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Ergonomic Assessment of Office Chairs in Vadodara City, India

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Abstract

The research studies highlight that a seating as per ergonomic standards should be given to the worker by the employees. Every 15 seconds, a worker dies from a work-related accident or disease. Every 15 seconds, 153 workers have a work-related accident. Every day, 6,300 people die as a result of occupational accidents or work-related diseases – more than 2.3 million deaths per year. To assess the available office chairs as per the ergonomic standards in the market of Vadodara City, Gujarat. A market survey on the different office chairs available in the market of Vadodara was conducted. The office chairs were of different style and different price range starting from Rs. 2,000 – Rs. 28,000. The market survey revealed that good chairs which provide more comfort were expensive and not bought very often by the users. Thus, provisions should be made to have some economical options for the users so that they don't have to compromise on the comfort.

Keywords: Office chair, Comfort, Ergonomic, Back, Armrest, Lumbar support.

Introduction

The research studies highlight that a seating as per ergonomic standards should be given to the worker by the employees. It has been reported that, a worker dies from a work-related issues in every 15 seconds. A study has reported that 153 workers have a work-related accident. Statistics reveal that six thousand and three hundred workers have lost their life due to occupational accidents or work-related diseases – more than 2.3 million deaths per year. 317 million accidents occur on the job annually; many of these resulting in extended absences from work. This has increased the adversity of human cost daily and the economic burden of poor occupational safety and health practices is estimated at 4 per cent of global Gross Domestic Product each year. The ILO aims to create worldwide awareness of the dimensions and consequences of work-related accidents, injuries and diseases and to place the health and safety of all workers on the international agenda and to stimulate and support practical action at all levels[1].

The company's productivity is severely affected due to the injuries faced by the workers, such that the loss goes about to be in millions at times. To avoid such losses, there must be a call and sensitization towards the significance of giving a well-designed working environment with appropriate training which can aid in lessening the cost. Thus it is very helpful if the work chairs be ergonomically designed and user friendly. Experts have agreed that a chair is a very significant element of a fit working environment. The right ergonomic chair with the proper ergonomic training can help reduce injuries.

Studies have revealed a variety of contributing factors to musculoskeletal discomfort including: increased job demands and more hours working at a computer[2,3] increased levels of psychological stress[3-6] and a lack of specific ergonomic features in the workstations and office buildings[7,8]. Typically these studies are cross-sectional in design[9]. Although there is a growing interest among employers to improve office workplaces, few longitudinal field studies have examined the effects of office ergonomics interventions on worker's health and performance[10-12]. There is some evidence, however that ergonomics training[13] in workstation and building design[7,8,14-16,] can prevent or reduce musculoskeletal symptoms in office environments. One method for reducing the prevalence of musculoskeletal and visual symptoms is to provide specialized.

Office ergonomics training helps employees to understand proper work station set-up and postures[13,16,18-20] Green and Briggs revealed that by just providing furniture which can be adjusted may not avoid the injury. Although, it cannot be avoided and ignored that providing adjustable furniture can decrease WMSDs but it should be coupled with ergonomics training.

The studies have shown that the injuries related to work may be decreased and there can be an increase in the productivity by utilizing a chair that has ergonomic features. In 90's, a research discovered that 17.5% productivity was increased among workers who have an ergonomically sound working area as paralleled to one which was not ergonomically sound.

The researches have revealed that sitting on an ergonomic chair should be given to all the employees in the offices. The major task of designing for the human body is that the measurements are diverse and unique. As a result, a design that may be comfortable for one person can be inappropriate for other. Thus,

this study was conducted to investigate the available office chairs.

Objective: To assess the available office chairs as per the ergonomic standards in the market of Vadodara City, Gujarat.

Methodology

A market survey on the different office chairs available in the market of Vadodara was conducted. The office chairs were of different style and different price range starting from Rs. 2,000 – Rs. 20,000. There were ten chairs assessed by the researcher. The chairs which were mainly purchased and used in offices were taken for the study. The chairs were assessed with the help of a checklist by American Physical Therapy Association, 2008. The checklist consisted of two sections namely critical features matrix and the compliance matrix.

The critical features matrix included whether the chair has Forward Tilt, Easy-to-use Adjustments, Low Position/Standard Position Pneumatic Cylinder, Synchronous Tilt Mechanism, 3-point Pivot Mechanism, Seat Depth Adjustment, Pivot Arm, Depth Adjustable Arm, Width Adjustable Arm, Height Adjustable Lumbar, Depth Adjustable Lumbar, Asymmetrical Lumbar and Pelvic Support.

