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.....*Empowering Minds*

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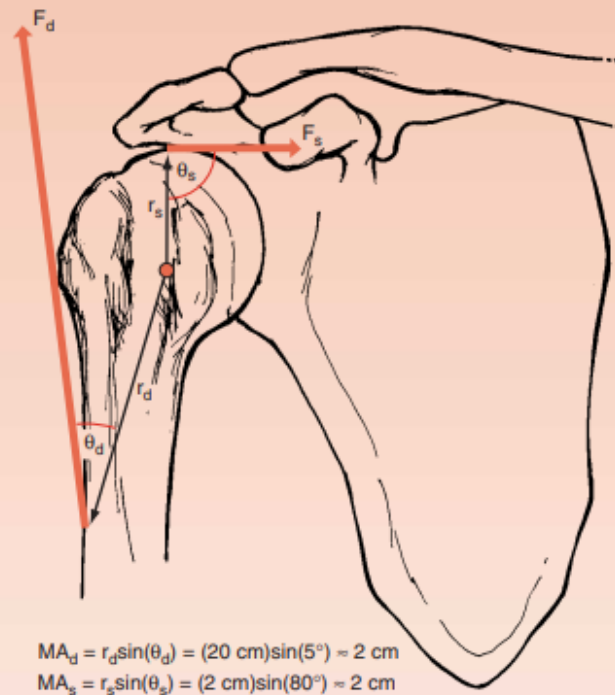
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T.DURGA PRASAD

