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An introduction to medical physics pdf

For decades now, video game makers have been trying to recreate real-world physics. They use simulated physics engines to build in principles of gravity, velocity, collision detection and momentum that affect your racecars, planes and even Mario as he jumps and scrambles through the underworld. Without these elements, there are no rules or boundaries to gameplay that make any real sense.The same goes for character deaths. With primitive games, characters always died to exactly the same pre-scripted, static animation. That was fine and dandy in simpler times, but improved hardware made room for better all-around graphics performance. Dedicated graphics processing cards took some of the burden from the CPU, allowing for more sophisticated gameplay and, you guessed it, better death animations.Games like the "Halo" series and "Max Payne" feature realistic movements as bodies are jolted by bullets. And Rockstar Games has made a name for itself with its "Grand Theft Auto" series, which is filled with natural-looking lighting effects and human motion that's almost startling in its accuracy. Thanks in part to ragdoll physics, instead of canned graphics, programmers make characters that respond in real time to other onscreen elements, from walls to bombs to bullets."Hitman: Codename 47" was one of the first games to employ ragdoll physics. After you incapacitated an opponent, you could drag the lifeless, rolling body and steal its clothes as a disguise. Bullets slammed into bodies with ridiculous force. The elements weren't altogether convincing, but they added a new layer of believability that had been missing from gameplay."Hitman" used Verlet integration, an algorithm used to incorporate Newton's equations of motion into applications such as computer animation. Each part of an animated skeleton is defined as points connected to other points with some basic rules as guidelines. The comparative simplicity of this algorithm means it uses less CPU processing time than other techniques.Blended ragdoll physics combines real-time physics processing with premade animations, in games such as "Jurassic Park: Trespasser." The static animations interact more realistically with the environment; animated characters don't just flop down. They crash and bend more like actual human beings. But there are still visual flaws that don't make sense to the human brain. It doesn't look natural enough.Procedural animation is the latest and most immersive type of game physics. There are no predetermined animations here. Instead, all of the characters and much of the environment is continually responsive to in-game physics. That applies to death animations, of course, but it also makes every other aspect of the game more convincing, too. An effective exercise program needs to be fun and keep you motivated. It helps to have a goal.Your goal might be to:Manage a health conditionReduce stressImprove your staminaBuy clothes in a smaller size Your exercise program can also be a good way for you to socialize. Taking exercise classes or exercising with a friend are both good ways to be social.You may have a hard time starting an exercise routine, but once you do start, you may begin to notice other benefits, such as:Better control of your weight and appetiteImproved fitness, making it easier to do everyday activitiesImproved sleepMore confidence in yourselfLower risk for heart disease, diabetes, and high blood pressureGETTING STARTEDYou do not need to join a gym to exercise. If you have not exercised or been active in a long time, start slowly to prevent injuries. Taking a brisk 10-minute walk twice a week is a good start.Try joining a dance, yoga, or karate class if it appeals to you. You could also join a baseball or bowling team, or even a mall-walking group. The social aspects of these groups can be rewarding and motivating.The most important thing is to do exercises that you can maintain and enjoy.IMPORTANT NOTE: Talk with your health care provider before starting an exercise program if:You have diabetes, heart disease, lung disease, or another long-term illnessYou are obeseYou have not been very active latelyYou get chest pains or shortness of breath when you are activeBUILD PHYSICAL ACTIVITY INTO YOUR REGULAR ROUTINE Simple lifestyle changes can make a big difference over time.At work, try taking the stairs instead of the elevator, walking down the hall to talk with a co-worker instead of sending an email, or adding a 10- to 20-minute walk during lunch.When you are running errands, try parking at the far end of the parking lot or down the street. Even better, walk to the store or other nearby places.At home, do chores such as vacuuming, washing the car, gardening, raking leaves, or shoveling snow.If you ride the bus or other public transportation, get off 1 stop before your usual stop and walk the rest of the way. REDUCE YOUR SCREEN TIMESedentary behaviors are things you do while you are sitting still. Decreasing your sedentary behaviors can help you lose weight. For most people, the best way to decrease sedentary behaviors is to reduce the time they spend watching TV and using a computer and other electronic devices. All of these activities are called "screen time."Some ways to decrease screen time are:Choose 1 or 2 TV programs to watch, and turn off the TV when they are over.Do not keep the TV on all the time for background noise -- you might end up sitting down and watching it. Turn on the radio instead. You can be up doing things around the house and still listen to the radio.Do not eat while you watch TV.Take the batteries out of your TV remote control and get up to change the channel.Before you turn on the TV, take your dog or a neighbor's dog for a walk. If you are going to miss your favorite show, record it.Find activities to replace TV watching. Read a book, play a board game with family or friends, or take an evening cooking class.Work out on an exercise or yoga ball while you watch TV. You will burn calories. Or, set up a stationary bike or treadmill in front of your TV and use it while you watch. If you like playing video games, try games that require you to move your whole body, not just your thumbs.HOW MUCH EXERCISE DO YOU NEED?The Physical Activity Guidelines for Americans recommends that adults get a total of 150 to 300 minutes per week of moderate-intensity activity, or 75 to 150 minutes per week of vigorous activity. You could also meet this recommendation with an equivalent amount of combined moderate and intense activity. Muscle strengthening, also called strength training, resistance training, or endurance exercise, should also be done 2 or more days a week. As you become more fit, you can challenge yourself by increasing the intensity of your exercise by going from light to moderate activity. You can also increase the amount of time you exercise. Updated by: Linda J. Vorvick, MD, Clinical Associate Professor, Department of Family Medicine, UW Medicine, School of Medicine, University of Washington, Seattle, WA. Also reviewed by David Zieve, MD, MHA, Medical Director, Brenda Conaway, Editorial Director, and the A.D.A.M. Editorial team. Page 2Updated by: Linda J. Vorvick, MD, Clinical Associate Professor, Department of Family Medicine, UW Medicine, School of Medicine, University of Washington, Seattle, WA. Also reviewed by David Zieve, MD, MHA, Medical Director, Brenda Conaway, Editorial Director, and the A.D.A.M. Editorial team. Plasma, the fourth state of matter, is by far the most abundant form of known matter in the universe. Its behavior is very different from the other states of matter we are usually familiar with. To understand it, a rigorous formalism is required. This is essential not only to explain important astrophysical phenomena, but also to optimize many industrial and medical applications and for achieving fusion energy on Earth. This physics course, taught by world-renowned experts of the field, gives you the opportunity to acquire a basic knowledge of plasma physics. A rigorous introduction to the plasma state will be followed by a description of the models, from single particle, to kinetic and fluid, which can be applied to study its dynamics. You will learn about the waves that can exist in a plasma and how to mathematically describe them, how a plasma can be controlled by magnetic fields, and how its complex and fascinating behavior is simulated using today's most powerful supercomputers. This course is the first of two courses introducing plasma physics and its applications. After completing this course, you will have the prerequisites to enjoy Plasma Physics: Applications, which deals with plasma applications in astrophysics, industry, medicine, nuclear fusion and laser-plasma interaction. Basic knowledge of plasma physics and the different models used to describe plasmas An understanding of how to numerically simulate complex plasma dynamics Basic knowledge of MATLAB programming through introduction videos and exercises Week 1: Description of the plasma state Week 2: Kinetic description of plasmas Week 3: Fluid description of plasmas Week 4: Fluid description of plasmas II Receive an instructor-signed certificate with the institution's logo to verify your achievement and increase your job prospectsAdd the certificate to your CV or resume, or post it directly on LinkedInGive yourself an additional incentive to complete the courseedX, a non-profit, relies on verified certificates to help fund free education for everyone globally"This is an extraordinary course. A great opportunity to learn physics. I wish to thank to the professors, tothe EPFL and to edX by have offered this interesting MOOC." "I found thelectures very informative and clear. I like the"interactive" style which you present, it works the best for beginners who need to be introduced step bystep into the topic. I would recommend this course to any student curious of plasma physics."Unfortunately, learners residing in one or more of the following countries or regions will not be able to register for this course: Iran, Cuba and the Crimea region of Ukraine. While edX has sought licenses from the U.S. Office of Foreign Assets Control (OFAC) to offer our courses to learners in these countries and regions, the licenses we have received are not broad enough to allow us to offer this course in all locations. edX truly regrets that U.S. sanctions prevent us from offering all of our courses to everyone, no matter where they live. Photo Courtesy: Ren Chao/Xinhua/Getty