

EMBRY-RIDDLE

Aeronautical University™

SCHOLARLY COMMONS

Publications

2008

Ergonomic Analysis of a Hair Salon

Joseph Keebler

Embry-Riddle Aeronautical University, keeblerj@erau.edu

David Schuster

San Jose State University

Scott Ososky

U.S. Army Research Laboratory

Follow this and additional works at: <https://commons.erau.edu/publication>



Part of the [Ergonomics Commons](#)

Scholarly Commons Citation

Keebler, J., Schuster, D., & Ososky, S. (2008). Ergonomic Analysis of a Hair Salon. *Journal of Management and Engineering Integration*, 1(1). Retrieved from <https://commons.erau.edu/publication/460>

This Article is brought to you for free and open access by Scholarly Commons. It has been accepted for inclusion in Publications by an authorized administrator of Scholarly Commons. For more information, please contact commons@erau.edu.

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/259219081>

Ergonomic analysis of a hair salon

Article · January 2009

CITATIONS

0

READS

304

3 authors, including:



[Scott Ososky](#)

Army Research Laboratory

32 PUBLICATIONS 100 CITATIONS

[SEE PROFILE](#)



[Joseph Roland Keebler](#)

Embry-Riddle Aeronautical University

71 PUBLICATIONS 156 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Human Robot Interaction [View project](#)



Augmented Reality in Training Systems [View project](#)

All content following this page was uploaded by [Joseph Roland Keebler](#) on 20 April 2016.

The user has requested enhancement of the downloaded file. All in-text references [underlined in blue](#) are added to the original document and are linked to publications on ResearchGate, letting you access and read them immediately.

Ergonomic Analysis of a Hair Salon

Scott Ososky, David Schuster, Joseph R. Keebler
University of Central Florida

sososky@ist.ucf.edu, schuster@mail.ucf.edu, joekeebler@gmail.com

Abstract

Cosmetology involves a number of diverse tasks that have been implicated in cumulative trauma disorders and in other workplace injuries. This case study presents an analysis of injury risk and prevalence in a salon. Individual, occupational, and organizational factors are considered, and potential areas where risk can be reduced are presented.

1. Introduction

Cosmetologists are at risk for a variety of work-related injuries. Their job is characterized by standing for prolonged periods of time in awkward body postures, handling a variety of chemicals, and undergoing repetitive hand movements. Cosmetologists' workplace injuries have been studied extensively throughout the world [1], [2], although few studies have been conducted in the United States. While attention has been given to the ergonomic design of scissors [3], there are many other tasks performed by hair stylists in the course of a normal day including: shampooing, mixing, applying color, drying, and styling.

Cosmetology is different from most occupations requiring hand tool use and repetitive actions; stylists take much pride in their creative work, and often favor quality work over personal safety. Individual differences in safe behavior may also exist.

The study described here was an ergonomic evaluation of an Orlando, Florida, area hair salon. This study examined levels of risk at the task, organizational, and personal levels. Because we examined a single salon, organizational factors may not be widely generalizable, but we feel that

potential problem areas found in one salon can be a starting point for a more systematic investigation of salons in general.

1.1 Literature review

Several potential sources of workplace injury were examined. Specifically, we considered contortions of the wrist and hands while using tools, time spent standing and bending, and exposure to chemicals in styling products and hair coloring products.

The use of scissors is one area of workplace risk and injury in a hair salon. For example, it is reasonable to expect that ergonomically designed scissors can help alleviate wrist and hand pain when compared to normal scissors. Indeed, Boyles, Yearout, and Rys described a new design for scissors that could be used to reduce the amount of time stylists bend their wrists [3]. Cosmetologists may also suffer cuts and lacerations due to hitting the non-dominant hand with the scissors during certain types of cutting actions [4]. Improved scissors with rounded tips, for example, may reduce this risk.

