Strength in Science

The Science of Exercise

Extracurricular Exercise Classes for Teenage Girls
Physical inactivity is one of the leading risk factors for poor health and is now identified by the World Health Organization (WHO) as the fourth leading risk factor for global mortality. In Ireland, physical inactivity is thought to be responsible for 8.8% of the burden of disease from coronary artery disease, and 10.9% of type 2 diabetes.

Currently, only 8% of female secondary students in Ireland receive the Department of Education and Skills (DES) recommended 60 minutes of Physical Education (PE) per week. The goal of the “Strength in Science” project is to develop cross-curricular resources for science and PE teachers that are linked with the Junior Cycle Science and PE curricula which will increase girls’ interest in both learning science and participating in exercise. We hope to make science more personal and relevant to teenage girls by linking how the biology and physics involved in exercise affects their health.

This booklet presents fun and unique ways to participate in exercise and includes contact details for fitness instructors who work with teenagers in the Galway and Dublin areas*. It also includes the scientific effects that each exercise has on the body. Further resources such as films, flyers and lesson plan booklets are free to download at: www.curamdevices.ie/curam/public-engagement/teachers-in-residence

We hope that you and your students find these resources an enjoyable way to learn about how exercise affects your body and about scientific research which is happening here in Ireland!

Sincerely,

Dr. Sarah Gundy
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Teachers in Residence
Programme Manager
What is CrossFit?

Does swinging on gymnastics rings as part of your exercise regime sound tempting? If so, then CrossFit may be just the exercise for you! CrossFit has become a phenomenon in the fitness world in the last ten years with lots of celebrities and athletes claiming to be big fans. One reason for CrossFit's huge popularity is because of the sense of community promoted within the workouts. CrossFit is a great way to meet and socialise with fellow CrossFitters, and participants can even compete at CrossFit Games held all over the world! CrossFit incorporates elements of strength training, gymnastics and high-intensity interval training. Participants can attend classes at a certified CrossFit gym, or go online (www.crossfit.com/workout) to look up the workout of the day, otherwise known as the “WOD.” Typical WODs include elements of strength, gymnastics and cardiovascular exercises. CrossFit is suitable for everyone and the intensity can be changed to suit anyone's level and ability.

Workouts are changed daily and because there is such a wide variety of movements and skills, you'll never lose interest. Certain workouts are repeated every few months so you can measure the progress of your strength and fitness levels.

How Does CrossFit Affect Your Body?

There are so many great ways that CrossFit can influence your body. The high-intensity interval training in CrossFit will make your heart stronger so that it can pump more blood with less effort. This will lower your blood pressure and the force of the blood on your arteries which will help prevent damage to the insides of you blood vessels. The jumping and gymnastic movements will apply forces to your bones which will stimulate your bone cells to make your bones stronger. Also, because the exercises are always different, the constant variety will keep your body guessing and create new neural pathways in the brain.

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What is Zumba?

High energy music? Check! Lots of options to suit all ages and fitness levels? Check! So fun you won’t even realise it is a workout? Check! No wonder Zumba is one of the most popular group exercise classes in the world. Zumba really feels more like a dance party than a workout. And, you don’t actually have to be a good dancer to do a Zumba class as the emphasis is about moving to the music and having a good time.

There are so many different kinds of Zumba classes, from Zumba Toning which uses weights for building strength, to Strong by Zumba which incorporates boot camp style moves that are synced to music. There is even Aqua Zumba classes which are performed in a swimming pool. You can find a Zumba class that suits you best anywhere in the world by searching on their website at www.zumba.com

How Does Zumba Affect Your Body?

Learning the moves in a Zumba class forces you to process and perform new movement patterns. This requires mental focus and the creation of new neural pathways in the brain. A brain with a more complex and varied neural network is stronger and may be more resistant to memory loss with ageing. The aerobic exercises in Zumba keep blood vessels healthy by lowering LDL (“bad”) cholesterol. Aerobic exercises also boost nitric oxide production by the cells lining the insides of the blood vessels. This keeps the insides of your blood vessels smooth and slippery which prevents white blood cells and platelets from attaching and blocking your arteries.

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What is Dance?

There are so many options of dance-inspired workouts ranging from break dancing to belly dancing that you will never be bored! Dance is categorised and described by its movements, historical period or place of origin. You can change your workout with the type of dance you choose. For example, fast-moving dance styles like salsa provide an aerobic workout while slower styles like ballet provide strengthening. Most dance-inspired classes focus on aerobic exercise to get the heart rate up. This style includes classes such as Hip Hop, Jazzercise, Piloxing and The Mix. Slower styles emphasise improving balance, coordination, core-strength and flexibility. Examples of this style include workouts using a ballet barre like Piloxing Barre and Barre 45. Other styles blend dance with yoga or martial arts, such as Nia, to bring a mind-body element to the workout. These styles are a great option for beginners looking for a way to ease into exercise.

How Does Dancing Affect Your Body?

When you jump on the bike, perform a bicep curl, or hike up a mountain, your body is performing a movement pattern it is familiar with. The neural pathways in your brain involved in performing these movements already exist and are being reinforced through repetition. You are more or less ‘going through the motions’ without having to mentally concentrate on the mechanics of each step. Dancing compared to other exercises requires you to learn new moves, which creates new neural pathways in your brain. Also, dancing is generally performed to music. Just listening to music in itself activates brain areas associated with movement, emotions and creativity. Music also activates our ‘reward centres’ in our brain and increases a neurotransmitter called dopamine. This is why listening to music can give you a pleasant or happy feeling!

