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REVIEW OF FOOTWEAR STANDS/RACKS USED AT RELIGIOUS PLACES & RELATED RESEARCH

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Abstract

India is a land of diversity. It is a country with a wide range of religious community. There are number of religious places where people visit frequently. People remove footwear before entering into religious places. Generally these religious places have a system to keep the footwear for some duration till these people return from the religious place. These systems are run by some agencies. The space is provided by the religious place & agency is running that system. For this short duration storage of footwear these agencies charge some amount to the people. Footwear are generally picked from ground by hands and are placed on the racks. Again these footwear are picked from the rack & given to these people. Lot of ergonomic problems are occurring in storage & retrieval of these footwear from the racks. In this work, footwear racks/stands at various religious places are studied. Review of the earlier research work done in case of footwear stands/racks is taken. Findings are given at the end of this paper.

Keywords: Footwear stand/rack, footwear, ergonomics, musculoskeletal disorders

I) INDIAN CULTURE, RELIGIOUS PLACES & FOOTWEAR

In Indian culture, foot-wears are removed before entering any religious place. This helps to retain the sanctity of the religious places. It is a mark of respect & is in order to pay proper respect to the deity within the religious places. Due to this, Indians feel home and comfortable inside the place of worship which is considered holy. Irrespective of whether it is a temple, mosques, church or any other religious place of the Indian subcontinent, it is habitual for worshippers to remove their footwear before entering a house of worship, where they believe they are entering into the presence of the divine. Apart from the above, footwear accumulates dirt and dust. As we wear these to stop the dirt and dust gathering on the feet, we remove the footwear before entering any holy place (or even home) so as to leave the dirt and dust outside.

II) ERGONOMICS

It is a process of arranging/designing workplaces, products and systems so as to fit the people who use them. Its aim is to improve the workspaces and environments to reduce the risk of harm or injury or discomfort. It is the scientific discipline which is concerned with the understanding of interactions among humans and other elements of a system. Ergonomics applies principles, theory, data and methods to design for optimizing human well-being and overall system performance.

Musculoskeletal disorders (MSD) are disorders or injuries of the tendons, cartilage, joints, muscles, nerves and spinal discs. Work-related musculoskeletal disorders (WMSD) are conditions in which:

- a) The work environment and performance of work contribute significantly to the condition; and/or.
- b) The condition is made worse or persists longer due to work conditions

Examples of MSDs include: Carpal tunnel syndrome, Hernia, Sprains, strains, and tears, Back pain.

Musculoskeletal disorders are associated with high costs to employers such as disability, lost productivity, and increased health care, absenteeism, and worker's compensation costs. MSD cases are more severe than the average nonfatal injury or illness. There are few tools using which we come to know the existence of ergonomic issues and their severity. These tools are RULA (Rapid Upper Limb Assessment) and REBA (Rapid Entire Body Assessment). RULA method/tool is designed to quickly evaluate the load on the musculoskeletal system due to postures of the neck, waist, and upper limb; muscle function; and the additional burden imposed on the body. REBA method/tool uses a systematic process to assess the risks of MSD (Musculoskeletal Disorders) for the whole body and the risks associated with ergonomic design associated with work. It is an observation method sensitive to MSDs in different varieties of task.

III) EXISTING FOOTWEAR STANDS/RACKS AT VARIOUS PLACES IN INDIA

India is a religious country with people of different religions staying in different parts of country. People in India often visit to their religious places for/ in search of mental peace, to pray to their idols, to perform worship. The footwear racks used at various religious places are different. The structure of

these footwear racks, the method of storage, handling of these footwears for keeping the footwears in rack & giving back to the people is studied through online survey. Photographs of these footwear racks & handling postures are collected for studying the ergonomic issues with these systems. Below are few photographs showing the actual footwear racks/stands at different religious places in India.

The photographs shown ahead belong to various religious in India and abroad. Analysis of each photograph is also done.

Photographs of footwear racks used at various religious places

Photograph 1



Photograph 2



Photograph 3



Photograph 4



Photograph 5



Photograph 6



Photograph 7



Photograph 8



Photograph 1 shows a footwear rack used to store the footwears outside religious places. This rack is showing different compartments made for keeping the footwears. At some religious places these racks are not having any separate compartment. They are provided with only flat surfaces at different elevations as shown in Photograph 2, 6 and 7. If the separate compartments are made for storage of each footwear, the cost of manufacturing increases due to the increased material cost and also due to manufacturing cost. If the separate compartments are not made, it facilitates to some extent easy storage and retrieval due to less obstruction of vertical walls.

Photograph 2 shows that for storage and / retrieval of footwear the person has to sit partially in some cases. Few vertical walls are provided in the rack at some intervals. It is also showing that storage and/ or retrieval needs use of hand which further leads to unhygienic conditions of hands.

Photograph 3 shows that the person has to bend for retrieval of footwears in the racks. It is also showing that the visitors of religious places have to pick their footwears with their hands and give it for storage. This happens also during the process of taking back these footwears while leaving the religious place. Few footwears are kept on the floor instead of keeping them in the rack. This may be due to more number of footwears from a single family or group of persons visiting the religious place.

Photograph 4 shows the footwear storage rack with larger size of compartment and manual (with hand touch) handling of footwears.

Photograph 5 shows a footwear rack with numbering system. Actually all footwear rack compartments are having number. The number coupons are given to the people for identification of their footwear storage compartment. On the footwear rack shown in the Fig. 5 these numbers are clearly seen & for the footwear racks in other figure, these numbers are not due to the orientation of the camera/view.

Photograph 6 shows the footwear rack full of footwears. It is seen that the rack is filled completely. Few footwears are actually kept on the ground below the first compartment of the rack.