Contact dermatitis on or near the hands and wrists is also prevalent among hairdressers. Almost 60% of hairdressers surveyed in Melbourne, Australia, had experienced some change in their hands since beginning the profession [5]. Uter et al. found a significant difference in prevalence of dermatitis and skin allergies in cosmetologists when compared with other occupations [6]. The use of gloves for certain tasks, such as mixing dyes and shampoos, is important in preventing these conditions. Kang et al. found similar results among hairdressers with the addition of a higher

prevalence of musculoskeletal disorders and respiratory problems in hairdressers than in the general population [1].

The musculoskeletal disorders experienced by cosmetologists are primarily cumulative trauma disorders (CTDs). A study by the Korean Group for Occupational Medicine demonstrated that pain among hairdressers was distributed as follows: 61% complained of shoulder pain, 59.9% of neck pain, 53% of lower back pain, and 42% of hand and wrist pain [7].

Contortion of the upper body during certain tasks can also result in CTD. Tooru et al. examined changes in trunk inclination angle (TIA) between stylists operating either behind or to the side of a shampoo bowl [8]. It was determined that standing behind the bowl placed less stress on the body's trunk.

Despite mostly satisfactory ergonomic conditions in salons, the "high peak of concentration of chemicals during dyeing, bleaching, permanenting and hair spraying still pose a significant health problem" [2]. Stations in which chemicals are mixed or applied should be well-ventilated, providing sufficient air exchange to remove potential irritants.

Given these potential sources of injury, the purpose of the study was to evaluate occupational risk in a specific salon in the United States. The influence of personal, environmental, and organizational factors on workers' health was also examined.

2. Methodology

2.1 Equipment

To facilitate data collection, several surveys and interview aids were employed. CTD risk was measured using the fuzzy hierarchical model described by McCauley-Bell, Crumpton, Crumpton-Young, and Wang [9]. This model was used because it includes factors of both the individual and the environment. Because some factors are consistent across the workplace and others are unique to the individual stylist, we found

it necessary to separate these factors and measure them using two separate instruments.

The first was a pen-and-paper demographics questionnaire. This asked information such as age, gender, and time on the job. Individual CTD risk factors were also collected on this form. Finally, participants were asked to rate the incidence of a number of injuries common to stylists that were identified in the literature. Responses were requested on a scale from 1 to 7, with 1 indicating "never," and 7 indicating "always." The items investigated are presented in Table 1.

Table 1. Types of injuries included on the demographics form

Respiratory Problems	Pain in Lower Back
Skin Irritation	Pain in Hands
Cuts or injuries during scissor use	Pain in Wrists
Pain in Neck	Pain in Arms
Pain in Shoulders	Dizziness

The second instrument was a workstation checklist adapted from OSHA ergonomic recommendations [10]. This quick yes-or-no checklist was designed to highlight potential problem areas.

The third instrument used was a hand tool evaluation checklist derived from a reference text [11]. This open-ended questionnaire guided researcher observations of potential hazards in using a hand tool. This was especially relevant to our study because hairstylists have a high degree of hand tool use.

The final instrument used was a count of trunk inclination adjustments. A ten-minute interval was specified during which the researcher counted the number of times the participant bended at the waist.

2.2 Participants

The target population was composed of the stylists working at an Orlando area salon. Our sample of this population consisted of the seven cosmetologists working during a two-hour period, 1 male and 6 female. The participants ranged in age from 22 to 34 years. The mean age was 27 years. The stylists ranged in overall experience from 1 year 11 months, to 11 years. The mean length of experience was 6 years.

2.3 Procedures

The goal of the data collection was an ergonomic analysis that was as comprehensive as possible. To that end, surveys, researcher observations, and one-on-one interviews were administered. Each participant was explained the purpose of the project and asked if they would volunteer to participate. No participant declined to participate. The demographics and personal CTD risk questionnaire was given for the participants to complete first. Following this, we explained that we would be making observations while the participant worked.

