or life-threatening chronic illnesses may stop trying to improve their conditions. When seriously ill patients who feel little personal control face a new severe stressor, they show more emotional distress and, perhaps, less effective endocrine function than those who feel more control. The main psychological help such people need is to boost their self-efficacy and reduce their passiveness and helplessness. A pessimistic outlook increases people's potential for stress and can have a negative effect on their health.

How can a person's sense of control be enhanced?

The process can begin very early. Parents, teachers, and other caregivers can show a child their love and respect, provide a stimulating environment, encourage and praise the child's accomplishments, and set reasonable standards of conduct and performance that he or she can regard as challenges, rather than threats. Doing these things is likely also to enhance the child's resilience or hardiness, and hardy individuals tend to use coping strategies that manage their stress effectively.

Adults' personal control can be enhanced, too. Employers can help by giving workers some degree of control over aspects of their jobs, allowing them input in decisions about the hours they work, which tasks to work on, and ways to improve the quality of their work. For people with serious chronic illnesses, health psychologists can help those with little control by training them in effective ways to cope with stress.

Organizing One's World Better

“Where did I put my keys?” you have surely heard someone ask frantically while running late to make an appointment. People often feel stress because they are running late or believe they don't have enough time to do the tasks of the day. They need to organize their worlds to make things happen efficiently. This can take the form of keeping an appointment calendar, designating certain places for certain items, or putting materials in alphabetized file folders, for instance. Organizing one's world reduces frustration, wasted time, and the potential for stress.

An important approach for organizing one's time is called **time management**. It consists of three elements. The first element is to set goals. These goals should be reasonable or obtainable ones, and they should include long-term goals, such as getting a job promotion next year, and short-term ones, such as meeting a weekly sales quota. The second element involves making daily To-Do Lists with priorities indicated, keeping the goals in mind. These lists should be composed early each morning, or late in the preceding day. Each list must be written—trying to keep the list in your head is unreliable and makes setting priorities difficult. The third element is to set up a schedule for the day, allocating estimated time periods to each item in the list. If an urgent new task arises during the day, the list should be adjusted to include it.

Exercising: Links To Stress and Health

You have probably heard from TV, radio, magazine, and newspaper reports that exercise and physical fitness can protect people from stress and its harmful effects on health. These reports cite a wide range of benefits of exercising from increased intellectual functioning and personal control to decreased anxiety, depression, hostility, and tension. Do exercise and fitness reduce the potential for stress and its effects on health?

Correlational and retrospective studies of this question have found that people who exercise or are physically fit often report less anxiety, depression, and tension in their lives than do people who do not exercise or are less fit.

Preparing For Stressful Events

In our previous lectures we have discussed many types of stressful events, ranging from being stuck in traffic, to starting day care or school, being overloaded with work, going through a divorce, and experiencing a disaster. Preparing for these events often can reduce the potential for stress. For instance, parents can help prepare a child for starting day care by taking the child there in advance to see the place, meet the teacher, and play for a while.

Many studies have been done to determine what methods are effective in preparing people psychologically for surgery. The most clearly effective methods of preparing people for the stress of surgery are those designed to enhance the patients' feelings of control. Health psychologists play key roles in dealing with all these issues.

In the next lecture, we will consider ways to manage stress, that is, reduce the reaction to stress once it has begun.

LESSON 22**STRESS MANAGEMENT**

In our previous lecture, we discussed several methods that are helpful in reducing the potential for stress and, thereby, benefiting health. These methods take advantage of the stress-moderating effects of social support, personal control, exercise, being well organized, and being prepared for an impending stressor. In this lecture we will consider ways to reduce the reaction to stress once it has begun.

Reducing Stress Reactions: Stress Management

People acquire coping skills through their experiences, which may involve strategies they have tried in the past or methods they have seen others use. But sometimes the skills they have learned are not adequate for a current stressor because it is so strong, novel, or unrelenting. In some cases, the approaches they have acquired reduces stress in the short run— as alcohol or cigarette smoking can do—but are not adaptive and increase stress in the long run. These problems in coping often arise in individuals whose potential for stress is high because of a lack of social support, personal control, and so on; but coping problems also happen among people whose potential for stress is relatively low. When people cannot cope effectively, they need help in learning new and adaptive ways of managing stress.

Many techniques are available to help individuals manage stress. These stress management techniques are mainly psychological, but pharmacological approaches are also used sometimes under medical supervision.

Medication

Of the many types of drugs physicians prescribe to help patients manage stress, we will consider two: **Benzodiazepines** and **Beta-blockers**.

Both of these drugs reduce physiological arousal and feelings of anxiety. Benzodiazepines appear to work by activating a neuro-transmitter that decreases neural transmission in the central nervous system. Beta-blockers appear to block the activity of sympathetic neurons in the peripheral nervous system that are stimulated by epinephrine and nor-epinephrine.

Beta-blockers cause less drowsiness than benzodiazepines, probably because they act on the peripheral rather than central nervous system. Using drugs to manage stress should be only a temporary measure, either to help during an acute crisis, such as in the week or two following the death of a loved one, or while the patient learns new psychological methods for coping. But more and more people are relying on drugs for long-term control of their stress and emotions.

Behavioral and Cognitive Methods

Psychologists have developed methods they can train people to use in coping with stress. Some of these techniques focus mainly on the person's behavior, and some emphasize the person's thinking processes. People who use these methods usually find them helpful.

Relaxation

The opposite of arousal is relaxation—so relaxing should be a good way to reduce stress. “Perhaps so, you say, but when stress appears, relaxing is easier said than done. Actually, relaxing when under stress is not so hard to do when you know how. One technique people can learn to control their feelings of tension is called progressive muscle relaxation (or just progressive relaxation), in which they focus their attention on specific muscle groups while alternately tightening and relaxing these muscles.

The idea of teaching people to relax their skeletal muscles to reduce psychological stress was proposed many years ago by Edmund Jacobson (1938). He developed a device to measure electrical activity in muscle fibers. Using this device, he found that people would reduce the tension in their muscles when simply asked to “sit and relax.” He later found that muscle tension could be reduced much more if the subjects were

taught to pay attention to the sensations as they tense and relax individual groups of muscles. Research findings indicate that one reason muscle relaxation reduces psychological stress is that the technique tends to arouse pleasant thoughts in the person.

Although there are various versions of the progressive muscle relaxation technique, they each outline a particular sequence of muscle groups for the person to follow. For example, the sequence might begin with the person relaxing the hands, then the forehead, followed by the lower face, the neck, the stomach, and, finally, the legs. For each muscle group, the person first tenses the muscles for 7–10 seconds, and then relaxes them for about 15 seconds; paying attention to how the muscles feel. This is usually repeated for the same muscle group two or three times in a relaxation session, which generally lasts 20 or 30 minutes. The relaxation technique works best in a quiet, non-distracting setting with the person lying down or sitting on comfortable furniture.

Stress management has been applied mainly with adults, but children also experience stress without being able to cope effectively. Fortunately, many behavioral and cognitive methods are easy to learn and can be adapted so that an adult can teach a young child to use them. Relaxation exercises provide a good example. An adult could start by showing the child what relaxing is like by lifting and then releasing the arms and legs of a rag doll, allowing them to fall down: Then, the adult would follow a protocol, or script, giving instructions to relax. When children and adults first learn progressive muscle relaxation, they sometimes don't actually relax their muscles when told to do so. Instead of letting their arms and legs fall down, they move them down.

They also sometimes tense more muscles than they are asked to—for example, tightening facial muscles when they are supposed to tense only hand muscles. These errors should be pointed out and corrected.

Often, after individuals have thoroughly mastered the relaxation procedure, they can gradually shorten the procedure so they can apply a very quick version in times of stress, such as when they are about to give a speech. This quick version might have the following steps: (1) taking a deep breath, and letting it out; (2) saying to oneself, “Relax, feel nice and calm”; and (3) thinking about a pleasant thought for a few seconds. In this way, relaxation methods can be directly applied to help people cope with everyday stressful events.

Research has demonstrated that progressive muscle relaxation is highly effective in reducing stress. What's more, people who receive training in relaxation show less cardiovascular reactivity to stressors and stronger immune function.

Systematic Desensitization

Although relaxation is often successful by itself in helping people cope, it is frequently used in conjunction with systematic desensitization, a useful method for reducing fear and anxiety. This method is based on the view that fears are learned by classical conditioning—that is, by associating a situation or object with an unpleasant event. This can happen, for example, if a person associates visits to the dentist with pain, thereby becoming “sensitized” to dentists.

According to Joseph Wolpe, an originator of the desensitization method, the reversal comes about through the process of counter-conditioning, whereby the “calm” response gradually replaces the “fear” response. Desensitization has been used successfully in reducing a variety of children's and adults' fears, such as fear of dentists, animals, high places, public speaking, and taking tests.

An important feature of the systematic desensitization method is that it uses a stimulus hierarchy—a graded sequence of approximations to the conditioned stimulus, the feared situation. The purpose of these approximations is to bring the person gradually in contact with the source of fear in about 10 or 15 steps. To see how a stimulus hierarchy might be constructed, we will look at the one in the following example that deals with the fear of dentists. The person would follow the instructions in each of the 14 steps.

Example of a Stimulus Hierarchy for a Fear of Dentists

1. Think about being in the dentist's waiting room, simply accompanying someone else who is there for an examination.
2. Look at a photograph of a smiling person seated in a dental chair.
3. Imagine this person calmly having a dental examination.
4. Think about calling the dentist for an appointment.
5. Actually call for the appointment.
6. Sit in a car outside the dentist's office without having an appointment.
7. Sit in the dentist's waiting room and hear the nurse say, 'The hygienist is ready for you'.
8. Sit in the examination room and hear the hygienist say, 'I see one tooth the dentist will need to look at.'
9. Hear and watch the drill run, without its being brought near the face.
10. Have the dentist pick at the tooth with an instrument.
11. See the dentist lay out the instruments, including a syringe to administer an anesthetic.
12. Feel the needle touch the gums.
13. Imagine having the tooth drilled.
14. Imagine having the tooth pulled.

As you can see, some of the steps involve real-life, or in vivo, contacts with the feared situation and some do not. Two types of non-real-life contacts, of varying degrees, can be included. One type uses imaginary situations, such as having the person think about calling the dentist. The other involves symbolic contacts, such as by showing pictures, films, or models of the feared situation.

The systematic desensitization procedure starts by having the person do relaxation exercises. Then the steps in a hierarchy are presented individually, while the person is relaxed and comfortable. The steps follow a sequence from the least to the most fearful for the individual. Each step may elicit some wariness or fear behavior, but the person is encouraged to relax. Once the wariness at one step has passed and the person is calm, the next step in the hierarchy can be introduced.

Completing an entire stimulus hierarchy and reducing a fairly strong fear can be achieved fairly quickly—it is likely to take several hours, divided into several separate sessions. In one study with dental-phobic adults who simply imagined each step in a hierarchy, the procedure successfully reduced their fear in six 1 1/2-hour sessions. Individual sessions for reducing fears in children are usually much shorter than those used with adults, especially for a child who is very young and has a short attention span.

Biofeedback

Biofeedback is a technique in which an electromechanical device monitors the status of a person's physiological processes, such as heart rate or muscle tension, and immediately reports that information back to the individual. This information enables the person to gain voluntary control over these processes through operant conditioning. If, for instance, the person is trying to reduce neck-muscle tension and the device reports that the tension has just decreased, this information reinforces whatever efforts the individual made to accomplish this decrease.

Biofeedback has been used successfully in treating stress-related health problems. For example, an experiment was conducted with patients suffering from chronic muscle-contraction headaches. Those who were given biofeedback regarding muscle tension in their foreheads later showed less tension in those muscles and reported having fewer headaches than subjects in control groups. What's more, these benefits continued at a follow-up after 3 months. Biofeedback seems to be about as effective as progressive muscle relaxation methods for treating headache.

Modeling

People learn not just by doing, but also by observing. They see what others do and the consequences of the behavior these models perform. As a result, this kind of learning is called modeling, and sometimes “observational” or social learning.

People can learn fears and other stress-related behavior by observing fearful behavior in other individuals. In one study, children (with their parents’ permission) watched a short film showing a 5-year-old boy’s reaction to plastic figures of the cartoon characters Mickey Mouse and Donald Duck. In the film when the boy’s mother showed him the Mickey Mouse figure, he screamed and withdrew; but when she showed him the Donald Duck figure, he remained calm and displayed no distress. While the subjects watched the film, physiological measures of stress were taken, confirming that the children were more aroused while watching the episode with Mickey Mouse (fearful) than while watching the one with Donald Duck. After the children watched these scenes, they each participated in a task that involved the two figures from the film. At this time, they tended to avoid the Mickey Mouse figure (the stressful one) in favor of Donald Duck.

