

Performance Enhancing Drugs In Bodybuilding Their Effects And Abuse

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I. Introduction

Performance-enhancing drugs (PEDs) have spread throughout many sports, often tainting the spirit of competition. PED use among athletes is reported at varying frequencies, ranging from 5 to 31%. What's more, some of these drugs seriously endanger the health and safety of sportsmen. Human growth hormone, creatine, erythropoietin and blood doping, amphetamines and stimulants, and beta-hydroxy-beta-methylbutyrate are examples of common PEDs. Recent technological developments have made gene doping more likely. Because of the frequently unawareness of these medications, doctors of sports medicine do not usually bring up PEDs with their patients. Physicians, however, need to become knowledgeable about the physiology, performance advantages, negative effects, and testing procedures in order to make a good impact on the sports community. Physicians can then instruct athletes of all skill levels and discourage the use of possibly harmful PEDs^[1]

In the fitness and bodybuilding industry, the use of performance-enhancing drugs (PEDs) for non-medical purposes is common. The motivations for using PEDs are frequently hedonistic in nature, and they are frequently used in "cycles" lasting several weeks.. PED users frequently self-medicate with drugs to lessen unwanted side effects and consequences; occasionally, PED users also discuss such drugs and request them from general practitioners^[2]. These practices are extremely unhealthy and lead to long-term adverse effects on the human body.

It is import for us to understand the structure and magnitude of Performance enhancing drugs , their harmful effects of usage, their common abuse and significance in order to help educate the youth and other ages of society that are largely mislead by social influences and other factors that in-turn have a huge destructive impact on the society of today and to help eradicate toxic substance in-take as the new norm and spread awareness relating to performance enhancing drugs.

Understanding P.E.Ds

Any substance that has the potential to alter how the human body functions and affects sports ability is considered a performance-enhancing drug. The PED should ideally improve physical function in such a way that it gives the user a noticeable edge over non-user opponents^[3]. PEDs or performance enhancing drugs, are substances used to enhance physical performance. Despite rules in sports and prohibitions banning some of these medications, elite athletes frequently take them. Numerous steroids and hormones that are used to improve performance also have other authorised medicinal purposes. However, they are frequently used to improve athletic performance and aesthetics because they increase muscles, hasten recovery, and have other physiological effects .Anabolic steroids are one of the PEDs that are most frequently taken, but there are other options that enhance and improve athletic performance and ability^[4]. The widespread use of PEDs, sometimes known as doping, in the world of sports and fitness has been fueled by the ambition to win and to be the best athlete possible .Before, only followers of muscle-building sports like weightlifting were aware that sportsmen used PEDs, or performance-enhancing substances,but now PED scandals have hit almost , every sport today^[3].

There are certain ambiguities in how drugs are categorised as performance-enhancing substances. Similar to other categories of classification, some archetypal performance enhancers, like anabolic steroids, are universally categorised as such, while other substances, such vitamins and protein supplements, are hardly ever labelled as such despite having an impact on performance. There are ambiguous examples, as is common with categorization; for instance, some people perceive caffeine to be a performance booster while others do not^[5].

Science Behind P.E.Ds

Glands all across the body naturally create hormones. The hormones are circulated throughout the body after they enter the bloodstream. Hormones attach to cells when they come into contact with receptors on those cells. This causes the cell to undergo chemical changes, which alter how the body functions. Hormone-mimicking medications are used to enhance performance. These substances connect to certain cells, just like hormones, and modify how the body functions.

Therefore, if an athlete wants to improve his physical capabilities, he is likely to take performance-enhancing drugs that mimic or duplicate a hormone that has the desired effect. For instance, drugs like anabolic steroids mimic or duplicate testosterone, a naturally occurring hormone produced by the body that binds cells to produce increased muscularity and size. The various glands in the human body having endocrine function, relating to secretion of hormones are:

- The pituitary, hypothalamus, and pineal glands ,
- Glands of the thyroid and parathyroid
- Thymus
- Kidneys, pancreas, and adrenal glands
- Ovaries(female)
- Testes(male)

Each gland produces hormones, such as growth hormones, oxytocin, and testosterone, which have a variety of effects on the body^[6].

Types Of P.E.D.S

It would be challenging to compile a comprehensive list of performance-enhancing substances. There are many different substances and medications available that fall under this category. However the following categories of performance-enhancing medications prevalent in sports can be made below^[7]:

1. **Anabolic steroids**: Anabolic steroids help the body recuperate from workouts more rapidly by increasing the amount of testosterone produced by the body. It can be administered topically, as an injection, or as a tablet.

2. **Androstenedione**: Androstenedione enables athletes to train more intensely and recover from demanding workouts more quickly. Some hazards include acne, a decline in sperm production, testicular shrinkage, and the masculinization of women.

3. **Human growth hormone (HGH)** :is an injectable hormone that is only available with a doctor's prescription. Fluid retention, cardiomyopathy, which weakens the heart muscle, muscle weakness, and joint pain are among the risks.

4. **Erythropoietin**: Athletes take erythropoietin to improve the flow of oxygen to their muscles. This medication has a high risk of death, strokes, and heart attacks.

5. **Diuretics**: Diuretics alter the body's normal levels of salt and water. This medication may be used to lose weight or to detoxify the body in order to pass drug testing. Diuretics can cause fatal cardiac arrhythmias, dehydration, fatigue, and heatstroke.

6. **Creatine**:The most widely used substance for increasing athletic performance is creatine. It helps the muscles release energy and is available over the counter. Cramps in the stomach and muscles, nausea, weight gain, and liver and kidney damage at high doses are among side effects of creatine.

