# A QUANTITATIVE STUDY OF THE VALUE OF ERGONOMIC TRAINING AT A MIDDLE EASTERN POST SECONDARY INSTITUTION

by

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## Abstract

The use of portable, compact technology is prevalent in today's society, particularly among the student population. It would be assumed that the more a user of this technology is aware of ergonomic principles and safe usage then the lower the risk of mobile technology related musculoskeletal injuries (MSIs). Unfortunately, many users do not have the knowledge to successfully employ these technologies safely and comfortably. A study was carried out at the College of the North Atlantic, Qatar campus (CNA-Q) in three stages: 1) to determine mobility usage prevalence and associated musculoskeletal risk factors, 2) identification of a suitable introductory ergonomics training program, and 3) identification of a suitable delivery method of the ergonomics training program (instructor-led versus web-based learning). Results of the study found that of students who use mobile technology improper postures were adopted approximately 100% of the time. To assist in decreasing the probability of future soft tissue injuries, an Introduction to Ergonomics program was selected and delivered to students. Upon comparison of the presentation formats, the students who received the information by a teacher retained the greatest amount of information (as compared to the group that received the information via the web and those that received no training) in the short-term (immediately following the training session). However, there was no statistically significant difference in retention among the three groups after one month following the training.

# ACKNOWLEDGEMENTS

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## List of Symbols, Nomenclature or Abbreviations

| | |
|---|---|
| American Public Health Association | APHA |
| Analysis of Variance | ANOVA |
| Confidence Interval | C.I. |
| College of the North Atlantic, Qatar campus | CNA-Q |
| English as a Foreign Language | EFL |
| Grade Point Average | GPA |
| International English Language Testing System | IELTS |
| Information Technology | IT |
| Journal of the American Osteopathic Association | JAOA |
| Language Studies and Academics | LSA |
| Memorial University of Newfoundland | MUN |
| Musculoskeletal injury | MSI |
| National Institute for Occupational Safety and Health | NIOSH |
| Reproductive Health Response in Conflict Consortium | RHRC |
| Registered Nurse | RN |
| Technician Preparatory Program | TPP |

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# Chapter 1: Introduction

Mobile computing has grown considerably worldwide over the past number of years, particularly in the Middle East. Internet use alone in this region grew by 294% between 2007 and 2012 (Internet World Stats, 2012). However, there has been no study conducted in this part of the world relating mobile usage and the level of ergonomic knowledge.

Doha is the capital city in Qatar, an oil rich and technologically developing country in the Middle East. Qatar has one of the fastest developing economies in the world with oil, gas, and petrochemicals forming the backbone of the State's economy. It is a progressive nation in the Arabian Gulf. According to the Qatar Statistics Authority, Qatar's population more than doubled from approximately 0.98 million in 2006 to 2.1 million in 2014 (Ministry of Development, Planning and Statistics, 2015). To assist the country in its educational directive, the College of the North Atlantic, Qatar (CNA-Q) was established in 2002, educating approximately 8000 students since that time in the fields of Health Science, Engineering Technology, Technician Preparatory Program (TPP), Business Studies, Language Studies and Academics (LSA) and Information Technology (IT) (College of the North Atlantic, 2014).

Mobile computing is defined as technology that allows transmission of data, via a computer, without having to be connected to a fixed physical link (Koudounas & Iqbal, 2014). It may include a host of portable technologies such as notebooks, smartphones, e-books and laptops. The ability to access information on demand has become common place in today's world. A survey conducted by the Dahlstrom and Warraich (2012) in Qatar stated that 95% of students surveyed owned a mobile phone, 86% owned a laptop/notebook and 84% owned a smartphone. This surge in internet usage reflects an increase in finger and thumb usage, creating increased need for attention to the prevention of MSIs.

According to the National Institute of Occupational Safety and Health (NIOSH, 2015, p. 1), MSIs are defined as "injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and disorders of the nerves, tendons, muscles and supporting structures of the upper and lower limbs, neck, and lower back that are caused, precipitated or exacerbated by sudden exertion or prolonged exposure

to physical factors such as repetition, force, vibration, or awkward posture." With the increase of computer work and mobile device usage, comes an increased probability of MSIs in the neck and shoulder area and upper limbs and back regions, as well as wrist pain (Ketola, 2003). Repetitive motion injuries are often caused by the recurring motions of the fingers and thumbs while touching the screen. Such repeated movements can cause damage to the joints, muscles, tendons and nerves. Gustafson, Johnson and Hagberg (2010) reported that participants, whether sitting or standing and the type of mobile work being completed (holding the phone vs. texting), affected their muscle activity and thumb positions. In addition, several studies reported an increase in the number of cases of arthritis, tendonitis, and tenosynovitis among participants who send a high volume of text messages via mobile phones (Ashurst, Turco & Lieb, 2010; Cooper, C. and Kleiner, B.H., (2001); Fontana, Neel, Claise, Ughetto & Catilina, 2007; Gustafsson, E., Johnson, P.W., Hagberg, M., 2010; Jonsson, Johnson, Hagberg & Forsman, 2011; Menz, 2005; and Werner, Franzblau, Gell, Hartigan, Ebersole, & Armstrong, 2005).