Since people can learn stressful reactions by observing these behaviors in others, modeling should be effective in reversing this learning and helping people cope with stressors, too. A large body of research has confirmed that it is. The therapeutic use of modeling is similar to the method of desensitization:

The person relaxes while watching a model calmly perform a series of activities arranged as a stimulus hierarchy—that is, from least to most stressful. The modeling procedure can be presented symbolically, using films or videotapes, or in vivo, with real-life models and events.

Approaches Focusing on Cognitive Processes

Because stress results from cognitive appraisals that are frequently based on a lack of information, misperceptions, or irrational beliefs, some approaches to modify people’s behavior and thought patterns have been developed to help them cope better with the stress they experience. To achieve this goal, these methods guide people toward what Arnold Lazarus (1971) has called a “restructuring” of their thought patterns or “Cognitive Restructuring”.

Cognitive restructuring is a process by which stress-provoking thoughts or beliefs are replaced with more constructive or realistic ones that reduce the person’s appraisal of threat or harm.

A widely known approach that focuses on cognitive restructuring is rational-emotive therapy (RET), which was developed by Albert Ellis. RET is based on the view that stress often arises from faulty or irrational ways of thinking. These ways of thinking affect stress appraisal processes, increasing the appraisal of threat or harm.

To illustrate how irrational thoughts can increase stress and lead to psychological problems, consider the case of a college baseball player, nicknamed “Bart,” who was not hitting up to expectations, and was very depressed about his poor performance. In talking with Bart, it quickly became apparent that his own expectations were unrealistic.

For instance, Bart wanted to hit the ball so hard that it would literally be bent out of shape (if someone happened to find it in the next county!). After a particularly bad batting session, he would go home and continue to practice until he was immobilized with exhaustion. Simply put, he believed that if an athlete was not performing well, this could only mean he was not trying hard enough.

Bart’s therapy involved progressive muscle relaxation and cognitive methods to help him realize two important things. First, although motivation and desire do increase performance, they do so only up to a point, after which additional motivation impair performance. Second, although hitting very well is nice,

hitting moderately well is not “terrible” or “intolerable”. These realizations restructured Bart’s thinking about his performance, and his batting average increased dramatically. Similar methods can help people reduce irrational thoughts that lead to their debilitating feelings of anxiety and depression.

There are other approaches also to manage stresses that include Meditation, Hypnosis, and Massage. These approaches are and can be used in conjunction with the techniques described above. But we will not go into the details of these approaches here.

LESSON 23**THE PHENOMENON OF PAIN
ITS NATURE AND TYPES**

Wouldn't it be wonderful never to experience pain, many people have thought when they or others they have known were suffering. Pain hurts, and people typically dislike it and try to avoid it. But being able to sense pain is critical to our survival—without it, how would we know when we are injured? We could have a sprained ankle or an ulcer, for instance, without realizing it, and not seek treatment. And how would we know we are about to be injured, such as when we approach a hot flame without seeing it? Pain serves as a signal to take protective action.

Are there people who do not feel pain? Yes—several disorders can reduce or eliminate the ability to sense pain. People with a condition called **congenital insensitivity to pain**, which is present from birth, may report only a “tingling” or “itching” sensation when seriously injured. A young woman with this disorder seemed normal in every way, except that she had never felt pain. As a child she had bitten off the tip of her tongue while chewing food, and had suffered third-degree burns after kneeling on a hot radiator to look out of a window. When examined by a psychologist, in the laboratory, she reported no pain when parts of her body were subjected to strong electric shock, to hot water at temperatures that usually produce reports of burning pain, or to a prolonged ice-bath. Equally astonishing was the fact that she showed no changes in blood pressure, heart rate, or respiration when these stimuli were presented. Furthermore, she could not remember ever sneezing or coughing, the gag reflex could be elicited only with great difficulty, and the cornea reflexes (to protect the eyes) were absent. This disorder contributed to her death at the age of 29.

People with congenital insensitivity to pain often die young because injuries or illnesses, such as acute appendicitis, go unnoticed.

Health psychologists study pain because it influences whether individuals seek and comply with medical treatment and because being in pain can be very stressful, particularly when it is intense or enduring. In this and coming lectures we will examine the nature and symptoms of pain, and the effects it has on its victims when it is severe. As we consider these topics, you will find answers to questions you may have about pain. What is pain, and what is the physical basis for it? Can people feel pain when there is no underlying physical disorder? Do psychosocial factors affect our experience of pain? Since pain is a subjective experience, how do psychologists assess how much pain a person feels?

What is Pain?

Pain is the sensory and emotional experience of discomfort, which is usually associated with actual or threatened tissue damage or irritation (Sanders, 1985). Virtually all people experience pain and at all ages—from the pains of birth for mother and baby, to those of tummy ache and teething in infancy, to those of injury and illness in childhood and adulthood. Some pain becomes chronic, as with arthritis, problems of the lower back, migraine headache, or cancer.

People's experience with pain is important for several reasons. For one thing, no medical complaint is more common than pain. According to researcher Paul Karoly, “pain is the most pervasive symptom in medical practice, the most frequently stated ‘cause’ of disability, and the single most compelling force underlying an individual's choice to seek or avoid medical care” (1985, p.461). As we know that people are more likely to seek medical treatment without delay if they feel pain. Also, severe and prolonged pain can come to dominate the lives of its victims, impairing their general functioning, ability to work, social relationships, and emotional adjustment.

Last, pain has enormous social and economic effects on all societies of the world. In the United States at any given time, a third or more people suffer from one or more continuous or recurrent painful conditions that require medical care, and tens of millions of these people are partially or completely disabled by their

conditions. Americans spend tens of billions of dollars each year on pain-related expenses, such as for treatment, loss of income, disability payments, and litigation.

The Qualities and Dimensions of Pain

Our sensations of pain can be quite varied and have many different qualities. We might describe some pains as “sharp” and others as “dull,” for example— and sharp pains can have either a stabbing or pricking feel. Some pains involve a burning sensation, and others have a cramping, itching, or aching feel. And some pains are throbbing, or constant, or shooting, or pervasive, or localized. Often the feelings we experience depend on the kinds of irritation or damage that has occurred and the location. For instance, when damage occurs deep within the body, individuals usually report feeling a “dull” or “aching” pain; but damage produced by a brief noxious event to the skin is often described as “sharp”.

The painful conditions people experience also differ in how the pain originates and how long it lasts. We will consider two dimensions that describe these differences, beginning with the degree to which the origin of the pain can be traced to tissue damage.

Organic Versus Psychogenic Pain

People who suffer physical injuries, such as a serious burn, experience pain that is clearly linked to tissue damage. When discomfort is caused mainly by tissue damage, it is described as organic pain. For other pains, no tissue damage appears to exist—at least, medical examinations fail to find an organic basis. The discomfort involved in these pains seems to result primarily from psychological processes. For this reason, this type of discomfort is described as psychogenic pain. I once witnessed an extreme example of psychogenic pain in a schizophrenic man: he claimed—and really looked like—he was “feeling” stings from being “shot by enemy agents with laser guns.”

Not long ago, researchers considered organic and psychogenic pain to be separate entities, with psychogenic pain not involving “real” sensations. As pain researcher Donald Bakal has noted, a practitioner’s reference to pain as “psychogenic” was taken to mean “due to psychological causes,” which implied that the patient was “imagining” his pain or that it was not really pain simply because an organic basis could not be found. Psychogenic pain is not experienced differently, however, from that arising from physical disease or injury. Psychogenic and organic pain both hurt.

Researchers now recognize that virtually all pain experiences involve an interplay of both physiological and psychological factors. As a result, the dimension of pain involving organic and psychogenic causes is viewed as a continuum rather than a dichotomy. Different pain experiences simply involve different mixtures of organic and psychogenic factors. A mixture of these factors seems clear in the findings that many people with tissue damage experience little or no pain, others without damage report severe pain, and the role of psychological factors in people’s pain increases when the condition is long lasting. When people experience chronic pain with no detectable physical basis, psychiatrists diagnose the condition as a pain disorder (classified within somatoform disorders) and often assume the origin is mainly psychogenic. Keep in mind, however, that failing to find a physical basis for someone’s pain does not necessarily mean there is none. Unfortunately, many health care workers still think pain that has no demonstrated physical basis is purely psychogenic, and their patients struggle to prove that “the pain isn’t just in my head, Doc” (Karoly, 1985).

Acute versus Chronic Pain

Experiencing pain either continuously or frequently over a period of many months or years is different from having occasional and isolated short-term bouts with pain. The length of experience an individual has had with a painful condition is an important dimension in describing his or her pain.

Most of the painful conditions people experience are temporary—the pain arrives and then subsides in a matter of minutes, days, or even weeks, often with the aid of painkillers or other treatments prescribed by a

physician. If a similar painful condition occurs in the future, it is not connected in a direct way to the earlier experience. This is the case for most everyday headaches, for instance, and for the pain typically produced by such conditions as toothaches, muscle strains, accidental wounds, and surgeries.

Acute pain refers to the discomfort people experience with temporary painful conditions that last less than 6 months or so. Patients with acute pain often have higher than normal levels of anxiety while the pain exists, but their distress subsides as their conditions improve and their pain decreases.

When a painful condition lasts for more than 6 months, it is called chronic. People with chronic pain continue to have high levels of anxiety and tend to develop feelings of hopelessness and helplessness because various medical treatments have not helped. Pain interferes with their daily activities, goals, and sleep; and it can come to dominate their lives. Pain patients frequently say that they could stand their pain much better if they could only get a good night's sleep... They feel worn down, worn out, exhausted. They find themselves getting more and more irritable with their families, they have fewer and fewer friends, and fewer and fewer interests. Gradually, as time goes by, the boundaries of their world seem to shrink. They become more and more preoccupied with their pain, less and less interested in the world around them. Their world begins to center around home, doctor's office, and pharmacy.

Although pain itself can interfere with sleep, intrusive thoughts and worry before getting to sleep may be a more important factor. Another problem of people with chronic pain is that many leave their jobs for emotional and physical reasons and must live on reduced incomes at the same time that their medical bills are piling up. The experience of pain is very different when the condition is chronic than when it is acute.

The effects of chronic pain also depend on whether the underlying condition is benign (harmless) or is malignant (injurious) and worsening and whether the discomfort exists continuously or occurs in frequent and intense episodes. Using these factors, researchers have described three types of chronic pain:

1. Chronic-recurrent pain stems from benign causes and is characterized by repeated and intense episodes of pain separated by periods without pain. Two examples of chronic-recurrent pain are migraine headaches and tension-type (muscle-contraction) headaches.
2. Chronic-intractable-benign pain refers to discomfort that is typically present all of the time, with varying levels of intensity, and is not related to an underlying malignant condition. Chronic low back pain often has this pattern.
3. Chronic-progressive pain is characterized by continuous discomfort, is associated with a malignant condition, and becomes increasingly intense as the underlying condition worsens. Two of the most prominent malignant conditions that frequently produce chronic-progressive pain are rheumatoid arthritis and cancer.

As we shall see later in this lecture and in the next one, the type of pain people experience influences their psychosocial adjustment and the treatment they receive to control their discomfort.

Perceiving Pain

Of the several perceptual senses the human body uses, the sense of pain has three important and unique properties. First, although nerve fibers in the body sense and send signals of tissue damage, the receptor cells for pain are different from those of other perceptual systems, such as vision. For instance, the visual system contains specific receptor cells that transmit only messages about a particular type of stimulation—light—there are no specific receptor cells in the body that transmit only information about pain. Second, the body senses pain in response to many types of noxious stimuli, such as physical pressure, lacerations, and intense heat or cold. Third, the perception of pain almost always includes a strong emotional component.

As we are about to see, perceiving pain involves a complex interplay of physiological and psychological processes.

LESSON 24**THE PHYSIOLOGY OF PAIN PERCEPTION**

To describe the physiology of perceiving pain, we will trace the bodily reaction to tissue damage, as when the body receives a cut or burn. The noxious stimulation instantly triggers chemical activity at the site of injury, releasing chemicals called **algogenic substances** that exist naturally in the tissue. These chemicals—which include **Serotonin**, **Histamine**, and **Bradykinin**—promote immune system activity, cause inflammation at the injured site, and activate endings of nerve fibers in the damaged region, signaling injury.

The signal of injury is transmitted by afferent neurons of the peripheral nervous system to the spinal cord, which carries the signal to the brain. The afferent nerve endings in a damaged region of the body that respond to pain stimuli and signal injury are called **Nociceptors**. These fibers have no special structure for detecting injury; they are simply free nerve endings. They may be found in skin, blood vessels, subcutaneous tissue, muscle, joints, and other structures. When activated, these end organs, like other receptors, generate impulses that are transmitted along peripheral fibers to the central nervous system.

Pain signals are carried by afferent peripheral fibers of two types: **A-delta** and **C fibers**. A-delta fibers are coated with myelin, a fatty substance that enables neurons to transmit impulses very quickly. These fibers are associated with sharp, well-localized, and distinct pain experiences. C fibers transmit impulses more slowly—because they are not coated with myelin—and seem to be involved in experiences of diffuse dull, burning or aching pain sensations.