7. **Stimulants**: Stimulants are taken to improve endurance, lessen weariness, and boost alertness. They raise heart rate and blood pressure. Stroke, dehydration, seizures, heart attack, and palpitations are some of this drug's side effects. Baldness, acne, infertility, hypertension, drug dependence, liver abnormalities, tumours, cardiac issues, and circulation issues are some of the adverse side effects^[8].

Anabolic steroids

Anabolic steroids, also known as anabolic-androgenic steroids, are drugs that, in their capacity to stimulate the development of secondary sex traits in men and to promote muscular building, mirror the effects of the male hormone testosterone. Humans utilise anabolic steroids therapeutically to cure a number of ailments, such as anaemia, breast cancer, hypogonadism, short stature, malnutrition, osteoporosis, and wasting syndrome from the human immunodeficiency virus (HIV). Veterinary medicine also makes use of the medications (e.g., to aid recovery from starvation or injury). Nandrolone, oxandrolone, oxymetholone, stanozolol, and trenbolone acetate are a few anabolic steroid examples.

Anabolic steroids target the androgen receptor, which is testosterone's and its metabolite dihydrotestosterone's natural biological receptor. The stimulation of the androgen receptor causes cell proliferation, which increases the size of the muscles. Additionally, it causes

virilization, or the emergence of masculine characteristics including a heightened libido and a deeper voice^[9]. Anabolic steroids are prescribed by medical professionals to treat specific hormonal issues in men, delayed puberty, and muscle loss caused by certain disorders. However, some individuals abuse anabolic

steroids. To increase muscle mass and athletic performance, some bodybuilders and athletes utilise anabolic steroids. The steroids can be consumed orally, administered intramuscularly, or used topically as a gel or cream. These doses could be 10 to 100 times larger than those prescribed for treating ailments. It is not legal or safe to use them in this way without a prescription from a doctor^[10]. The medications are also used to build muscle growth in livestock, and they are occasionally administered to racehorses to heighten performance and stamina. In the majority of human sports and several equestrian sports, the use of anabolic steroids is either prohibited or strictly regulated.

However, abusing anabolic steroids can cause serious damage to the body. Animals, including livestock, can have similar negative impacts^[9].

Using anabolic steroids improperly, especially over an extended period of time, has been associated with a number of health issues, such as:

- Teens' growth is slowed.
- Elevated blood pressure
- Cholesterol changes
- Cardiac issues, such as heart attacks
- Malignancy among diseases of the liver
- Kidney injury
- Aggressive attitude
- Additionally in males, it may result in:
 - Baldness
 - Breast expansion
 - Infertility due to low sperm count
 - Reduction in testicular size
- For females, it can additionally lead to:
 - Modifications to your menstrual cycle (period)
 - Body and face hair growth
 - Baldness with a male pattern
 - A deep voice.

Anabolic steroids have a strong potential for addiction while not producing a high. If you stop using them, you could have withdrawal symptoms like:

- Fatigue
- Restlessness
- Reduced appetite
- Issues with sleep-
- Reduced sex desire
- Drug cravings
- Depression, a condition that can occasionally be severe and even result in suicide attempts.

Addiction to anabolic steroids can be treated with both behavioural treatment and medication^[10].

Some of the most common steroids used in the sport of building are as follows:

1. **Testosterone:** One of the most sought-after substances today is testosterone, which was the first anabolic steroid ever made. Strength and muscle mass will increase significantly as a result of testosterone. Additionally, it will speed up fat loss, drastically altering the body's composition. When attempting to improve muscle size during bulking cycles, it is typically employed. Its cost, relative mildness (in comparison to other bulking steroids), and lack of strong adverse effects all contribute to its popularity. For their initial cycle, many inexperienced steroid users may cycle Testosterone exclusively.
2. **Dianabol:** was created to be less androgenic and more anabolic than testosterone. Bodybuilders frequently attest to the fact that Dianabol causes greater increases in strength and muscle mass than Testosterone does. Testosterone is still a potent steroid, thus there isn't a significant change. Arnold Schwarzenegger's preferred steroid, dianabol, is still highly sought-after today. It causes a quick weight gain and is best used off-season. Dianabol, which has a low androgenicity and is not one of the toughest steroids on the market, is well-liked even by beginners. One of the best steroids for adding size and muscular mass is dianabol. Since it is often available orally, injections are not required.
3. **Anadrol:** a steroid that significantly enhances size and strength, is similar to Dianabol. It may be stronger than Dianabol due to the fact that it is used in higher quantities (mg per mg). Oral anadrol is a steroid that frequently comes in 50mg capsules. It is quite dangerous, thus beginners or those with minimal steroid expertise should avoid it. Users who already have cardiac issues may wish to avoid taking Anadrol because it will cause significant rises in blood pressure. All of the typical adverse effects of steroids will also be present

with anadrol, albeit more so. Concern over liver toxicity will also arise because it enters the body without going through the liver.

