Approval Sheet

The Industrial Design project III titled

"GYM EQUIPMENT for HOMES"

By
Suhrid K. Palsule
08613803

is approved as a partial fulfillment of requirements for
Masters in Design degree in Industrial Design Centre

Project guide: .....

External examiner: .....

Internal examiner: .....

Chair person: .....

Date: 21.06.10

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/ source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signature: 

Name of the student: Suheid Pabule

Roll No. : 08613803

Date: 21/05/10

GYM EQUIPMENT for HOMES

REPORT BY :

SUHRID PALSULE

08613803

Guide: Prof. Athavankar

Co-Guide: Prof. R. Sandesh

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Acknowledgement

Foremost, I offer my sincerest thanks to my project guide Prof. U. Athavankar who, in the first place, agreed to guide me at all, despite his already over-full schedule. His attitude and manner of working was inspiring and motivating, respectively. Doing a project under his guidance turned out to be not just a great learning experience, but was fun throughout. One enjoyed the luxury of calling upon him at one's convinience, without any worries. He was always more like a highly experienced senior, than a *typical* professor. It was a pleasure working with him. Thank you, sir.

I would like to thank Prof. R. Sandesh, for co-ordinating mine and all other projects and always keeping in mind our best interests. Also all the other professors at IDC for their constructive criticism and guidance.

Special thanks to my parents and family for supporting me at every stage of the project. The contribution of my friends and batch mates is immeasurable. Their presence and support was vital in the successful completion of the project. Thank you all.

Special thanks to the workshop staff of the all the studios.

Lastly, the numerous people whom I spoke to or who helped me in any and every way, for their support and help at various stages of the project.

Abstract

What is this project: The project deals with the design of fitness equipment. ‘Fitness’ in itself is a very broad term which brings to mind a plethora of images and thoughts. This project, however, deals with a certain kind of fitness equipment, widely known as ‘gym equipment’ (although its technical name would be Strength or Resistance training equipment), keeping in mind a specified objective and user profile, which shall be explained later on.

Why this project: This project was born out of the desire to provide people (namely young men and women) the necessary equipment that they would need to perform ‘strength training exercises’ at home.

Current scenario: The product in question is the ‘home gym’, specifically designed for the purpose of performing strength training exercises at home. There are quite a few variants available in the market, and they differ in the number/ kinds of exercises offered, build quality and price. However, what remains common is the fact that most are similarly designed (with respect to structure, size, floor area occupied etc.). This Is also the reason that most of these ‘home gyms’ are purchased mostly for ‘building societies’, community centers and small hotels, which need gym equipment but lack the space for bigger equipment.

What is lacking: Thus there is a pressing need for a product that is actually suitable for home use, in every respect, be it the exercises offered, space occupied or the cost. Young people (men and women) do not have anything to work out with, at home. Dumbbells and other small equipment are only good for a certain kind of exercises and have their own issues. What was needed was a gym machine that truly delivered, what other products promised.

Methodology: The project involved an in-depth study of the human body and the physiological aspects of strength training, as well as a detailed analysis of different kinds of gym equipment, their classification and studying the way they were designed and functioned. The design is fully focused on the man-machine interaction that takes place during working-out, and that is essentially the core of the project. The idea was that the product be very compact(collapsible, even) and suitable for use at home, but sans any compromise on the functionality and bio-mechanics*.

Final outcome : Concept development was concerned with extreme simplification of the ‘assemblage of exercises,’ which was what the product looked like, after initial ideation (this statement shall make more sense at the end of the report). The final product, thus obtained, is radically different from the conventional designs currently available in the market and is, in the authors opinion, a design that is truly suited for the Indian scenario.

*- the study of forces and motions w.r.t. the Human body.

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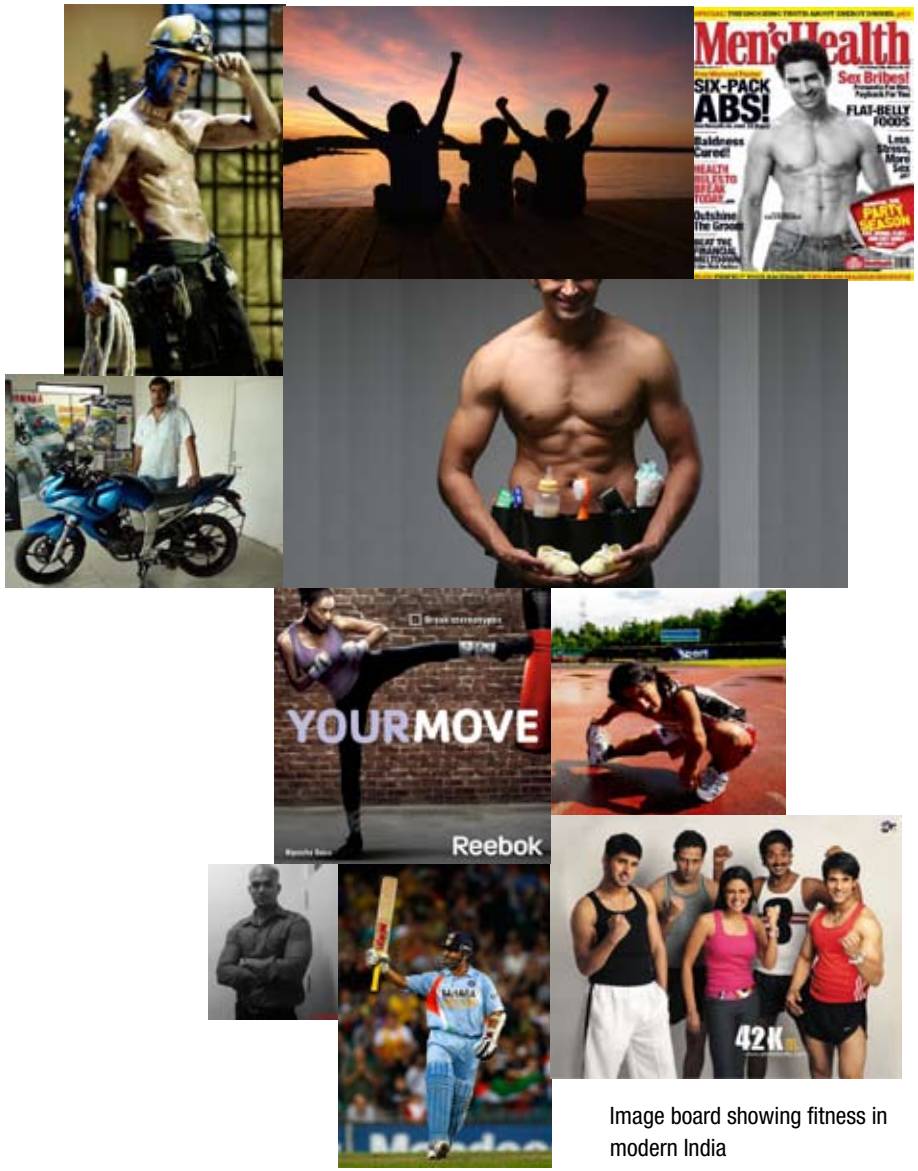


Image board showing fitness in modern India

1_ Introduction

Fitness: is where it all starts. The word is defined as a “way of life” by some. And fitness is a hot subject in Urban India, for good and bad reasons. Health centers, spas, clubs and gyms can be found in almost every locality these says. From Health-Baba’s on TV’s to slimming ‘results guaranteed’ adverts in the newspaper and from the numerous food products tagged ‘healthy’ to the posh gyms loaded with the fanciest equipment, modern India is definitely bitten by the fitness bug. Fitness products and related healthcare accessories (expensive and cheap, genuine and otherwise; the whole bunch) are selling like hot cakes. The time for a genuine fitness product could not be better.

Yoga

Malkhamb

Kalaari

2_ History of Fitness

History of Fitness in India: Ancient history of fitness

Yoga: "Hatha Yoga", is a system of Yoga introduced by Yogi Swatmarama, a sage of 15th century India as preparatory stage of physical purification that the body practices for higher meditation. The Asanas and Pranayama were what the Hindu Yogis used to physically train their body for long periods of meditation. Hatha Yoga is what most people in the Western world associate with the word "Yoga" and is most commonly practiced for mental and physical health.

Malkhamb: Mallakhamb is a traditional Indian sport in which a gymnast performs poses and feats while hanging from a vertical wooden pole or rope. Mallakhamb also refers to the pole used in the sport. The word "Mallakhamb" is composed of malla, which denotes a gymnast or a man of strength, and khamb, which is a pole. Mallakhamb, therefore, can be translated in English as pole gymnastics. Mallakhamb can be used as a form of exercise or as strength training for police or other jobs requiring a high level of fitness

Kalari: Kalari or Kalarippayattu is the only form of the most ancient traditional systems of physical, culture, self-defence and martial techniques still in existence. It is the ancient martial art of the State of Kerala. It is considered as the forerunner of Karate & Kung-fu. The co-ordination of the body and mind is given max importance in this art.

Others: Other instances of strength training/ fitness development in ancient India were sought, but to not much success. However in a country as old as ours, where numerous wars were fought over thousands of years, there are bound to be numerous other examples of fitness training and physical development.

Authors comment: The idea of fitness among men is changing. Chiseled, muscular men adorning the silver screen are painting the new picture of modern fitness. Today, being in shape means looking the part, too. The aspirations of the urban male have risen and there is a race to look and feel better/ stronger.

3_ Fitness

Strength

Stamina

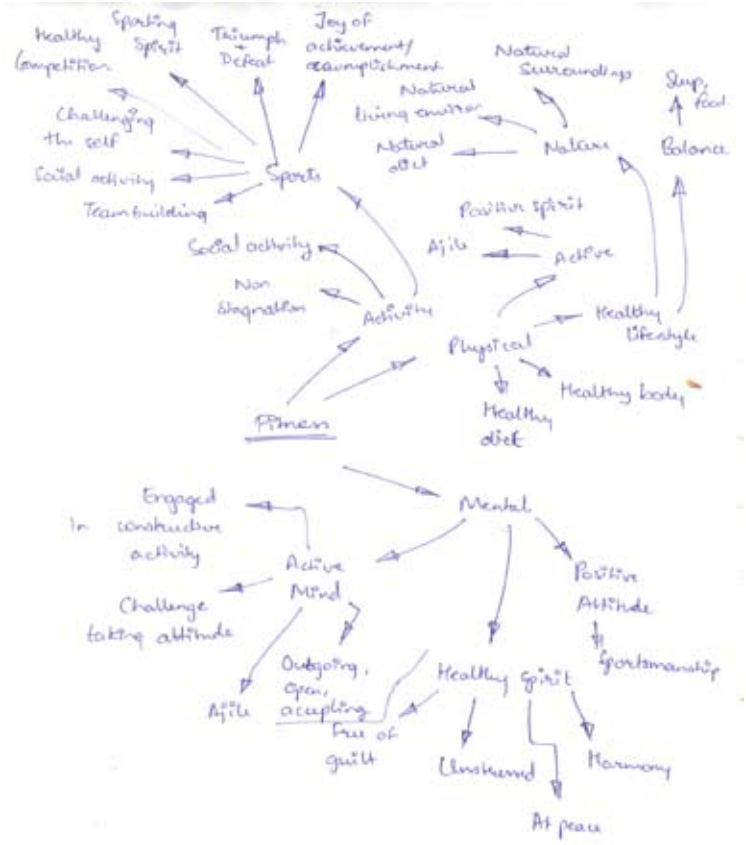
Flexibility

Fitness can be categorized into three parts, viz. strength, stamina and flexibility;
Strength: The ability to lift, pull, push, kick, and throw with force.
Stamina: ability for being to exert itself for long periods of time.
Flexibility: The absolute range of movement in a joint or series of joints that is attainable in a momentary effort with the help of a partner or a piece of equipment. Flexibility in some joints can be increased to a certain degree by stretching.
All three aspects are interconnected but have their own respective roles to play in the human body, each serving their special purpose. And different people have different needs from each category of fitness.

What is also common is that all the three aspects of fitness can be developed/ improved with proper training. For e.g.- Stamina development (at home/ indoors) requires a special category of machines popularly known as **cardio** equipment. Improving flexibility also requires the use of certain products, but it is largely an equipment free activity.

However, strength training is much more dependent, when it comes to kind and number of equipment needed for developing human body strength at home.
To cater to the relatively under-looked ‘strength training’ aspect of fitness at home, this project concerns itself with only that, i.e. providing strength training equipment for the home.

4_ First Steps



Fitness Mind Map

This was the initial Aim at the start of the project;

“To design gym equipment to be used at home, for the purpose of muscle-building”

It also mentioned the following: *’The product would have an assortment of correctly designed bars, handles, maybe pulleys-levers and other gear which would enable the user to perform the decided exercises at his will/ convenience.’*

Thus one can see that the initial brief was quite rigid in terms of the expected final outcome and assumed typical parts of gym equipment as mandatory in the product. However, as the project progressed, the image of the final product became clearer and one no longer subscribed to such presupposed notions. Creating a mind map [shown on left side] helped in creating a mental picture of what attributes the product should have.