Signals from A-delta and C fibers follow different paths when they reach the brain. A-delta signals, which reflect sharp pain, pass through specific areas of the thalamus on their way to motor and sensory areas of the brain. This suggests that signals of sharp pain receive special attention in our sensory awareness, probably so that we can respond to them quickly. On the other hand, C fiber signals, which reflect burning or aching pain, terminate mainly in the brainstem and lower portions of the forebrain, such as the limbic system, thalamus, and hypothalamus. The remaining C fiber impulses spread to many areas of the brain by connecting with a diffuse network of neurons. Signals of dull pain are less likely to command our immediate attention than those of sharp pain, but are more likely to affect our mood, general emotional state, and motivation.

So far, the description we have given of physiological reactions to tissue damage makes it seem as though the process of perceiving pain is rather straightforward. But it actually isn't. One phenomenon that complicates the picture is that pains originating from internal organs are often perceived as coming from other parts of the body, usually near the surface of the skin. This is called **referred pain**. The pain people often feel in a heart attack provides one of the most widely known examples of this phenomenon: the pain is referred to the shoulders, pectoral area of the chest, and arms. Other examples of referred pain include:

- Pain perceived to be in the shoulder that results from inflammation of the diaphragm.
- Pain in the upper back originating in the stomach.
- Pain in the ear or in the wrong area of the mouth that result from a toothache.

Referred pain results when sensory impulses from an internal organ and the skin use the same pathway in the spinal cord. Because people are more familiar with sensations from the skin than from internal organs, they tend to perceive the spinal cord impulses as coming from the skin. Another issue that complicates our understanding of pain perception is that people feel pains that have no detectable physical basis, as the next section discusses.

Pain without Detectable Body Damage

Some pains people experience are quite mysterious, since they occur with no detectable “reason”—for instance, no noxious stimulus is present. Most of these pain experiences belong to one of three syndromes:

neuralgia, causalgia, and phantom limb pain. These syndromes often begin with tissue damage, such as from an injury, but the pain (1) persists long after healing is complete, (2) may spread and increase in intensity, and (3) may become stronger than the pain experienced with the initial damage.

Neuralgia is an extremely painful syndrome in which the patient experiences recurrent episodes of intense shooting or stabbing pain along the course of a nerve. In one form of this syndrome, called **trigeminal neuralgia**, excruciating spasms of pain occur along the trigeminal nerve that projects throughout the face. Episodes of neuralgia occur very suddenly and without any apparent cause. Curiously, attacks of neuralgia can be provoked more readily by harmless stimuli than by noxious ones. For instance, drawing a cotton ball across the skin can trigger an attack, but a pin prick does not.

Another mysterious pain syndrome is **Causalgia**, which is characterized by recurrent episodes of severe burning pain. A patient with causalgia might report, for instance, that the pain feels like my arm is pressed against a hot stove. In this syndrome, the pain feels as though it originates in a region of the body where the patient had at some earlier time been seriously wounded, such as by a gunshot or stabbing. Curiously, only a small minority of severely wounded patients develops causalgia—but for those who do, the pain persists long after the wound has healed and damaged nerves have regenerated.

Episodes of causalgia often occur spontaneously and may take minutes or hours to subside, but may occur repeatedly each day for years after the injury. The frequency and intensity of the spontaneous pain-attacks may increase over the years, and the pain may even spread to distant areas of the body.

Phantom Limb Pain is an especially puzzling phenomenon because the patient—an amputee or someone whose peripheral nervous system is irreparably damaged—feels pain in a limb that either is no longer there or has no functioning nerves. After an amputation, for instance, most patients claim to have sensations of their limb still being there—such as by feeling it “move”—and most of these individuals report feeling pain, too. Phantom limb pain generally persists for months or years, can be quite severe, and sometimes resembles the pain produced by the injury that required the amputation.

Although the pain tends to decrease over time, it sometimes gets worse. Individuals with phantom limb pain may experience either recurrent or continuous pain and may describe it as shooting, burning, or cramping. For example, many patients who feel pain in a phantom hand report sensing that the hand is tightly clenched and its fingernails are digging into the palm.

Why do people feel pain when no noxious stimulation is present? Perhaps the answer relates to the neural damage that precedes the development of causalgia and phantom limb pain—and perhaps even neuralgia involves neural damage, even though of a less obvious nature, such as from infection. But then why is it that the large majority of patients who suffer obvious neural damage do not develop these curious pain syndromes? Although the puzzle is far from being solved, the explanation will almost surely involve both physiological and psychological factors.

The Role of the “Meaning” of Pain

Some people evidently like pain—at least under some, usually sexual, circumstances—and are described as masochists. For them, the meaning of pain seems to be different from what it is for most people. Some psychologists believe individuals may come to like pain through classical conditioning, that is, by participating in or viewing activities that associate pain with pleasure.

Most of the evidence for the view that the meaning of pain can change by its association with pleasure comes from research with animals. For example, Ivan Pavlov (1927) demonstrated that the dogs’ negative reaction to aversive stimuli, such as electric shocks or skin pricks, changed if the stimuli repeatedly preceded

presentation of food. Eventually, the dogs would try to approach the aversive stimuli, which now signaled that food, not danger, was coming.

Physician Henry Beecher (1956) described a dramatic example of how the meaning of pain affects people's experience of it. During World War II, he had examined soldiers who had recently been very seriously wounded and were in a field hospital for treatment. Of these men, only 49% claimed to be in 'moderate' or "severe" pain and only 32% requested medication when asked if they "wanted something to relieve it."

Some years later, Beecher conducted a similar examination—this time with civilian men who had just undergone surgery. Although the surgical wounds were in the same body regions as those of the soldiers, the soldiers' wounds had been more extensive. Nevertheless, 75% of the civilians claimed to be in "moderate" or "severe" pain and 83% requested medication.

Why did the soldiers—who had more extensive wounds—perceive less pain than the civilians? Beecher described the meaning the injuries had for the soldiers, who had been subjected to almost uninterrupted fire for weeks. Notable in this group of soldiers was their optimistic, even cheerful, state of mind.... They thought the war was over for them and that they would soon be well enough to be sent home. It is not difficult to understand their relief on being delivered from this area of danger. The battlefield wound marked the end of disaster for them.

For the civilian surgical patients, however, the wound marked the start of a personal disaster and their condition represented a major disruption in their lives.

Personal and Social Experiences and Pain

Imagine this scene: little Steve is a year old and is in the pediatrician's office to receive a standard immunization shot, as he has done before. As the physician approaches with the needle, Steve starts to cry and tries to kick the doctor. He is reacting in anticipation of pain—something he learned through classical conditioning when he had received vaccinations before.

Learning and Pain

We learn to associate pain with antecedent cues and its consequences, especially if the pain is severe and repeated, as it usually is with chronic pain. Many individuals who suffer from migraine headaches, for example, often can tell when headaches are on the way because they experience symptoms, such as dizziness, that precede the pain. These symptoms become conditioned stimuli that tend to produce distress, a conditioned response, and may heighten the perception of pain when it arrives. Also, words or concepts that describe the pain people have experienced can become conditioned stimuli and produce conditioned responses.

A study of people who do and do not have migraine headaches measured their physiological arousal in response to pain-related words, such as "throbbing," "sickening," "stabbing," "scalding," and "itching." Migraine sufferers displayed much stronger physiological reactions to these words—especially the words that described their own experience with pain—than those without migraines did. Other findings indicate that people who suffer from chronic pain, such as headaches, show lower discomfort thresholds for pain and non-pain stimuli than others do. Perhaps they learn to notice and react more strongly to low levels of discomfort.

Learning also influences the way people behave when they are in pain. People in pain behave in characteristic ways—they may moan, grimace, or limp, for instance. These actions are called pain behaviors, and generally, they can be classified into four types:

- Facial or audible expression of distress, as when people clench their teeth, moan, or grimace.
- Distorted ambulation or posture, such as moving in a guarded or protective fashion, stooping while walking, or rubbing or holding the painful area.
- Negative affect, such as being irritable.
- Avoidance of activity, as when people lie down frequently during the day, stay home from work, or refrain from motor or strenuous behavior.

Pain behaviors are a part of the sick role, and people in pain may begin to exaggerate these behaviors because, they think, “No one believes me”. Regardless of why the behaviors start, they are often strengthened or maintained by reinforcement in operant conditioning, as Wilbert Fordyce has pointed out (1976; Fordyce). When pain persists and becomes chronic, these behaviors often become part of the person’s habits and lifestyle. People with entrenched patterns of pain behavior usually feel powerless to change.

How Pain Behaviors are Reinforced?

Although being sick or in pain is unpleasant, it sometimes has benefits, or “secondary gains.” Someone who is in pain may be relieved of certain chores around the house or of going to work, for instance. Also, when a person has a painful condition that flares up in certain circumstances, such as when lifting heavy objects, he or she may begin to avoid these activities. In both of these situations, pain behavior is reinforced if the person does not like doing these activities in the first place: getting out of doing them is rewarding.

Another way pain behavior and other sick-role behaviors may be reinforced is if the person receives disability payments. Studies of injured or ill patients who differ in the financial compensation they receive have found that those with greater compensation tend to remain hospitalized and miss work longer, report more chronic pain, and show less success from pain treatments.

Placebos and Pain (Role of Cognitions)

You have probably heard of physicians prescribing a medicine that actually consisted of “sugar pills” when they could not find a physical cause for a patient’s complaints or did not know of any medication that would help. You may also have heard that this treatment sometimes works—the patient claims the symptoms are reduced. An inert substance or procedure that produces an effect is called a placebo. Studies have shown that placebos can often be effective in treating a wide variety of ailments, including coughs, nausea, and hypertension, at least on a temporary basis.

Placebos can also be effective in treating pain. They do not always work, but they seem to produce substantial relief in about half as many patients as do real drugs, such as aspirin or morphine. The effect of placebos depends on the patient’s belief that they will work—for instance, they are more effective:

- With large doses—such as more capsules or larger ones—than with smaller doses.
- When injected than when taken orally.
- When the practitioner indicates explicitly and strongly that they will work.

Unfortunately, however, the effectiveness of placebos in treating pain tends to decline with repeated use.

Social Processes and Pain

People who suffer with pain also receive attention, care, and affection from family and friends, which can provide social reinforcement for pain behavior. Researchers have demonstrated this relationship with both child and adult patients. Karen Gil and her colleagues (1988) conducted a study of parents' reactions to the pain behavior of their children who had a chronic skin disorder with severe itching that should not be scratched since it can cause peeling and infection. The researchers videotaped the behavior of each child and his or her parent in the child's hospital room.

As you might expect, the parents paid attention to the scratching, perhaps because of the harm it can do. But what effect did the attention have? An analysis revealed that parent attention appeared to increase the children's scratching, rather than decrease it, and paying attention to the children when they were not scratching seemed to reduce their scratching behavior.

Research has examined how family members' reactions affect pain behavior. Studies have used questionnaires to assess how patients' pain behaviors relate to their receipt of social rewards, such as being able to avoid disliked social activities or getting from their spouses considerate care, that is, high levels of help and attention. Receiving higher levels of social reward was associated with patients reporting more pain and showing more disability and less activity, such as in visiting friends or going shopping.

Research findings on parents' and spouses' reactions to chronic pain behavior and the social climate within the family system illustrate how each family member's behavior impacts on the behavior of the others. When families lack cohesion or the members are highly attentive to pain behavior without encouraging the patient to become active, they are likely to promote sick-role behavior. These conditions can develop into a vicious circle—for example; solicitousness may lead to more pain behavior, which elicits more solicitousness, and so on.

Showing care and concern when people are in pain is, of course, important and constructive. But the patient's diminished activity may then lead to physical deterioration, such as through muscle atrophy, and lead to progressively more pain and less activity. These social processes in the family system of pain-patients are gradual and insidious—they tend to increase the patients' dependency and decrease their self-efficacy and self-esteem. Self-efficacy is important because people who believe they cannot control their pain very well experience more pain and use more medication than those who believe they can control it.

Gender, Socio-cultural Factors and Pain

Studies have found gender and sociocultural differences in the experience of pain. Men and women appear to differ in the types of pain they experience and reactions to pain, Women have higher incidence rates of pain from arthritis, migraine headache, myofacial neuralgia, and causalgia; but men have a greater incidence of back pain and cardiac pain.

Women tend to report more than men that pain interfered with their daily activities. Surveys of adults in different countries who suffer from chronic low back pain revealed greater work and social impairments among Americans, followed by Italians and New Zealanders, and then by Japanese, Colombian, and Mexican individuals (Sanders et al., 1992). Research on the pain experienced after dental surgery by people from different ethnic groups in the United States found that blacks reported more pain than people of European, Asian, or Hispanic backgrounds, and women in each group reported more pain than men. The reasons for these gender and sociocultural differences are not clear, but they may include differences in the social support and financial consequences these people receive for being sick.