The compliance matrix covered Seat Pan Height, Seat Pan Depth Adjustment, Seat Pan Width, Seat Pan Angle Adjustment, Seat Pan Front Edge "Waterfall" Contour, Seat Back Minimum Tilt Adjustment, Seat back height, Seat back width, Armrest Length, Armrest Width, Armrest Vertical, Inside Distance Between Armrest, Armrest Comprised of a Padded Material, Lumbar Support Height Adjustment, Chair Casters Compatible with Floor Surface and Chair with Five Legged Base of Support.

Results and Discussion

Chair 1: The chair was priced at 2,500 INR it was observed that the chair did not have any mechanism like synchronous tilt mechanism, 3 point pivot mechanism. The chair did not provide seat depth, lumbar support height and depth seat pan adjustment for lumbar. The seat pan height was 19.5", the seat pan depth and width were 16" and 17" respectively. The seat back height and width measured 23" and 17.5" respectively. The seat back height and width were 23" and 17.5", the minimum height of a seat back height should be more than 12.2" to provide full support to the back. The chair did not have any support height adjustments. It was reported that the chair had easy to use adjustments and chair casters compatible with the floor surface. It has also had a five legged base support.

The chair did not have features like low position/ standard position pneumatic cylinder to provide support for smaller users with low and majority range with standard. It did not provide pivot arm, depth and width adjustable arm. The arm rest length was 14" which was appropriate as the armrest length should be minimum 6" that means the chair can provide good armrest while working. The width of the armrest was 2".

The review had highlighted that the armrest vertical should be 6.9"-10.8" and distance between the armrest should be minimum 18" and more and it should have a padded material. The chair vertical measured 10" and the gap was 18".

Chair 2: The chair 2 was priced 3,500 INR which was also purchased in bulk by many offices in Vadodara City. The chair had few more features than the chair costing 2,500 INR. The chair had 3 point pivot mechanism which provide comfortable, relaxed postures and also helps in keeping the users' feet on the floor. Similarly, like the previous chair it also didn't have a forward tilt which allows the user to vary posture during the day. It did not have height, depth and seat depth adjustments for lumbar support. It did not have asymmetrical lumbar which helps maintain natural curve of spine while allowing users to choose support for the body. The pelvic support to aid in rotating pelvis forward to maintain natural shape of spine. The measurements of the chairs made it evident that it is user friendly and will give good support to the back. The seat pan height must range between 15"-19.9" chair had 20". The seat pan width should be greater than 18" which was 19.5" in the present chair. The seat back height and width were 27.5" and 17.5" respectively.

The back of the user needs a good support for long hours. The lumbar support must be adjustable but was not given in this chair. The chair had accommodated main features. The armrest were very comfortable and the length (16.5"), width (3"), vertical (11.5") and inside distance between armrest (19.5") which was in accordance with the standard measurements hat is more than 6", more than 2" and 6.9"-10.8" respectively. The chair casters were compatible with floor surface. The chair had five legged base of support.

Chair 3: This chair costed 4,500 INR, it was also used by offices and bought in bulks. This was mainly termed as an executive chair and bought for the higher posts. The chair provided for seat depth adjustment which was not found in this chair. The seat depth adjustment feature supports different sized users' thighs and allows the user to use backrest for support. This chair had other features similar to the previous chair. The seat pan height, depth and width was 20.5", 19.5" and 20.5" respectively. The chair did not have seat pan angle adjustment, seat pan front edge "waterfall contour" to support the back as well the seat pan did not have a tilt. The seat back height should be greater than 12.2" to be able to support the back properly and the present chair was heighted as 28". The seat back width was 19.5".

The chair had easy to use adjustments as well as the chair casters were compatible with the floor as well as it had a five legged base support.

The armrest was of a padded material. It did not as well provide a pivot arm, an adjustable arm depth wise and widthwise. The

armrest must also be adjustable such that to accommodate all type of users and provide more comfort while working. The armrest length was 14.5" and the width was 2". The armrest vertically measured 9" which very well circumfixes the requirement that is 6.9" - 10.8".

Chair 4: This chair costed 6,500 INR. This was used in offices by few companies. The chair had a synchronous tilt mechanism which provides the seat and back to move together at varying degrees to provide support through recline. It did not have forward tilt to allow the user to move the seat and back together to provide support. The chair did not provide the seat depth, height and depth adjustments as well as asymmetrical lumbar and pelvic support. The measurements of the seat pan height, depth, seat back height and width were in accordance of standards. The chair did not have the seat pan front edge adjustment and seat back minimum tilt as well.

The chair had easy to use seat adjustments with five legged base support and the casters were compatible to any floors. The chair did not have any low position or standard position, pivot arm, depth and width adjustable arm. The length, width and the height of the armrest was 16", 3" 8.5" which was in accordance with the standard measurements of the armrest.