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What is Cheerleading?

That annoying, bubbly stereotype is no longer true as cheerleaders are serious athletes these days! This team sport has taken off so much in Ireland over the last ten years that they have even formed an Irish Cheer Sport Association. Cheerleading mixes dancing and stunts with a bit of jumping and tumbling. Imagine a dance routine with people getting thrown into the air and performing gymnastic moves. Cheerleading is a great sport to release that inner dare-devil.

Originally, cheerleading squads were formed in order to “cheer” on sports teams, but now most squads only showcase their skills in competitions against other squads. Everyone performs an important role in a cheerleading squad and there is strong comradeship within the sport. Don’t let the pom poms fool you! Cheerleading requires lots of practice, especially when training for competitions. But, all that hard work pays off when you get to travel to really fun places, such as Florida, to compete.

How Does Cheerleading Affect Your Body?

Just like other activities involving dancing, learning the routines in cheerleading creates new neural pathways to strengthen your brain. But, cheerleading is a great activity to strengthen your bones as well. The jumps and gymnastics moves performed in cheerleading apply a healthy amount of force to your bones. Exercises that apply forces against your bones stimulate cells deep in your bones to build up your bone density. Most people obtain what is called their peak bone mass between 16-25 years. This is the maximum amount of bone a person has during their life. Cheerleading can help build your peak bone mass to be as strong as possible when you are younger, in order to prevent your bones from getting weaker as you get older.

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What is Circus Performance?

If you are looking for a totally unique workout experience, circus performance might be your thing. You can get your exercise while learning skills such as juggling, balancing, tightrope-walking, floor acrobatics or aerial acrobatics. Challenging yourself and facing your fears by mastering these skills will give you a major confidence boost. But don’t worry— you don’t have to be a dare-devil to do the activities. Circus exercises are taught in a completely safe environment for all levels of ability and trust.

Aerial silks involve performing acrobatic moves while hanging from long strands of fabric that are suspended from the ceiling. Aerial hoops, circular apparatuses that look like hula-hoops, are used in a similar way to balance and move around. A trapeze is a short bar that is hung by ropes which you’ve probably seen in circus performances. Trapeze exercises may be performed with the bar swinging or not swinging, and as a solo or group act.

How Does Circus Performance Affect Your Body?

The tendons that attach your muscles to bones can get stiff which limits your ability to move a bone around its joint. If you aren’t very flexible it is easier to push a bone too far beyond its limited movement which can cause an injury. Performing circus exercises with equipment that suspend you in the air (such as aerial silks, hoops and trapeze) will increase your flexibility which will help to prevent injuries from happening to your body. Circus exercises also strengthen the muscles in your arms and core better than popular workouts that typically focus on the lower body. Circus performance also requires coordination and focus so your brain will get a workout as well. Juggling, in particular, can improve your hand-eye coordination, reflexes and peripheral vision as well as heighten the communication between the right and left hemispheres of your brain.
What is Yoga?

Recently, yoga has become a popular way for people to exercise and it involves doing poses that help improve control over their minds and bodies to enhance well-being. But, people have actually been practicing yoga for thousands of years! There are eight components, called “limbs”, to yoga such as pranayama (breathing), pratyahara dharana (concentration) and dhyani (meditation). Most people who practice yoga focus on the third limb, called asana, which involves postures designed to physically strengthen the body. Think you need to be super flexible to do yoga? Well, you are wrong! There are so many styles of yoga so you can choose which suits your fitness level the best. If you prefer to focus on breath and movement, try Ashtanga yoga which is a traditional series of postures done in the same order every time. If you want some extra support, try Iyengar yoga which focuses on alignment and uses props such as belts and blocks to help you do the postures in the correct position. If you like it hot, you can try Bikram yoga, or “hot” yoga, where you do poses in a room heated to 40°C. If you want something a bit daring, there is even Aerial yoga where you perform the poses while suspended in the air by a super strong, silky hammock.

How Does Yoga Affect Your Body?

Cortisol is a hormone that is released in your body to protect you from immediate stress in your life such as an exam or speaking in front of a large group of people. Short bursts of cortisol are good for us and helped our ancestors survive in the harsh wilderness thousands of years ago. But unlike our ancestors, we seem to be faced with stressful situations constantly which makes our cortisol levels be high all of the time. If our cortisol levels are always high, it causes high blood pressure and it leads to our immune system not to work as well. Practicing yoga will help lower cortisol levels in your body which will in turn keep your blood pressure and immune system healthy. Yoga will also help to decrease your resting heart rate which can make you live longer!
About CÚRAM

Backed by Science Foundation Ireland (SFI), CÚRAM is a world leading SFI Research Centre with expertise in medical device technology. With ten partner institutes and 32 industry partners, researchers at CÚRAM are designing the next generation of medical devices. CÚRAM’s aim is to improve the quality of life for people suffering from chronic illnesses like diabetes, cardiovascular disease and Parkinson’s disease. In support of SFI’s ‘Agenda 2020’ goal of having the most engaged and scientifically informed public, CÚRAM has developed a unique and innovative Education and Public Engagement programme (EPE) called ‘Breaking Barriers’. CÚRAM’s EPE programme aims to raise awareness of Irish research and increase understanding of preventative behaviours that can reduce the incidence of chronic illnesses.

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