Emotions, Coping Processes and Pain

People in chronic pain experience high levels of anger, fear, and sadness. Pain and emotion are intimately linked, and cognitive processes mediate this link, in a study of these relationships, Gerry Kent (1985) had

dental patients fill out a brief dental anxiety scale while waiting for their appointments. Then they rated the pain they expected in their visits. After the appointment, the patients rated the pain they actually experienced, and rated it again by mail 3 months later. The results revealed that anxiety played a role in their expectations of pain and in their memories of it 3 months later. The patients with high dental anxiety expected and later remembered four times as much pain as they experienced. In contrast, the low-anxiety patients expected and remembered less than twice as much pain as they experienced. These findings suggest that high-anxiety patients' memories of pain are determined more by what they expect than by what they feel.

Does Emotion Affect Pain?

A study of emotion and pain compared the anxiety and stress levels of children who suffered from migraine headache with those of their best friends, and then had the migraine sufferers keep diaries of their headaches over the next 4 months. Although the scores on tests of anxiety and stress were about the same for the two groups and were within the normal range, migraine sufferers with high levels of anxiety had more frequent and severe headaches than those with lower anxiety. Other investigations using self-report methods have found that migraine and muscle-contraction headaches tend to occur after periods of heightened stress and that Type A individuals have more frequent chronic headaches than others do. These studies clearly indicate that stress and headache are related. Has any research shown that stress causes headaches?

Convincing evidence that stress can cause headaches comes from a study with adults who suffered from either chronic headache or only occasional headaches. Before testing a subject, researchers attached sensors to the person's body to take several physiological measurements, such as of heart rate and electrical activity of muscles. A researcher also told the subjects that they "might or might not" experience headache pain in the procedures and that they would rate their perception of pain several times during the study. After sitting quietly for 15 minutes, they were given a stressful task—calculating arithmetic problems, such as $349 + 229$, every 15 seconds for an hour—and told that a buzzer would sound if their performance fell below a norm. Actually, the buzzer sounded periodically regardless of their performance. Then the subjects sat quietly for 10 minutes. How did they react to these conditions? More than two-thirds of the chronic headache sufferers and only one fourth of the occasional sufferers reported developing headaches during the stress task. Ratings of headache pain increased throughout the stress condition, and decreased later while they sat quietly. The headaches tended to resemble tension-type headaches and be preceded by sustained physiological arousal. These are important findings that indicate that stress can cause headaches.

Emotions are also related to other kinds of pain, but whether emotions cause the pain is still in question. Research has demonstrated, for instance, that the amount of pain people with sickle cell disease report increases with the amount of stress they experience each day and with increases in stress during the preceding 2 days. But although people with recurrent low back pain report higher levels of anxiety and tension than pain-free control subjects do, these mood states do not worsen in the day or so preceding pain attacks.

Feelings of depression appear to result from pain people with chronic discomfort experience on previous days, and lead to pain on subsequent days. Pain is itself very stressful, and many people with chronic pain consider their discomfort—the actual pain and the physical limitations it produces—to be the most prominent stressor in their lives. Health psychologists who work with pain patients often try to assess how well they cope with their pain.

Coping with Pain

Part of the stress that chronic pain patients experience stems from their common belief that they have little personal control over their pain, aside from avoiding activities they believe can trigger an attack or make it worse. As a result, they tend to deal with their stress by using emotion-focused coping strategies. That is, rather than trying to alter the problem itself, they try to regulate their emotional responses to it. Some of the

more common coping methods adults and children with chronic pain use include hoping or praying the pain will get better someday and diverting their attention, such as by counting numbers or running a song through their heads. These approaches are not very effective in reducing chronic pain.

How effectively do people cope with pain? Studies that tested pain patients with the MMPI have found some fairly consistent outcomes. These outcomes lead to three conclusions: First, individuals who suffer from various types of chronic pain, such as severe headache and low back pain, show a characteristic MMPI profile with extremely high scores on hypochondriasis, depression, and hysteria—the neurotic triad scales. But their scores on the seven other MMPI scales tend to be well within the normal range. Second, this pattern appears to hold regardless of whether their pain has a known organic source. In other words, people whose pain might be classified as psychogenic by a physician tend to show similar problems of adjustment on the MMPI as those whose pain has a clear organic basis. Third, individuals with acute pain, such as patients recovering from injuries, sometimes have moderately elevated scores on the neurotic triad scales, but these scores and those for the remaining MMPI scales are generally well within the normal range. These findings make sense and reflect the differential psychological impact of pain that patients expect will end soon versus pain they fear will never end. Keep In mind also that people with chronic-recurrent pain conditions show worse psychological symptoms during pain episodes than during pain-free periods.

It is clear that being in frequent, severe discomfort is related to having high scores on the MMPI neurotic triad scales, but does chronic pain cause maladjustment? One school of thought is that the causal sequence may be the other way around—that is, chronic pain may be a symptom of a psychological disorder, such as depression, that preceded the pain syndrome. But most current evidence points in the other direction—indicating, for instance, that people in chronic pain become depressed because of the stress they experience without being able to change their situations. They develop a sense of helplessness, which leads to depression. One type of evidence indicating that pain leads to depression is that people whose pain has ended show substantial reductions in various measures of psychological disturbance.

Of course, this does not mean psychological factors cannot lead to physical pain—for instance, we’ve seen that stress can cause headaches. One study examined this issue prospectively for 8 years and found support for both causal directions. People who are depressed are somewhat more likely than others to develop a chronic pain condition in the future, and people with chronic pain are much more likely than others to become depressed. Pain and maladjustment involve interactive processes, with each feeding on the other overtime, but chronic pain is more likely to lead to maladjustment than the other way around. Also keep in mind that not all patients with severe chronic pain become maladjusted—many adapt to their conditions much better than others do. Coping well with chronic pain is a struggle that unfolds over time, as this arthritis patient noted: Over time I’ve figured out that I can do things to bring on the pain and things that could limit it. I also figured out that my flares won’t last forever, although while they’re happening it seems like forever. It took quite a while to figure that out.

To summarize, the process by which people perceive pain involves a complex chain of physiological and neuro-chemical events. These events can be affected by psychosocial processes, such as people’s beliefs about whether a drug will reduce their discomfort.

Pain also affects and can be influenced by people’s learning, cognition, social experiences, and emotion. Although people can indicate through their behavior that they are feeling pain, the pain they perceive is actually a private and subjective experience.

How can researchers and clinicians who work with patients who have painful symptoms assess the level and type of pain these individuals perceive? We will be answering this question in our next lecture.

LESSON 25**ASSESSING PAIN**

To summarize our previous lecture, the process by which people perceive pain involves a complex chain of physiological and neuro-chemical events. These events can be affected by psychosocial processes, such as people's beliefs about whether a drug will reduce their discomfort.

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Assessing People's Pain

Researchers and clinicians have developed a variety of techniques for assessing people's pain. Although virtually all these methods can be applied both in research and in treating pain patients, some techniques are used more often in research, whereas others are used mostly to supplement a detailed medical history in clinical practice. In either setting, it is advisable to use two or more different measurement techniques to enhance the accuracy of the assessment. We will organize our discussion of techniques for measuring people's pain by classifying them into three groups: self-report methods, behavioral assessment approaches, and psycho-physiological measures.

1. Self-Report Methods

Perhaps the most obvious approach to measuring people's pain is to ask them to describe their discomfort, either in their own words or by filling out a rating scale or questionnaire. In treating a patient's pain, health care workers ask where the pain is, what it feels like, how strong it is, and when it tends to occur. With chronic pain patients, medical and psychological professionals often incorporate this kind of questioning within the structure of a clinical interview.

A. Interview Methods in Assessing Pain

To treat chronic pain effectively, professionals need more information than just a description of the pain. Interviews with the patient and key others, such as family members and coworkers, provide a rich source of background information in the early phases of treatment. These discussions ordinarily focus on such issues as:

- The history of the pain problem, including when it started, how it progressed, and what approaches have been used for controlling it.
- The patient's emotional adjustment, currently and before the pain syndrome began.
- The patient's lifestyle—recreational interests, exercise patterns, diet, and so on—before the pain condition began.
- The pain syndrome's impact on the patient's current lifestyle, interpersonal relations, and work.
- The social context of pain episodes, such as happenings in the family before an attack and how family members respond when the pain occurs.
- Factors that seem to trigger attacks or make them worse.
- How the patient typically tries to cope with the pain.

The information obtained in these interviews can also be supplemented by having the patient and key others fill out questionnaires.

B. Pain Rating Scales

One of the most direct, simple, and commonly used ways to assess pain is to have individuals rate some aspect of their discomfort on a scale. This approach is used very often to measure how strong the pain is.

Because rating scales are so easy and quick to use, people can rate their pain frequently. Averaging these ratings across time gives a more accurate picture of the pain the person generally experiences than individual ratings do. Repeated ratings can also reveal how the pain changed over time, such as during everyday activities or during the course of an experiment. One use of repeated ratings is in showing the ebbs and flows of pain intensity that patients often experience.

For instance, one patient's wife believed that her husband was experiencing incapacitating and severe pain every waking hour of his life. This belief contributed to her preventing him from participating in any but the simplest chores around the house. Their social life had deteriorated, and the couple had grown increasingly depressed over the course of 4 years. Upon hearing that her husband experienced only moderate pain most of the time, that he indeed felt capable of various tasks, and that he actually resented his wife's efforts at pampering him, she was helped to alter her behavior.

Repeated ratings during each day may also reveal patterns in the timing of severe pain. Is the pain most severe in the evening, or on certain days? If so, are there some aspects of the environment that may be responsible and perhaps changeable?

C. Pain Diaries

Pain ratings can also be used in a pain diary, which is a detailed record of a person's pain experiences. The pain diary a patient keeps would include pain ratings and information about the time and circumstances of pain episodes, any medications taken, and comments about each episode.

D. Pain Questionnaires

Pain is only partly described by the intensity of the discomfort people feel—the experience of pain has many qualities and dimensions. Ronald Melzack began to recognize the multidimensional nature of pain through his interactions with pain patients. He described in an interview how this realization emerged from talks he had with a woman who suffered from phantom limb pain. She would describe burning pains that were like a red-hot poker being shoved through her toes and her ankle. She would cry out from the pain in her legs. Of course, there were no legs. Well, that made me realize the utter subjectivity of pain—no objective physical measure is very likely to capture that... I began to write down the words she used to describe her pain. I realized that the words describing the emotional-motivational component of her pain—“exhausting, sickening, terrifying, punishing—were very different from those for the sensory component—shooting, scalding, splitting, cramping.” Later I came to see there was also an evaluative component such as “it's unbearable” or “it's annoying”. I wrote down the words other patients used, too, but I didn't know what to do with them.

Melzack determined that pain involves three broad dimensions—*affective* (emotional-motivational), *sensory* and *evaluative*—by conducting a study in which subjects sorted over 100 pain-related words into separate groups of their own making.

Melzack's research also indicated that each of the three dimensions consisted of sub-classes. For instance, the sensory dimension included a sub-class with the words “hot,” “burning,” “scalding” and “searing”—words relating to temperature. Notice that these four words connote increasingly hot temperatures, with searing being the hottest. Similarly, the affective dimension included a subclass of three words relating to fear: “fearful,” “frightful,” “terrifying.” Then, by determining the degree of pain reflected by each word, Melzack (1975)—a professor at McGill University—was able to construct an instrument to measure pain. This test is called the McGill Pain Questionnaire (MPQ).

2. Behavioral Assessment Approaches

Because people tend to exhibit pain behaviors when they are in discomfort, it should be possible to assess their pain by observing their behavior. A person is likely to show different types and patterns of behavior if the pain is intense as compared to moderate; if it involves a headache as opposed to low back pain; and if chronic pain is recurrent than if it is intractable. Psychologists have developed procedures for assessing pain behavior in two types of situations: in everyday activities and in structured clinical sessions.

A. Assessing Pain Behavior in Structured Clinical Sessions

Procedures are available whereby health care workers can assess the pain behavior of patients in structured sessions that are usually conducted in hospital settings. They are structured by the specific pain behaviors to be assessed and the tasks the patient is asked to perform. One approach of this kind has been developed into a pain assessment instrument—the UAB Pain Behavior Scale—for use by nurses during their standard routines, such as in early morning rounds. The nurse has the patient perform several activities and rates each of 10 behaviors, such as the patient’s mobility and use of medication, on a 3-point scale: “none,” “occasional,” and “frequent.” These ratings are converted into numerical values and summed for a total score.