FACULTY ARTICLE

Biomechanical Principles

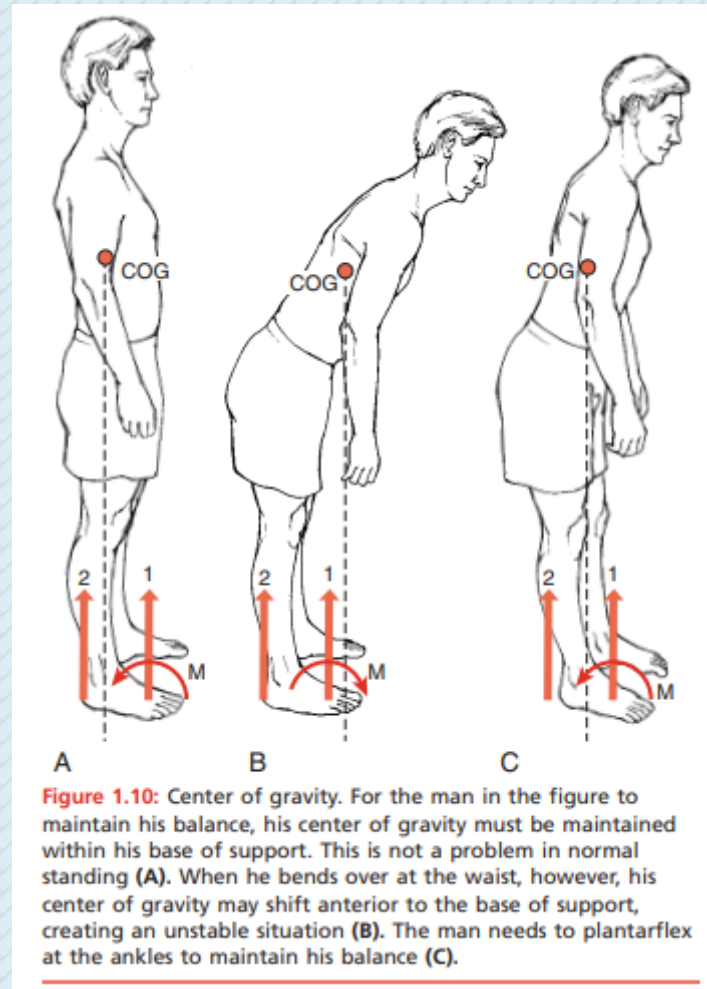


MATHEMATICAL OVERVIEW

This section is intended as a review of some of the basic mathematical concepts used in biomechanics. Although it can be skipped if the reader is familiar with this material, it would be helpful to at least review this section. Units of Measurement The importance of including units with measurements cannot be emphasized enough. Measurements must be accompanied by a unit for them to have any physical meaning. Sometimes, there are situations when certain units are assumed. If a clinician asks for a patient's height and the reply is "5-6," it can reasonably be assumed that the patient is 5 feet, 6 inches tall. However, that interpretation would be inaccurate if the patient was in Europe, where the metric system is used. There are also situations where the lack of a unit makes a number completely useless. If a patient was told to perform a series of exercises for two, the patient would have no idea if that meant two days, weeks, months, or even years. The units used in biomechanics can be divided into two categories. First, there are the four fundamental units of length, mass, time, and temperature, which are defined on the basis of universally accepted standards. Every other unit is considered a derived unit and can be defined in terms of these fundamental units. For example, velocity is equal to length divided by time and force is equal to mass multiplied by length divided by time squared.

Center of Gravity and Stability

Another example of a parallel force system is the use of the center of gravity to determine stability. The center of gravity of an object is the point at which all of the weight of that body can be thought to be concentrated, and it depends on a body's shape and mass distribution.



The center of gravity of the human body in the anatomical position is approximately at the level of the second sacral vertebra. This location changes as the shape of the body is altered. When a person bends forward, his or her center of gravity shifts anteriorly and inferiorly. The location of the center of gravity is also affected by body mass distribution changes. For example, if a person were to develop more leg muscle mass, the center of mass would shift inferiorly. The location of a person's center of gravity is important in athletics and other fast motions because it simplifies the use of Newton's second law. More important from a clinical point of view is the effect of the center of gravity on stability. For motions in which the acceleration is negligible, it can be shown with Newton's first law that the center of gravity must be contained within a person's base of support to maintain stability. Consider the situation of a person concerned about falling forward. Assume for the moment that there is a ground reaction force at his toes and heel. When he is standing upright, his center of gravity is posterior to his toes, so there is a counterclockwise moment at his toes (Fig. 1.10A). This is a stable position, since the moment can be balanced by the ground reaction force at his heel.

If he bends forward at his hips to touch the ground and leans too far forward, his center of gravity moves anterior to his toes and the weight of his upper body produces a clockwise moment at his toes (Fig. 1.10B). Since there is no further anterior support, this moment is unbalanced and the man will fall forward. However, if in addition to hip flexion he plantarflexes at his ankles while keeping his knee straight, he is in a stable position with his center of gravity posterior to his toes (Fig. 1.10C).



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ALUMNI ARTICLE

APPLICATION OF NANOMATERIALS IN AUTOMOBILE INDUSTRY

Nano materials are comes into picture because of its separate physical and chemical properties present in it and in its product. Best way to define nano materials is anything whose size is comparable in the range of 0.1 to 100 nanometre. Nanotechnology has been widely used automotive industry to bring improvisation in automotive industries and improve vehicle performance. The applications of nano material in vehicles can provide better strength and durability performance over conventional material.

Nano material may offer new methods or tools for controlling or modifying the structures and properties of the materials to achieve better performance. We know that for modern world we need improvisation but on the other hand we also consider safety concerns and durability for vehicles like automobiles, aerospace and marines, nano material have the tendency to fulfil these requirements. In the modern transportation, new smart high and efficient vehicles are unimaginable without the application of nanotechnologies such as lightweight nano materials, scratch resistant paints, and Nano fluids.

Nanotechnologies could be applied in various body parts, including the chassis, tires, windows, engines, etc. to enhance their performance and durability. However, there are certain health issues and environmental risks associated with the application of nanotechnology in transportation which demands high attention. The details of the applications of nanotechnology in transportation are explained as impact vs demand graph.