A slightly better worded brief is given under. Here, however, no details are mentioned. Also included is a list of probable user profiles that the author feels would make his future list of buyers.

“To design strength training equipment for use in urban homes”.
Target user: athletes, amateur bodybuilders, sportsmen and fitness enthusiasts.

5.1_ Study: Strength training

The world of strength training

Human body (basic anatomy, physiology, muscle anatomy), science of exercise(types of exercise, kinematics of human body, process of muscle building, types of muscle training techniques, nutrition).

Definition:

Strength training: is the use of resistance to muscular contraction to build the strength, anaerobic endurance and size of skeletal muscles.

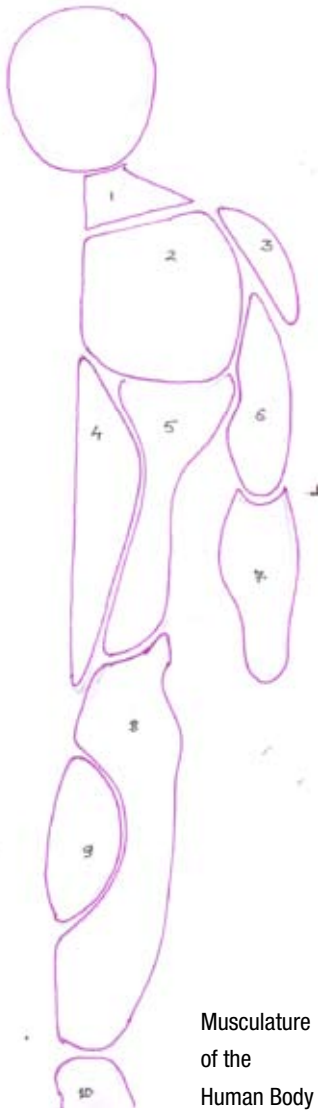
There are many different methods of strength training, the most common being the use of gravity or elastic/hydraulic forces to oppose muscle contraction. These will be explained in detail, in the next few pages.

Benefits of strength training :

Please keep in mind that the terms strength training, resistance training and weight training are all essentially the same.

- Weight training tones the muscles, making them look good and raises the basal metabolism, which causes the body to burn more calories 24 hours a day. One even burns more calories while one is sleeping.
- Weight training can reverse the natural decline in your metabolism which begins around age 30.
- Weight training strengthens your bones reducing the risk of developing osteoporosis.
- Weight training improves muscular endurance.
- Weight training makes one strong. Strength gives confidence and makes daily activities easier.
- Weight training makes one less prone to low-back injuries.
- Weight training decreases the resting blood pressure.
- Weight training decreases the risk of developing adult onset diabetes.
- Weight training increases your blood level of HDL cholesterol (the good type).
- Weight training improves posture.
- Weight training improves the functioning of the immune system.
- Weight training lowers the resting heart rate, a sign of a more efficient heart.
- Weight training improves a persons balance and coordination.
- Weight training energizes the body and elevates the mood.

5.2_ Study: Human body (basic anatomy, musculature)



Musculature of the Human Body

Basic Muscle Groups [see fig.]

1. Neck
2. Chest(Pectorals, Pecs)
3. Shoulder(Deltoids, Delts)
4. Abdominals
5. Anterior and External Obliques
6. Upper arms(Biceps, Triceps)
7. Forearms
8. Thigh and Butt(Quadraceps, Hamstrings, Glutes)
9. Inner thigh muscles
10. Calves(*not shown in diag*)

Basic Anatomy:

Learning the basic anatomy will help in understanding better, the principles and techniques of strength training.

The human body is the entire structure of a human organism, and consists of a head, neck, torso, two arms and two legs. The organ systems of the body include the musculoskeletal system, cardiovascular system, digestive system, reproductive system among several others.

Musculature:

A musculoskeletal system (also known as the locomotor system) is an organ system that gives animals (including humans) the ability to move using the muscular and skeletal system. The musculoskeletal system provides form, support, stability, and movement to the body. The human musculoskeletal system consists of the human skeleton, made by bones attached to other bones with joints, and skeletal muscle attached to the skeleton by tendons. The general architecture of the skeletal muscles as a whole – as well as the specific composition of individual muscles – determines how each muscle functions.

Authors Note:

The muscular structure is basically the same in men and women. There are roughly around 11 different major muscle groups in the body (chest, abdomen, thigh muscles- to name a few) and one need not get bogged down by the actual complexity of the muscular system. Each muscle has its own specific purpose, which largely determines its size and shape. Working out of a particular muscle group, along with proper rest and nutrition results in development of that and other related muscles.

5.3_ Study: Process of muscle building, types of muscle training techniques, nutrition

Process of muscle Building

The subject of muscle building includes sub-topics such as different exercise techniques, proper nutrition and understanding metabolism and body-functions, in general.
The first necessary step for increasing muscle size is for the muscle fibers to be activated. If a specific muscle is not stimulated to produce force, then it will not respond and adapt to the stimulus. To activate a muscle fiber, you must apply adequate exercise intensity.
Which is where, resistance training comes into the picture. It is nothing but application of resistance to the muscle movement in order to activate it.

Training techniques:

The world of strength training has seen hundreds of different types of training programs introduced in magazines, by fitness and health clubs, by fitness experts and in TV infomercials.
Designing a training program is ultimately a very individual process, and the needs of the individual are paramount while doing so.
What must be kept in mind is that the machine is merely a tool and that the user must have adequate knowledge about his/ her abilities and needs.

Nutrition and metabolism

Is such an important part of the process that it needs mention in here. Again, there are many theories regarding the appropriateness of different kinds of nutritional techniques, number of meals in a day, kinds of foods and rest periods. One must be able to find the plan that suits them the best and it is always a good idea to seek professional guidance regarding such matters.

5.4_ Study : Science of exercise(types of exercise techniques, kinematics of human body

Bio-mechanics & kinematics

Biomechanics is the application of mechanical principles to living organisms.
The study of biomechanics ranges from the inner workings of a cell to the movement and development of limbs, to the mechanical properties of soft tissue, and bones.
Biomechanics is also applied in studying human muscleskeletion systems.
However, most importantly, bio mechanics in connection with this project refers to the motion of the human body while performing different exercises and other activities that occurred, when the body was subjected to loading.
Knowing this was important for the project as it was an area that was clearly beyond the authors scope and it was well understood that the design of the equipment cannot, in any manner, affect the basic way the exercises were performed. Thus the different variables such as direction of loading, size of equipment(handles, grips, weights), motion path of limbs must remain unaffected in the final design.

Types of strength training equipment

Free Exercises- Push ups, pull ups, etc.
Free Weights- Dumbbells, Barbells, Kettle Bells
Elastic-Latex bands, springs
Exercise machines- Gravity assisted, hydraulic, elastic, etc.

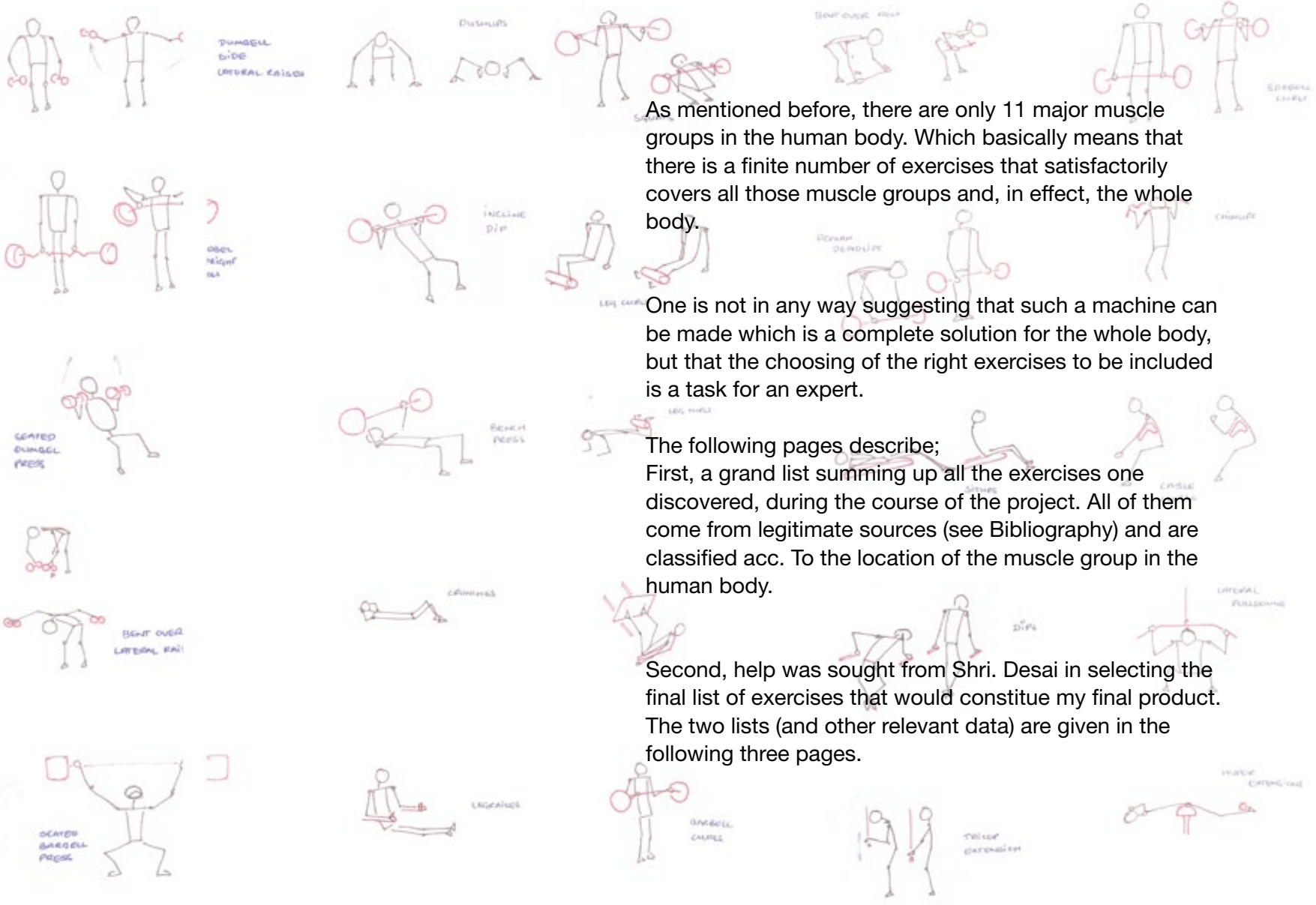
Free weights vs. Machines

Dumbbells and Barbells offer the advantages of flexibility (in kind and number of exercise), space saving and cost. However, it is best for such equipment to be used under guidance or by experienced people only, as safety is a major concern when using free weights. Things like posture, weight selection and number of repetitions, if not performed with complete care may lead to severe repercussions like aches, injuries or worse.

Although even this matter is open to debate, there are however, several reasons that make gym machines superior to free weights.
Advantages of Gym Machines (as compared to free weights);

- safer than free weights for novice trainees
- users need not concentrate so much on maintaining good form, they can focus more on the effort they are putting into the exercise.
- some exercises are almost impossible to do without machines.
- allow very good concentration on the targeted muscle or muscle group. E.g. - leg curls for the calves, long-range cable rows for the lateral and collar muscles, standing and seated calf raises for the calf and soleus muscles of the lower legs
- Perfect fit for all- allow dimensional adjustability.

5.5_ Study: Science of exercise- Types of exercises



As mentioned before, there are only 11 major muscle groups in the human body. Which basically means that there is a finite number of exercises that satisfactorily covers all those muscle groups and, in effect, the whole body.

One is not in any way suggesting that such a machine can be made which is a complete solution for the whole body, but that the choosing of the right exercises to be included is a task for an expert.

The following pages describe;
First, a grand list summing up all the exercises one discovered, during the course of the project. All of them come from legitimate sources (see Bibliography) and are classified acc. To the location of the muscle group in the human body.

Second, help was sought from Shri. Desai in selecting the final list of exercises that would constitue my final product. The two lists (and other relevant data) are given in the following three pages.

5.6_ List of exercises

The following is the complete list of excercises and are classified according to the part of the body they work out. Also, the 1st coloumn shows the range of excercises covered by all Home gym machines, together. And the second one shows the excercises that the product is intended to provide.

EXERCISES	MUSCLE GROUP	Popular Exercise Machines	recommended by instructor
UPPER BODY			
barbel shrug	trapezius		
standing military press			
machine shoullder press			
dumbell side raises			
barbell seated overhead press			
dumbell front raises			
dumbel rear raises			
bench press			
dumbell bench press			
incline bench press			
vertical chest press			
machine pec fly			
pull ups/ chin ups			
lat pulls			
bent over row			
one arm dumbell row			
seated cable row			
seated machine row			
dips			
assisted chin ups			
assisted dips			
close grip bench press			
tricep pressdown			
tricep extension			
dumbell bicep curl			
EZ bar curls			
hammer curls			
cable curls			
chinups			
barbel curls			
barbell upright row			
hyper extensions			
LEGS			
front squat			
back squat			
leg press			
dumbell front lunge			
dumbell reverse lunge			
dumbell side lunge			
dumbell step-up			
roman deadlift			
deadlift			
seated leg curl			
seated leg extensions			
seated hip abductions			
seated hip adduction			
standing calf raise			
leg press calf raise			
seated calf raise			
smith machine/ machine calf raise			
leg raises			
TORSO			
abdominal exercises			
machine ab-crunch			
stability ball crunch			
roll-out			
jacknife			
stability ball pushup			
machine ball overhead reach			
outside calf touch			
prone plank			

5.7_ Final list of exercises for a home gym: exercises + muscle groups

This page shows the final list of exercises selected for inclusion in the product. The individual exercises themselves have been shown in the next page.