Chair 5: This chair was priced 10,000 INR. As per the market survey, the chair was not that purchased in offices, they were termed as executive chairs and thus were only purchased for main heads of the any departments in the offices. The chair also had synchronous tilt mechanism and 3 point pivot mechanism for the support of the back. The chair did not provide equivalent number of features as the above mentioned chairs like height, depth adjustable lumbar. The seat pan height (22)', depth (19") and width (19") which were in harmony with the standards. This meant that the chair gave good support to the back of the user. The chair did not feature forward tilt and height and depth adjustments for lumbar.

This chair also had easy to use adjustments with five legged support. The chair had comfortable armrests. The armrests were in accordance with the standards, the armrest had a padded material to add more support to the arms and the user while working. The chair did not provide adjustable arms to accommodate users' of different sizes.

Chair 6: The chair was found to be purchased a lot for executives in the offices. The chair was priced at 13,000 INR. This chair was very comfortable in sitting and had a leather material. The chair was padded with a very good material. It also did not provide forward tilt and height, depth adjustments for the lumbar. The seat pan height (22"), depth (20") and width (19.5") were in accordance with the standards. The seat back height was 28" and width was 21". It did not have lumbar support height adjustment.

The chair had padding as well as wooden panel around the padding for armrest. The chair did not have any adjustable armrest as well as a pivot arm for keying and mousing. The armrest length was 15", width was 3" and vertically it was 9". The inside distance between the armrest was 21".

Chair 7: This chair was priced at 15,000 INR. This chair was very comfortable in using and had a leather material. The chair was padded with a very good material. It also did provide forward tilt but not for the height and depth adjustments for the lumbar. The seat pan height (22"), depth (20") and width (19.5") were in accordance with the standards. The seat back height was 27.5" and width was 22". It did not have lumbar support height adjustment.

The chair had padding as well as wooden panel around the padding for armrest. The chair did not have any adjustable armrest as well as a pivot arm for keying and mousing. The armrest length was 17", width was 3" and vertically it was 9". The inside distance between the armrest was 21".

Chair 8: This chair costed 16,500 INR. This was used in offices by very few companies as executives, it was mainly purchased by the banks. The chair had a synchronous tilt mechanism which provides the seat and back to move together at varying degrees to provide support through recline. It also had forward tilt which allowed the user to move the seat and back together to provide support. The chair provided only depth adjustment and did not have the seat height and depth adjustments as well as asymmetrical lumbar and pelvic support. The measurements of the seat pan height, depth, seat back height and width were in complete accordance of standards. The chair did not have the seat pan front edge adjustment and seat back minimum tilt as well.

The chair had easy to use seat adjustments with five legged base support and the casters were compatible to any floors. The chair did not have any low position or standard position, pivot arm, depth and width adjustable arm. The length, width and the height of the armrest was 18", 4" 8.5" which was in accordance with the standard measurements of the armrest. The padding of the armrest was very soft and fluffy with metal on its side.

Chair 9: This chair costed 21,000 INR. This was used in offices by very few companies as executives. The chair had a synchronous tilt mechanism which provides the seat and back to move together at varying degrees to provide support through recline. It also had forward tilt which allowed the user to move the seat and back together to provide support. The chair provided seat height and depth adjustments as well as asymmetrical lumbar and pelvic support. The measurements of the seat pan height (24), depth (21"), seat back height (28.5") and width (19") were in complete accordance of standards. The chair did not have the seat pan front edge adjustment and seat back minimum tilt as well.

The chair had easy to use seat adjustments with five legged base support and the casters were compatible to any floors. The chair had low position or standard position, pivot arm, depth and

width adjustable arm. The length, width and the height of the armrest was 18", 4" 8.5" which was in accordance with the standard measurements of the armrest. The padding of the armrest was very soft and fluffy with metal on its side.

Chair 10: This chair was priced 28,000 INR. As per the market survey, the chair was not that purchased in offices, they were termed as executive chairs and thus were only purchased for main heads of the any departments in the offices. The chair also had synchronous tilt mechanism and 3 point pivot mechanism for the support of the back. The seat pan height (24)', depth (19") and width (20") which were in harmony with the standards. This meant that the chair gave good support to the back of the user. The chair also features forward tilt and height and depth adjustments for lumbar.

This chair also had easy to use adjustments with five legged support. The chair had comfortable armrests. The armrest was in accordance with the standards, the armrest had a padded material to add more support to the arms and the user while working. The chair provided adjustable arms to accommodate users' of different sizes.

Conclusion

The chairs were very much in accordance with the standards of an ergonomic chair but few features like forward tilt as well as adjustable seat height adjustments and the armrest adjustments should also be incorporated in the designs. The market survey revealed that good chairs which provide more comfort were expensive and not bought very often by the users. Thus, provisions should be made to have some economical options for the users so that they don't have to compromise on the comfort.

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