Applications of Nano materials in Automobile Industries

There are more than thousand applications where Nano Materials are used. This review paper only covers the applications of Nano materials in automobile industries. We talk only those examples which are attracted the most of the scientists, researchers, and the world. All the examples which we are taking are based on their researches. The first application is Nano Base, Nano Base is a Nano type structure which makes the cap of tyre stronger, improve its gripping power and handling properties, and it also helps to reduce heat effect in tyres and reduce rolling friction. It is currently used in WR A3 tyres. Second example is Nano pro-Tech, which is an example of Nano coating for the tyre thread, which reduces heat generation. The third one is Nano Clay containing BIMS and Lamellar nano material organ clay. Nano clay containing BIMS is also pronounced as brominated isobutyl-co-paramehylstyrene elastomers) which is developed and localised by Exxon Mobil. It increases the air seizing property and increase halo butyl rubber by 50%. The other one is lamellar nano material organ clay, the great example of this type of clay is Montmorillonite clay (MMT) developed by Pirelli. It allows the tyre to maintain its neutral behaviour and equalize its performance in longitudinal as well as in lateral direction for a better experience of handling.

It has better thermoplastic stability; it also helps to reduce decay. The nano materials and its application listed in

Automobile requirement The most critical and demanding aspect to develop a good material is that it has good strength and weight ratio, which is best fit for an automobile which includes fuel economy with improved engine performance in efficient manner. The important parts of automobile component The properties of the combination of metal matrix composites (MMCs) consist of High specific strength, Low coefficient thermal expansion and high thermal resistance, good damping capacities, Superior wear resistance , High specific Stiffness , Satisfactory level of corrosion resistance.

Nano-reinforced composites Polymer compounding producing filled polymer, assembly of laminate composites and polymerizing rigid rod polymer are some procedures which are followed earlier when we require processing metal matrix composites. There are two major Purposes of Nano Reinforced composites. The first one is that it can replace the old materials which are limited in performance whereas Nano reinforced composites can help

Nanomaterials	Purpose	Pros of Nanomaterials
Aluminium oxide	Polishing Slurries & Structural ceramics	Faster rate of surface removal reduces operating costs and Improved mechanical properties
Cerium oxide	Polishing Slurries & Catalysts	Less material required due to small size of particles and Increased wear resistance
Aluminium titanate	Structural ceramics	Reduced production cost due to lower sintering temperature
Titanium oxide	Catalysts	Increased activity due to smaller particle size
Tungsten Carbide	Hard coating	Thin coating reduces the amount of material required
Silver	Conductive inks	Increased conductivity reduces consumptions of valuable metal
Tungsten	Conductive inks	Increased conductivity reduces consumptions of valuable metal
Nickel	Conductive inks	Allows electron lithography

to break the limit and can be superior. The other purpose is to use these Nano reinforced composites in that places where these traditional and old fashion materials cannot be fitted. The main part which is most attractive is its benefits, nanotechnology in composite materials can break the limitation of composite functionalities. Most important part which can be achieve is, we can reach the percolation threshold at low volume (<1%) after mixing of a nano materials in host matrix. Also additional functionality can be added when we and nano particle in matrix as host and able to control the orientation at nano scale.