EXERCISES	MUSCLE GROUPS	MOVEMENT INVOLVED	HUMAN BODY POSITION	HANDLE / EQUIPMENT	POSITION
Multi press	shoulder, arms, chest, upper back	vertical:	lying, inclined, upright seated	straight, partially curved. Spaced apart and located at shoulder width	shoulder height.
Lat pulley	trapezius, chest, upper back, arms	vertical:	upright, back bent slightly fwd	long handle bent at sides, cable connection	top: 7 ft.
Leg curls	hamstrings, calves	curved, inwards, pivoted at knee,	lying prone(face forward), or seated	2 roller sets, pivoted, cable connection	knee height
Leg extensions	quadraceps	curved, outwards, pivoted at knee	seated	2 roller sets, pivoted, cable connection	knee height
Seated row	lower back, lats, arms	horizontal	seated on bench, feet supported, back straight	handle, cable	hip height
Chin ups	trapezius, chest, upper back, arms	body swings vertically	holding only handles at > shoulder width, body hanging	long horizontal handle, fixed at sides	top: 7 ft.
Dips	triceps, lats,	body moves vertically up,	holding bars only, body hanging, upper arms parallel to ground	parallel bars	parallel bars, chest height
Leg raises	lower abs, thighs, legs	lower body swings through 90 degrees	lower arms resting on horizontal pads, back supported, rest body hanging	padded parallel bars + vertical stump grips	parallel bars, chest height
Tricep pressdown	triceps, chest	lower arms	standing, back slightly bent	small handle	independent handle
Leg press	legs(complete)	legs fold and open	seated on small seat, feel on pad	flat plate/ pad	hip height
Pec fly	pecs, shoulders	arms open and close	lying on back/ seated upright	angular handle, padded vertical members	shoulder height, when lying on bench
Hyper extension	lower back, hams	torso swings from hip	lower body supported at angle, free from hip upwards	roller + inclined pad for thigh	

5.8.1_ Final Exercises for inclusion in product


Lateral Pulldown: Involves a wide-grip pulling down action using both arms simultaneously.


Leg curls: Upward circular(Knee at center of rotation) motion using ham-string muscles and calves


Leg Extensions this is the reverse of a *curl.* Thigh muscles are used to work against resis-tance in a circular motion


Bench(Multi)press: Chest muscles used to push load verti-cally up while lying.


Multi press-2 (Shoulder) Load pushed up. Spine vertical.


Leg press Complete set of leg + butt muscles used to push aginst load. Torso fully supported.

5.8.2_ Final Exercises(2) for inclusion in product

Chin-up
body hangs free from hands set apart in a wide grip. then body pulled slowly up using only arm muscles.

Dips
body suspended between parallel bars. Brought down slowly in a controlled manner using Arm and chest muscles and then pushed back up to starting position.

Leg Raises
Lower arms resting on cushion, hands gripping short vertical bars. full back support.
Legs (straight from hips)raised slowly upwards in a circular motion.

Hyper-

extensions
Legs supported in brace as shown, thus keeping torso suspended freely. Lower back muscles used to slowly bring torso parallel to ground.

5.9_ Visited: AIPT & Public Gyms

AIPT Main Building, Pune

Ustad Govind Singh Rathore

Army Institute of Physical Training

[Pune]

The study of the science of exercising and fitness led to a visit to AIPT Pune, which is the Indian Army's national centre for athletic training. The objective of the visit was to investigate the role played by weight training in sports training and to witness these machines being used by experts.

The visits proved very helpful in improving ones understanding of the different techniques of resistance training. One received a lot of advice from the experts even in an informal conversations and this helped a great deal while designing.

The AIPT is a Training Cum Residential Institute and houses a number of world-class Athletes, Gymnasts and Sportspersons.
Salient features of the institute;
World class facilities and Instructors
Facilities for Body development and conditioning
strength building
Stamina building
sporting skills development

Ustad Govind Singh Rathore [in pic.] is a professional athlete and a weight training expert. His guidance has helped at various stages of the project

Pro Fitness Hub- Kandivili

Is a well known public gym in Kandivili. It is owned by Shri. Rajesh Desai, who himself is a qualified gym instructor with several years of experience and a certified fitness expert. Discussion about the project with him also were very helpful.
His guidance was sought at many different stages of the project;
1.- at the beginning, for his general opinion on home gyms and exercising at home.
2- later on, for selecting the excercises that should be included in the ideal home gym
3- for validation of my final product.

5.10_ Interview: Physiotherapist

Dr. Paralikar
Head of Physiotherapy
DM Hospital, Pune

Was interviewed as it was felt that a professional opinion from a certified practitioner would help, and it truly did. Physiotherapy is that branch of medical practice that comes closest to dealing with physical exercise, and thus she was the right person for an interview.

In the end, the interview felt more like a conversation with topics ranging from physiotherapy to body-building, from human physiology to the current fitness trends in India and from the different kinds of fitness products available in the market to the viability of this project. The meeting was immensely helpful. Given below are some useful bits of the conversation.

Excerpts from interview;

“Unsupervised exercise not recommended.. however, physical instructions are *easy to understand*, and if followed properly, **no harm** in working out at home.. therefore, training at home is **OK**.. ”

“Three basic factors of fitness – Strength, Stamina and Flexibility..”
(She was the source for the above given classification.)

“Machines offer the promise of fitness..”

6_Analysis

6.1_ General Fitness Equipment

Presents the entire spectrum of fitness equipment available, from Cardio equipment to dumbells and free weights to weight machines and other accessories.

6.2.1, 2_ Spectrum of existing gym machines:

Gym machines have been classified into **four** groups. This classification is largely based on the complexity of the equioment and the number of exercises it offers;

- Basic Machines: Bench press, Hyper extension
- Home Gym: are thus next in the order as they are highly compact and provided relatively less number of exercises
- Multi-Station: Much less space-efficient than ‘Home-gyms’ but no. of functions are more.
- Commercial Gym Equipment: is the most complex as it has maximum adjustability features and each machine is designed for only 1 exercise

6.3_Home-gym equipment:

is again looked at in detail and issues with current products are explained in detail.

6.4_Home-made gym equipment: is a review of equipment improvised at home.

6.5.1, 2_Variability

Explains the flexibillity availaible for the designer, even for the same exercise.

6.6_ Semantics of Gym Equipment:

is an attempt to assess what visual elements of the product bring the *Gym* and *fitness* feel to the equipment and how one can incorporate those characteistics into a new product. Also the subject of what kind of semantics the equipment must posses is addressed, since the current ‘Home‘ gyms clearly fail in that department.

6.7_Total Gym

Is the one example that truly comes close to what a home gym must be like.

6.1_Analysis: Fitness equipment (General)



Cardio

Dumbbells

Barbells


Kettlebells



Basic machines

Accesory1

Stability Ball

Accesory2

Latex Band

Analysis of fitness equipment

Like mentioned previously, some kinds of fitness training is more hardware intensive than others. The kind and number of equipment also differs widely. According to the nature of training involved (strength, stamina, flexibility), one may classify fitness equipment as follows;

Types of equipment;

Cardio: Cycles, Treadmills, Elliptical Trainer

Strength

Free Weights: Dumbbells, Barbells, kettlebellsWeight

Machines: basic (bench press, hyperextension)
advanced commercial gym machines
home gym machines
multi-systems

Flexibility: Ball, Mat

Others: Accessories

6.2.1_ Analysis: Spectrum of existing gym machines

Basic
- Primary equipment
- basic design, function
- Only 1 muscle group per product

Home
- Multi-exercise
- Space saving design
- Affordable(relative to other machines)

Analysis of Basic machines and Home gyms

Even among gym equipment designed exclusively for strength training, there exists a wide variety of products. A classification is given on this and the next page.

Basic: these are very simple in construction and represent the most primary of equipments.
E.g-Bench press,Hyper extension

Features;
Primary equipment
basic design, function
Only 1 muscle group per product

Home Gyms: Offer multiple(4-6) different types of exercises. All products are similar looking as they strive to cover the largest muscle groups in the body – chest, lats, thighs, legs

Features;
Multi-exercise
Space saving design
Affordable(relative to other machines)

6.2.2_ Analysis: Spectrum of Existing gym machines(2)

Multi gym

- more exercises than a home gym
- Can accommodate multiple users.

Commercial

- less exercises
- near perfect ergonomics and build quality.
- Very expensive

Analysis of Multi-station and Commercial

Gym equipment

Multi station: A space saving alternative for smaller gyms, health centers. They are a lot bigger than ‘home’ gyms and are meant for use in public health centres, community clubs, etc..

Features;
Plenty more exercises than in a home gym
Can easily accommodate multiple simultaneous users.

Commercial: The best designed(and most expensive) of the whole lot, these offer a fully adjustable set of equipment for each exercise.

Features;
Number of exercises offered is less (cover mostly only 1 muscle group)
But near perfect ergonomics and build quality
However, prices are sky-high.

6.3_ Analysis: Home-gym equipment

Diff. types of Home-gym equipment

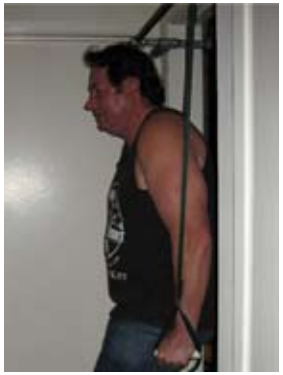
Analysis of Home Gyms

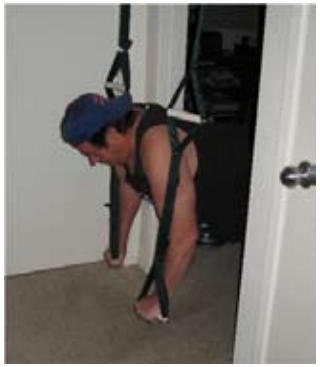
Home gyms are specifically designed for the purpose of performing strength training exercises at home. Although they differ in the number/ kinds of exercises offered, build quality, price etc., most products in India are largely the same. This is specially true when it comes to structure, size, floor area occupied etc.. This Is also the reason that most of these ‘home gyms’ are purchased not for homes, but mostly for ‘building societies’, community centers and small hotels, which need gym equipment but lack space for bigger equipment.

The products are designed for some hypothetical user with a large pocket and an even larger house, apparently. Young people of our country (men and women) do not have a sensible product to work out with, at home. Dumbbells and other small equipment are only good for a certain kind of exercises. And have their own issues as well (explained earlier). Thus there is an immediate need for a product that is actually suitable for home use, in every respect, be it the exercises offered, space occupied or the cost. What is needed is a ‘Home gym machine’ that truly delivered, what other products promised.

Problems with current home gyms;
Space consuming: Bulky, non-collapsible
Eyesore, ugly looking, industrial looking
Do not offer inspiration/ motivation: Non-inviting.
No flexibility in exercises: Rigid
Non-modular(market strategy): Redundancy
Cables, pulleys and levers make for too much equipment: Complicated.
Dificult to clean and maintain (oiling, greasing)

6.4_ Analysis: Home-made gym equipment





Diff. types of Home-made gym equipment

Analysis of Home-made Gym equipment

The images shown alongside are examples of gym equipment improvised at home using local materials.

These serve as inspiration as well as triggers for getting ideas.

Most equipment is cheap and highly functional and this was important learning. That the outcome of **this** project be as non-imposing in the interiors of the house as the equipment shown here. Basically, an industrially manufactured version that has a similar *feel.*

6.5.1_Analysis: Degree of Freedom

1

2

One has been harping about the fact that bio-mechanics and the physiology of the exercise are areas beyond the scope of this project. If that were an absolute fact, It would be very difficult to make any major changes in the design of the equipment. Fortunately, though, despite the constraints brought in by the bio-mechanics of the exercises, there is a sufficient degree of freedom available
when it comes to designing the *mechanism* for any particular exercise.

This can be demonstrated with an example of the '**Leg Press**' exercise. Given alongside are four different machines which are all designed for performing the leg press.

1. Fixed seat with moving leg pad: the leg press 'pad' is connected with four links to the base and a five pulley arrangement guides the force along the cable which pulls the weight up when the pad is presssed in the forward direction.

The leg motion involves the thigh, butt and calf muscles and all act in sync to push frontwards against the resistance.

2. Fixed seat with sliding levered weight: the working of this machine is such that the circular weights, which are mounted on a slider(which in turn is mounted on a smooth plated guide rod) move upwards as the foot pads are pressed forward. The whole apparatus is hinged from the top point. The motion of the foot pads is not perfectly straight either.