4. **Trenbolone:** is a highly severe steroid, similar to Anadrol. However, due to its incredible strength in terms of adding lean muscle mass, it continues to be popular among bodybuilders. Tren accomplishes this without causing any water retention because it does not aromatize or transform into oestrogen. Trenbolone allows bodybuilders to maintain their aesthetic and lean appearance rather than bloating and holding onto water. Due to low levels of fluid outside the muscle cells, users may also experience increased vascularity and striations. For better results when bulking, trenbolone—which is primarily an injectable steroid—is frequently combined with testosterone and anadrol. Additionally, cutting cycles can benefit from the usage of trenbolone to enhance fat loss while maintaining or adding to existing muscle mass.
5. **Turinabol:** An effective oral steroid is turinabol, sometimes referred to as Tbol. Additionally, some bodybuilders call it "baby Dbol" (Dbol being an abbreviation for Dianabol). This moniker developed as a result of Tbol being a less potent version of Dianabol. Since turinabol does not cause water retention, the majority of the weight gain will be muscle. It is therefore very helpful for athletes who want to improve performance without adding extra water weight. Although turinabol is not the most effective steroid for bulking up, it nevertheless results in observable increases in size and strength. Due to its 'dry' character, it is often used throughout cutting cycles to help users preserve muscle size.
6. **Stanozolol:** often known as Winstrol, effectively increases muscular mass while concurrently decreasing fat. This makes it a potent oral steroid that can be used for cutting or bulking. However, when compared to potent bulking steroids like Anadrol, Dianabol, Testosterone, or Trenbolone, Winstrol's muscular gains aren't as noticeable. As a result, rather than being the primary substance utilised, it is typically added to a stack to boost muscular gains. Another "dry" steroid, Winstrol helps a bodybuilder look slimmer by helping the body rid itself of water. It also increases muscle definition. Because there is less water to function as a cushion around the joints after taking Winstrol, the joints may feel more strain. The adverse effects of Winstrol are also fairly severe, with blood pressure and ALT/AST liver levels dramatically increasing.
7. **Anavar:** Most people agree that Anavar (Oxandrolone) is the safest steroid available. It aids in fat burning and slight muscular growth for bodybuilders. As a result, it is frequently applied during a cutting phase. Anavar is a "dry" steroid like Winstrol, thus when bodybuilders cycle it, they will appear even more ripped. Since Anavar is still FDA-approved for medical use and is frequently administered to even women and children, side effects are frequently extremely modest. Anavar is frequently taken by newbies due to its safety and simplicity of use (being an oral steroid). However, given that it is more difficult to make and less common, Anavar can be quite expensive on the underground market.
8. **Equipoise:** Equine vets frequently administer the injectable steroid Equipoise (Boldenone Undecylenate) to their patients. Equipoise and Deca Durabolin are comparable anabolic steroids, although Equipoise is more potent and androgenic than Deca. As a result, adverse effects are probably a little more severe. Although the benefits might be comparable to those of Deca, bodybuilders often combine Equipoise with more potent bulking steroids to achieve substantial increases in size and mass. Equipoise alone will produce modest and steady growth, similar to Deca Durabolin, with cycles typically lasting 12 to 20 weeks^[11].

Androstenedione

Androstenedione is a steroidal hormone that is produced in the adrenal glands, male and female gonads, and is well known for playing a crucial part in the synthesis of oestrogen and testosterone. Additionally offered as an oral supplement, androstenedione is used to raise testosterone levels. It is frequently promoted as a natural substitute for anabolic steroids and is simply referred to as "andro" by sportsmen. It is believed that increasing testosterone levels will improve sexual performance, body muscular development, fat loss, energy levels, and athletic performance. However, some of these impacts have not yet been proved by science^[12].

The adrenal glands, testicles, and ovaries are where androstenedione is largely made. It is categorised as a weak androgen because, compared to traditional anabolic/androgenic steroids like testosterone, it binds to the body's androgen receptor in a considerably weaker manner. It is a direct precursor of testosterone and is produced by the synthesis of the hormone precursor dehydroepiandrosterone (DHEA). Androstenedione can also be transformed under normal physiological conditions into strong feminising hormones like estrone and estradiol (both of which belong to the oestrogen class of hormones). It's important to note that numerous peripheral body tissues, including muscle, bone, the liver, and the brain, also contain the enzymes that convert androstenedione to powerful hormones like testosterone and estradiol^[13].

When taken for 2-3 months in conjunction with weight training, oral dosages of 100–300 mg of androstenedione per day do not significantly increase muscle strength, muscle size, or lean body mass. When taken orally, androstenedione may not be safe for the majority of people. Men may also have behavioural changes, heart problems, shrinking testicles, painful or protracted erections, breast development, and other negative effects. Women may acquire masculine characteristics like a deeper voice, facial hair, acne, male-

pattern baldness, and rougher skin. Women may also experience sadness and irregular menstrual cycles. Androstenedione is toxic to the liver and can raise the risk of developing breast, prostate, or pancreatic cancer^[12].

Human growth hormone (HGH)

Human growth hormone (HGH) is a drug that some people use in the hopes that it will keep them looking and feeling young. But experts claim that optimism is misplaced. Worse then, some goods may be dangerous.

The pituitary gland's HGH stimulates growth in children and adolescents. Additionally, it aids in maintaining body fluid balance, muscle and bone development, sugar and fat metabolism, and perhaps cardiac function. HGH, a synthetic hormone, is the main component of several prescription medications. The FDA granted approval for specified uses of synthetic human growth hormone in both children and adults in 1985. In an effort to gain muscle and boost athletic performance, some individuals utilise the hormone in combination with other performance-enhancing substances like anabolic steroids. However, it is unclear how HGH affects sports performance. Some so-called anti-aging experts have conjectured and asserted that HGH products could repair age-related bodily degradation because the body's HGH levels gradually decline with age. But these assertions are also unsupported. The FDA has not approved the use of HGH for anti-aging. However, some patients get injectable HGH from medical professionals who recommend it for unapproved uses.