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STUDENT ARTICLE



Nvidia Corporation is an American multinational corporation and technology company headquartered in Santa Clara, California, and incorporated in Delaware. Founded in 1993 by Jensen Huang (president and CEO), Chris Malachowsky, and Curtis Priem, it is a software company which designs and supplies graphics processing units (GPUs), application programming interfaces (APIs) for data science and high-performance computing, and system on a chip units (SoCs) for mobile computing and the automotive market. NVIDIA is also a leading supplier of artificial intelligence (AI) hardware and software. NVIDIA outsources the manufacturing of the hardware it designs. NVIDIA'S professional line of GPUs are used for edge-to-cloud computing and in supercomputers and workstations for applications in fields such as architecture, engineering and construction, media and entertainment, automotive, scientific research, and manufacturing design. Its GeForce line of GPUs are aimed at the consumer market and are used in applications such as video editing, 3D rendering, and PC gaming. With a market share of 80.2% in the second quarter of 2023, Nvidia leads global sales of discrete desktop GPUs by a wide margin. The company expanded its presence in the gaming industry with the introduction of the Shield Portable (a handheld game console), Shield Tablet (a gaming tablet), and Shield TV (a digital media player), as well as its cloud gaming service GeForce Now. In addition to GPU design and outsourcing manufacturing, NVIDIA provides the CUDA software platform and API that allows the creation of massively parallel programs which utilize GPUs. They are deployed in supercomputing sites around the world. In the late 2000s, NVIDIA had moved into the mobile computing market, where it produced Tegra mobile processors for smartphones and tablets and vehicle navigation and entertainment systems. Its competitors include AMD, Intel, Qualcomm, and AI accelerator companies such as Cerebras and Graphcore. It also makes AI-powered software for audio and video processing (e.g., NVIDIA Maxine). NVIDIA'S attempt to acquire Arm from Soft Bank in September 2020 failed to materialize following extended regulatory scrutiny, leading to the termination of the deal in February 2022 in what would have been the largest semiconductor acquisition. In 2023, NVIDIA became the seventh public U.S. company to be valued at over \$1 trillion, and the company's valuation has increased rapidly since then amid growing demand for data centre chips with AI capabilities in the midst of the AI boom. In June 2024, for one day, NVIDIA overtook Microsoft as the world's most valuable publicly traded company, with a market capitalization of over \$3.3 trillion.

MOTIVATIONAL QUOTES

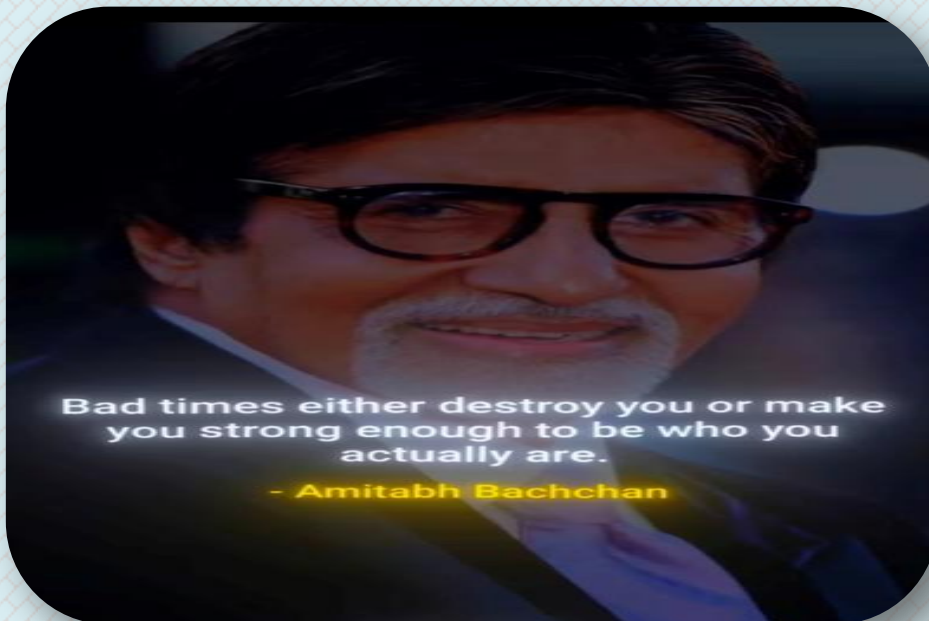


Tom Hardy once said:

Some people don't understand that sitting in your own **house alone** in peace, eating snacks and minding your business is **just priceless.**

Follow @TheMotivationFusion

SUCCESS TIPS



Bad times either destroy you or make you strong enough to be who you actually are.

- Amitabh Bachchan



.....Empowering minds

SRI VASAVI INSTITUTE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

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