The leg motion is similar to no. 1, except that in that the final part of the motion path, the feet move a few inches over the level of the buttocks, and this is fine too.

6.5.2_ Analysis:Degree of Freedom(2)

3

4

3. Fixed pad and Moving Seat: a relatively less complicated design. Here the pressing action causes the seat/ bench to slide upwards on the rails, causing the weight to be pulled upwards.

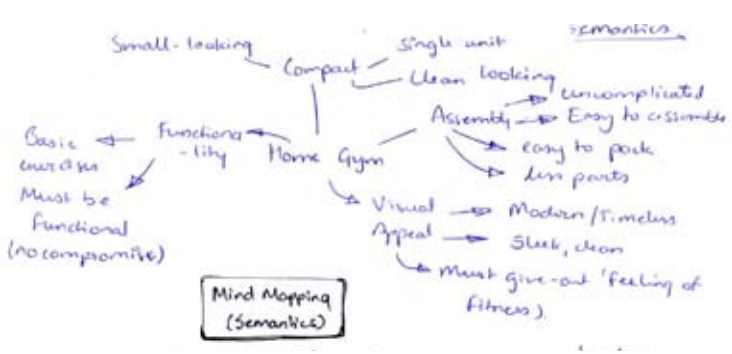
Same leg motion, only the torso is not stationary in this case.

4. Leg Sled: this one is similar to no. 3. just that the cable pulley arrangement is substituted with free weights. Again, the leg motion is same, but with the torso moving up.

Conclusion: The point of stating all this is to demonstrate the flexibility available , when it comes to selection of any mechanism for a particular exercise. This is the freedom the designer is enabled with and therein lies the scope for improvement of such seemingly unalterable designs.

some other ways of performing the leg press

6.6_ Analysis: Semantics of Gym Equipment



Mind map of 'Symantics' of Gym equipment

Visual clues - fitness equipment

Visual Clues:

As mentioned before, this is an exercise to find out what **visual elements** of a Fitness product bring-in the *Gym* and *fitness* feel to the equipment and how one can incorporate those characteristics into a new product.

Also, it is realised that just like the term "Home-gym" itself, the product would need to possess dual semantics - that of a fitness equipment and also of a household product.

This leads to some very interesting thoughts regarding the design of the product.

Alongside are arranged images of fitness equipment and some household items that are relevant in terms of size, materials and product category.

Then the best elements were picked and sketches were created to visualise the 'look' of the product. They are inserted at a later stage in the report.

Visual clues - household items

6.7_Analysis: Total Gym®

During the course of this project, one came across a lot of different *kinds* of equipement- expensive and cheap, genuine and otherwise.

Even in discussions about the project, references to products sold by Tele-marketeers and other similar operators came up. Although most of us are well aware about the authenticity and reliability of such products, however the concepts themselves are interesting, sometimes even amusing to look at.
One has not yet found a single genuine, authentic looking, compromise free fitness product, let alone any strength training equipment. The one (and only) example that comes closest to what a home gym must be like (in the authors opinion) is the Total Gym®

The Total Gym® consists of a sled which acts as the seat and handles, which are threaded through pulleys and attached to the same sled. The idea is that you pull your own body weight while exercising and that eliminates the need for any additional weights.
Also, the sled moves on guide rods that are mounted on an inclined frame, the advantage being that the angle of the frame would be proportional to the intensity of the exercise. A variety of exercises can be performed in this manner.

On the downside, however, this machine involves constant motion, which may not be desirable for all excercises. Also, cables offer lesser support as compared to rigid parts, thus making its authenticity a personal matter.

7_Product Brief

“To design strength training equipment for use in urban homes”.

Target users: Fitness enthusiasts, Amateur bodybuilders, sportspersons, Athletes.

Objectives;

Functionality:
The final product must not affect the way the exercises are performed.
There must be no compromise in the number(see list on previous page) of exercises or the way they are performed.

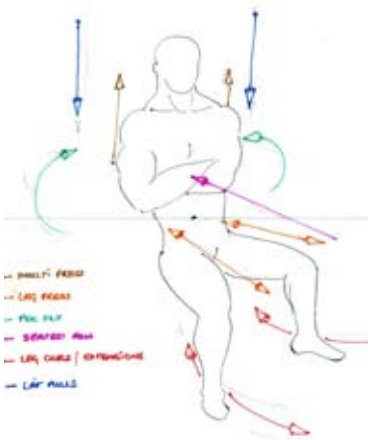
Compactness:
It must be compact, in the true sense of the word and must be comfortable for use even in a small apartment. When not in use, it should be capable of collapsing/ folding into a volume that is comfortably available even in a small urban apartment.

Build quality and Visual appeal:
Must be strong yet non-bulky and potent yet inviting.

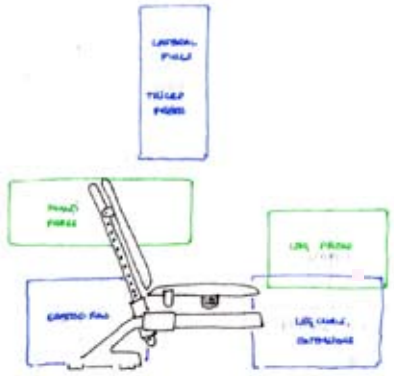
Semantics:
Must successfully convey that it is a piece of fitness equipment and it should simultaneously blend into the home environment.
Must look like a piece of Fitness equipment when in use and as a non-imposing household item, when not. [pl refer to the ‘Semantics’ page]

Cost:
Must be truly affordable and well under the price of current home gyms.

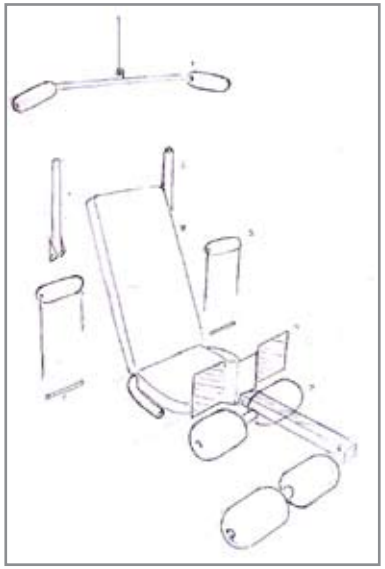
8.1_ Ideation-1



motion analysis



space analysis



envisioned product

volume ideation

The following diagrams were intended to give direction to the ideation process. Since the final list of exercises was known, it was natural to represent them visually as shown below.

Motion analysis: shows the motion paths of various limbs/ body parts for each exercise.

Space analysis: is a representation of the approximate space occupied by different exercises. This was based on the design of other preexisting home gyms.

Envisioned product: again, the essential parts, the ones which the body makes contact with during exercise, were sketched. All other mechanisms and details have been omitted. This is in order to help understand the so called ‘hard(unalterable) items’ and the room for play(designing).

Authors Note: In retrospect, one finds that these exercises were not so helpful as one already assumed many things to be unchanged in the final outcome. However, a new design can never be born unless one sheds all old baggage and questions all notions. The why’s were missing at this point. It is only when one starts asking the why not’s that new ideas start coming into picture.

8.2_ Ideation-2: multi press

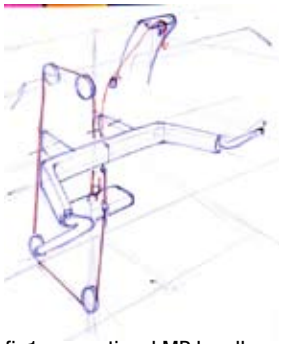


fig1:conventional MP handle setup

[**Note:** Please refer to the description of the exercise given earlier in the report]

Initial: ideas were about reducing the size and material needed for the multi press handle, which, in most machines was pivoted and connected with a cable to the weight stack[fig1].

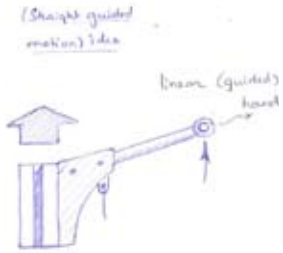


fig2:sliding handle

Different ideas for motion of the handle were tried out. One on the left shows an exploration of a sliding handle intended to be smaller in size. However, improper force distribution would affect hamper its working.

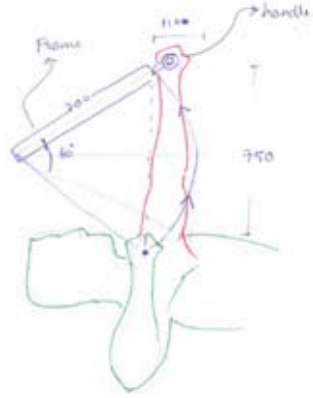
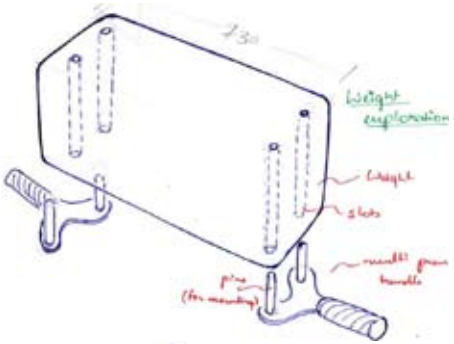


fig3:rotational handle

Rotational handle exploration, with dimensions. although the multi press bar must ideally move vertically upwards, some amount of deflection is permissible (as confirmed from study of several other machines)
The necessary calculations were done to check if the figures were within limits.



The sketch on the left shows an idea of centralising the weight, which is an ideal location, excercise-wise. but there are obvious issues of entering under the weight and safety.

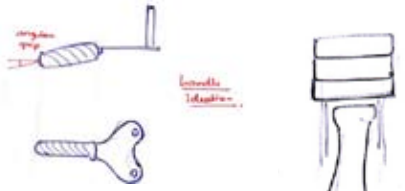


Fig4,5,6(clockwise from top:) central weight idea

As shown in the fig alongside, it would be very good if the weight were acting vertically downwards on the hands. Force distribution would be optimum, then.

fig7(left): central weight idea

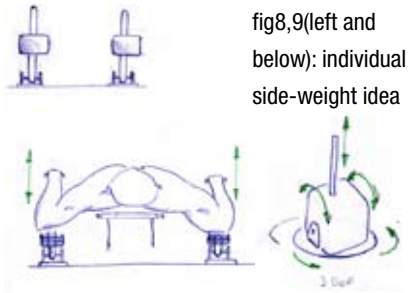


fig8,9(left and below): individual side-weight idea

This is an exploration depicting two individual weights on both sides. This is a big improvement because it completely eliminates the need for a central bar or elaborate handle setup.

8.3_ Ideation-3: Multi press(2)

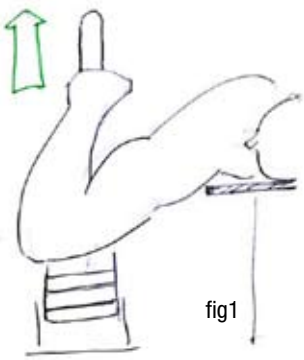


fig1

These are explorations depicting the two individual weights idea mentioned earlier. And on the ideal way of loading the weight on each hand.

fig2: eccentric dumbell shape exploration

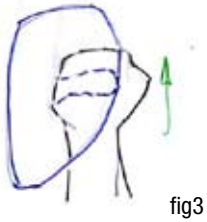


fig3

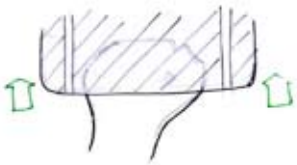


fig4: ‘glove-type’ weight idea

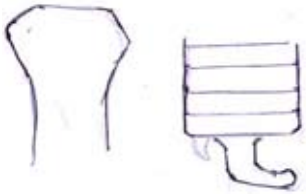


fig5: Grip and handle

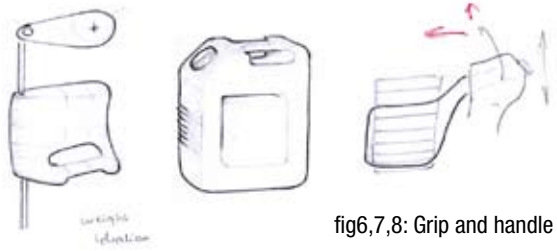


fig6,7,8: Grip and handle

The jerry-can on the left is intended to be an idea trigger for getting the ideal form of the weight, as it also deals with handling a large amount of weight.

fig9

Further weight holding technique explorations

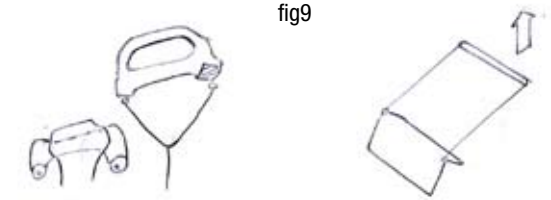


fig10

The sketches on the left are all explorations for the handle design for the multi press ‘weight-stack‘

fig11

The idea was to have two independent weight stacks on two sides and these are explorations for handles for the same

8.4_ Ideation-4: Multi press(3)

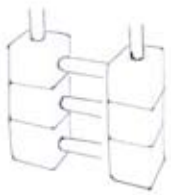


fig1

Further handle explorations.
The intention was to find the most comfortable way of loading the hands and the sketches show the process.