Following are a list of possible HGH adverse effects:

- Joint, muscle, or nerve pain
- Due to fluid in the body's tissues, swelling (edema)
- Palmar-plantar syndrome
- Skin tingling and going numb
- High levels of cholesterol

HGH can also make people more likely to develop diabetes and help malignant tumours grow^[14].

Erythropoietin

EPO is classified as a Glycoprotein Cytokine (sometimes called hematopoietin or hemopoietin). Proteins called glycoprotein cytokines, which are employed for signalling, bind to amino acid chains via tiny protein peptides. These are often released by the kidneys in response to areas of the body that are oxygen deficient at the tissue level, or hypoxia. When released into the bloodstream, the protein hormone EPO, which is created in the kidney, binds to the bone marrow and promotes the creation of red blood cells. Erythropoiesis, the process of making red blood cells, is stimulated by EPO in bone marrow. Common reasons of elevated EPO include anaemia and hypoxia.)

Several advantages of EPO include:

- ✓ Lower Fatigue Boosts Metabolism
- ✓ Boosts recovery
- ✓ Greater Endurance

Red blood cells are stimulated, which increases the amount of oxygen in the circulation and improves performance. Without peds like EPO, Tyler Hamilton quoted Graham Bensinger as saying it would be nearly difficult to win a race. Bodybuilders assert that it can increase vascularity and spur the growth of satellite cells, which will result in more durable muscle cells. There is a lot of hyperplasia, which can potentially result in plasma leakage. Bodybuilders could notice bruises because the cells can divide so quickly that they weaken new cells.

Because there are more blood cells, EPO is extremely harmful because it causes the body to become dehydrated like a diuretic. Tyler Hamilton acknowledged using EPO during the Tour de France and mentioned a nasty bag of blood when his urine went black. While he acknowledges that he was more concerned about not being able to compete than his health, it was obvious to him that that awful bag of blood was not working. There is still a risk even when they are being cared for by specialists^[15].

Diuretics

In order to compete in bodybuilding contests, athletes work to have the strongest and most muscular appearance they can. This entails growing muscle over a period of months or years, followed by several weeks of calorie-restricted eating and cardiac exercise designed to bring out the full definition of the muscle while simultaneously lowering body fat to the absolute minimum. Since they aim to upset the body's normal homeostasis of fluid and electrolyte balance and can disturb several bodily functions, they are all potentially harmful to some extent. But the body is an expert at maintaining a healthy equilibrium. Most of the time, it can

adapt to this by altering electrolyte balances and retaining exactly the right amount of fluid to continue operating normally. However, diuretic medications are strong enough to circumvent the body's defences and cause havoc.

Potassium-sparing, osmotic, and loop diuretics are the three primary categories of diuretics:

Osmotic Diuretics-

These medications are injectable and work by essentially telling the kidneys to excrete everything they receive. Osmotic diuretics are non-discriminative, which means they remove any water from the body that enters the kidneys, regardless of the maintenance of a healthy electrolyte balance. These medications interfere with kidney function and can result in renal (kidney) failure. Bodybuilding does not use osmotic diuretics very frequently.

Diuretics that conserve potassium-

Despite being modest diuretics, they cause their own set of issues. They lessen the body's ability to absorb sodium and water again through the kidneys and wash them out. But they make a distinction by leaving potassium(K) in the system rather than flushing it out. However, because they prevent the body from flushing and maintaining the proper balance of electrolytes, despite being slower acting and more acceptable, they might result in an excess of K in the body. In the worst circumstances, this can result in cardiac dysrhythmia .

Loop diuretics-

These are by far the most often used diuretics in bodybuilding and are to blame for the great majority of hospitalizations and fatalities related to the sport. The most popular loop diuretic is definitely furosimide , which is affordable and widely available. Medicinal uses for loop diuretics include the management of edoema and excessive blood pressure, as well as the removal of poisons and foreign substances from the blood in situations of blood poisoning, heartbeats and possibly abrupt death^[16].

Creatine

The bodybuilding community and athletes primarily utilise the supplement creatine to boost their endurance when working out in the weight room or on the field. Depending on the amount of energy needed, this supplement is naturally created in the liver, kidneys, and pancreas at a rate of about 2 grams per day. Therefore, it can be referred to as an amino acid derivative that makes it easier for the body's energy-producing cells to recycle ATP (Adenosine Triphosphate). For people looking to grow lean muscle mass and boost their strength, creatine is a crucial substance.

This supplement comes in a variety of forms and comes in various sorts. The way a supplement is made affects how quickly it may enter the bloodstream and, consequently, how effective it will be.

Creatine monohydrate, which has been rendered accessible for simple absorption into the body muscles, is one of the most well-liked and widely used forms. This kind is frequently micronized, which means that it has undergone special processing to make it more soluble in water. Magnesium chelate, ethyl ester, and creatine hydrochloride are a few of the other forms that are less popular. Creatine works by making muscle cells stronger and more hydrated. This increases your exercise tolerance, and the visible results are bigger muscles on your body. Stomach disturbances and mild headaches are a couple of the minor adverse effects. The latter is treated by consuming a lot of water because it is brought on by water being absorbed into the muscles^[17].

The body's capacity to manufacture energy more quickly is enhanced by creatine. Because it occurs naturally in your body and aids in fueling your muscles, creatine is sometimes used as a supplement to improve athletic performance. Consuming protein should not be seen as a replacement for taking creatine supplements. This is so because protein and creatine function in various ways. In summary, protein helps muscles repair themselves more quickly after exercise whereas creatine increases strength during exercise^[18].

