Ergonomic Evaluation of a Barista's Workstation

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Little known to the public, a Barista's occupation involves many dangerous situations that can often lead to injury. The duties of a Barista involve handling liquids and tools at high temperatures, serving customers under time-pressure, and carrying out physically exerting tasks in small, cramped work areas. Barista's also face the risk of developing musculoskeletal disorders due to spending long hours at a time standing, and engaging in awkward postures, movements, and excessive force in the wrists, elbows, shoulders, and lower back while carrying out duties.

Dainty, Alcorn, Ferguson, and Gregory (2014) examined the prevalence of lower back pain (LBP) and pain in upper extremities in Baristas by administering questionnaires to 59 participants and conducting biomechanical analysis via video recordings on 10 participants. The results of the questionnaire revealed that 73% of the sample had experienced lower back pain (LBP), and 50% of them attributed this pain to their occupation as a Barista. The questionnaire also showed that 68% of the sample reported experiencing shoulder pain, and 50% of them attributed the pain to their tasks as a Barista. While Baristas face many risks when conducting the duties of their occupation, the likelihood of injury and pain arises due to the repetitive nature of these duties. Their duties such as such as grinding, tamping coffee, removing and attaching the portafilters in the espresso machines, and carrying large loads, when carried out repetitively during long shifts, result in the increased risk of future musculoskeletal disorders. I chose to conduct my ergonomic evaluation on the workstation of a barista, due to these various risks that are typically associated with the occupation.

I conducted my ergonomic analysis with the help of a barista and manager that was employed at an Einstein Bros. establishment within the University of Idaho campus. My client's name was Ray and she is a female barista and manager at the Einstein Bros. establishment. She is between 25 and 34 years old, with a height of 180.34cm and a weight of 135 pounds. Her average work shift lasts seven and a half to eight hours per day. During the interviews I discovered that she leads an extremely active lifestyle and enjoys the active nature of the

occupation. She mentioned that the long work hours spent standing, and the handling of large loads at various awkward postures did not affect her performance or mental well-being. She also reported that she had no history of lower back pain (LBP) or injuries in her shoulder, elbow, or wrist.

During the interview with my client, I was able to garner some information regarding her responsibilities as a manager and barista. Her responsibilities included preparing complicated, multi-step hot or cold beverages for the customers, as well as interacting with customers in a pleasant manner and operating the register. She also carried out duties such as serving and preparing food items on the menu, cleaning work areas, utensils, and equipment used, and restocking any supplies needed to prepare the beverages and food items for customers. Her managerial duties also involved completion of paperwork required, and coordinating other employees' shifts for each working day.

My client also mentioned several steps management of the establishment had already taken to reduce the risk of injury or pain in their employees. New employees are given a thorough training on the appropriate techniques of handling of tools, equipment, and lifting loads. Employees are also required to wear slip-resistant shoes to prevent any slipping hazards in the workstation. There is also plenty of room for movement with 167.64cm of space between the various workstations behind the counter (See Figure 1). Employees have enough clearance to complete their tasks without hindrance, especially during the rush hours of the day. Additionally, one of the primary tasks of a barista that results in injury and pain in the shoulder and wrist is tamping. Tamping is a method of compressing coffee grounds in an evenly dispersed manner for the brewing process, and requires applying a significant amount of pressure on the coffee grounds. To prevent any shoulder strain that arises from manual tamping in their employees, the establishment uses an automatic tamper integrated into the espresso machine.

After speaking with my client regarding her duties and implemented ergonomic practices, I was able to identify some physical, environmental, and mental stressors in the workstation. Some of the physical stressors of the workstation includes carrying out repetitive motions in

awkward postures and lifting large loads when preparing complicated, multi-step beverages for customers, standing during the long hours of a work shift, and having to lift large boxes when restocking supplies for the food and beverage preparation process. Some of the mental stressors of this job include having to provide excellent customer service in a high-pressure, and busy environment. Baristas need to constantly display pleasant mannerisms in order to cater to the customer's desires and ensure a positive experience for them. This need to provide an emotional performance may take a toll on the mental well-being of those in this occupation. Another mental stressor is the frequent intake of caffeinated drinks throughout a work shift. This may increase the level of stress of the employee when serving customers under a time-pressure. An environmental stressor that may affect the Barista's well-being would be the level of noise in the coffee shop during hectic work shifts.