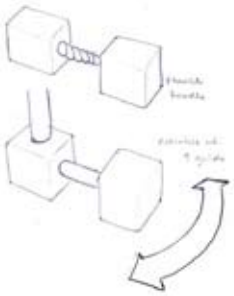


fig2: rope connected
dumbell idea.

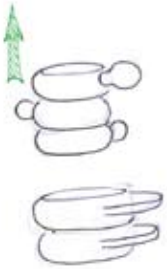
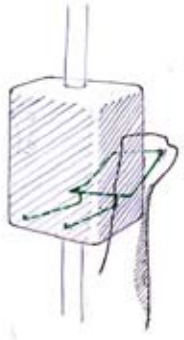


fig3:
separatehandle
on each waeight



The fig.4 on (bottom left) is one of the final explorations is selected as the best method of loading .
This arrangement is intended to give the user the feeling of exercising using free weights (ideal) whilst providing the safety of an exercise machine

fig4: final preffered handle position
and location

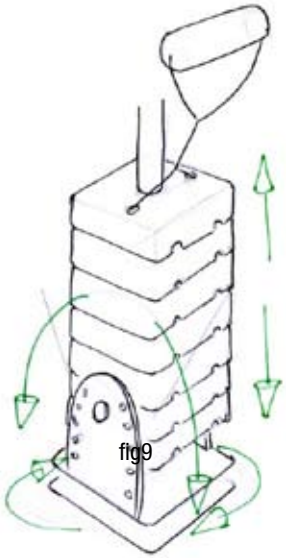


fig9

fig5: ‘weight
stack‘ detailing

The sketch on the left is an exploratory detailing of the ‘weight stack’.

It is shown as provided with a palm grip attached with a short cable to the weights.

The stack of weights is adjustable and can tilt and rotate as need be.

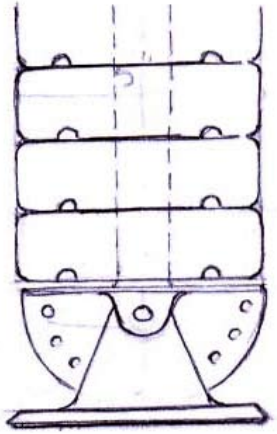


fig6: Base detailing

8.5_ Ideation-5: Lateral pulley & Seated row

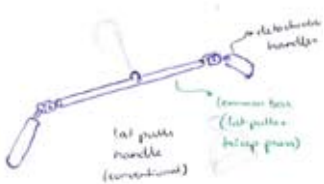


fig1

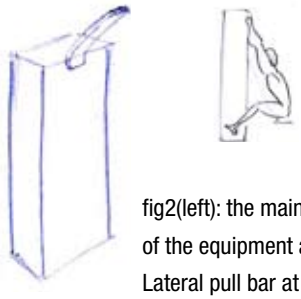


fig2(left): the main 'frame' of the equipment and the Lateral pull bar at the top.

fig3: top member explorations.

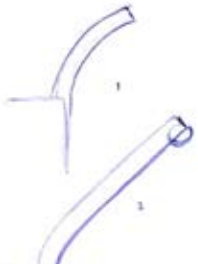


fig4: top member explorations.

[**Note:** Please refer to the description of the exercise given earlier in the report]

Initial: The main issue with this exercise was that it required the placement of the handle(which also is of a particular size) at a certain height(approximately 6 feet). Hence the natural response was in trying to see how one could provide the equipment of the required geometry yet make it small enough for storage/ use inside the home.

Lateral pull top member:

was a problem as even though the ermaining components could be compacted in a tight volume, this member would need to be at the stipulated height and location

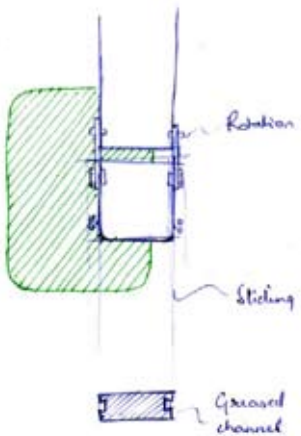
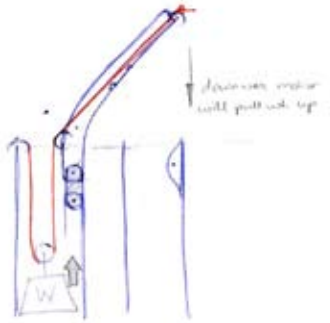


fig5: top member detailing



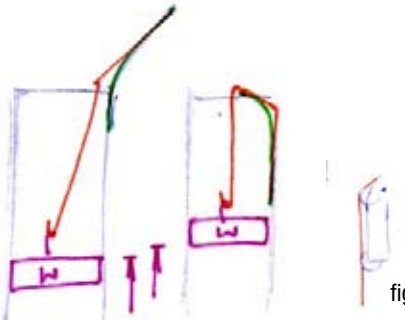


fig7: Base detailing

Collapsability:
It would be best if the top member (shown in fig6) could somehow collapse or be folded in, once its use was over.

One idea was to pivot it such that, in the process of folding, some weight from the weight stack(to which it is connected) gets pulled upwards as one is lowering the member in the downward direction (see fig7).

This weight would assist raising the bar when the equipment was being set-up, the next time.

8.6_ Ideation-6: Lateral pulley & Seated row(2)

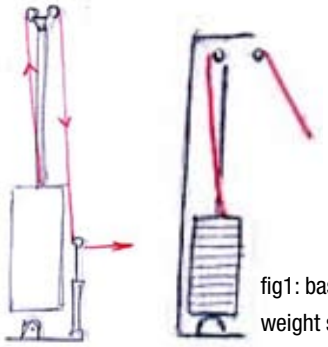


fig1: basic weight stack

The ideas on this page are built around the ‘weight stack’ concept discussed previously in the multi-press section.

The idea was to have just a weight stack, sans the frame, and this was to be designed in such a way that it enbled the iser to perform all the different exercises.

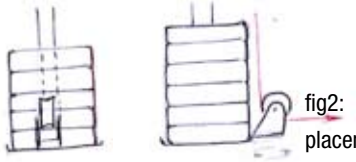


fig2: placement of pulley

this page explains the ideation process concerning the lateral pull exercise.

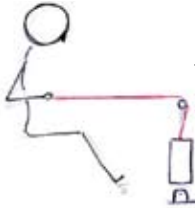


fig3,4(left, below left): seated row explorations

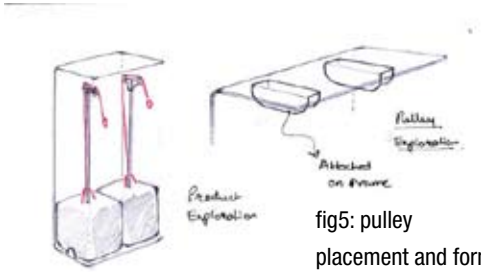


fig5: pulley placement and form exploration for frame

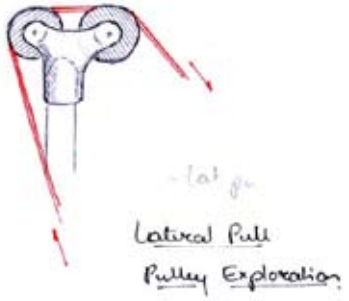
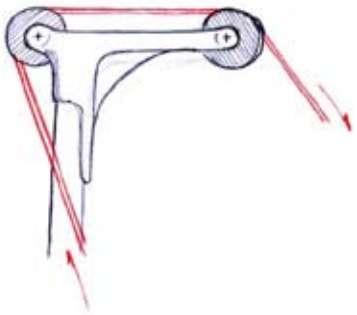


fig6,7(above, below): exploraions for pulley



8.7_ Ideation-7: Leg Press

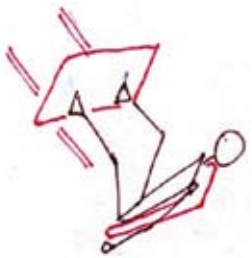


fig1

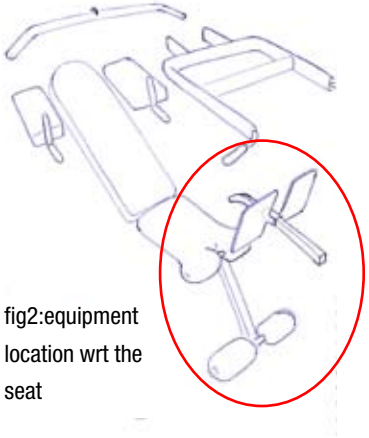


fig2:equipment location wrt the seat

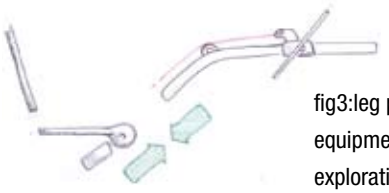


fig3:leg press equipment explorations.

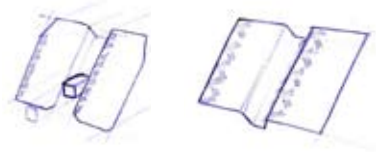


fig4: leg press pad

[**Note:** Please refer to the description of the exercise given earlier in the report]

Initial: The leg press exercise has been discussed in detail previously in the erport.

The effort in this case was to reduce material by combining the equipment required for doing the two leg exercises in the “final list” - i.e. Leg Press and Leg extension/ Curls.

The fig2 on the left shows the location of various equipment for performing different exercises.

The equipment needed for doing the leg press and the leg extensions exercises has been highlighted in red

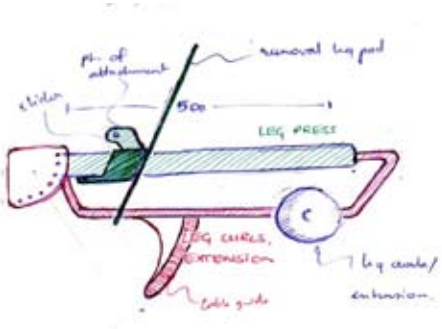


fig5: common equipment (leg press, leg extensions)

Reducing redundancy:
As explained perviously, the leg press exercise requires that the user be subjected to a force acting towards his Pelvis and that he must be able to use his legs in order to push against this resistance.

The leg extension exercise required resistance against the lower legs moving in a circular fashion.

Both the exercises were located near the end of the bench and involced the legs.
the fig6 shows the mechanism designed for enabling both exercises using a single piece of equipment.

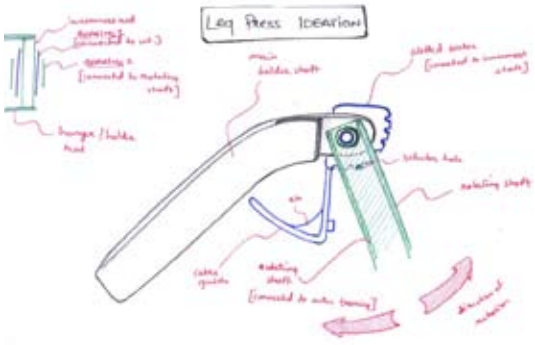


fig6: mechanism for common equipment.

8.8_ Ideation-8: Leg Press(2)

fig1: 'weight stack'

Initial: What the previous page fails to mention is that the equipment was designed for a conventional cable-pulley mechanism.

The sketches on this page, however, depict the previously discussed "weight-stack" idea, which is based on completely doing away with any cables or pulleys.

Reduction in material by removing/ reducing dependancy on the conventional cable-pulley machanisms has largely been the driving force for most ideas.

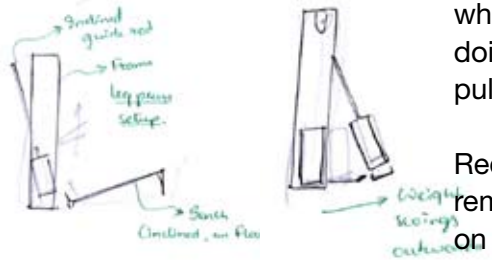


fig2:the weight stack is kept at an angle meant for performing the leg press exercise

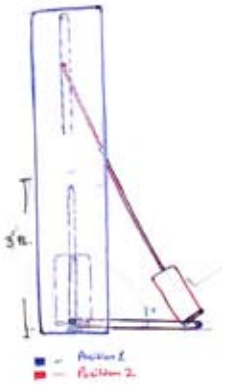
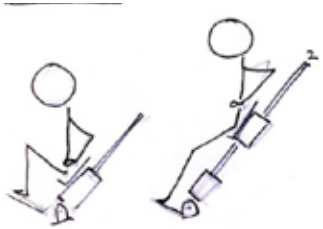


fig3:tilting weight-stack concept

fig4: leg press pad

fig5,6,7(left, below, extreme bottom): reverse leg press



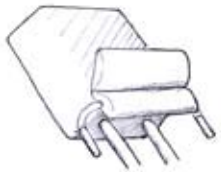


fig6: seat attached on weights

Reverse Leg Press:
is one of the several ways in which the leg press exercise can be performed, a fact demonstrated earlier.

The images 5, 6 and 7 show explorations of the reverse leg press.