Stimulants

Traditional nervous system stimulants are quite popular throughout the fitness world, not only among bodybuilders, as is well known by those in the supplement industry. Stimulants are used by millions of people every day for a variety of reasons, and are typically part of a comprehensive fat-loss or pre-workout product. The most commonly used drug in the world, caffeine from coffee, is included in this category. These medications have a long list of well-researched advantages, including boosted mood, better mental and physical performance, more energy, and quicker fat loss.

Most often, persons who use substances carelessly do so because they are either ignorant or addicted. Numerous stimulants, particularly those that affect the dopaminergic system, have been clinically shown to seriously and permanently impair neurotransmitter function. By harming dopamine neurons, the brain's capacity to maintain synaptic concentrations of dopamine is inhibited, which has a wide range of adverse physical,

emotional, psychological, and mental consequences, such as depression, irritation, weariness, lack of desire, the inability to enjoy daily activities, cognitive decline, and many others. The severity of this side effect will depend on the extent of the damage already done, and it may take months (or even longer, depending on the medication) until normal functioning is again achieved.

Although, stimulant-based fat loss treatments often require daily use to optimise outcomes, as a general guideline, their use should be restricted to 4–6 times per week if it's for any other purpose. If you do use them more regularly than that, space out your use with at least brief breaks to give your body a chance to get back to normal neurotransmitter production and function before more serious problems start to arise. Safe usage can offer a variety of advantages with little danger, abuse can lead to long-term impairment that negatively impacts almost every aspect of the user's life^[19].

Observation of P.E.D users

According to research done by Front Psychol using data gathered over a year and a half of participant observation in a gym, 30 semi-directive interviews with gym-goers with a variety of characteristics were undertaken, including age (ranging from 21 to 59 years old), gender (23 men, 7 women), occupation, marital status, and length of time in the practise (between 3 and 40 years). Since bodybuilding is their primary profession, PEDs are an important part of their lifestyles, and the majority of them compete and utilise APEDs.

Fictitious names	Age	Gender	Occupations	Years of experience in the gym	Average of training sessions per week	Investment in the gym	Gym enthusiasts status*	Supplements	APED
Alex	21	Male	Safety officer	5	5.5	regular	convert – C	x	x
Alfred	31	Male	Unemployed	10	5	variable	convert – I	x	x
Bertrand	30	Male	Administrator	10	4	variable	ordinary	x	
Corentin	26	Male	Student	10	2.5	variable	ordinary	x	
Diego	30	Male	Nurse	4	3.5	regular	ordinary	x	
Eric	30	Male	Student	10	4	variable	ordinary	x	
Fabrice	35	Male	Policeman	20	5	regular	convert – C	x	
Guillaume	35	Male	Safety officer	6	5	regular	convert – C	x	x
Hervé	25	Male	Student	8	5	regular	ordinary	x	
Igor	39	Male	Administrator	20	4.5	regular	convert – I	x	x
Jean	33	Male	Teacher	17	5.5	regular	ordinary	x	
Kevin	25	Male	Executive director	6	5	variable	convert – I	x	
Léo	47	Male	Gym owner	17	4	regulier	convert – I	x	x
Marc	30	Male	Administrator	10	3	variable	ordinary	x	
Norbert	31	Male	Engineer	4	3	variable	ordinary	x	
Aude	49	Female	Administrator	30	3.5	regular	convert – C	x	x
Béatrice	40	Female	Administrator	20	5	regular	convert – I	x	x

Fig 1(A collective data of few of the PED users interviewed)^[20].

It has been determined through investigation that not all practitioners go on to become bodybuilders, and for those who do, it takes time. Groups of heterodox people (14) and a group of bodybuilding converts (16, including 12 competitors) were distinguished between the regular practise of gym-goers and the quasi-professional practise of bodybuilding. This distinction is similar to that made by earlier authors like Bednarek (1985) and Monaghan between "weight trainers" and "bodybuilders" (2001).

Each practitioner had no intention of taking performance-enhancing drugs or becoming a bodybuilder. After a period of exploration, the practitioners' intention to continue on the road of bodybuilding is explained by two distinct social factors, which are highlighted by the analysis of the sociocultural profiles of the population that was observed. The subjects of the interviews are divided between these two categories that stood out. Some of them might straddle the line between these two classifications and accumulate conversion-friendly features. Practitioners in the first category are defined as having a "initial social inclination" to value strength and muscle through familial support, career goals, or a positive work environment. They are typically involved in security-related professions and consider their muscular bodies to be resources for their work because they are from the working classes.

The second group, classified as contemplative, is socially more diverse and corresponds to persons whose life paths are marked by breaks and who have no special social propensity to valorize muscularity and

physical prowess. Furthermore, it is a somewhat distinct experience for individuals that is unrelated to their social universes. Practitioners with these profiles are vulnerable in their personal and/or professional lives, and they quickly come to regard bodybuilding as a way of caring to their bodies, strengthening them, regaining control of life and themselves, and reinventing themselves.

One of the prerequisites for bodybuilding is sacrifice. One must accept the growing influence of bodybuilding in their lives in order to attract attention and afterwards be allowed entry into the designated areas. Beyond consistency in training and an increase in muscle mass, one must demonstrate their worth through a significant financial commitment and equal physical effort. This shatters the experts' pretended disinterest. Despite the fact that they appear to ignore the newcomers, Goffman (1963) observed them in what he called an unfocused interaction. They locate those who look worthy of interest through their covert observation. If the latter are committed enough, they start to gain the attention of the small group of "genuine" bodybuilders, and more than just these indications from insiders, they begin to gain acceptance from the outside world.