Some studies using structured clinical sessions have focused on assessing discomfort in individuals suffering from low back pain. Each investigation had patients perform a standard set of activities. In one study, for example, the people were asked to walk, pick up an object on the floor, remove their shoes while sitting, and perform several exercises, such as trunk rotations, toe touching, and sit-ups. Patients in each investigation were videotaped, and trained assessors rated their performance for several pain behaviors, such as guarded movement, rubbing the pain area, grimacing, and sighing. These studies have shown that pain behaviors can be assessed easily and reliably and that behavioral assessments correlate well with patients’ self-ratings of pain.

B. Assessing Pain Behavior in Everyday Activities

How does the pain patient behave in everyday activities especially at home? Does the person spend much time in bed, complain of discomfort a lot, seek help frequently in moving, or walk with a limp most of the time? How much of these behaviors do the person exhibit? Behavioral assessments of everyday activities like these can be made.

Family members or key others in the patient’s life are usually the best people to make these everyday assessments of pain behavior. These people must, of course, be willing to help and be trained to make careful observations and keep accurate records.

Researcher Wilbert Fordyce (1976) has recommended a procedure whereby the assessor—say, the client’s spouse—compiles a list of five to ten behaviors that generally signal when the patient is in pain. Then the spouse is trained to watch for these behaviors, to keep track of the amount of time the patient exhibits them, and to monitor how people, including the assessor, react to the client’s pain behavior. This procedure is useful not only in assessing the patient’s pain experiences but in determining their impact on his or her life and the social context that may maintain pain behaviors.

These supplemental procedures provide additional data that can be of value in dealing with interpersonal issues that influence the pain experience.

3. Psychophysiological Measures

Another approach for assessing pain involves taking measurements of physiological activity, since pain has both sensory and emotional components that can produce changes in bodily functions. Psychophysiology is the study of mental or emotional processes as reflected by changes they produce in physiological activity.

A. One psychophysiological measure researchers have used for assessing pain uses an apparatus called an **Electromyograph (EMG)** to measure the electrical activity in muscles, which reflects their tension. The findings of various researches suggest that differences between pain patients and controls may exist when the subjects' muscles are active. And headache patients show different EMG patterns when they have headaches than when they do not.

B. Researchers have also attempted to assess peoples' pain with **measures of autonomic activity**, such as of heart rate and skin conductance.

Although some measures of autonomic activity may be useful in assessing the emotional component of pain, they are not likely to be very useful because changes in autonomic activity also occur in the absence of the sensation of pain.

C. The last psychophysiological measure of pain we will consider involves the **electrical activity of the brain**, as measured by an **electroencephalograph (EEG)**.

When a person's sensory system detects a stimulus, such as a clicking sound from earphones, the signal to the brain produces a change in EEG voltage. Electrical changes produced by stimuli are called evoked potentials and show up in EEG recordings as sharp surges or peaks in the graph. Pain stimuli produce evoked potentials that vary in magnitude—the amplitudes of the surges increase with the intensity of the stimuli, decrease when subjects take analgesics, and correlate with people's subjective reports of pain.

Even though psychophysiological measures provide objective assessments of bodily changes that occur in response to pain, these changes may also be affected by other factors, such as attention, diet, and stress. In clinical situations, measures of muscle tension, autonomic activity, and evoked potential are probably best used as supplements to self-report and behavioral assessment approaches.

Assessing Pain in Children

When a patient has symptoms that include pain, the physician usually needs to know its location, intensity, quality, duration, and temporal patterning. This information helps in making an accurate diagnosis. Although children's ability to provide this information is limited, especially if they are young, researchers have developed measures that use self-report, behavioral, and physiological methods. Effectively interviewing children requires considerable skill in developing rapport with them, asking the right questions in ways they can understand, and knowing what their answers mean.

What kinds of self-report methods are available to assess children's pain? One approach uses rating scales to describe the intensity of their pain. Another approach uses questionnaires. These instruments assess the pain itself and its psychosocial effects, such as how the child and family reacted to the pain. Adults may help the children fill out portions of the questionnaires when they lack needed language skills.

Behavioral and physiological assessment approaches also provide valuable ways to measure children's pain, especially in early childhood. The most obvious behavioral approach simply involves having the child or parents report the child's pain behaviors in pain diaries. Other behavioral assessments can use structured clinical sessions in which health care workers rate or record the occurrence of pain behavior. Methods for physiological assessment are like those we considered earlier.

Children's pain experiences are affected by a variety of psychosocial factors, particularly the social environment in which pain occurs. Parents serve as models and agents of reinforcement for the pain behavior of their children. But little is known about the personality and family characteristics of children that may contribute to the intensity and frequency of their pain. Most studies on pain have focused on adult

subjects, not on children, and the studies conducted with children have generally produced unclear results because they were often poorly designed and carried out. Now that researchers have methods to assess children's pain, they can do the kind of high-quality research that is needed.

LESSON 26**DEALING WITH PAIN****Clinical Pain**

Not all of our pain experiences receive professional treatment, and not all of them require it. The term clinical pain refers to any pain that receives or requires professional treatment. The pain may be either acute or chronic and may result from known or unknown causes. Clinical pain calls for treatment in and of itself, and not only because it may be a symptom of a progressive disease, such as arthritis or cancer. Relieving pain is important for humanitarian reasons, of course—and doing so also produces medical and psychosocial benefits for the patient. Let's look at medical and psychosocial issues that are associated with controlling clinical pain, beginning with acute pain.

A. Acute Clinical Pain

By using techniques to prevent or relieve acute pain, practitioners make medical procedures go more smoothly, reduce patients' stress and anxiety, and help them recover more quickly. Much of the acute pain people experience in today's world has little survival value. What survival value would there be in feeling the pain as a dentist drills a tooth or a surgeon removes an appendix? How would people's survival be enhanced by feeling the intense pain that accompanies normal healing while resting in a hospital during the days after surgery? But one thing is important; i.e., if acute pain is ignored, it can sometimes develop into more severe conditions or chronic pain.

B. Chronic Clinical Pain

When pain persists and becomes chronic, patients begin to perceive its nature differently. Although in the acute phase the pain was very aversive, they expected it to end and did not see it as a permanent part of their lives. As the pain persists, they tend to become discouraged and angry and are likely to seek the opinions of many other physicians. This can be constructive. But when this is not successful, and as patients come to see less and less connection between their discomfort and any known or treatable disorder, increasing hopelessness and despair may lead them to resort to consulting quacks.

The transition from acute to chronic pain is a critical time when many of these patients develop feelings of helplessness and psychological disorders, such as depression, especially if the pain is disabling. These changes typically parallel alterations in the patients' lifestyles, employment status, and family lives.

Chronic pain often creates a broad array of long-term psychosocial problems and impaired interrelationships, which distinguish its victims from those of acute pain.

Individuals who receive treatment for their pain after it has progressed and become chronic tend to exhibit certain physical and psychosocial symptoms that characterize a chronic pain syndrome. According to psychologist Steven Sanders (1985), these symptoms include:

- Persistent pain complaints and other pain behaviors, such as grimacing or guarded movement, when in discomfort.
- Disrupted daily activity patterns, characterized either by a general reduction or by recurrent large fluctuations.
- Disrupted social, marital, employment, and recreational activities.
- Excessive use of drugs or repeated use of surgical procedures to relieve pain.
- Disturbed sleep patterns.
- Increased anxiety and depression.

Chronic pain patients usually exhibit the first two symptoms and at least one of the remaining ones. Generally speaking, the more symptoms the patient presents, the greater the impact the pain has had and the greater the maladjustment it has produced.

Because of the differences between acute pain and chronic pain in their duration and the effects they have on their victims, these conditions usually require different treatment methods. Health care professionals need to distinguish between acute and chronic pain conditions and provide the most appropriate pain relief techniques for the patient's needs. Failing to do so can make the condition worse. Keeping this caution in mind, we will now turn our attention to the many medical, psychological, and physical techniques available to help control patients' pain.

1. Medical Treatments for Pain

Historically, most of the pain relieving practices adopted by the medical professionals was brutal especially if they involved some form of surgery. In 19th-century America, alcoholic beverages and medicines laced with opium were readily available. Today when patients suffer from pain, physicians and doctors try to reduce the discomfort in two ways— surgically and chemically.

A. Surgical Methods for Treating Pain

Treating chronic pain with surgical methods is a relatively radical approach, and some surgical procedures are more useful than others. In some procedures, the surgery removes or disconnects portions of the peripheral nervous system or the spinal cord, thereby preventing pain signals from reaching the brain. These are extreme procedures—and if they are successful, they produce numbness and, sometimes, paralysis in the region of the body served by the affected nerves. But these procedures seldom provide long-term relief from the pain, which is often replaced after some days or months by pain and other sensations that are worse than the original condition. Because of the poor prospects of permanent relief and the risks involved in these surgical procedures, they are rarely used today.

Other surgical procedures for relieving pain do not remove or disconnect nerve fibers and are much more successful. One example is the **Synovectomy**, a technique whereby a surgeon removes membranes that become inflamed in arthritic joints. Surgery procedures are commonly used in the United States to treat back pain, but there is little evidence that they produce better long-term pain reduction than non-surgical methods, and they are used at a far lower rate in other developed countries, such as Denmark and England. Surgery for chronic skeletal pain conditions is most appropriate when the person is severely disabled and non-surgical treatment methods have failed. Physicians and patients usually prefer other medical approaches, such as chemical methods.

B. Chemical Methods for Treating Pain

The field of medicine has been much more concerned with developing methods for curing disease than with reducing pain. Let's look at the use of chemical methods for treating acute and chronic pain.

Using Chemicals for Acute Pain

Many pharmaceuticals are very effective for relieving acute pain, such as after surgery. Physicians choose the specific drug and dosage by considering many factors, such as how intense the pain is and its location and cause.

Using Chemicals for Chronic Pain

When a patient is dying, practitioners generally view options for pain relief differently from those when a person has chronic pain from a non-terminal illness. Many health care practitioners have long advocated using narcotics for the relief of severe pain in cancer patients, and narcotic analgesics are commonly prescribed when these patients are dying. In some cases of cancer, severe pain becomes chronic as the disease progresses.

To summarize, medical treatments of pain focus mainly on using chemical approaches to reduce discomfort. For chronic pain patients, these approaches can be enhanced when combined with pain control methods that other health care professions provide. Physicians usually want to minimize the use of medication by their patients, especially when drugs would be taken on a long-term basis. Reducing the patient's drug consumption is one of the goals in using other methods of pain control with pain patients.

2. Psychological Methods for Treating Pain

In today's world, plentiful research evidence suggests that pain can be controlled not only by biochemical methods that alter sensory input directly, but by modifying motivational and cognitive processes, too. This more complex view of pain provided the rationale for psychologists to develop techniques to help patients (1) cope more effectively with the pain and other stressors they experience and (2) reduce their reliance on drugs for pain control. Psychologists have developed approaches involving behavioral and cognitive methods, and we will examine some of these approaches here.

1. Behavioral Methods

The first approach focuses on changing patients' pain behavior through techniques of operant conditioning.

A. The Operant Approach

Consider the case of a 3-year-old girl whose pain behaviors hampered her rehabilitation after she suffered severe burns months earlier. The help therapists provided was successful. The approach the therapists used in changing this girl's behavior involved extinction procedures for her pain behavior and reinforcement for appropriate, or well, behavior.

Observations of the child's social environment revealed that the hospital staff reinforced her pain behaviors—crying, complaining of pain, resisting the nurse's efforts to put her splints on, and so forth—by giving attention to those behaviors and allowing her to avoid uncomfortable or disliked activities, such as physical therapy. To change this situation, the therapists instructed the hospital staff to:

- Ignore the pain behaviors they paid attention to in the past.
- Provide rewards for obedient behavior—telling her, for instance, “If you don't cry while I put your splints on, you can have some cookies when I'm finished, or, If you do this exercise, we can play a game.”

Changing the consequences of her behavior in these ways had a dramatic effect: her pain behaviors decreased sharply, and she began to comply with requests to do exercises, make positive comments about her accomplishments, and assist in putting on her splints,

The operant approach to treating pain can be adapted for use with individuals of all ages, in hospitals and at home—and elements of the operant approach can be introduced before pain behavior becomes chronic. But treatment programs using this approach are usually applied with patients whose chronic pain has already produced serious difficulties in their lives. These programs typically have two main goals: the first is to reduce the patient's reliance on medication. The second goal of the operant approach is to reduce the disability that generally accompanies chronic pain conditions.

The reinforcers may be of any kind—attention, praise and smiles, candy, money, or the opportunity to watch TV, for example—and may be formalized within a behavioral contract. The therapist periodically reviews the record of pain behavior to determine whether changes in the program are needed. Studies have shown that operant techniques can successfully decrease patients' pain reports and medication use and increase their activity levels.

B. Relaxation and Biofeedback

Many people experience chronic episodes of pain that result from underlying physiological processes, and these processes are often triggered by stress. If these patients could control their stress or the physiological processes that cause pain, they should be able to decrease the frequency or intensity of discomfort they experience. Thus relaxation and biofeedback methods are effective in treating and reducing pain.