When identifying features of the workstation that could be improved, I focused on improving the physical stressors of this occupation. I specifically focused on stressors in the multi-step preparation process of beverages for customers, and the when standing for long periods of time during work shifts. I also used some ergonomic checklists to establish any risk factors in this workstation. Through the checklists, I was able to establish that this occupation involved a large risk with manual material handling, specifically in terms of reaching, bending, stooping, and conducting frequent, repetitive motions. I also found that some of the ergonomic hazards of this job were standing, reaching, and lifting and lowering objects below waist height.

The first task that I analyzed was the step of pumping syrup into flavored beverages within the multi-step beverage preparation process. This task involved reaching forward to grasp the syrup pump, and conducting fast, repetitive motions of pushing downwards. The distance between the countertop edge and syrup pumping station is 62.23cm. Since my client is of a petite stature, the motion of reaching forward and pushing the pump repetitively can be uncomfortable (See Figure 2 & 3). While this may not be as severe of an issue for employees with a taller stature, this motion increases forward reaching and shoulder flexion in my client. When this movement is combined with the quick, and frequent exertions of the pumping motion, and the

combination is carried out many times a day; the completion of the task may result in fatigue. This may lead to a higher risk of developing shoulder cumulative trauma disorders (CTD) in the future. My recommendation to improve this task to reduce the risk of developing cumulative trauma disorders (CTD) was to reduce the distance between the syrup pumping station and the edge of the counter. Reducing the distance can be achieved by simply bringing the syrup station forward, and in line with the espresso machine at 49.53cm from counter edge (See Figure 4). However since that might result in reduced counter space for other tasks in the beverage preparation process, I suggest providing more counter space to allow for the change in placement of the syrup station. Since one of the espresso machines on the counter was not in use, replacing the espresso machine with the syrup station would provide a more streamlined setup for the beverage preparation process. I also recommend implementing frequent rotation among employees for this task, to prevent the associated risk of conducting this task repetitively.

The second task I focused on was also a part of the drink preparation process. The task entails reaching for and lifting large jugs of milk from the under the counter mini fridge (See figure 5). My client completed this task by stooping to lift a one-gallon milk jug from the mini fridge. The total height of the mini fridge was 72.39 inches, however my client had to stoop below her waist height to reach for the milk jug. This task also demanded asymmetric load handling, as my client would lift the milk jug with one hand. Since the task included asymmetric load handling, it may increase the compression and shear forces on the spine and decrease postural stability, resulting in an increased risk of lower back pain (LBP). I was able to assess the stooping posture with the given height measurements in 3DSSPP to assess the level of risk associated with the posture. I found that while the balance of the posture was acceptable, there was high to moderate risk in the torso, knee, hip, and ankle joints (See Figure 6, 7, & 8). The level of compression showed that in the L4/L5 discs are at moderate risk. To improve the ergonomics of this current task, I recommended that the mini fridge should be placed above the counter to prevent below the waist stooping when handling the 8.3lb load of the milk jugs. This would eliminate the risk of developing lower back pain (LBP) in the future. I also recommended

lifting the load with both hands to prevent the risks associated with handling asymmetric loads. Since counter space is limited at this venue, and placing the mini fridge above the counter may not be feasible, I also suggested that squatting instead of stooping would reduce the risk of developing lower back pain (LBP).

Another task that posed a significant amount of risk to of developing pain or injury in the lower back, joints, and feet, was standing continuously during long work shifts. My client's work shift lasted an average of seven and a half to eight hours per day. When discussing her work routine during the day, she mentioned that she was allowed a half an hour lunch break in combination with several 10-minute breaks throughout the shift. However, since my client also carries out duties as a manager and is usually needed within the workstation frequently during her shift, she does not take advantage of the 10-minute breaks, or the complete 30 minutes of her lunch break. To prevent the risk of developing lower back pain (LBP), or pain in the joints, or feet, I recommended that my client should take advantage of the available breaks. When calculating the ideal rest period for my client through the Murrell's work/rest cycle equation or moderate bodily work at 2900Kcal per day, I found that my client should take 40 minutes of rest per hour during a workday. Since my client has many duties to fulfill within her work shift in the high-pressure environment service environment, it may be challenging to take a 40-minute rest period per hour. Instead, I suggested that my client takes advantage of the frequent 10-minute breaks, as well the complete duration of the lunch break. During these breaks I suggested that she should sit in a comfortable chair that provides lumbar support, as well as incorporate stretching into her routine in order to eliminate some of the tightness in muscles that occurs from continuous standing and awkward postures and frequent load handling. Another way to minimize the risks of standing for long periods of time is to have additional support for the lower back and feet. I suggested integrating additional support through wearing shoes that have stiff soles and appropriate cushioning, or through placing rubber or gel mats on the floor .