8.9_ Ideation-9: Leg extension, Curls

fig1: rotating member detail of bearing

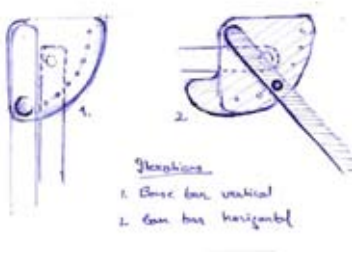


fig2,3,4(anti-clockwise from above):explorations of rotating member

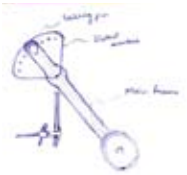
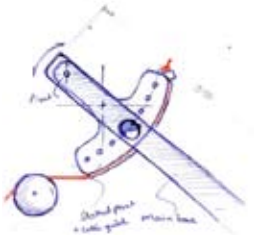


fig5,6(left, below left):explorations



[**Note:** Please refer to the description of the exercise given earlier in the report]

Initial: Much has been mentioned about this exercise in the previous pages.

The explorations were mainly an attempt to combine the needs of the leg press and leg extension exercise.

the leg press exercise demanded a horizontal bar on which a Pad must slide, with the resistance directed towards the pelvis of the user.

And the leg extension needed a straight member that swung from the edge of the seat(where the user's knees were located)

The explorations maily deal with designing a mechanism that could indicidually swing or remain fixed, as need be, to perform any one of the two exercises.

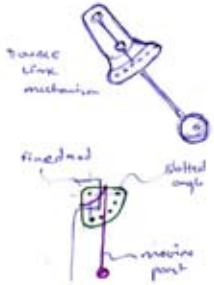


fig7(left): explorations

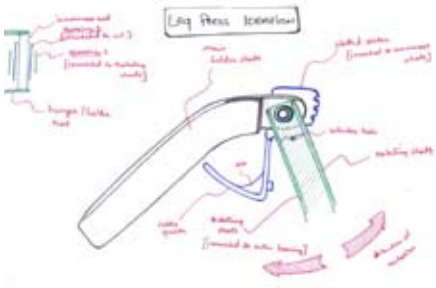


fig8(top):detail of equipment

fig9,10: adjustable seat base

Final mechanism:
Shown in image 8 is the same the one shown before.

Adjustability is an important concern, as any equipment designed for exercise must accomodate for all body types.

Hence the bench seat[fig 9,10] is in two parts(can be moved forward or back, as need be) in order to provide the right fit for users having different leg lengths

8.10_ Ideation-10: Leg extension, Curls(2)

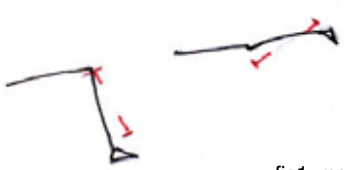


fig1: motion desired

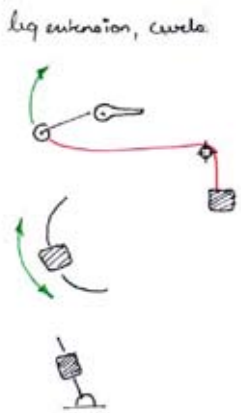


fig2,3,4(left): explorations of possible motions and mechnisms

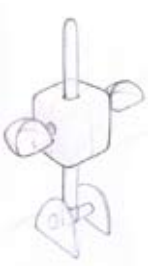


fig5,6: (left, below left): the swinging rod idea

Alternate, fresh ideas were sought to replace the concentional cable-pulley options and fig2 on the left shows the explorations of performing the leg extension exercise in three completely different ways;

1. conventional cable-pulley
2. circular guide rod, rotating weight
3. short guide rod that moves like a pendulum(the weight, which is attached to the users legs will follow the desired circular motion)

The sketches on this page depict the various explorations done for finding out the simplest way of performing these exercises.

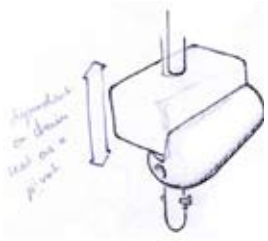
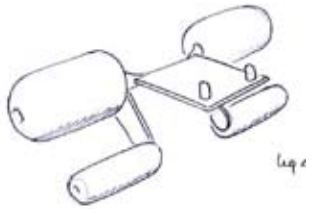


fig7(left): exploration for attachment of weight to rod



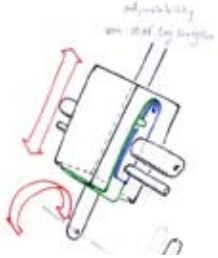


fig8,9(above and left): exploration for attachment of rods/ cushions to the weight

8.11_ Ideation-11: Frame, base

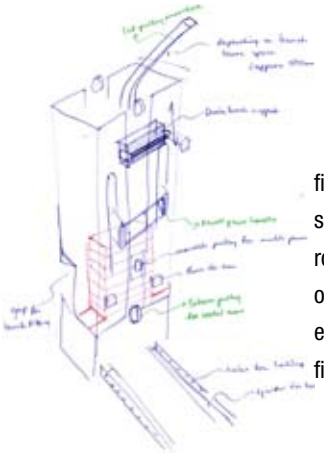


fig1: sketch showing rough location of various equipment in final product

Alternate, fresh ideas were sought to replace the concentional cable-pulley options and fig2 on the left shows the explorations of performing the leg extension exercise in three completely different ways;

1. conventional cable-pulley
2. circular guide rod, rotating weight
3. short guide rod that moves like a pendulum(the weight, which is attached to the users legs will follow the desired circular motion)

The sketches on this page depict the various explorations done for finding out the simplest way of performing these exercises.

fig4(left): rough positioning of various equipment

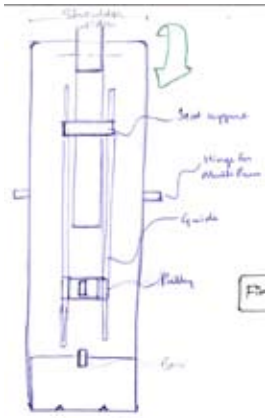


fig2,(left): explorations of final product

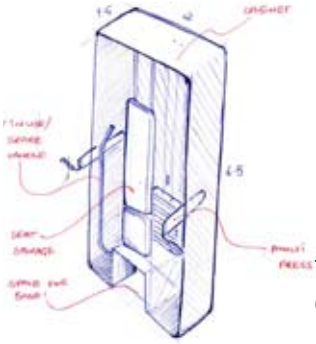


fig5(left): exploration of collapsibility

fig6(left): an exploration for storage.

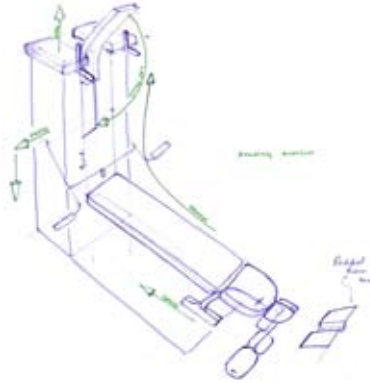


fig3: (left): final product exploration

fig7(left): aspirational sketch of the final product (size and proportion)

8.12_ Ideation-12: Bench

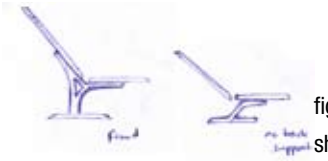
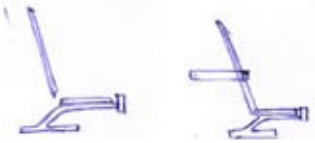


fig1: sketch showing the various explorations of the bench.



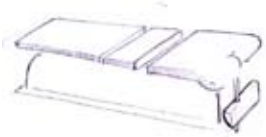
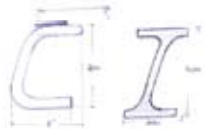


fig2,(left): conventional gym bench (free-standing)

fig3: (left): exploration of collapsability



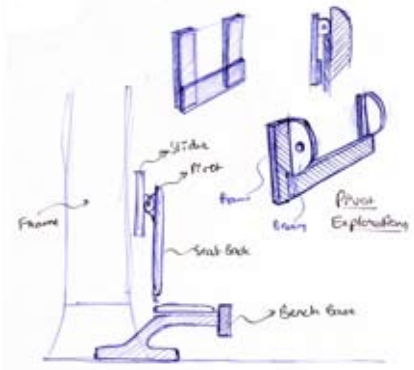


fig4,5(above left, left): suspended bech ideation

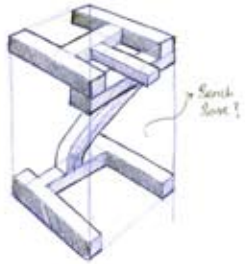
The bench is a vital part of this product(home gym). The essence of a home gym lies in providing exercises in the most compact package possible.

Hence a conventional floor bench will not be suitable for a product for the home. It must be an integral part of the whole product.

The ideations on this page depict the attempts to design a bench that is

1. fully-functional(accomodates all exercises)

2. compact (least material intensive)



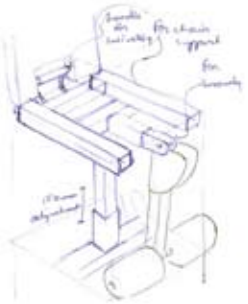


fig6(left): detailing of a bench base form

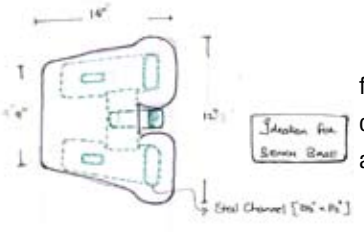


fig7: exploration of bench base + attachment pod

fig8, 9(left, below): bench base exploration

8.13_ Ideation Phase 2-

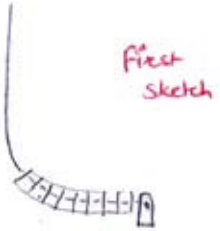


fig1: first sketch

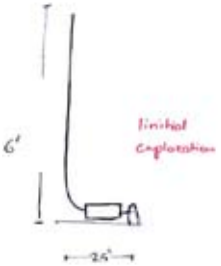
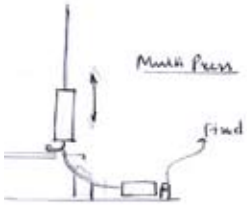


fig2(left): initial parts exploration- curved guide rod, weights and pivot

fig3,4,5(left, below, bottom): initial exploration of possible exercises



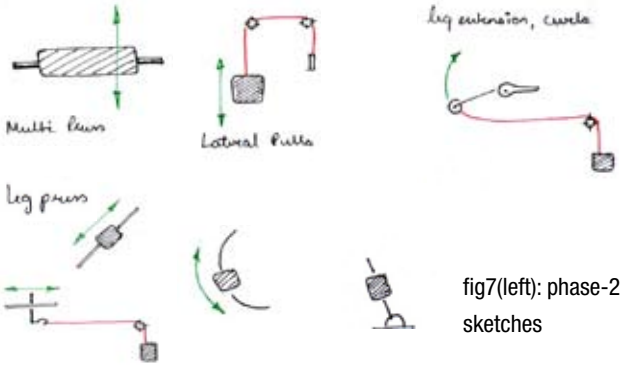


fig7(left): phase-2 sketches

The second phase of ideation refers to the part after the formation of the first concept. The first concept was analysed and all points lacking in it were noted.

It was clear that the ideal home gym was to be times more lighter and non material-intensive.

Keeping this in mind, the core *essence* of each exercise was studied[fig. 7] and ideation was begun all over again. The key was to not be influenced by any of the conventional equipment which basically meant not taking for granted any part of the hardware/ mechanism of the exercise.

This time around, the ideas were much more radical and free-flowing.

The images on the left[fig1,2,3,4] depict the initial sketch of what was to subsequently become the final concept.

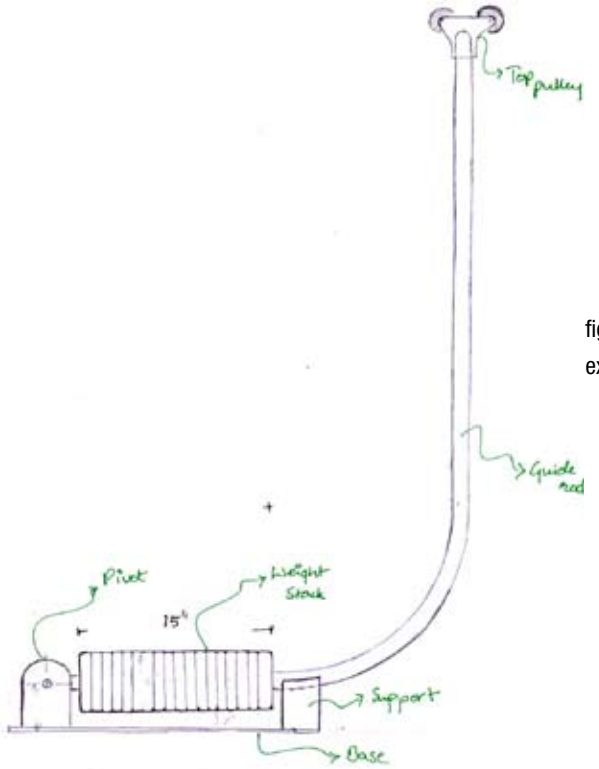


fig6(left): initial exploration

The idea is that the equipment essentially consists of a single continuous *guide rod* which is pivoted at the base and extends horizontally, circularly and vertically after that[seefig 6].