Computer usage, including mobile devices, in sustained non-neutral postures have been identified as a controllable risk factor. Postural stress often causes leaning forward while using the mobile technology and flexion and extension of the wrist while holding input devices have been associated with MSIs. Awkward postures cause the spine to be taken from the natural "S" curve, wrists often taken from the natural $180^0$ line and the head often tipped forward. In a study conducted by the Harvard School of Public Health, the techniques of holding a mobile device increased the strain on the neck muscles (Young, Trudeau, Odell, Marinelli & Dennerlein, 2012). According to E. Gustafsson (2012) a study was conducted to investigate thumb adduction/abduction and flexion/extension activity while texting. It was found that there was an increase in musculoskeletal symptoms in the hands and forearms of the study group. Young, Trudeau, Odell, Marinelli and Dennerlein (2012) reported that the amount of head and neck positions varied according to how a tablet was positioned when in use. The results of the study confirmed that the head and neck were flexed to a greater degree when using a tablet than when using desktop and notebook computing. Gold et.al (2012) found that 91% of the university participants flexed their necks while operating a mobile device while 90.3% maintained a non-neutral posture.

Research has is varied as to the most successful training method. Numerous sources stated that an instructor led learning environment allows students to ask questions and have direct interaction with the instructor and the other participants. Permissible, as well, is hands on training that allows transfer of theory to actual practice. The drawback on this style of learning, however, is that it is held at a pre-selected time and does not allow the students to progress at their own pace. Web based training, on the other hand, allows students to learn at their own pace. However, it does not permit verbal interaction and discussion of information. (Figlio, D., Rush, M., and Yin, L. (2010); Gratton-Lavoie, C. & Stanley, D., (2009); Howsen, R., Lile, S. (2008); Jacob, L. & Taveira, A. (2011); Lyke, J. and Frank, M. (2012); Rucker, N.P. (2004); and Toth, M., Amrein-Beardsley, A., & Foulger, T.S. (2010). In a country, such as Qatar, where English is not the dominant language, we based instruction may be prohibitive for successful knowledge acquisition. As such, this study will attempt to determine if this statement can be supported.

Ergonomic training is essential as a measure to reduce the probability of developing a MSI. A study was carried out at the College of the North Atlantic, Qatar campus (CNA-Q). The objective is threefold: 1) to determine mobility usage prevalence and associated musculoskeletal risk factors, 2) identification of a suitable introductory ergonomics training program, and 3) identification of a suitable delivery method of the ergonomics training program (instructor-led versus web-based learning). To carry out these objectives, Stage 1 of the study included a questionnaire and direct observation in order to determine mobility usage and risk factors. Stage 2 involved identifying, assessing and then selecting the most suitable ergonomics training program based on a number of evaluation criteria, Finally, Stage 3 involved a pre, mid and post test experiment to compare ergonomic learning between and instructor-led group (Group A), web based instruction (Group B) and no instruction (control Group C). Statistically, the hypothesis is as follows:

$H_0$: all population means at the different points are equal ($\mu_{\text{pre-test}}=\mu_{\text{mid test}}=\mu_{\text{post-test}}$)
$H_1$: At least one population mean is different.

# Chapter 2: Review of Literature

A number of literature searches were conducted for this study. Nine (9) databases were used for studies and articles published between 1999-2015: Medline, Toxline, ProQuest, Google Scholar, Academic One-File, Dissertation Abstracts, Education Research Complete, Medline, and PubMed. Search words were categorized as follows: category 1: mobile technology usage; category 2: ergonomics training, training effectiveness; category 3: rubric; and category 4: training statistics and training evaluation.

## 2.1 Mobile Usage

Research has been conducted to study the effects of mobile usage, particularly among the student population (Cooper, Sommerich, Cambell-Kyureghyan, 2009). While the negative effects of mobility usage are well known, there are numerous positive effects as well. Particularly in the student population, smartphones are often considered fashion accessories, thus often required for group inclusion (Katz and Sugiyama (2006). In addition, mobility and accessibility are paramount reasons why mobile technology is prominent in today's culture. From a behavioral point of view, it has been suggested that people who frequently use a mobile phone, and are thus in communication with others, have a lower level of perceived loneliness (Ogata, Izumi, and Kitaike, 2006) and make friends much more easily (Kamibeppu and Sugiura, 2005). Mobile phones are also often chosen as the tool of choice to curb many addictions such as smoking (Abroms, Padmanabhan, Thaweethai, and Phillips, 2011) and can assist in the management of severe mental health disorders (Prociow and Crowe, 2010).