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Figures

Figure 1. Space between workstations.

Figure 2. Client reaching for syrup pumping station.

Figure 3. Syrup pumping station

Figure 4. Workstation.

Figure 5. Mini Fridge.

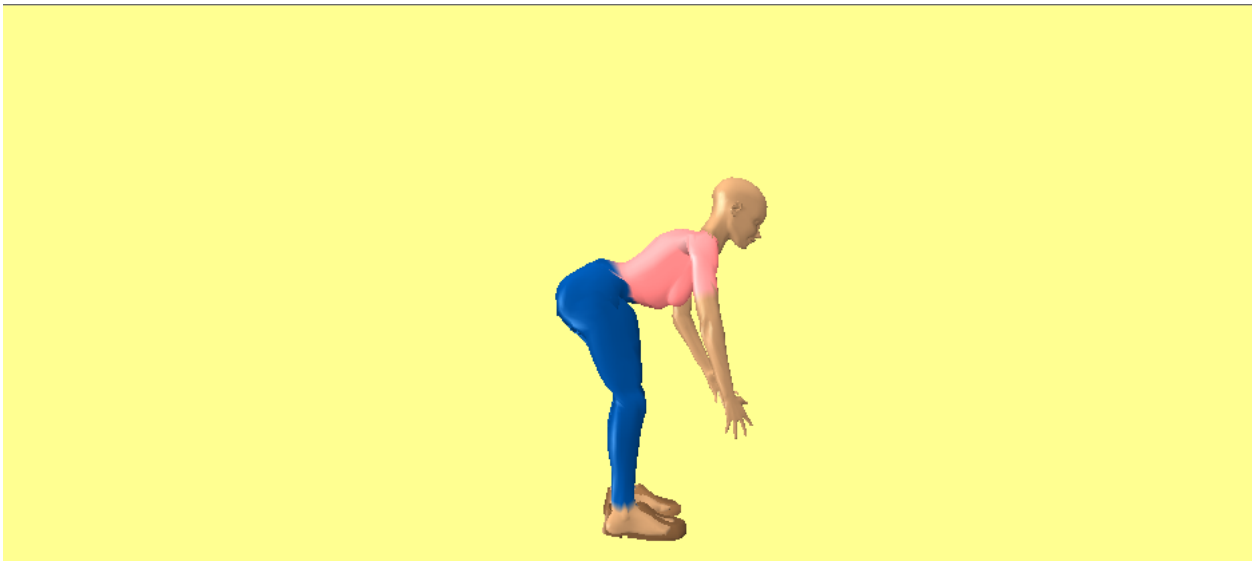

Figure 6. 3DSSPP Humanoid in stooping posture.