The idea is that all loading and setup takes place in the horizontal part and the weights are moved up to the vertical part which is the *working zone.*

8.14_ Ideation Phase 2- Rethink(2)

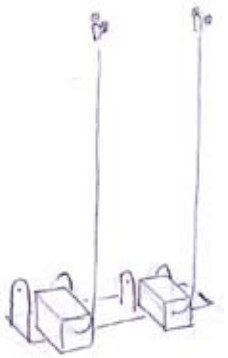


fig2(top): The complete product consists of TWO guide rods, two weight stacks and a base cum storage setup;

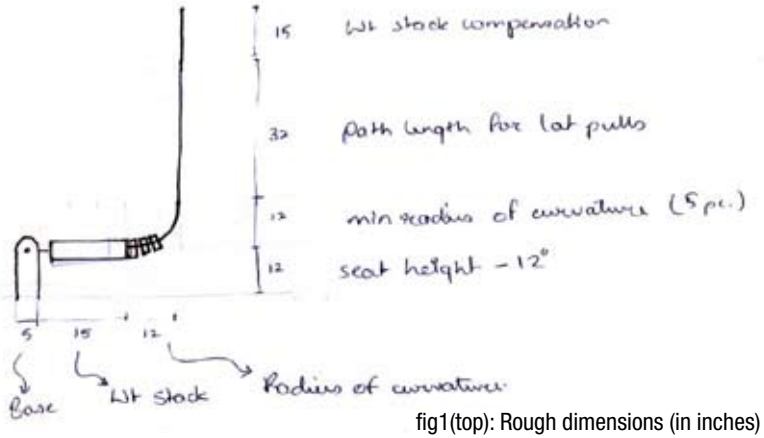


fig1(top): Rough dimensions (in inches)

This page describes the explorations done regarding the details of the equipment.

The initial work involved ascertaining the rough dimensions of the product to get a grasp of the scale[fig1].
Others included a visualisation of the actual product[fig2], and an exercise that dealt with assesing the collapsibility of the product[fig3].

There were some concerns regarding smooth movement of the weights over the circular part of the guide rod, which are worked upon and depicted in fig4, 5 and 8.

But the advantages offered such as extreme simplicity in design, minimal footprint and flexibility of the hardware were substantial and it was decided to develop this concept further.

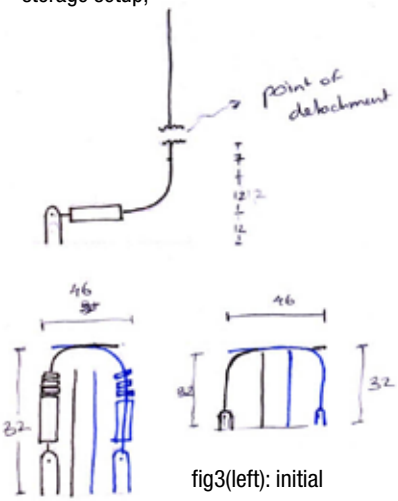


fig3(left): initial exploration for collapsibility of equipment

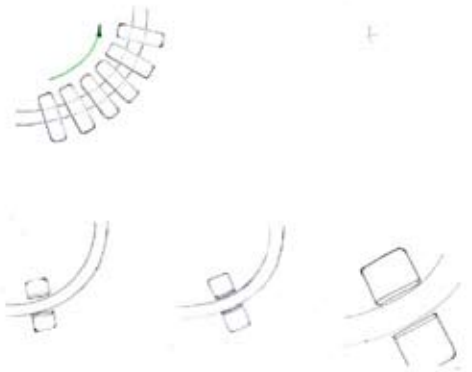


fig8(left): a study on possible movement issues over circular part of the guide rod.

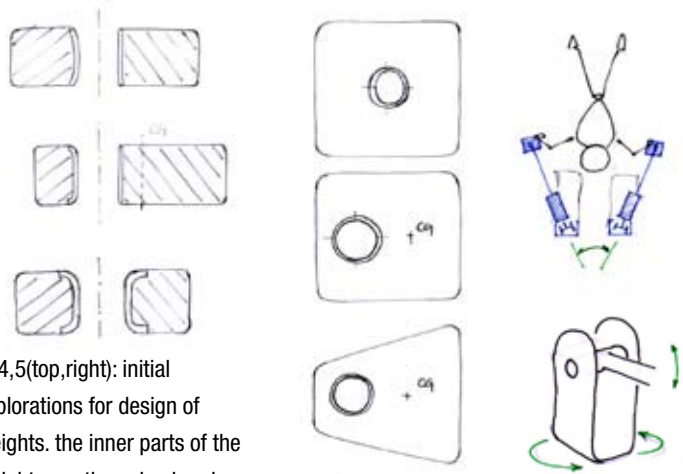
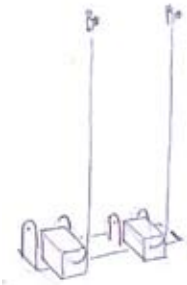


fig4,5(top,right): initial explorations for design of weights. the inner parts of the weights are the nylon bearings

fig6.7(above,top): swivelling base, the equipment set up for multi press configuration

8.15_ Ideation Phase 2: Multi Press



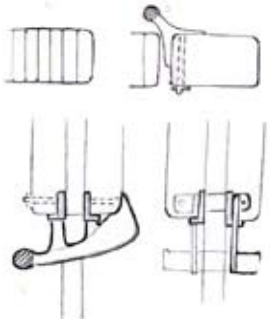


fig2(top): Weight selectiona dn handle attachment

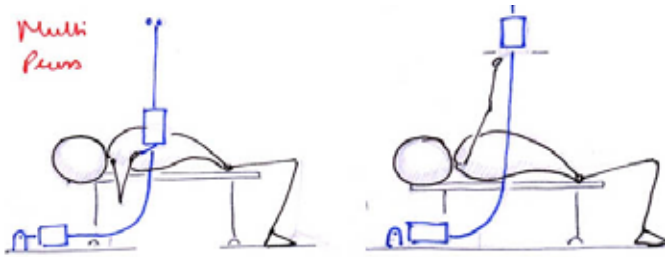
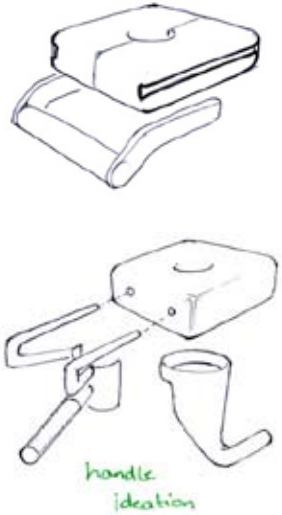
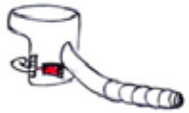


fig1(top): Multi-press

This page describes the explorations done regarding the details of the multi press exercise.

This basically involved handle form explorations[fig 2,3], and general study of the setup needed by the user before he/she can use the machine for that particular exercise.





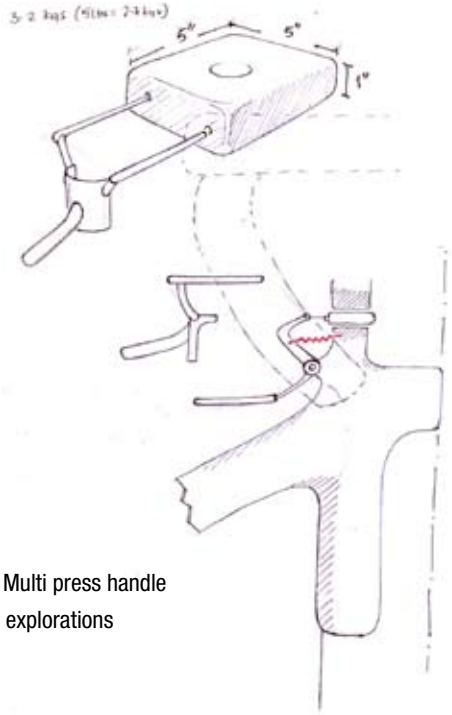
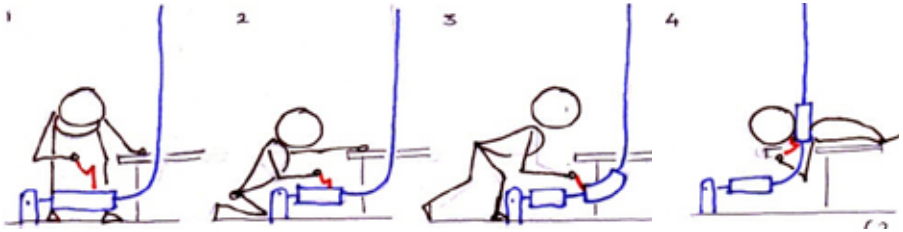


fig3: Multi press handle form explorations

fig4: Setup for getting equipment exercise ready. [steps 1-4]



8.16_ Ideation Phase 2: Lateral Pulls

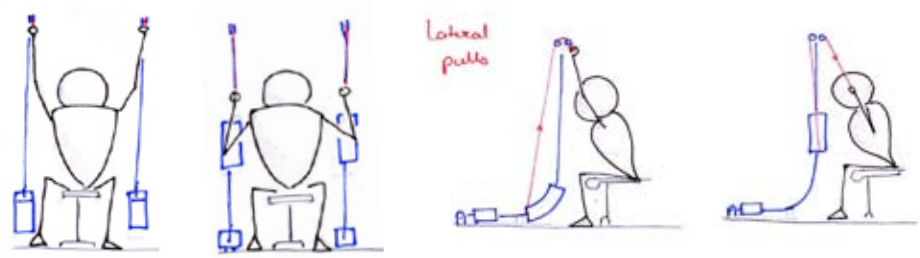


fig1,2(left, extreme left): Lateral pull

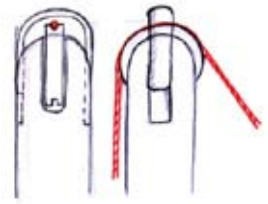


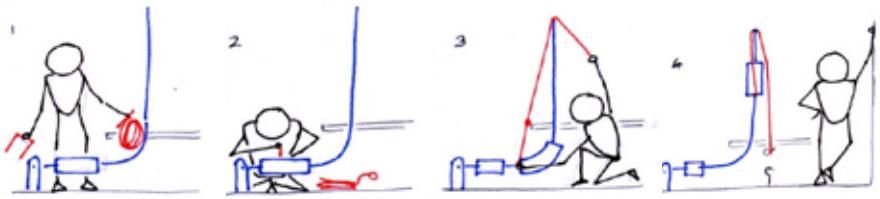
fig3(top): Lateral pull pulley exploration

This page describes the explorations involving the Lateral Pull exercise.

This involved designing a suitable mechanism[fig 3,4], and general study of the setup needed by the user before he/she can use the machine for that particular exercise[fig5].

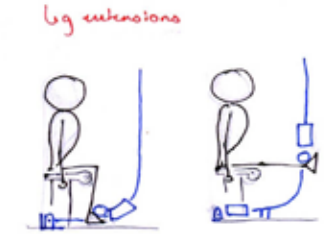
fig4(top): Lateral pull mechanism

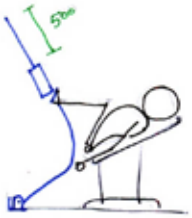
fig5: Lateral pull - exercise setup



8.17_ Ideation Phase 2: Leg Press, Leg Extensions

fig1,2(left, extreme left):
leg press





This page describes the explorations done regarding the details of the two leg exercises- leg press and leg curls, extensions.

This basically involved leg press “pad” design explorations[fig 3], and an analysis of the working of the leg curl/ extension exercise with respect to the new form of the equipment.

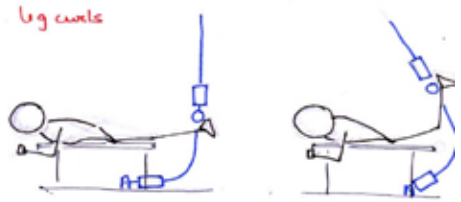


fig5: Leg extensionexercise explorations

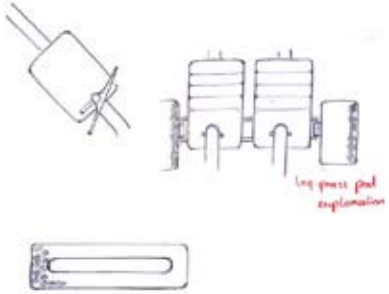


fig3(bottom, left and above):
LP “pad” Explorations

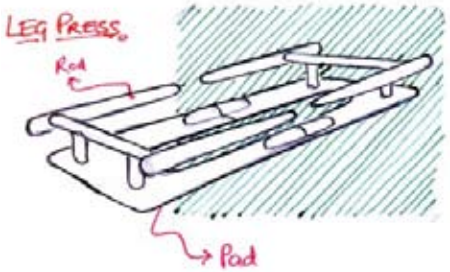
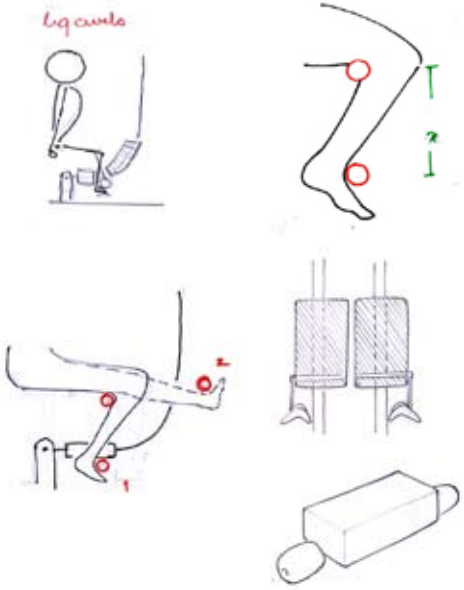


fig3(top): Leg press pad construction.