Photograph 7 shows that the rack is completely occupied with the footwears. People have kept the footwears on the ground. This generally happens on specific day or month of the year on which people prefer to visit that religious place. The provisions should be made for these crowded occasions.

Photograph 8 shows a rack with more height as compared to the racks shown in other figures. This increased height leads to uncomfortable conditions during the storing and retrieval of footwears in the compartments located at top.

IV) LITERATURE REVIEW

Poh Kiat Ng et al. (2015) designed and developed an automated footwear stand/rack for improved usability. A market research was conducted to know the available footwear stand/rack designs. Then, two stages of conceptualizations with selection matrices were done. This helped for selection of the most feasible design to be worked upon. Using the concept selection matrices, the automated footwear lift bench concept was chosen. Autodesk Inventor Professional 2013 software was used during the design. After fabricating the footwear stand/rack, the Rapid Entire Body Assessment (REBA) usability test was used as validation for improved usability. A REBA score of 1 (negligible risk) was obtained for the new shoe stand/rack while a REBA score of 6 (medium risk) was obtained for the

conventional footwear stand/rack. This improvement was a result of minimization of neutral deviation from the neck, trunk and leg regions where users did not require bending, squatting or stretching to obtain shoes from the lowest stand/rack. In all usability of developed storage systems was improved due to the, the automated shoe bench lift system. Thus the developed system was proved to be extremely beneficial.

Talia Serrano Salazar and, Lucía Aspizua Sáezm (2014) provided a new concept of a useful headboard. This headboard was having shelves and one footwear stand/rack in each side. Footwear stand/rack was treated as a quite useful piece of furniture. Nevertheless, cultural difference was not expected. The cultural difference was with reference to the position of shoes placed in the home. Spanish people keep their footwear in their own bedroom; while Swedish people generally usually take their footwear in the house entrance. Due to this reason, the Footwear stand/rack was removed from the total facilities in the design of the headboard. This idea was facilitating them to design a proper piece of furniture for all countries. Because of the Footwear stand/rack unexpected problem, other possible solutions were sketched. This concept combined a part of shoe rack, which can be used for shoes from others seasons, and a shelf part.

Huang Wenkang et al. (2013) designed and prototyped a new household multifunctional footwear cabinet. This footwear cabinet was very much innovative from storage point of view. It also retained the features of multi-function and intelligent control of the traditional one. The space utilization rate was determined through geometric space analysis & computation. It was found that the designed rotary footwear cabinet was 1.6 times more utilization rate.

A fully automatic footwear-cleaning device was designed and prototyped by using cam mechanism, electronic timers and profiling mechanism. Ozone disinfection and PTC dryer were used in footwear maintenance. Performance test were carried out & it was found that the designed shoe cabinet can accommodate eighteen pairs of footwears in common use and clean and maintain footwears of size 34 ~ 45.

Sanjog J. et al. (2012) made an effort to address the problem of usability of most of the footwear stand/racks available in market because of ergonomic criteria. A small user survey was carried out initially, after which brain storming was done. It was finalized that the intended design should be useful to all members of a small family. All footwears in each rack to be visible for someone standing in front, simplicity in use i.e., taking footwears & put on them etc., easy to move, aesthetically appealing & compact. Then the design of footwear stand/rack was done keeping in mind that the small family of 5-6 members of will be from different age groups (considering kids to grandparents in a typical Indian family living in apartments). Safety, protection against dust, appropriate clearance dimensions etc. were considered for design of this footwear stand/rack. A 3D-CAD model of designed footwear stand/rack was prepared using the concept sketching. Various human factor aspects were evaluated in DELMIA software considering the anthropometric data of Indian users.

Nor Fadilah Bt Yah (2010) designed & prototyped a small smart footwear stand/rack which was foldable and of multifunction usage. Before the design of the footwear stand/rack, review of different things was taken using the sources like internet and domestic area. It was found that most of the available designs were having more rigid position. i.e., no product was capable of providing the space or storage for a stuff like umbrella. Considering the mindset of the present-day customers, who expect a portable product with multi-functionality, the design of new smart footwear stand/rack was done. Due to this new rack, people don't have to hung the umbrella at the wall or put it under the stairs.

Ahmed Mokhtar (2009) studied about the position & relative location of prayer hall, bathroom, and footwear removing/ footwear stand/rack space, ablution space. It was found that footwear removing/ footwear stand/rack space was the most under-designed space in the prayer facility. It was observed that while some people are removing footwears & placing them in sand/rack, at the same time, few others were taking the footwears from the racking leading to rush at that place. It was recommended that the design should provide sufficient space in front of each footwear stand/rack to allow the above activities to take place simultaneously without rush.

V) FINDINGS OF THE STUDY/ CONCLUSIONS

- Mostly stands or racks are provided outside the religious places to keep the footwears. But, at few places, there is no provision of keeping footwears outside the religious places.
- There exist difference in storage & retrieval of footwears at different religious places.
- The footwears storage systems are run by some people who pick the footwears of other people & place them at the stands/ racks & also give them back.
- Footwear stands/racks are of different heights.
- Footwear stands/racks are placed on the ground. The lowest compartments/sections in which footwears are stored are very much near to the ground.
- The footwear stands/racks used presently at religious places are not ergonomically designed.
- Persons giving the service at these footwear stands/racks are prone to musculoskeletal disorders.
- Persons giving service at these footwear stands/racks touch the footwears which is not good from hygienic & other point of view.
- Presently footwear stands/racks used at religious places are not engineered product.
- A few researchers have done research on footwear stands/ racks used at home. But no research is done on the ergonomics of footwear racks/stands used at religious places.
- There is need of ergonomically designed footwear stand/rack at all religious places.

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