The researcher observations for each participant included the TIA count for a ten-minute period and task-related factors for CTD.

Observations were also made for the organization. Organizational CTD risk factors were recorded with insight from the salon's manager. A hand tool evaluation was completed for scissors, a flat iron, the hairdryer, and a clipper.

Finally, qualitative data was collected from individual interviews. Each participant was asked their opinions regarding the configuration and use of their work areas.

3. Analysis

In order to draw the most meaningful conclusions given the size of the sample, a correlation analysis was performed for each pair of quantitative variables of interest.

Demographic variables included age, gender, work experience, smoking habits, and number of healthy hobbies. Symptom-related variables included preexisting diagnoses for CTD, diabetes and thyroid conditions, and complaints of respiratory problems, skin problems, hand cuts, neck pain, shoulder pain, lower back pain, pain in the hands, wrist pain, arm pain, and dizziness.

Variables related to the nature of the job tasks included the following: shift length, break length, use of gloves, and proportion of time spent cutting, shampooing, mixing, applying color, drying hair, and other. Finally, the number of trunk inclination adjustments was included.

CTD analysis was performed according to the method described by McCauley-Bell, Crumpton-Young and Wang [10]. Analysis of the workstations, hand tools, and interviews was done qualitatively and is described below.

Trunk inclination adjustment scores were divided by 10 for each participant to obtain the average number of TIA changes per minute.

4. Results

4.1 Quantitative correlations

Significant correlations from the correlation analysis are presented in Table 2. All results are significant at the $p < .05$ unless otherwise indicated. For clarity, only significant correlations are shown.

4.2 CTD risk

CTD risk was assessed using the model weights specified in McCauley-Bell, Crumpton-Young and Badiru [9]. Participants 1 and 2 ended their shifts before their individual risk factors could be assessed and were omitted from the analysis.

The mean score was 0.48. This is described as average risk. "Individual may experience minor musculoskeletal irritation on a regular but not excessive irritation" [9].

Table 2. Results of correlation analysis

Variables		<i>Spearman's rho</i>
Healthy Hobbies	Age	.89
Healthy Hobbies	Gender	.878
Work Experience	Pain in Neck	.805
	Pain in shoulders	.787
Arthritis	Pain in neck	.804
	Pain in shoulders	.827
Respiratory complaints	Time spent shampooing	-.816
Skin problems	Pain in hands	.790
	Pain in neck	.780
Hand cuts	Shift length	.845
	Preexisting CTD	.941

4.3 Workstation evaluations

In the salon studied, five stations were set up according to task. Stylists did not have their own work areas at the stations. Instead, all areas are shared. These stations are clusters of work areas for haircutting, styling, shampoo, applying hair-color, and mixing hair-color. The ergonomic workstation checklist was used for each station.

The shampooing workstation seemed to be well-designed, with the stylist being positioned behind the shampoo bowl. The literature suggests that this is physically less stressful compared to standing on the side of the bowl. All equipment was placed within easy reach. The tilt angle of the bowl is adjustable, but the workstation was otherwise unable to be repositioned. This could lead to problems, depending on the height of the stylist.

The haircutting stations and hair coloring stations were generally congruent with our ergonomic checklists. Minimal amounts of twisting and bending were required due to

the close placement of tools and supplies. Fixed-height chairs and tables were observed at the hair color station, which could put stylists in uncomfortable positions, again depending on their height.

The “mixing lab” was an area where stylists prepared hair dye and other chemical treatments. The workstation analysis revealed several problem areas, including fixed work surfaces and sharp edges. All chemicals were stored on shelves along the wall, sometimes requiring reaching up high or low to access chemicals or tools.

Finally, we found air vents throughout the building providing airflow to each workstation. The “mixing lab” was expected to be problematic because it was enclosed, but we found that the wall did not continue to the ceiling, allowing for adequate ventilation.