9.1_ Concept 1

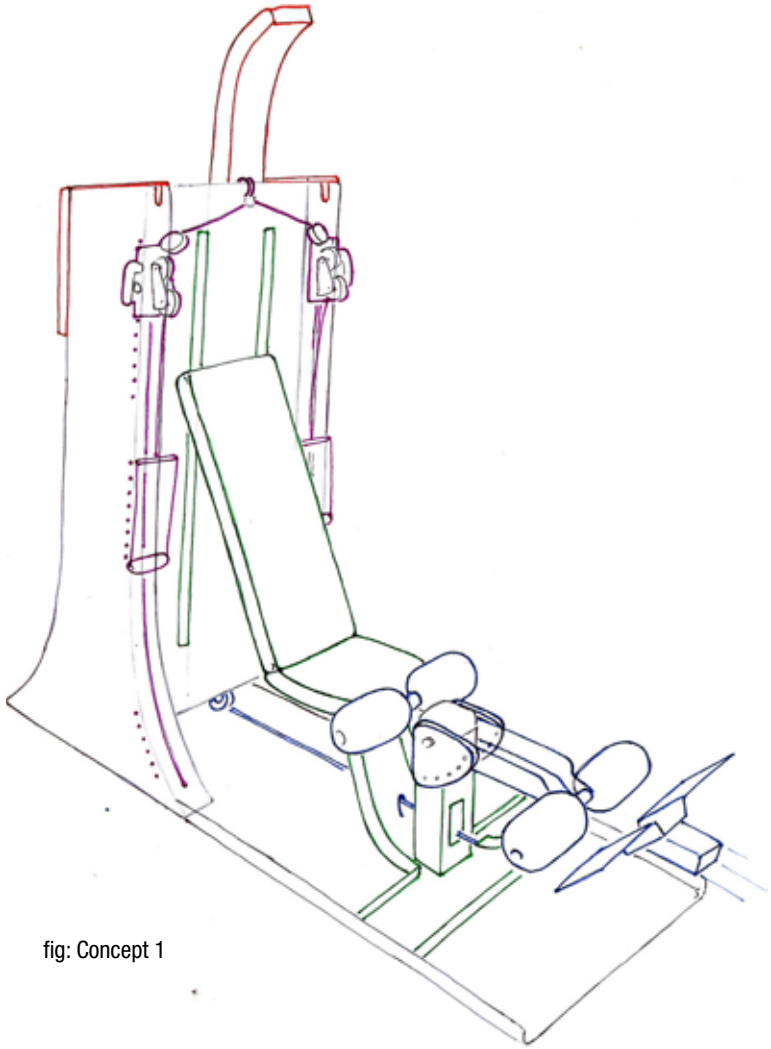


fig: Concept 1

The concept 1 was the first assemblage of all ideas obtained as a result of independent ideation of all the various exercises. On the good side, it helped in visualising what the product looked like and where it stood. And on the other hand, it spoke of the tremendous changes and efforts that would be needed in order to arrive at a satisfactory final product.

9.2_ Concept 2

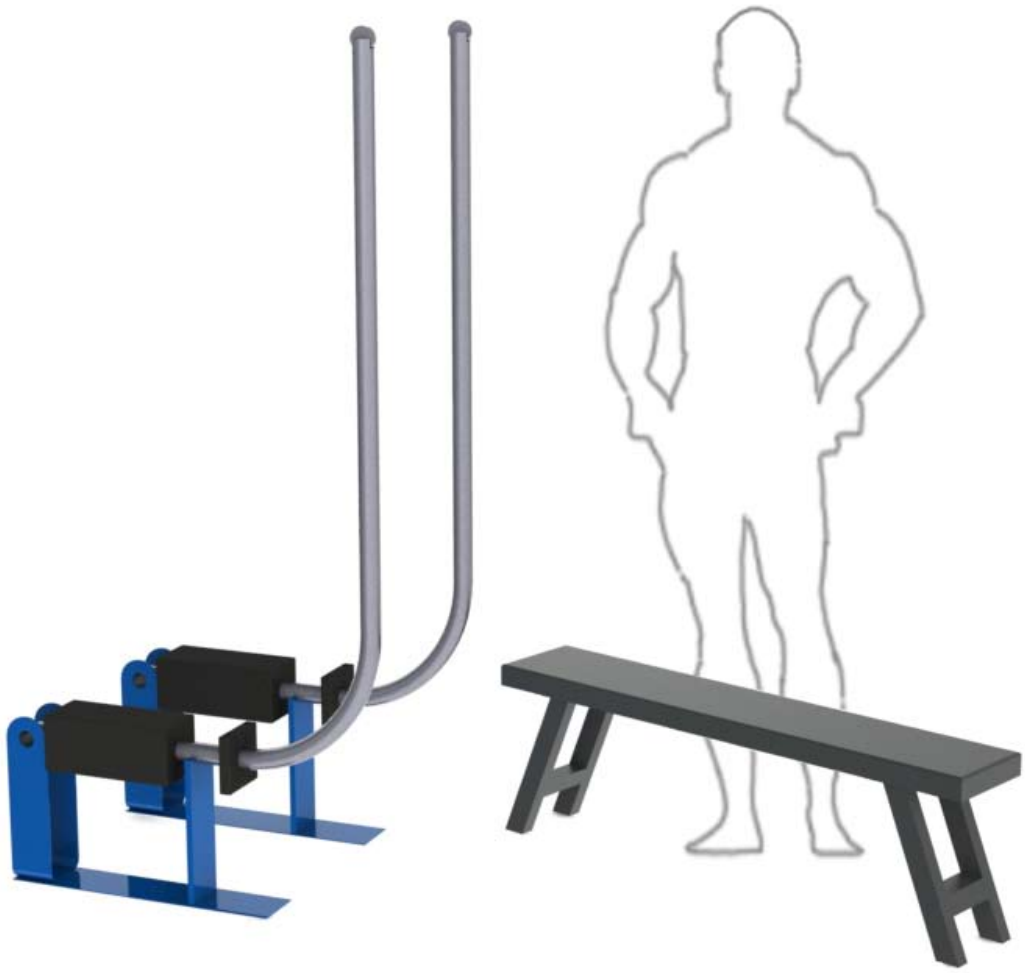


fig: Concept 2

The image alongside is a visualisation of concept 2. This design has several advantages to offer;

- *Functionality:* Offers majority of the exercises (among those in the list).
- *Compactness:* is ultra compact (collapsibility discussed earlier)
- *Build quality and Visual appeal:* Definitely an improvement over most competition, but lacks elegance.
- *Cost:* The minimal material needed will ensure the price is a fraction of what other models cost.

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GYM EQUIPMENT for HOMES

REPORT BY :

SUHRID PALSULE

08613803

Guide: Prof. U Athavankar

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9.2_ Concept 2

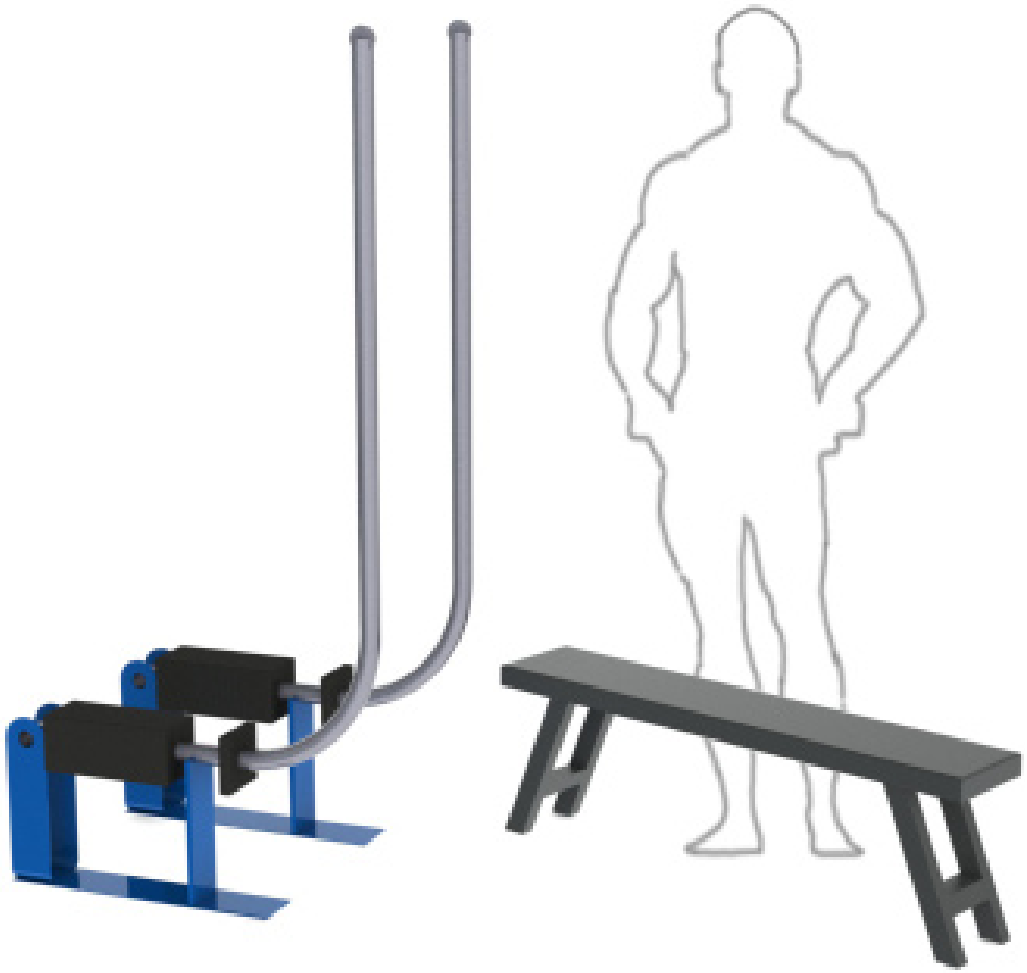

fig: Concept 2

The image alongside is a visualisation of concept 2. This design has several advantages to offer;

- *Functionality:* Offers majority of the exercises (among those in the list).
- *Compactness:* is ultra compact (collapsibility discussed earlier)
- *Build quality and Visual appeal:* Definitely an improvement over most competition, but lacks elegance.
- *Cost:* The minimal material needed will ensure the price is a fraction of what other models cost.

10_Final Concept

fig: Final Model

The final concept is shown alongside. One of the very important objectives of the project was to design the product such that it had the semantics of a home-use object, such that it blends-in with the interiors of an urbanIndian apartment.
Features;

• Size & Compactness: (400 * 700 * 1700 mm.) The weight stack, mechanism (pulleys and levers) and other parts are enclosed within the central volume. This drastically reduces the overall space consumption and gives the product a clean look.

• Build quality and Visual appeal: The materials remain same as those found in regular gym equipment - namely *steel* (channels, weight plates, rods etc), but care has been taken to conceal these members as much as possible, as these bring in strong visual connotations of a bulky, industrial product. The body panels are designed taking cues from the surface treatment of home appliances and other common objects found in the home like upholstery etc. The overall look of the object is clean and contemporary.

• Usability/ Product Interaction: Great care was taken to ensure that all user activity was done from the front of the equipment. The exercises themselves are not affected in any way due to the equipment and it requires hardly any set-up time.

_Conclusion

fig1: Exercises : Bench press, Leg Press, Lateral Pulls

Fig 1 on the left shows the various major exercises that can be performed on the gym.

Final Word: The main aim behind the product was to provide a very compact, efficiently designed. aesthetically pleasing piece of gym equipment. The idea was that the product should be small and neat-looking for use at home, but must not have effect on the function and bio-mechanics of the exercises themselves. In that, the desired aim has been achieved. However, there is much more possible in terms of size reduction and the overall efficiency of the design. The number of exercises provided are also less for a product of this cost and the current product will leave the buyer wanting more from the product.

Product Innovation: Since the time the project was undertaken, the *vision* of the product was an object or a piece of equipment that was so compact that it would probably occupy the same volume as a mid-size suitcase and would enable the user to perform a variety of exercises, just with the help of a few handles and attachments. “The aim was to replace the toolbox with a swiss knife .” This analogy probably best describes the efforts made by the author and the direction this project was heading towards.

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