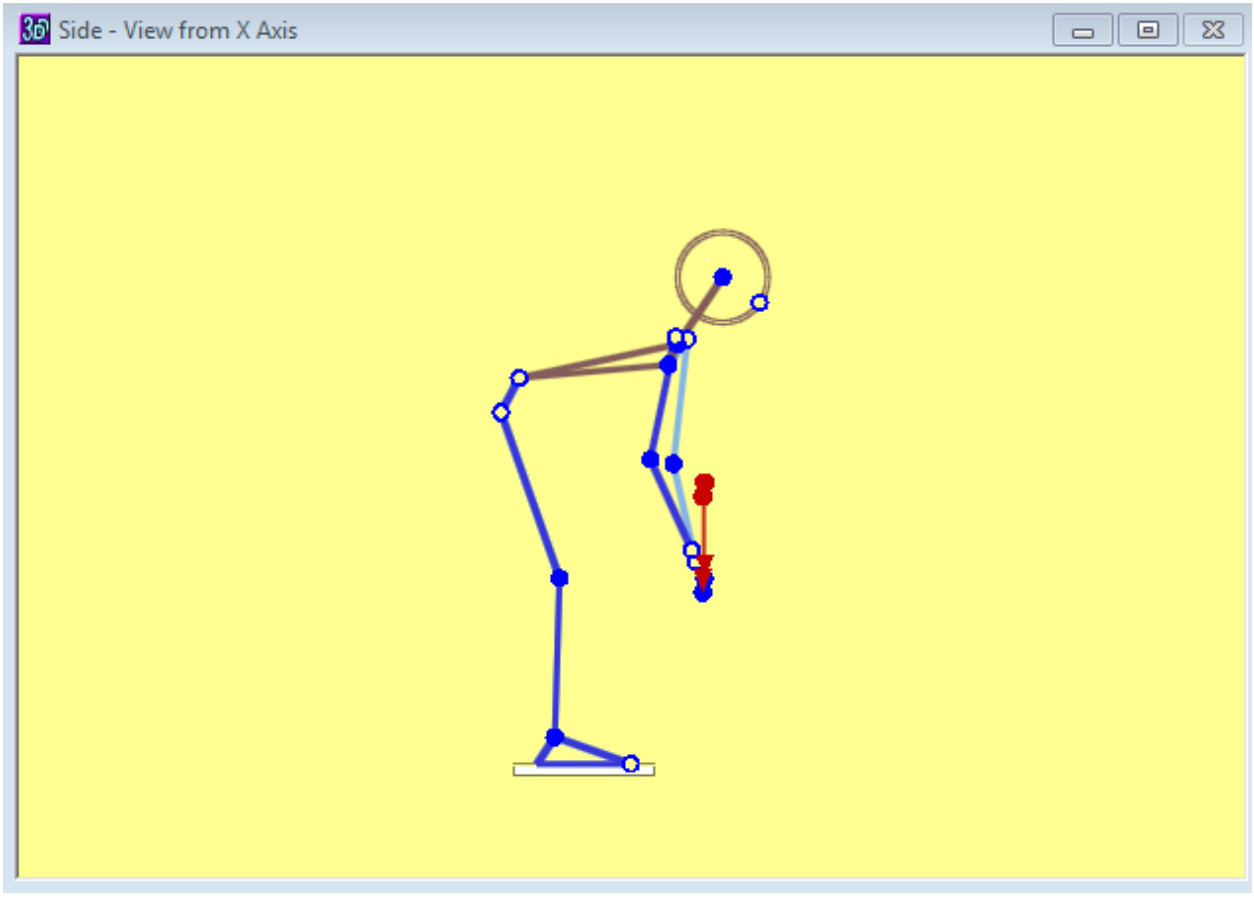

Figure 7. 3DSSPP Side view in stooping posture.

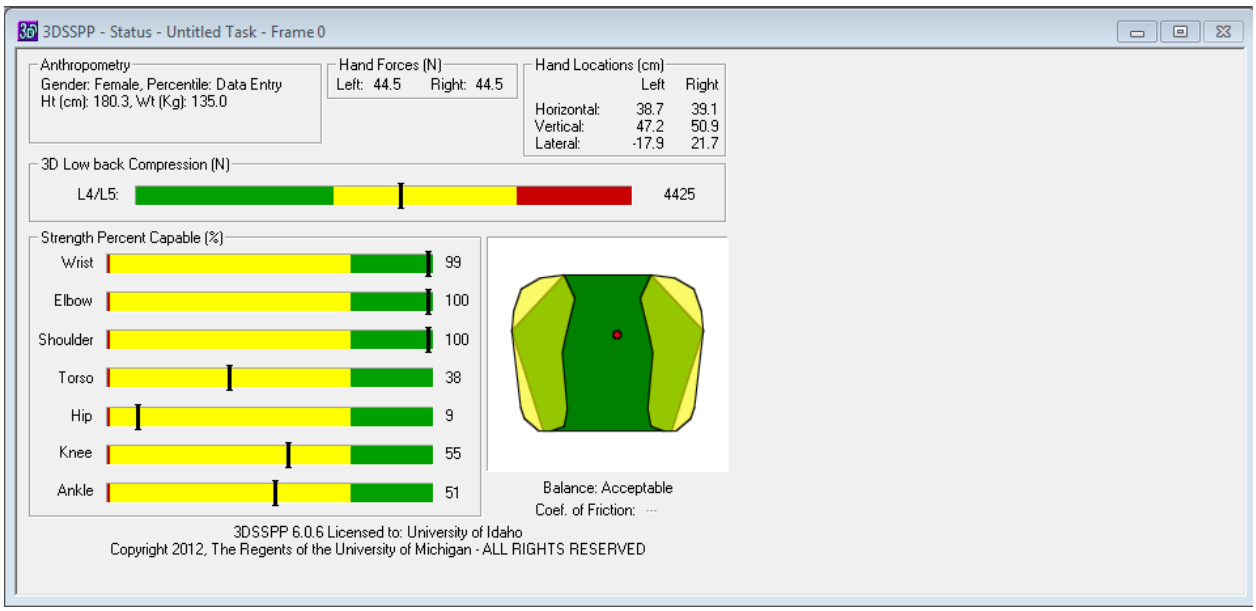

Figure 8. 3DSSPP Risk Analysis Output.