The study of performance-enhancing drug usage calls for the articulation of numerous different scientific perspectives. In this study, we used a sociological approach focusing on the process of conversion to highlight the importance of social and cultural variables that provide a better understanding of how a person transitions into bodybuilding and is led to use APEDs. It is likely that the pathology is caused by bodybuilding rather than being the cause^[20].

Effects of PEDS

PEDs are perceived unfavourably, however some studies suggest that they may have benefits for military applicants, such as helping the athlete handle high training loads. Due to their unlawful status unless recommended by a doctor, PEDs typically carry a bad reputation. The usage of steroids by people like bodybuilders, who utilise these drugs to enhance their physical capabilities and appearance, is another reason why they are frequently connected with vanity. As they can give sportsmen unfair advantages, PEDs are perceived unfavourably. PEDs are forbidden to allow for fair competitions amongst athletes. It creates an even playing field for the athletes and supports the idea of a fair and equal chance for victory. A substance is prohibited from an event by the World Anti Doping Agency (WADA) if it meets two of the criteria listed below:

- a. The chemical might improve athletic performance.
- b. The drug might have a detrimental effect on the athlete's health.
- c. The substance, according to WADA, is in violation of the sport's governing principles.
- d. Investigation on the negative effects of steroids.

Many individuals in trials receiving "stacks" of PEDs, or numerous drugs, led to study on the negative consequences of steroids. These trials, meanwhile, were conducted in the past, and there isn't much proof that using smaller dosages is actually useful. It is difficult to determine whether the cumulative effects of PEDs distorted the results because studies primarily included participants who were already using steroids.

From caffeine to amphetamines, PEDs are available. Stimulants can help athletes feel less exhausted and perform better in aerobic activities when used in the right dosage, which lowers perceived exertion. The individual should think about whether taking steroids is essential and whether doing so will actually be successful before deciding to do so. It is impossible to get a six-pack by taking steroids. Athletes are able to train harder thanks to the assistance of steroids with training volumes. They require hard work to develop muscular bulk and strength and work in conjunction with a healthy diet and exercise routine.

Athletes should consider the full range of advantages and disadvantages of PEDs; where steroids may increase strength, they may also have negative side effects such as increased aggression. Even taking readily available stimulants such as caffeine should be carefully monitored as they can lead, for example, to dehydration. Athletes should always pay attention to proper dosages and should be fully committed before taking PEDs^[21].

Mental Health impact

1. *Anabolic steroids* are known to increase irritability and aggression, according to case studies and short studies, though results could be skewed by personality traits that are overrepresented in steroid users. Misuse of anabolic steroids is associated with higher levels of rage, fights, verbal abuse, and violence toward intimate partners than nonusers.
2. Users of anabolic steroids are more prone to report anxiety than nonusers. Anabolic steroid use at moderate to high levels has also been linked to severe *mood disorders* such as mania, hypomania, and significant depression. In one study, manic symptoms were not uniformly present in all participants; whereas most showed minimal psychological change, a few showed notable impacts^[33].

II. Awareness And Control Of P.E.Ds

Doping

Doping refers to the use of illicit chemicals by athletes to boost their performance. Stimulants and hormones are the most widely used illegal drugs. They are prohibited by the governing organisations of sports due to the health concerns associated with their use. When products or procedures improve performance, endanger the health of athletes, or go against the spirit of sport, they are classified as doping agents^[22].

Doping Test

Mass spectrometry is a well-known method used in the typical testing for doping items. This entails ionising urine samples with an electron beam, which converts atoms into charged particles by adding or removing electrons. Since the weight of various steroids, for example, is known to the scientists and each drug in the sample has a distinct "fingerprint," they can quickly identify doping. The system, however, has its flaws. A strong enough signal may not be produced by some by-products of doping agents because they are too tiny to be detected. EPO and artificial oxygen carriers can be found through blood tests, while blood transfusions cannot.

The biological passport is one technique that has been used to assist in the detection of such transfusions. The passport, introduced by Wada in 2009, seeks to identify the consequences of doping rather than the substance or technique itself. It is a digital record of an athlete that includes specific data points from throughout their career. Officials are notified if there is a significant change in these that suggests doping by the athlete. The effectiveness of the passport has been questioned by some experts, particularly when complicating circumstances like training at altitude are taken into account, as well as its sensitivity to micro-dosing, a little-but-often approach to doping^[22].

Urine Test

The athlete will be asked to provide a urine sample, which will be divided into two portions and stored in sealed containers bearing the same unique identifying number and designation as A- and B-samples. After a confirmation test on sample A yielded the same results, an athlete whose A-sample tested positive for a prohibited substance requests an analysis of his or her B-sample. If the B-sample test results agree with the A-sample test results, the athlete has a positive test; otherwise, the test results are negative. This confirmation procedure ensures the individual's safety^[23].

Beating testing

Athletes use a variety of methods to avoid testing positive. The following are the most common methods:

- ✓ Urine replacement is the practise of replacing dirty urine with clean urine from someone who is not using prohibited substances.
- ✓ Diuretics are used to cleanse the system prior to providing a sample.
- ✓ Athletes can avoid being tested during training periods by making themselves unavailable. Athletes must report their location at all times to mitigate this. If intended doping tests cannot be performed because the athlete cannot be located three times in a year, it is considered a doping violation, just as refusing a test is.
- ✓ Transfusions of blood improve the blood's ability to carry oxygen, enhancing endurance without the use of substances that can cause a positive test result^[23].

Doping – why?

Most commonly, doping has been examined as an individual or psychosocial process, though occasionally in relation to social standards^[24]. It is essential to learn about influences and question the motives as to how and why these substances are used and learning about one's self and their body with respect to the impact of such detrimental choices.