2. Cognitive Methods

To help people cope effectively with pain, medical and psychological practitioners need to assess and address their patients' beliefs. Cognitive techniques for treating pain involve active coping strategies, and many of these methods are, in fact, quite effective in helping people cope with pain. These techniques can be classified into three basic types: distraction, imagery, and redefinition. We will examine these methods and consider their usefulness for people with acute and chronic pain.

A. Distraction

Distraction is the technique of focusing on a non-painful stimulus in the immediate environment to divert one's attention from discomfort. We can be distracted from pain in many ways, such as by looking at a picture, listening to someone's voice, singing a song, counting ceiling tiles, playing a video game, or doing mathematics problems.

Distraction strategies are useful for reducing acute pain, such as that experienced in some medical or dental procedures, and they can also provide relief for chronic pain patients in some circumstances. Singing a song or staring intently at a stimulus can divert the person's attention for a short while—and this may be a great help, such as for an arthritis sufferer who experiences heightened pain when climbing stairs. People who want to use distraction for moderate levels of continuous pain may get longer-lasting relief by engaging in an extended engrossing activity, such as watching a movie or reading a book.

B. Imagery

Sometimes when children are about to receive injections, their parents will say something like, "it'll be easier if you think about something nice, like the fun things we did at the park." Non-pain imagery—sometimes called guided imagery—is a strategy whereby the person tries to alleviate discomfort by conjuring up a mental scene that is unrelated to or incompatible with the pain. The most common type of imagery people use involves scenes that are pleasant to them—they think of "something nice. This scene might involve being at the beach or in the country, for instance.

Therapists usually encourage, or "guide," the person to include aspects of different senses: vision, hearing, taste, smell, and touch. As an example, the scene at the beach could include the sight and smell of the ocean water, the sound of the waves, and the warm, grainy feel of the sand. The person generally tries to keep the imagined event in mind as long as possible.

The imagery technique is in many ways like distraction. The main difference is that imagery is based on the person's imagination rather than on real objects or events in the environment. As a result, individuals who use imagery do not have to depend on the environment to provide a suitably distracting stimulus. They can develop one or more scenes that work reliably, which they "carry" around in their heads.

Although imagery clearly helps in reducing acute pain, the extent of this technique's usefulness with longer-lasting pain episodes is unclear. One limitation with using imagery in pain control is that some individuals are less adept in imagining scenes than others.

C. Redefinition

The third type of cognitive strategy for reducing discomfort is pain redefinition, in which the person substitutes constructive or realistic thoughts about the pain experience for ones that arouse feelings of threat or harm. Therapists can help people redefine their pain experiences in several ways. One approach involves teaching clients to engage in an internal dialogue, using positive self-statements. There are basically two kinds of self-statements for controlling pain:

A. Coping statements emphasize the person's ability to tolerate the discomfort, as when people say to themselves, "It hurts, but you're in control," or, "Be brave— you can take it".

B. Re-interpretative statements are designed to negate the unpleasant aspects of the discomfort, as when people think, it's not so bad," "It's not the worst thing that could happen," or, "It hurts, but think of the benefits of this experience." This last statement can be particularly appropriate when undergoing painful medical procedures.

LESSON 27**ADJUSTING TO CHRONIC ILLNESSES**

“It’s not fair” 12-year-old Joe complained. Why can’t I eat the stuff I like? Other kids can. Why do I have to check my blood everyday and take shots? Nobody else has to do that,” He voiced these complaints as he left the emergency room after suffering severe stomach cramps because he was not adhering to his medical regimen. Hospital tests recently determined that Joe has diabetes, and he was not adjusting well to the regimen his physician instructed him to follow.

His parents tried to explain that not following the regimen could have serious health consequences, but he thought, “I’ll do some of the things they say I should do, and that’ll be enough. I feel fine—so those problems won’t happen to me.” When his noncompliance led to his being rushed to the hospital with severe abdominal pain and difficulty breathing, he finally believed the warnings he received, and he began to adhere closely to his regimen.

Different individuals react differently to developing a chronic illness. Their reactions depend on many factors, such as their coping skills and personalities, the social support they have, the nature and consequences of their illnesses, and the impact of the illnesses on their daily functioning. At the very least, having a chronic condition entails frequent impositions on the patients and their families. Chronically ill people may suffer periodic episodes of feeling poorly and need to have regular medical checkups, restrict their diets or other aspects of their life styles, or administer daily treatment, for instance. Many chronic conditions entail more than just impositions— they produce frequent pain or lead to disability or even death.

This and the next coming lectures focus mainly on tertiary prevention for chronic illness— to retard its progression, prevent disability, and rehabilitate the person, physically and psychologically. We will examine how people react to and cope with chronic health problems and what can be done to help these people cope effectively.

The present lecture concentrates on health problems that are less likely to result in death but often lead to disability. We will begin by discussing people’s reactions to having a chronic condition, then we will examine the experiences and needs of individuals living with various health problems, and then we will consider psychosocial interventions to enhance patients’ long-term adaptation to their conditions.

Our discussion in these lectures will address many questions that are of great concern to patients, to their families and friends, and probably to you. How do individuals react after their initial shock of learning that they have a chronic illness? What kinds of health problems usually involve the most difficult adjustments for people? How do patients’ chronic conditions impact on their families? What can families, friends, and therapists do to help chronically ill people adapt effectively to their conditions?

Adjusting To a Chronic Illness

I felt like I’d been hit in the stomach by a sledgehammer—this is how many patients describe their first reaction upon learning that they have a disabling or life-threatening illness. Questions without immediate answers flash through their minds: Is the diagnosis right and, if so, what can we do about it? Will I be disabled, disfigured, or in pain? Will I die? How soon will these consequences happen? What will happen to my family? Do I have adequate medical and life insurance? Learning of a chronic health problem usually comes as a great shock, and this is often the first reaction individuals experience when the physician tells them the diagnosis.

Initial Reactions on Having a Chronic Condition

By observing patients in rehabilitation and health settings, Franklin Shontz (1975) has described a sequence of reactions people tend to exhibit following the diagnosis of a serious illness. This sequence of reactions is:

1. Shock—an emergency response, marked by three characteristics: (a) being stunned or bewildered, (b) behaving in an automatic fashion, and (c) feeling detached from the situation, that is, feeling like being an observer rather than a participant in the events that occur. The shock may last only a short while or may continue for weeks, occurs to some degree in any crisis situation people experience, and it is likely to be most pronounced when the crisis comes without warning.

2. Encounter—a phase that is marked by disorganized thinking and feelings of loss, grief, helplessness, despair, and being overwhelmed by reality.

3. Retreat—a phase in which people tends to use avoidance strategies, such as denying either the existence of the health problem or its implications. But then reality begins to intrude: the symptoms remain or get worse, additional diagnoses confirm the original one, and it becomes clear that adjustments need to be made. Using retreat as a “base of operation,” patients tend to contact reality a little at a time until they reach some form of adjustment to the health problem and its implications.

Do all individuals react in the ways Shontz has described when they are faced with such crises as being diagnosed with a serious illness? No, but probably most do. For instance, when faced with a crisis, most people react with shock initially, but other individuals may be “cool and collected, while others may be “paralyzed” with anxiety or may become hysterical”. Similarly, although many people with serious illnesses feel extremely helpless and overwhelmed after the initial shock, others do not. And many patients do not rely heavily on avoidance strategies to cope with the stress caused by having a health problem.

People who use denial and other avoidance strategies do so to control their emotional responses to a stressor, especially when they believe they can do nothing to change the situation. But the usefulness of this approach has limits. Although using avoidance strategies often provides psychological benefits early in the process of coping with health problems, excessive avoidance can soon become maladaptive to patients’ physical and psychological well-being.

For example, when hospitalized people receive information about their conditions and future risk factors, those individuals who use avoidance strategies heavily, gain less information about their conditions than those who use these strategies to a lesser degree. Patients often need to make major decisions about their immediate treatment. How can they make these decisions rationally if they fail to take in the information that the practitioners present to them? Later, they may need to take action to promote their recovery, reduce the likelihood of future health problems, and adjust their lifestyles, social relationships, and means of employment. What factors influence how people cope with their health problems? The next section provides some answers to this question.

Influences on Coping with Health Crisis

Healthy people tend to take their health for granted. They expect to be able to carry out their daily activities and social roles from one day to the next without substantial disruptions due to illness. When a serious illness or injury occurs, their everyday life activities are disrupted. Regardless of whether the condition is temporary or chronic, the first phases in coping with it are similar. But there is an important difference: in contrast to the short-term disruptions that temporary illnesses cause, chronic health problems usually require that patients and their families make permanent behavioral, social, and emotional adjustments.

When people learn that they have a serious chronic illness, the diagnosis quickly changes the way they view themselves and their lives. The plans they had for tomorrow and for the next days, weeks, and year may be

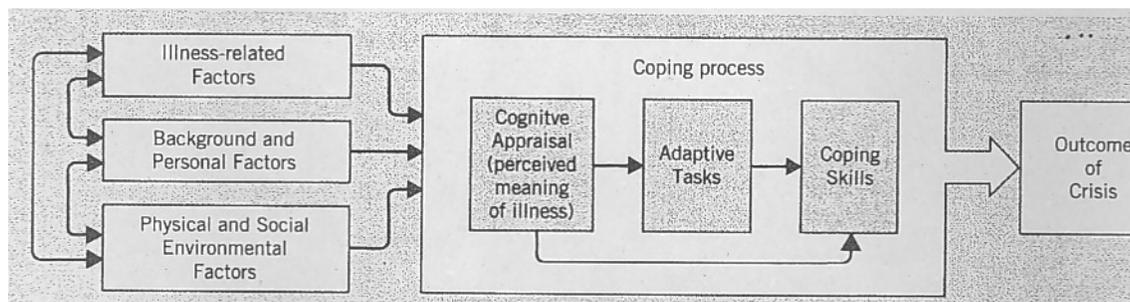
affected. Major plans and minor ones may change: Did they plan to go on a trip this weekend? They may change their minds now. Did they plan to complete a college education, or enter a specific career field, or get married and have children, or move to a new community when they retire? Some of these ideas for the future may evaporate after the diagnosis.

As psychologists Richard Lazarus and Cohen have noted, because the idea of being healthy, able, and having a normal physique is central to most people's image and evaluation, becoming ill can be a shock to a person's sense of security and to his or her self-image. Not only does it threaten the customary view of oneself, but it further underscores that one is indeed vulnerable; and that one's life may be changed in major respects. As a result adjustment to an illness or injury which is life-threatening or potentially disabling may require considerable coping effort. Potentially disabling or life-threatening conditions leave patients and their families with many uncertainties, Often no one can tell for certain exactly what the course of the illness will be.

The Crisis Theory

Why do some individuals cope differently from others after learning they have a chronic health problem? Rudolf Moos (1986) has proposed the crisis theory, which describes factors that influence how people adjust during a crisis, such as having an illness.

The diagram presents his conceptual model, showing that the outcome of the crisis— or the adjustment the person makes—depends on the coping process, which depends on three contributing influences: illness-related factors, background and personal factors, and physical and social environmental factors. We will look at these contributing influences, and then see how they affect the coping process the patient uses.



a) Illness-Related Factors

Some health problems present a greater threat to the person than others do—they may be more disabling, disfiguring, painful, or life-threatening, for example. As you might expect, the greater the threats patients perceive for any of these factors, the more difficulty they are likely to have coping with their conditions. Adjusting to being disfigured can be extremely difficult, particularly when it involves the person's face.

Many individuals whose faces are badly scarred withdraw from social encounters, sometimes completely. Often people who see the disfigurement react awkwardly, and some show feelings of revulsion. Even children react more negatively to people's facial disfigurements than to injuries to other parts of the body, such as when people are crippled or missing a limb.

Patients also have difficulty coping with illness-related factors that involve annoying or embarrassing changes in bodily functioning or that draw attention to their conditions. People with some illnesses, for instance, may need artificial devices for excreting fecal or urinary wastes. These devices may be noticeable either visibly or by their odors, and many patients have exaggerated impressions of the social impact such devices have.

Other chronically ill people must treat their conditions with ointments that may have odors or equipment that is visible or makes noise. Still others may experience periodic seizures or muscle spasms that can be embarrassing. Many people with chronic illnesses feel self-conscious about their health problems—or even stigmatized by them—and want to hide them from others.

Various other aspects of treatment regimens can make adjustment very difficult, too. Some treatments are painful or involve medications that produce serious side effects—either by leading to additional health problems or by interfering with the patient’s daily functioning, such as by making the person immobile or drowsy. Other regimens may have treatment schedules and time commitments that make it difficult for the person to find or hold a job. Some regimens require patients and their families to make substantial changes in their lifestyles, which they might resent and fail to carry out. Each of these factors can impair people’s adjustment to chronic health problems.

b) Background and Personal Factors

People who cope well with chronic health problems have the psychological and behavioral resources to resolve the chronicity or ‘long-termness’ of the situation, balance hope against despair and find purpose and quality in life. Often, these people have hardy or resilient personalities that allow them to see a good side in difficult situations.