4.4 Hand-tool evaluations

We first examined a pair of scissors. This tool has been the focus of much research and concern over hazards associated with cuts, wrist position, and pinching. Generally, the scissors allows the user to maintain a straight wrist and has a moderate pinching risk. Some were rounded at the tip to avoid hand cuts. However, each stylist typically owns his or her own pair(s) of scissors, based upon personal preference and cutting style.

The hairdryer is another frequently used tool. The salon manager explained that stylist preferences are taken into account when purchasing a hairdryer and that it took several iterations of purchases before adequate hairdryers were found. The model we evaluated was comfortable to use and did not require bending of the wrist. Unfortunately, the model was not well-suited for left-hand use; interestingly, the stylists reported that there were currently no left-handed employees.

The flat iron did not allow the user to maintain a straight wrist and put pressure into the palm of the hand. The clipper did not have these problems. Both the flat iron and clipper contained pinching hazards.

5. Discussion

5.1 Limitations of the study

The current study was an analysis of operations in a single salon during one day of measurement. This provided rich qualitative data and allowed us to examine the task, organizational, and personal levels. However, any issues found in the current sample are not immediately generalizable to all cosmetologists. A broader study would benefit from a survey of all employees at a salon, or a sample of salons in the United States.

As mentioned earlier, the literature review suggested consideration of airflow and ventilation within the salon. Although our observations and survey data did not detect major problems, future studies should include a direct measurement of the air quality. There were no self-reported issues with respect to inhalation of fumes from mixing chemicals or applying colors and aerosol sprays. However, it was later suggested that the stylists might already be accustomed to the air quality, and that some long-term risk might be prevalent.

5.2 Conclusions

The prevalence of serious injuries at this particular salon was low, but our analysis revealed a moderate level of risk for injury over the long-term. This is in agreement with the literature, which describes injuries that develop over an extended period of time.

We found moderate levels of CTD risk for most of the stylists. The correlation analysis had similar results. Work experience was significantly correlated with pain in neck and shoulders, and frequency of hand cutting was correlated with pre-existing CTD conditions. These results do not imply that one causes the other, but are relevant topics for future investigation.

The analysis of hand tools and workplace stations reveal moderate risk as well. The

hand tools included in this analysis do not give any indication of severe risk with respect to long term palm, finger, or wrist injury. At the same time, these tools do not exhibit any extreme qualities of ergonomic design, such as form fitted grips or angled handles.

With the exception of the hair cutting stations, the workplace was characterized by rigid, non-adjustable, surfaces. Most tools were within a reasonable reach at each workstation, except at the mixing lab. The mixing station had floor to ceiling shelves, and little floor space to maneuver for reaching these items. One participant found the sink too high and had to lean over to reach the faucet.

Employees also agreed that the floors throughout the entire salon were too hard to walk or stand on continuously. The use of anti-skid/ pressure dampening floor mats could be one ergonomic solution.

Clearly, the task and environmental factors might indicate that there should be a higher incidence of injury within this particular salon. One reason for low incidence of injury may have been individual differences and/or personal factors. Individual interviews with the stylists and staff reveal awareness of comfort and safety. For example, with respect to hairdryers, the manager reported that “we’ve gone through many different brands before agreeing on this one.” When asked about scissor design, stylists reported that there are many different types of scissors, depending upon the type of cut to be performed, and that it is not unusual for a stylist to have multiple pairs of scissors to accomplish this task. For example, stylists can have scissors with rounded tips to prevent hand cuts, while also having a pointed pair for precision cutting.

At the organizational level, we noted that personal health was discussed at the employee meetings. Topics included safe working postures, stretching during work, and breaking throughout the day for rest. Additionally, all employees reported participation in at least one athletic activity

outside of work.

In this salon, however, stylists balanced performance and safety. The manager remarked that, although they would certainly be willing to purchase a more ergonomically designed hair dryer, for example, the stylists would rather have tools and work in an environment which allowed them to do great work first. Safety, therefore, was sometimes a secondary consideration.

