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38.**MOTION SICKNESS: CAN IT BE CONTROLLED?**

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Since the beginning of transportation by airplane, boats, and automobile, man has had to deal with the problem of motion sickness. Motion sickness, in general, affects a large percentage of the population regardless of sex, color, or age. It is the most underpublicized disorder in the world. Motion sickness, contrary to popular belief, actually produces changes in one's physiology. The motion sickness sensation is detected by the inner ear (actually the vestibular system); in particular, the semicircular canals. The semicircular canals are filled with a fluid, endolymph, which flows through the canals whenever the head experiences angular acceleration. Flow of the endolymph deflects the cupula, a structure which behaves like a dangling pendulum. The amount the cupula is deflected is communicated to the brain. These signals generate reflex eye-movements, termed "nystagmus," whose primary function is to maintain the stability of the visual world. The symptoms of motion sickness are different for each person. Some subjects show erratic changes in their heart rate while others show rises in skin conductance level. Still other individuals show increases in skin temperature by a few degrees Fahrenheit.

The National Aeronautics and Space Administration, NASA, is one of the few research centers concerned with motion sickness. Since the physiology of man has been developed in the one-gravity-field Earth, the changes experienced by man in space are unique, and often result in symptoms that resemble motion sickness on Earth. NASA is concerned with motion sickness because it is very uncomfortable for the astronauts, and after all, the astronauts are the "stars of the show." Another concern of NASA is the possibility of a motion sick astronaut regurgitating while he or she is sealed in an airtight space suit. Not only would this be "gross" but it could be fatal. The regurgitated food could obstruct the breathing passage of the astronaut and he or she could suffocate. Motivated by these reasons, NASA spent thousands of dollars in research and development for a drug or technique for combatting motion sickness. Several different treatments have been developed for this disorder. This research paper will discuss three of the most effective ways of combatting motion sickness.

The first and most common way of dealing with motion sickness is drugs. Drugs are a common solution to many problems and motion sickness is no different. Pills are widespread and varied. Some contain vitamins, others calcium. The advantages of drugs are their convenience. Drugs are right where you need them, day or night. E. M. Glaser and R. A. McCance in 1959 found that scopolamine may be helpful in some patients in preventing motion sickness. The most common drug prescribed by most physicians remains "antihistamines," which have demonstrated effectiveness in controlled clinical tests. Although drowsiness is a common side effect of antihistamines, the sedation may contribute to their effectiveness. The antihistamines have fewer adverse side effects than scopolamine.

A second technique involves natural adaptation to repeated exposures to motion sickness stimuli (e.g., being on a boat every day). Your body is such a great machine that a natural resistance may be developed. Sailors often call it "getting your

sea legs." This principle of adaptation is not only applicable to sailing but to space travel as well. Darwin's "Origin of Species" discusses the possibility of man evolving around the need to change in order to survive. Based on this principle the theory of evolution was born. If one accepts the theory of evolution then he or she can expect or conclude that if man were to permanently stay in a weightless environment a physiological adaptation should occur. This adaptation would allow humans or their offspring to live in a weightless environment without becoming motion sick. The cost of designing, building, and deploying a facility capable of sustaining life for nine months (the time for a child to be born) would engulf the funds NASA has available. There is no guarantee that the child born would be resistant to motion sickness or would want to become an astronaut when he or she matured.

A third method of combatting motion sickness is a physiological conditioning procedure called Autogenic-Feedback Training (AFT). AFT is a procedure which enables human subjects to gain voluntary control of several of their own physiological responses simultaneously. The training technique AFT will use is a modification of a procedure known as biofeedback conditioning. Biofeedback provides a means of becoming aware of physiological activity. A consensus of researchers believe that once one is made aware of some bodily activity, then he or she can learn to influence the response to that activity. For example, we can learn to play the piano by pressing keys on a keyboard; our ears tell us whether or not we pressed the right note (i.e., made the right response). If we press the wrong note the information is conveyed to the brain (via neural pathways) and our brain then directs our fingers to the correct key on the piano. In this way, an information "feedback loop" is set up between the brain, the muscle of the finger, and the sense of hearing. And with practice we can eventually learn to hit the right keys. This same "feedback loop" is applied during an AFT test for preventing or controlling motion sickness. The subject is provided with the necessary equipment to monitor his or her own physiological activity during an AFT test. If the subject notices a dramatic change in physiological activity (such as erratic heart-beat) before or while he or she feels the symptoms of motion sickness and is trained to control these physiological responses, the AFT conclusion would be that the severity of the motion sickness symptoms would diminish.

Which of the aforementioned methods are the best? Well, the best way to determine that would be to look at the pros and cons of each method. Drugs have the convenience factor, while natural tolerance has the unprecedented tradition; and AFT has the computer technology of the eighties. Drugs (unlike natural tolerance) take only a few minutes to be effective. Antihistamines (though effective) are proven to cause drowsiness. Natural tolerance would be great for the "frequent flyer." But for the occasional traveler the rational prescription for discomfort due to the sensations of motion (other than natural motion) would be antihistamines. The decision would depend on how much time you have and how you felt about the health of your body. But in either case drugs would be an effective method of diminishing motion sickness symptoms.

Drugs would seem to be a better method of dealing with motion sickness than natural tolerance, but what about AFT? Well, AFT and natural tolerance both work on the principle of the capability of the body to adapt to adverse situations. The major difference is AFT voluntarily controls bodily functions (i.e., heart rate) whereas natural

tolerance is controlled subconsciously by the brain. The advantage of AFT over natural tolerance is that a person can be trained in a few hours while natural tolerance takes longer to be as effective.

The question to be answered in the 1990's is whether AFT is more effective than drugs. If AFT is proven to be more effective a whole new medical field is created. Pharmacists and doctors await anxiously.

Motion sickness is a disorder that affects 95% of all people. It is a disorder that is not very serious but nevertheless is important to control. The research and development world is closing in on the cause and treatments of motion sickness, and it won't be long now.