People with chronic diseases who are resilient can often find purpose and quality in their lives, maintain their self-esteem, and resist feeling helpless and hopeless.

The ways individuals cope with chronic health problems also depend on many other background and personal factors, such as their age, gender, social class, philosophical or religious commitments, emotional maturity and self-esteem.

With respect to gender differences, for instance, men are more likely than women to be “threatened by the decreases in ambition, vigor, and physical prowess that often result from serious illness because, by comparison with women, they are confident in the stability of their physical abilities and bodily functioning. Having a chronic illness often means that the individual must take on a dependent and passive role for a long period of time. For men, this can be especially difficult since it is inconsistent with the assertive and independent roles they generally occupy in most societies of the world.

The timing of a health problem in the person’s life span also affects the impact on him or her. In the case of very young children, their limited cognitive abilities prevent them from understanding fully the nature of their illnesses, the treatment regimens they must follow, and the long-term implications of their conditions. Their concerns are likely to focus on any restrictions that are imposed on their lifestyles and activities, the frightening medical procedures they experience, and possible separations from their parents. As children get older and their comprehension improves they may be able to participate in making some decisions about their treatment.

c) Physical and Social Environmental Factors

Many physical and social features of our environments can affect the way we adjust to chronic health problems. The physical aspects of a hospital environment for instance, are usually very dull and confining for patients, thereby depressing their general morale and mood. For some individuals, the home environment may not be much better. Many patients have difficulty getting around their houses or performing self-help tasks; such as buttoning clothes or opening food containers, and lack special equipment or tools that can help them do these tasks and be more self-sufficient. These people’s adjustment to their health problems can be impaired as long as these situations persist.

The patient’s social environment functions as a system, with the behavior of each person affecting the others. The presence of social support, for example, generally helps patients and their families and friends

cope with their illnesses. Individuals who live alone and have few friends or who have poor relationships with the people they live with tend to adjust poorly to chronic health conditions. But it is also true that sometimes people in a patient's social network may undermine effective coping by providing bad examples or poor advice. The degree to which each member of the social system adjusts in constructive ways to the illness affects the adjustment of the others.

The primary source of social support for children and most adults who are ill typically comes from their immediate families. People in old age whose spouses are either deceased or unable to help are likely to receive support mainly from their children, but also from siblings, friends, and neighbors. At almost any age, patients may join support groups for people with specific medical problems. These groups can provide informational and emotional support.

As the above given diagram depicts, crisis theory's three contributing influences are interrelated and can modify each other. The patient's social class or cultural background, for instance, may affect his or her self-consciousness about or access to special devices and equipment to promote self-sufficiency. These contributing factors combine to influence the coping process the person uses to deal with the crisis.

We will talk about the coping process in adjusting to chronic illnesses in our next lecture. We will also talk about the different chronic illnesses and their biopsychosocial impacts on patients.

LESSON 28**THE COPING PROCESS IN PATIENTS OF CHRONIC ILLNESS**

Crisis theory proposes that coping begins with the patient's cognitive appraisal of the meaning or significance of the health problem to his or her life. The outcome of this appraisal leads the individual to formulate an array of adaptive tasks and to apply various coping skills to deal with these tasks. Let's see what these tasks and skills are.

The Tasks and Skills of Coping

According to Moos (1982), people who are ill need to address two types of adaptive tasks in the coping process:

- Tasks related to the illness or treatment, which involve learning to (1) Cope with the symptoms or disability the health problem causes. (2) Adjust to the hospital environment and medical procedures needed to treat the problem and (3) Develop and maintain good relationships with their practitioners.
- Tasks related to general psychosocial functioning, which involve striving to (1) Control negative feelings and retain a positive outlook for the future, (2) Maintain a satisfactory self-image and sense of competence, (3) Preserve good relationships with family and friends, and (4) Prepare for an uncertain future.

These tasks can be very difficult for patients, particularly when their health problems may lead to disability, disfigurement, or death. Still, many people with poor prognoses [or their health manage to adapt successfully and make the most of their new life circumstances.

Crisis theory proposes that patients encounter these adaptive tasks in any health problem they experience. But the relative importance or salience of each task for each illness or injury depends on the nature of the condition and the patient's personality and environmental circumstances. A person who becomes blind may have little physical discomfort, but may experience difficulty maintaining a job or social relations. A woman who has a mastectomy may need to focus on adapting to her new self-image. A professional athlete, construction worker, or other physically active individual is likely to experience more difficulty adapting to a wheelchair than a more sedentary person.

Family members must make similar adjustments, and these individuals are critically important in helping patients achieve each goal. Patients are likely to adapt well to a chronic condition if their family members participate actively in their treatment regimens, encourage them to be self sufficient, and respond to their needs in a caring and sensitive manner.

What coping skills do patients and their families employ to deal with these adaptive tasks? The next section describes several useful strategies that they commonly use.

Coping Strategies for Chronic Health Problems

- **Denying or minimizing** the seriousness at the situation. As we have seen, this approach can be beneficial in the early phases of adjusting to a health problem. Patients may benefit from this approach by using it selectively to put aside their emotions temporarily, thereby saving them from feeling overwhelmed and giving them time to organize other personal coping resources.
- **Seeking information** about the health problem and treatment procedures.

- **Learning to provide one’s own medical care** such as self-administering insulin shots. With this approach, patients gain a sensed control and personal effectiveness with respect to their conditions.
- **Setting concrete, limited goals** such as in exercising or in going to shows or social gatherings, and maintaining regular routines as well as possible. By doing this, patients and their families have things to look forward to and opportunities to achieve goals they consider meaningful.
- **Recruiting instrumental and emotional support** from family, friends, and practitioners by expressing needs and feelings.
- **Considering possible future events** and stressful circumstances in order to know what lies ahead and to be prepared for unexpected difficulties.
- **Gaining a manageable perspective** on the health problem and its treatment by finding a long-term “purpose” or “meaning” for the experience. Patients often do this by applying religious beliefs or by recognizing how they have been changed in positive ways by the experience.

As we can see, each of these skills can help in achieving the goals of adaptive tasks and in leading to a positive outcome of the crisis. Is one approach best? Generally speaking, although moderate or temporary use of any specific skill can be beneficial, using any single skill exclusively may undermine the coping process. Some coping skills may be more appropriate for dealing with some tasks than with others. As a result; people generally use these skills selectively, often in combination.

For instance, seeking information may help patients deal with the symptoms, and setting reasonable goals may help them do exercises and reduce their incapacitation. Individuals who have adjusted successfully to each phase of the crises are ready to deal effectively with subsequent phases in their adjustment to their health problems.

Long-Term Adaptation to Chronic Health Problems

Chronic disorders last for a very long time—and patients and their families need to adapt to the illnesses whether they worsen, stay the same, or improve over time. The term adaptation refers to “the process of making changes in order to adjust constructively to life’s circumstances”. For chronically ill individuals and their families, the adaptive changes they make can enhance their quality of life by promoting their effective physical, psychological, and social functioning.

What does “quality of life” mean?

Quality of life refers to the degree of excellence people appraise their lives to contain. People around the world appraise excellence with similar criteria, such as performing daily activities, energy or discomfort, positive and negative feelings, personal control, interpersonal relations, pleasant activities, personal and intellectual growth, and material possessions.

When chronically ill people can expect to live for many years, they need to make many decisions, such as career selections, that involve examining their options based on realistic assessments of their conditions. People who continue to rely heavily on avoidance coping strategies, such as denial, are less likely to adapt effectively than those who use strategies that allow them to consider their situations more carefully and objectively.

Impacts of Different Chronic Conditions

What is it like to live with a chronic health problem? To some extent, the answer depends on the illness. Beginning with this section, we will consider the impact of specific chronic medical conditions and treatments on patients and their families. The particular health problems we will examine were selected to illustrate disorders of different body systems and widely different adjustment difficulties. Some of the health problems tend to develop at much earlier ages than others; some require much more complex treatment regimens than others; and some produce more pain and disability than others.

People who are disabled by illness are more likely than others to adjust poorly to their condition and become clinically depressed. After we discuss these disorders, we will consider psychosocial approaches to help chronically ill people adapt to their condition.

Although the medical problems we will discuss here include some that can be life-threatening, none of these chronic conditions is among the most deadly illnesses people around the world develop— particularly heart disease, cancer, stroke, and AIDS.

We will use a life-span perspective to organize the health problems: illnesses that generally begin in childhood will be presented first, and illnesses that usually begin in old age will be considered last. As we have seen, the impact of a health problem and the way people cope with it depend partly on the patient's age. We will start by considering the impact of asthma, a chronic respiratory disorder that generally begins in the early childhood years.

Asthma

We all experience respiratory disorders at one time or another. If we are fortunate, these disorders are limited to occasional bouts with colds and the flu. But millions of people are not so fortunate— they suffer from chronic respiratory problems. In some cases, these problems involve constant breathing impairments that vary in intensity from one day to the next. In other cases, the victims breathe normally most of the time but suffer recurrent episodes of impaired breathing. Some chronic respiratory disorders become severe enough to disable their victims and may even claim their lives. This can happen with asthma.

What Is Asthma?

Imagine being at home reading one evening and noticing that a slight whistling, wheezing sound starts to accompany each breath you take. Soon the sound becomes louder and your breathing becomes labored. You try opening your mouth to breathe, but very little air goes in or out. When your chest begins to contract from the effort and your heart pounds rapidly you are quite frightened and worry. “Will my next gasp for air be my last?” This is what a major asthma attack is like. Victims of extreme attacks may begin to turn blue and look as if they are about to die, and some do die.

Asthma is a respiratory disorder involving recurrent episodes of impaired breathing when the airways become obstructed. This disease is very prevalent around the world; in the United States alone, about 17 million people (6% of the population) suffer from asthma. Prevalence rates are much higher for children than adults. Although the disorder may emerge at any age, it is most likely to develop by age 5 in children and between the ages of 30 and 40 among adults.

Fortunately, most childhood cases of asthma become less severe over time, and 25 to 50% of the children who develop asthma no longer have symptoms by the time they reach adulthood. Each year, over 5,400 asthmatics in the United States die from asthma attacks; the death rates from attacks have increased since 1980 and are higher among African Americans than white individuals.

Because African Americans have lower incomes than whites and are less likely to have regular physicians, they tend to use hospital emergency rooms as their main source of treatment for asthma and seek help mainly when attacks are severe.

Asthma is clearly a major health problem. Let's see what causes asthma attacks.

The Physiology, Causes and Effects of Asthma

Asthma episodes typically begin when the immune system is activated to react in an allergic manner, producing antibodies that cause the bronchial tubes and other affected body tissues to release a chemical called histamine. This chemical causes irritation to those tissues. In an asthma attack, these events cause the bronchial tubes to become obstructed as their smooth muscles become inflamed, develop spasms, and produce mucus. These events last, perhaps, an hour or two and can lead to tissue damage, thereby increasing the likelihood of more frequent and severe future attacks. For some asthmatics airway inflammation becomes constant.

What Causes Asthma Attacks to Happen?

We do not have a full answer to this question, but we do know that attacks usually occur in the presence of certain conditions, called triggers. Asthma triggers can include personal factors, such as having a respiratory infection or feelings of anger or anxiety; environmental conditions, such as air pollution, pollen, or cold temperature; and physical activities, such as strenuous exercise. The triggers that lead to attacks are different for different asthmatics, and some individuals have attacks only when two or more triggers occur at the same time. The main triggers for many asthmatics are allergens— substances, such as pollens or molds, that are known to cause allergic reactions. But other asthmatics do not have any known allergies, and other factors, such as physical exercise or cold air, are the main triggers for them. Tests for allergic reactions usually involve injecting a small amount of the allergen under the skin and checking to see if the skin in that area becomes inflamed.

Medical Regimens for Asthma

Medical approaches provide the cornerstone of treatment for asthma. Asthma regimens consist of three components, the first being to **avoid known triggers of attacks**. The second component involves **medication**. To treat an acute attack, patients mainly use bronchodilators, which open up constricted airways. To prevent attacks patients can use anti-inflammatories, such as inhaled or oral corticosteroids and cromolyn, which reduce bronchial inflammation or block the release of histamine and other chemicals that cause inflammation.

The third component of asthma regimens involves **exercise**. In the past, physicians advised many asthmatics to avoid exercise because it could induce an attack. But it now appears that the less these people exercise, the worse their conditions get. Many physicians today recommend treatment regimens that carefully combine fitness training and the use of medication.

Asthma's potential for producing disability and, sometimes, death makes it important that patients adhere to their regimens. Although adhering to asthma regimens reduces attacks and incidents of wheezing, many asthmatics fail to take medication to prevent attacks and use medication during an attack incorrectly.