Images Physical activity offers many benefits for folks of all ages, but, in addition to promoting fitness, physical education can help kids develop many useful skills. This is precisely why physical education — often called P.E. — has been implemented into school curriculums the world over. So, let's explore just what P.E. is and how it can be beneficial to everyone — not just young athletes. Taught in schools as a way for students to develop physical fitness, physical education (P.E.) can also help students hone their teamwork skills and refine their strategic thinking abilities. In classes, students often participate in team sports, like soccer and basketball, as well as more individual sports, like gymnastics. Photo Courtesy: Kathryn Scott/The Denver Post/Getty Images With this in mind, physical education has been a requirement in schools across the world for hundreds of years. When schools across Europe began implementing formal P.E. programs during the 1800s, American schools followed suit. By the early 1900s, the States passed legislation that made P.E. a required course. According to the Centers for Disease Control and Prevention (CDC), "supporting schools to establish physical education daily can provide students with the ability and confidence to be physically active for a lifetime." According to the National Heart, Lung, and Blood Institute, P.E., or any type of physical activity, typically incorporates four main types of exercises — aerobic, muscle-strengthening, bone-strengthening, and stretching activities. Photo Courtesy: Michael Gottschalk/Photothek/Getty Images Aerobic activity, which includes running, jumping, and walking, benefits your heart and lungs. Looking to increase one's stamina, power, and strength? This can be accomplished through muscle-strengthening activities, which include pushups and situps as well as through bone-strengthening activities, which include jumping rope and lifting weights. Finally, stretching before and after P.E. is vital when it comes to improving flexibility and preventing injury. Since its formal implementation in schools, P.E. curriculum has set forth particular benchmarks. As such, the four primary objectives of physical education are improved physical fitness; appreciation of physical activity; sportsmanship development; and improved social skills. Photo Courtesy: Jose M. Osorio/Chicago Tribune/Tribune News Service/Getty Images Other objectives of physical education include body awareness, skill development, and personality development. Participating in P.E. helps kids explore what kinds of physical activities speak to their strengths and which might be areas for improvement. Ultimately, it's a real confidence builder when taught properly. Close to 14 million children and adolescents between the ages of 2 and 19 are medically obese. According to the Office of Disease Prevention and Health Promotion, physical activity can help prevent mitigate obesity and the issues that stem from it, which include heart disease, diabetes, stroke, and high blood pressure. Children who are exposed to physical education on a regular basis tend to lead more active lifestyles in general, which sets them up for maintaining these habits in adulthood too. Photo Courtesy: Kathryn Scott/Osler/The Denver Post/Getty Images In addition to helping students move their bodies, P.E. can help teach sportsmanship, teamwork, and cooperation. Often, P.E. students must work together in teams, which teaches them how to work toward a common goal. They also learn that in games, as in life, sometimes you win and sometimes you lose. And, no matter the outcome, it's important to be a good sport. Without a doubt, physical education gives students the chance to try new sports and develop new athletic pursuits. Additionally, younger children are able to develop motor skills and work on balance and flexibility. Developing these skills can help build self-confidence in physical ability as well as an appreciation of the importance of physical activity. Photo Courtesy: Alistair Berg/Getty Images P.E. also teaches students about body awareness. This means that kids will learn what they are physically able to do and their limitations. For example, some students might excel in sports that require strength, while others might have a knack for activities that demand flexibility and balance. Understanding that we all have unique abilities is essential to healthy development. Socializing is a huge part of P.E. After all, nothing fosters teamwork like (gently) pushing kids out of their comfort zone. In this recreational setting, they'll have to take risks, but they'll also learn to communicate with others; resolve conflicts (without storming off); and learn to either lead or take direction. Photo Courtesy: Kevin Dodge/Getty Images Participating in these recreational activities also helps improve students' enthusiasm, motivation and perseverance. That is, they'll want to help their team excel and cheer on their teammates from the sidelines. Needless to say, P.E. is more than just the chance to run around and get some energy out. With just a few hours of physical education a week, students can develop beneficial habits, skills, and traits that will last a lifetime.

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