Hairstylists may be willing to risk injurious behavior in order to garner a good reputation as a talented stylist and thereby retain a strong customer base. Certainly, this is important to one's success in the industry, but sacrificing safe practices risks the worker's health. In the salon environment, stylists must maintain an awareness of their long-term well-being, while also attending to the immediacy of the task. Examinations of other professions where creative or quality work is important, such as cooking or welding, may reveal similar ergonomic concerns.

[1] D.M. Kang, J.T. Lee, M.S. Kang, S.H. Park, S. H. Urm, and Kim, S. J., K.W. Jeong, H.S. Shon, B.J. Park., "Prevalence of Dermatologic, Respiratory and Musculoskeletal Symptoms Among Hairdressers", Korean Journal of Occupational and Environmental Medicine, Korea, Sept 1999, pp. 385-392.

[2] T.T. Leino, E.E. Kähkönen, L.L. Saarinen, M.M.L. Henriks-Eckerman, and H.H. Paakkulainen, "Working Conditions and Health in Hairdressing Salons", Applied Occupational and Environmental Hygiene, Taylor & Francis, London, Jan 1999, pp. 26-33.

[3] J.L. Boyles, R.D. Yearout, and M.J. Rys, "Ergonomic Scissors for Hairdressing". International Journal of Industrial Ergonomics, Elsevier, Amsterdam, 17 Mar 2003, pp. 199-207.

[4] J.S. Shiao, B. Wong, Jr., S. Chang, and Y. Guo, "Occupational Skin Disorders and Scissors-Induced Injury in Hairdressers", Safety Science, Pergamon, Netherlands, Feb-Apr 1997, pp. 137-142.

[5] H. Roberts, K. Frowen, M. Sim, and R. Nixon, "Prevalence of Atopy in a Population of Hairdressing Students and Hairdressers in Melbourne, Australia", Australian Journal of Dermatology, Blackwell, Richmond Vic., 25 Jan 2006, pp. 172-177.

[6] W. Uter, H. Lessmann, J. Geier, and A. Snuch, "Contact Allergies to Ingredients of Hair Cosmetics Female Hairdressers and Clients", Contact Dermatitis, Blackwell Munksgaard, Denmark, 27 Nov 2003, pp. 236-240.

[7] S.K. Park, Y.J. Choi, D.H. Moon, J.H. Chun, J.T. Lee, and H.S. Sohn, "Work Related Musculoskeletal Disorders of Hairdresser", Korean Journal of Occupational Environmental Medicine, Korea, Sept 2000, pp. 395-404.

[8] Y. Tooru, H. Kunio, I.T.O. Akiyoshi, and S. Kazuhiro, "Reducing Working Posture Loads of Hairdressers at Two Different Shampoo Tables", Journal of Science of Labour, Japan Publications Trading Co, Japan, Mar-Apr 2002, pp. 57-65.

[9] P. McCauley-Bell, L. Crumpton-Young, and H. Wang, "Measurement of Cumulative Trauma Disorder Risk in Clerical Tasks Using Fuzzy Linear Regression", IEEE Transactions on Systems Man and Cybernetics, Taylor & Francis, London, 01 Aug 1997, pp. 790-799.

[10] Occupational Safety and Health Administration, "Ergonomic workstation checklist", OSHA, Washington, 13 Mar 2008, Retrieved from OSHA Ergonomics (<http://www.osha.gov/SLTC/ergonomics/index.html>).

[11] K. Kroemer, H. Kroemer, and K. Kroemer-Elbert, Ergonomics: How to Design for Easy and Efficiency (2nd ed.), Prentice Hall, Upper Saddle River, NJ, 2001.

Authors

Scott Ososky is a graduate student in the Modeling & Simulation Ph.D. program at the University of Central Florida. David Schuster and Joseph Keebler are graduate students in the Applied Experimental & Human Factors Psychology Ph.D. program, also at the University of Central Florida.