The development of identity is a process as well. Your identity develops through learning. Utilizing performance-enhancing drugs results in new experiences that can be learned through mental and physical processes as well as by the body itself.

Instead than focusing on "human nature," doping must consider the "nature of human activities." Doping and other unethical behaviour must be examined as a progression of human endeavours rather than as a component of a person's life trajectory. For bodybuilders, human activities involve people who give circumstances meaning and identities, as well as behaviours in connection to expectations and interaction with other members of the community, where doping is a crucial activity^[24].

Overall F	Users (n = 21)	Ex-users (n = 26)	Non-users (n = 93)	Total (n = 140)	
Personal norm (1–7)					
It does not matter how I reach my objective	11.4**	4.9aa	4.2a	3.0b	3.5
People should decide for themselves what they use	5.6**	6.3a	5.9ab	5.2b	5.5
I want to reach my goal without using PED	42.1**	2.7a	3.7a	5.9b	5.0
I am proud if I reach my goal without using PED	12.7**	4.7a	5.4a	6.4b	5.9
Total score personal norm	33.9**	4.9a	4.3a	3.0b	3.5
Improving performance (0–30)					
To increase in power	3.3*	17.4a	15.3a	13.0a	14.1
To make training easier	6.5**	11.3a	6.2ab	5.2b	6.3
To gain a target weight	15.2**	18.3a	14.5a	9.3b	11.6
To improve performance	8.5**	21.1a	20.1a	14.9b	16.8
To improve performance quicker	8.0**	13.5a	12.9a	7.3b	9.3
To improve body shape quicker	12.8**	18.2a	17.6a	10.0b	12.7
To gain a muscled body	17.0**	22.7a	21.7a	14.7b	17.2
To gain a well-shaped body	16.4**	23.5a	21.6a	15.6b	17.9
To gain a slim body	5.1**	13.4a	13.3ab	9.1b	10.5
Total score for improving performance	18.7**	17.7a	15.9a	11.1b	13.0
Perceived use by others (1–8)					
Men in their own gym	7.9**	3.8a	3.5a	2.8b	3.1
Women in their own gym	4.1*	2.4a	1.8ab	1.7b	1.8
Men outside the gym	6.9**	2.5a	2.4a	1.6b	1.9
Women outside the gym	1.0	1.5a	1.6a	1.3a	1.4
Total score for perceived use by others	8.3**	2.6a	2.3a	1.7b	2.1

Fig 2. Statistical analysis of reasons for PEDs usage^[25].

Anti-Doping regime

It is essentially immoral and harmful to the entire spirit of sport to employ doping products or procedures to improve performance. Drug abuse can be detrimental to an athlete's health as well as the performance of other athletes. Using drugs to enhance performance or not, it seriously undermines the integrity, image, and worth of sport. A dedication to clean sport is essential for achieving integrity and fairness in athletic competition.

Clean sport is a fundamental right for all athletes. Any athlete may be subjected to testing both during and after competition, anytime, anyplace, and without warning. If it's in the athlete's body, they are accountable for it under the anti-doping law's strict liability rule.

In order to safeguard clean athletes, testing's goal is to identify and discourage doping among athletes. Utilizing supplements should be done with extreme caution. The incorrect usage of supplements, inadequate labelling, or contamination of nutritional supplements have all been blamed for a number of positive tests.

Bodybuilding athletes' use of dietary supplements raises questions since, in many nations, there are lax standards for supplement production and labelling, which increases the risk that a supplement contains an undeclared drug that is illegal under anti-doping guidelines. In a doping hearing, using a nutritional supplement with inadequate labelling is not a sufficient defence^[26].

Anti-Doping a boon

Athletes' rights, health, and well-being are safeguarded by an anti-doping programme, which also upholds the fair play in sports. Global sports like bodybuilding have developed over time into a multimillion dollar industry where sportsmen and sport figures act as powerful role models for people all over the world. Due to this effect, it is more crucial than ever to safeguard the principles upon which sport is built. Implementing efficient anti-doping procedures on a worldwide level is crucial since doping is a serious threat to sport's credibility.

The inherent conflict of interest that arises when a governing body is tasked with both promoting and policing its own sport is removed when a sport uses an independent anti-doping agency. An independent anti-doping agency is well positioned to act as an authority in anti-doping, offering trusted knowledge and expertise to testing, results management, adjudication, and athlete education programmes. This is in addition to eliminating conflicts of interest. An independent anti-doping agency has the unrestricted freedom to implement best practises and produce superior anti-doping operations since it is run by autonomous professionals picked for their anti-doping experience rather than their marketing or athletic background.

Increasing athlete trust in the anti-doping system and discouraging doping require clarity regarding testing results and sanctions.

Due process rights of athletes are balanced with the undeniable significance of public publication of test findings, case outcomes, and sanction decisions by independent anti-doping bodies operating under the World Anti-Doping Code^[27].

Preventive control of PEDs

Drug abuse related to performance-enhancing substances is curable. Some professional sportsmen who have overcome addiction share their personal experiences with others to show that recovery is always possible. Addiction treatment typically entails:

1. Therapy
2. Assistance from family and friends
3. Group counselling
4. Medication to treat withdrawal symptoms or a co-occurring disorder.

Being aware that there is a problem is the first step toward recovery. Learning to recognise symptoms is the first step to rehabilitating an addiction.