Psychosocial Factors in Asthma

Many people with asthma report that the triggers of their attacks often involve their emotional states, such as being worried, angry, or excited. Experimental research has shown that emotional arousal; such as when watching an exciting movie, can trigger attacks in some children. Studies have also found that suggestion can induce symptoms in some asthmatics.

In one study, researchers had asthmatics inhale several doses or a placebo solution, with each succeeding dose labeled as containing an increasingly strong level of an allergen. Nearly half of the subjects developed symptoms, either as full asthmatic attacks or as spasms of the bronchial muscles. Another study confirmed the effect of suggestion, but also showed that the asthmatic reaction could be negated if the subjects were

first given another placebo that was described as a new asthma drug. In other words, the first suggestion blocked the second one.

For example, studies have shown that false feedback indicating that the airways are becoming obstructed increases breathlessness in people with asthma.

Although there is little question that psychosocial factors can influence asthma attacks, we do not know how these factors work and which asthmatics are more affected by them. It is possible that psychosocial factors make asthmatics more sensitive to allergens or other conditions that trigger their attacks.

Asthma attacks are frightening for the patient and family alike; and frequent episodes are costly to the family and disrupt these people's lives and functioning. Living with this disorder adds to the stress that asthmatics and their families' experience, and studies have found that asthma is sometimes related to maladjustment in patients and their families.

LESSON 29**IMPACT OF DIFFERENT CHRONIC CONDITIONS****1. Epilepsy**

Epilepsy is a condition marked by recurrent, sudden seizures that result from electrical disturbances of the cerebral cortex. Although the seizures epileptics experience can vary greatly, the two most common types are the:

1. Grand mal (or “tonic-clonic”) attack, which is the most severe form and entails two phases. It begins with a very brief tonic” phase, in which the person loses consciousness and body is rigid. It then progresses to a longer “clonic” phase that lasts 2 or 3 minutes and includes muscle spasms and twitching. The body may then relax until the person awakens soon. Sometimes before a grand mal attack epileptics experience an aura which consists of unexplained sounds, smells, or other sensations.
2. Petit mal (or “absence”) attack, which involved diminished consciousness, and in which the person stares blankly for a short while, perhaps only a few seconds, and may show slight facial twitching. When the episode ends, the person simply resumes whatever he or she was doing, sometimes not even being aware that the event happened. Petit mal attacks occur mainly in childhood and usually disappear by adulthood.

Estimates of the prevalence of epilepsy vary somewhat, but it afflicts about 1 % of people worldwide. There are probably over 2 million cases of epilepsy in the United States, perhaps half of which are undiagnosed and untreated. Over 100,000 new cases are diagnosed each year. Although the condition can develop at any age, the great majority of epileptics experience their first seizures by 20 years of age.

What Causes Epilepsy?

Sometimes physicians find a specific neurological defect that is the cause of an epileptic’s disorder, but usually the reasons are unknown. Risk factors for developing epilepsy include a strong family history of the condition, severe head injury, infections of the central nervous system, and stroke.

Medical Regimens for Epilepsy

Anticonvulsant drugs provide the main medical treatment for epilepsy. These medications must be taken regularly to maintain the most effective serum concentrations throughout the day and can have undesirable side effects, such as facial hair in women, and blurred vision and nausea if the dose is too high. A promising new treatment involves using an implanted device that delivers stimulation to the Vagal nerve.

Epileptics whose seizures result from clear neurological defects may have the option of surgical treatment if they have frequent, severe attacks and other treatments do not work or cause problematic side effects. Neuro-psychologists conduct tests to pinpoint the affected area of the brain and minimize cognitive and motor impairments the surgery might produce. After surgery, as many as 80% of patients become seizure-free in the next few years. But undergoing surgery without becoming seizure-free may lead to subsequent psychosocial difficulties, such as heightened anxiety and depression.

Psychosocial Factors in Epilepsy

Because individuals who are having epileptic episodes lose control of their behavior and “act strange”, their condition stigmatizes them among people who do not understand it. Long ago, many people believed that individuals with this condition were possessed by the devil. Although few people in advanced societies today shun victims of epilepsy, witnessing an attack may still arouse feelings of fear and aversion.

Aside from the reactions their attacks produce in people, what other problems do epileptics face as a result of their illness? Having strong seizures, especially with a loss of consciousness, is sometimes associated with

important cognitive and motor impairments that can limit eligibility for certain activities and jobs: such as those that involve high work loads or danger from heights or machinery.

Epilepsy seems to be related to psychosocial processes in two ways. First, some evidence suggests that emotional arousal, such as of anxiety, may increase the likelihood or severity of epileptic episodes. Second, epileptics and their families sometimes adjust poorly to the disorder, especially if episodes are frequent and severe. Emotional difficulties, such as with anxiety or depression, often lead clients to drop out of rehabilitation programs. Many of the adjustment problems that epileptics face can be reduced through counseling when the diagnosis is made and through the work of support groups.

What to Do for a Seizure

People react negatively to seeing a grand mal attack for many reasons, one of which may be that they don't know what to do to help. Actually, there is little one can do other than to remain calm and try to protect the epileptic from injury as he or she falls or flails about during the tonic or clonic phases. If you witness a seizure, the following six actions are recommended:

1. Prevent injury from falls or flailing. Break the fall if possible and provide a cushion, such as a coat, between the person's head and the ground.
2. Do not put anything in the person's mouth. Many people believe they must put a spoon or other object in the mouth to prevent the epileptic from swallowing his or her tongue, which actually can not happen.
3. Loosen tight clothing around the neck. Turn the person on his or her side so that saliva does not obstruct breathing.
4. Do not restrain the person. If you believe the epileptic could be injured while flailing near a hard object, try to move the object.
5. If the person does not come out of the attack in about 5 minutes, call an ambulance.
6. After the person wakes up, describe what happened and see if he or she needs help when ready to leave. Epileptics are often disoriented after an attack. For the most part, the role of the bystander requires calm and composed caring and common sense.

2. Nervous System Injuries

Many thousands of people in the United States and many more all around the world suffer injuries to the brain or spinal cord each year, leaving them debilitated for life. Neuro-psychologists and health psychologists play important roles in assessing these patients' impairments and helping them adapt to their conditions. In this section, we will focus on the impact of having a spinal cord injury.

Prior to the 1940s, medical practitioners knew almost nothing about treating people who suffered a severe injury to the spinal cord. In World War I, 80% of the soldiers who received such injuries died within 2 weeks. People who survived severe spinal cord injuries had a poor prognosis for their future health, which was characterized by major health complications and a short life span. As a result, patients and practitioners had a defeatist attitude, and little attempt was made toward rehabilitation.

But in World War II, England established special medical units to develop and provide comprehensive care and rehabilitation for people with spinal cord injuries. These medical units served as a model for others to be developed in countries around the world.

The Prevalence, Causes and Physical Effects of Spinal Cord Injuries

The term spinal cord injury refers to neurological damage in the spine that results in the loss of motor control, sensation, and reflexes in associated body areas. The damage may be caused by disease or by an injury that compresses, tears, or severs the cord. When the cord is badly torn or severed, the damage is permanent because little or no nerve tissue will regenerate; but if the cord is compressed or has an abrasion, some function may be recovered when the pressure is removed or healing occurs.

The degree to which the person's function is impaired depends on the amount of damage and its location. If the cord is completely severed in the neck region, quadriplegia results. Actor, Christopher Reeve's (Superman) horse-riding accident left him quadriplegic. If a lower portion is severe, paraplegia results. If the cord is not completely severed, partial function remains.

Millions of people around the world are living with spinal cord injuries; in the United States, there are more than 250,000 people with this affliction, and about 8,000 new cases occur each year. About half of these people suffer neck injuries and are quadriplegics. The great majority of Americans who receive spinal cord injuries are males, and most of them are between 10 and 30 years of age at the time. The most common cause is automobile and motor cycle accidents, and the remainder result mainly from falls, sporting activities, and wounds, such as from a gunshot or stabbing.

The physical effects patients experience after spinal cord injuries change over time and progress through two stages:

1. Short-term effects

The immediate physiological reaction is called "spinal shock", which usually lasts between a few days and 3 months. In spinal shock, neural function is devastated either by the cord being severed or by inflammation at the site of lesser damage. The result is that the body cannot regulate blood pressure, temperature, respiration, and bladder and bowel function. Medical personnel must intervene to control these functions. Usually, the shorter the period of spinal shock, the better the prognosis of recovery.

2. Long-term effects

The full extent of spinal cord damage may not be clear for some time, and long term predictions are difficult to make during the first 6 months or so. If the cord is not severed, considerable functional recovery may occur over a long period of time. If the cord is severed, some autonomic functions will recover, but other functions will not. People who survive severe damage to the higher regions of the cord are typically fully paralyzed and unable to breathe without a respirator.

The initial care these patients receive typically focuses on their medical needs, with little or no attention to their psychological reactions. They receive very little information about their prognosis because it is so hard to predict, and medical staff want to avoid the depression their speculations might produce. Once the condition of these individuals has stabilized, the process of rehabilitation begins. Almost all spinal cord injury patients enter rehabilitation expecting to regain total function and are not prepared to cope with the reality of permanent functional losses. A major goal for psychologists at this time is to help these people adjust to the demands and limitations of the rehabilitation process.

Physical Rehabilitation

The process of physical rehabilitation for people with spinal cord injuries is geared toward helping them (1) regain as much physical function as the neurological damage will allow and (2) become as independent in their functioning as possible. This process focuses initially on training the patients to develop bladder and bowel control and on assisting them in moving paralyzed limbs to maintain their range of motion.

Hygienic bladder care is extremely important because a common cause of death in these patients after the spinal shock period is kidney failure from repeated infections.

The next phase of rehabilitation extends the focus of physical therapy toward maintaining and improving the function of muscles over which the person has some control. For example, quadriplegics receive special attention toward improving respiration; paraplegics do exercises to strengthen the upper body. When some neural connection to affected parts of the body remains, therapy with biofeedback to ‘re-educate’ the muscles in those areas appears to help some, but not all, patients.

The last phase of physical rehabilitation extends the therapy as much as possible to include activities of daily living. Those patients who have regained sufficient function learn how to perform self-care activities independently and to use devices to compensate for permanent physical losses. Some devices today are highly sophisticated and use computers, allowing paralyzed individuals to turn on lights, answer the telephone, and operate computer keyboards with voice commands.

Psychosocial Aspects of Spinal Cord Injury

The victims’ main challenges after spinal cord injury are to make the most of their remaining abilities and lead as full a life as possible. What can health care workers, family, and friends do to help? Psych-physiologists John Adams and Erich Lindemann described and contrasted case studies of two young men, 17 and 18 years of age, who had suffered spinal cord injuries that rendered them quadriplegic. One adapted successfully, and the other did not.

The patient who adapted well was able to accept the injury and abandon the part of his self-concept that was associated with his being a fine athlete. He then turned his energies toward academic pursuits and eventually became a history teacher. He also coached a local basketball team from his wheelchair.

The other patient provides a striking contrast. He was never able to accept the injury or the permanence of his condition. He became extremely withdrawn and depressed—at one point he was spending much time in bed with the curtains drawn and frequently with the sheet over his head. A Few years later, he was re-admitted to the hospital after taking an overdose of medication. At last contact, he was living at home, still clinging to the hope that he would walk again.

Why did these young men adapt so differently to their similar physical conditions? Adams and Lindemann noted the strikingly different ways these patients’ families and friends responded to their condition. In the case of the patient who adapted well to his condition, his parents and friends also accepted his paralysis and provided an environment in which he could redefine his self-concept. For instance, his parents installed ramps in their home and widened doorways to accommodate a wheelchair. The other patient’s family and friends were not able to accept his condition or provide the support he needed to help him adapt.

Family and friends can also help by providing social support without being overprotective and ‘taking over’ when the patient has difficulty performing self-help tasks. Having a disabled individual in the household increases the stress of all family members. They need to make many adjustments in daily living and, while doing so, try not to make the person feel like a burden. If the patient is a husband or wife, his or her spouse faces very difficult adjustments. Role changes occur immediately—at least for a while, and perhaps permanently.

The healthy spouse, with or without the help of other family members, must suddenly take on full responsibility for providing the family’s income, maintaining the household, caring for the children, and caring for the disabled person. Sexual-problems brought on by the patient’s injury may become a major source of stress in the marital relationship.

Disabled people also experience many unpleasant thoughts about themselves, their future, their relations with other people in general, and physical barriers in society. They find that many places they once liked to go to are inaccessible by wheelchair, for example. Further more, people in general act strangely toward them—staring, or quickly averting their eyes, or behaving awkwardly or uncomfortably in their presence.

These experiences tend to reduce the self-esteem of disabled people many of whom have heightened levels of depression and drug and alcohol use. Adapting to becoming disabled takes time, and a couple of years may pass before many individuals with spinal cord injuries report improvements in their adjustment and quality of life.