Seat Design Based on Ergonomics

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Abstract

Nowadays, people can't live and work without a chair. Especially those who work in a sitting position, they spend a third of their time in the chair every day. So seat design out of the material used correctly and aesthetically pleasing relationship, more important is to conform to the principle of ergonomics design, namely the seat design must fully consider the human body posture physical characteristics. Let the person sitting on it get better. The design of the modern seat should be reliable, durable and safe. More importantly, it should satisfy its function and comfort.

Keywords

Ergonomics, Office chair, Sitting position.

1. Introduction

All kinds of seats according to the basic rules of man-machine engineering, combined with the body's physiological and psychological needs, design a reasonable seat size and spatial distance, for users to design and produce the maximum free space and more convenient and security, visual aesthetic feeling, and so on. With levels of seat is by the repeated use, people contact with identify verified, seat, as a kind of fortifying the carrier of culture development to today, it is already in modern human life regulate bedroom environment art, decoration, is a blend of art and practical and new consumer products.

2. Body Posture Analysis

Posture is a kind of body posture to relax and have a lot of advantages, can be exempted from the human body while standing on his ankle, hip, knee and spinal joint part by static strength, reduce the body's energy consumption, fatigue. The body's blood circulation is better when sitting than when standing. It is easier for the body to maintain stability while sitting, which is more suitable for delicate work. In the case of foot operation, sitting position can keep the body in a stable state and make it easy to work. While sitting with a variety of benefits, but another aspect also has some disadvantages, sitting position limits the scope of human activities, especially the need of the efforts of upper limbs, often need to stand our homework, and frequent sit since alternately can also lead to waste. Maintain a posture for a long time to also can affect human body health, cause abdominal muscle relaxation, abnormal spine bending, as well as the damage to some organs, such as digestive organ and respiratory sitting for too long can cause swelling in the lower limbs, venous pressure increases. Partial pressure on the thigh increases the resistance of the blood flow, causing discomfort.

When the body is in a normal position, the lumbar spine of the spine is partially convex, while the sacrum is partially concave. In a good sitting position, the pressure is distributed appropriately on the intervertebral discs, and the muscle tissue is subjected to uniform static load. When in unnatural appearance, distribution of stress in the intervertebral disc is not normal, formation pressure gradient, serious extrusion between lumbar intervertebral disc will be came from, oppression central god,

produce the waist aches, fatigue and discomfort. Torso completely straight posture make severe spine bending, because of the intervertebral disc pressure cannot be normal distribution, the upper body of the load on the lumbar spine, cause discomfort, so the 90 degree Angle of the design of the chair is bad, the trunk forward position can make originally the former convex concave after lumbar spine straight and even reverse, this position is also very uncomfortable, consequently affects the normal bending of thoracic and cervical vertebrae, neck, back fatigue. So good posture: the waist and thigh into 135 degrees, the lumbar spine has support. Correct posture is hip distance back a little farther, upper body leaning back, legs between 90 ° to 115 °, large, between the legs keep between 100 ° to 120 °, calf and feet stay between 85 ° to 85 °, is in this state, people will feel comfortable and relaxed.

3. The Design Principles of the Seat

Seat of the basic function is to provide people with comfortable support and design principle of each part are as follows:

(1) the sitting height; Ergonomics research shows that the reasonable high shall be equal to the lower leg and foot high plus 25 to 30 mm heel minus 10-20 mm thick leeway, namely: the chair foot high + heel height = crus thick - the appropriate space. One foot high general leg should be suitable for all people over the 5th percentile. In terms of office chairs, it should be a bit higher than the rest chairs, high and well designed to be adjustable to fit most people use, generally take 400-440 - mm, if it is adjustable, 380-480 - mm.

(2) take a deep; Refers to the chair in front edge to the trailing edge of the distance, the size can't be too big. Correct deep should make chair easily support lumbar parts such as seat depth greater than the diminutive man's thigh length (hip or knee litter is apart from), a front edge socket oppression knee pressure sensitive areas, so if you want to support from the back of a chair, you must change the waist normal curve; Otherwise, take must move toward a margin in order to avoid oppression knee nest, without back of a chair, in order to adapt to the vast majority of users, a deep should be designed according to the small percentile group, so that short stature is sitting comfortable, body tall man as long as the calf get steady support, also won't cause stress fatigue in the thigh.

(3) the back of a chair; Consists of shoulder by and waist by two parts, most of the workplace, the waist on the primary. Back of a chair of the maximum height of 48, 63 cm, maximum width can be up to 35-48 cm. The size of the back of a chair is mainly composed of hip bottom to shoulder height (decision back high) and shoulder width (decision back width), determining the height must also be included in the effective thickness of the seat. In order to make the lower back and hip of the sacrum after appropriate convex space, seat surface between above and lower back should be recessed or leave an opening part, its height is 12.5 - at least 20 cm.

(4) chair cushion; According to human engineering, human body sciatic, compared with the surrounding muscles can bear greater pressure, and at the bottom of the leg has a large number of blood vessels and nerves system, pressure will affect the circulation of the blood and nerve conduction and discomfort. So the cushion Pressure should be according to the principle of different pressure at different positions of the hips to design, the maximum stress in sciatic place, to reduce gradually, to the thigh when pressure to a minimum. When people sit, about 75% of the weight of about 25 cm2 around sciatic section part of the bearing. Set up on the chair cushion soft hard moderate, greatly reduced to make hip pressure, bearing area by 900 cm2 increases to 1050 cm2 make hip pressure dispersion. In addition, the cushion material should be well ventilated and don't slip, in order to increase the comfort.

(5) waist by Angle; According to the general human ergonomics requirements of work seat seat main parameters given work Back of a chair is to help the spine to keep normal, easy form, waist by sheer Angle 95 ° ~ 115 ° is advisable.

(6) back of a chair, Back of a chair can help keep the spine normal, relaxed posture, general seat waist by should be 320 mm to 340 mm long, waist width should be 200 mm to 300 mm, the waist by high should be 165 mm to 210 mm. Back of a chair is primarily to support the waist, the main support

human lumbar section 4 ~ 5 lumbar curve. In the back of a chair and chair face should be set aside 125 ~ 200 mm between a gap. The ideal back of a chair should move with the movement of human body back.

(7) sit face Angle; Chair surface and horizontal plane Angle. Sit face slightly lean back, in order to prevent the hips forward sliding when sitting for a long time, and convenient back back to back. Chair due to work when you need to forward, tilt Angle should not be big, desirable 4 ° ~ 6 °.

4. Conclusion

Nowadays, with the improvement of living standard and the progress of science and technology, people have higher and higher requirements on seat comfort. But the design of the seat is not a simple task, it contains a lot of challenging design task of subject, in the middle of the seat design needs to consider many factors, especially the man-machine engineering. Only with ergonomics as the basis and taking into full consideration various factors, can we design a beautiful, comfortable and applicable seat in line with human body size and psychology.

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