The symptoms for identification of a victim of drug abuse are as follows-

- Control failure
- failure to fulfil obligations in job or school
- Positing a risk-taking attitude
- Problems in relationships
- appearing covert
- showing modifications to one's appearance or hygiene
- demonstrating medication tolerance
- having drug abuse in the family
- maintaining drug use despite negative effects
- neglecting pastimes that somebody used to enjoy, such as participating in sports

➤ expressing or claiming to have withdrawal symptoms, such as nausea, headaches, depression, sleeplessness, shaking, or perspiration.

Overcoming the anxiety of seeking assistance might occasionally be the first step towards stopping drug usage. According to one study, 56% of steroid users hid their usage from their doctor.

The suggested course of action for steroid use typically entails:

- For muscular dysmorphia, treatment options could include medication as well.
- hormone treatments
- Antidepressants

Some people benefit from behavioural counselling, and some with severe addictions may find respite from withdrawal symptoms from antidepressants and hormone-restoration drugs. Bodybuilders should consult a medical expert to find out the finest course of treatment. To have an impact on a loved one who is battling with PED addiction, an intervention may occasionally be necessary. If a PED user has in the past resisted help or has continued to use drugs despite attempts to encourage them to quit, having an intervention is beneficial. Even if a loved one has previously tried to stop using drugs, it could still be the greatest approach to let them know that you still have hope for them^[28].

Alternatives to PEDs

Steroids can be substituted with enteral nutrition, a specific liquid-only diet, to achieve remission. Due to the liquid diet's ability to supply all the nutrients needed, those following it do not need to consume any regular food or liquids. Steroids are more effective than enteral therapy at causing remission in adults, according to research, but liquid meals or nutritional supplements may be utilised to support nutrition^[29].

Over-the-counter (OTC) supplements are what are known as legal steroids, also referred to as multi-ingredient pre-workout supplements (MIPS). They are intended to support bodybuilding and increase exercise capacity and performance. Science does support some legal supplements, and they aren't wholly dangerous. Others, though, can be wholly ineffectual or even harmful.

Some methods of replacement of harmful PEDs are follows:

1. Creating a sound weighted training regimen, alternating between working different body areas, and gradually improving repetitions and approaches. Overworking your muscles and using drugs will not produce the same effects as a regular, difficult routine.
2. Include foods in diet that promote the development of lean muscle rather than just mass. Dietary items beneficial for muscle building may include:
 - eggs
 - lean seafood, such as salmon and tuna
 - Grecian yoghurt
 - quinoa
 - chickpeas
 - peanuts
 - tofu

The greatest way to gain muscle or become in shape is never to use steroids, legal or not. They may have negative impacts on your long-term health as well as undermine any progress you have made. It's best to concentrate on long-term, healthy approaches to maintaining your fitness. It is possible to avoid the potential harm to one's bodily and mental caused by relying on artificial means of achieving a certain degree of fitness^[30].

Alternative ingredients of PEDs

To grow muscular tissue and support other vital biological functions, the body naturally creates steroids like the hormone testosterone.

The term "natural steroids" often refers to substances that imitate human hormones or steroids that are found in plants, herbs, and other naturally occurring sources.

Natural steroid proponents assert that these substances behave similarly to anabolic steroids in the body. These substances promote the production of testosterone, which helps to build and repair muscle.

Some of the natural alternative ingredients are as follows:

Ashwagandha - In Ayurvedic medicine, *withania somnifera*, also known as ashwagandha, is a herb used to promote longevity, renewal, and youth. In comparison to those in the placebo group, ashwagandha is said to contribute to better gains in lower and upper body strength as well as a favourable body mass distribution.

Vitamin-D - Bone health depends on adequate levels of vitamin D in the blood. According to research, it may be important for maintaining the health of muscles and that a lack of vitamin D is associated with a loss of

muscle mass and strength. However, more research has to be done to fully explore this possible connection. According to studies, vitamin D may indirectly benefit muscular health by affecting fatty tissues. More research is required to see whether this connection holds true for larger groups.

Zinc - Known for regulating muscle growth and repair, zinc is a crucial trace element. The main emphasis of studies has been how zinc influences muscle control. The chemical might be connected to sarcopenia, a condition marked by age-related muscle loss.

Magnesium - Magnesium plays a key role in several enzymatic processes that influence how well muscles perform when they are working out. According to studies, the mineral may also support muscular integrity preservation during demanding activities.

DHEA- The body transforms the precursor chemical dehydroepiandrosterone into the hormones testosterone and estradiol. These enhance the production and consumption of protein, which in turn promotes the growth and strength of muscles.

Fenugreek- By preventing the body from turning testosterone into other sex hormones, the compounds in fenugreek extract may raise testosterone levels^[31].

These substances have no harmful effects on the body as compared to PEDs and their harmful effect on the user.

III. Conclusion

Performance Enhancing drugs have a huge impact on society on the whole, not many people are fully aware of the consequences of such harmful substances, their adverse effects, impact and cure. It is important to be self-aware and deal with drug abuse and help the athletes prioritize their safety and sanity over peer pressure, psychological influences and mental blockages. Today, most of the youth is affected by social influences that blindsides them of the hazard to the use and consumption of Performance based drugs. Bodybuilding as a sport and also a key influencer on major faction of society must get rid of the necessary evil, PEDs and impact and influence the society towards a natural and healthy state of the body and mind in the absence of enhancers, that will bring about a change.

People are willing to take significant risks in today's culture in order to succeed in sports and do their jobs more effectively. Additionally, some people in our culture place a high value on appearance. As a result, some people choose to reach these aims by using popular performance-enhancing medicines like anabolic steroids and items that act as anabolic steroid substitutes^[32].

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