From a business perspective, organizations may benefit greatly with the usage of mobile devices, which now often replace landline telephones. This advancement improves an organization's ability to respond quickly to its clients and staff, improves time management and increases flexibility. As a result, it is believed by many to be an economic savings tool for it increases productivity by reducing the amount of time employee's focus on minor tasks (Fontana, 2007).

While there are many benefits to mobile phones there are numerous physical hazards as well. The effects on the body related to mobile phone usage (i.e. smartphones) can be categorized as: (1)

recurring movements of the fingers and thumbs, (2) unnatural posture, (3) eye strain, (4) sleepiness, and (5) anti-social behavior. Each category is further discussed:

1. Repeated motion injuries are often caused by the recurring motions of the fingers and thumb while touching the screen. Such repeated movements can cause damage to the joints, muscles, tendons and nerves. Gustafson, Johnson and Hagberg (2010) reported that participants, whether sitting or standing, and the type of type of mobile work (holding the phone vs. texting), affected muscle activity and thumb positions. In addition, several studies reported an increase in the number of cases of arthritis, tendonitis, and tenosynovitis among participants who send a high volume of text messages via mobile phones (Menz, 2005, Ashurst, Turco and Lieb, 2010; Jonsson, Johnson, Hagberg and Forsman, 2011; Cooper and Kleiner, 2001; Gustafsson, Johnson, and Hagberg, 2010; Fontana, Neel, Claise, Ughetto and Catilina, 2007; and Werner, Franzblau, Gell, Hartigan, Ebersole; and Armstrong, 2005).

2. Physical problems are often caused by unnatural postures and forces. The position a person uses while on a mobile phone may induce physical stress. Awkward postures cause the spine to be taken from the natural "S" curve, wrists are often taken from the natural $180^0$ line and the head is often tipped forward. In a study conducted by the Harvard School of Public Health, the techniques when holding a mobile device increases the strain on the neck muscles (Young, Trudeau, Odell, Marinelli and Dennerlein, 2012). According to E. Gustafsson, 2012, a study was conducted to investigate thumb adduction/abduction and flexion/extension activity while texting. It was found that there was an increase in musculoskeletal symptoms in the hands and forearms of the study group. Young, Trudeau, Odell, Marinelli and Dennerlein (2012) reported that the amount of head and neck positions varied according to how a tablet was positioned when in use. The results of the study confirmed that the head and neck were flexed to a greater degree when using a tablet than when using desktop and notebook computing. Gold et.al (2012) found that 91% of the university participants flexed their necks while operating a mobile device while 90.3% maintained a non-neutral posture.

3. Reading computer monitors, smaller tablet screens and cell phones can cause eye strain and headaches because the characters and images are not clear or because the screen is obscured by glare or reflections. Symptoms include eye pain or redness, blurred or double vision, and headaches (Chu, Song, Kim, Lee, 2011; Hocking B, Westerman R. (2002); Oftedal, Straume, Johnsson, & Stovner, 2007; Sandstrom, M. Wilen, J., Hansson, M. K., Oftedal G. (2011)).

4. Sleepiness has been clinically associated with mobile phone usage. In studies conducted by Munezawa et.al. (2011) and Thomée, Härenstam and Hagberg, (2011) results showed a correlation between high frequency mobile usage and sleep difficulties.

5. Anti-social behavior has been associated with mobile phone usage. A paper titled "Hyper-Texting and Hyper-Networking Pose New Health Risks for Teens?" presented at the American Public Health Association (APHA) 138$^{th}$ annual meeting by Thomée, Härenstam, and Hagberg (2011) stated that hyper-texting (defined to be sending more than 120 text messages per day) and hyper-networking (spending more than three (3) hours per day on social network sites) is directly related to substance abuse, excessive sexual activity, absenteeism and fighting. Hyper-networkers have a high risk for stress, depression, suicide, substance abuse, fighting poor sleep, poor academic performance, and high television viewing and parental permissiveness.

## 2.2 Ergonomics Training Effectiveness

To reduce the risk of developing MSIs while using mobile technology, presenting an ergonomics course has been identified as an effective administrative control method to reduce the probability and consequence of injury (Jacob and Taveira, 2011). As a result, a review was conducted in the current study to assess the effectiveness of ergonomics training (see Table 1). To ensure the training was successful in increasing knowledge, pre- and post-training scores were used to determine intervention success.

**Table 1: Research into the Effects of Training on Ergonomics Knowledge**

| Source | Title of Paper | Author, Date | Vol. #, Pages | Evaluation |
|---|---|---|---|---|
| Scandinavian Journal of Work, Environment and Health | Effects of an ergonomic training program on workers with video display units | Brisson, Montreuil and Punnet, 1999 | 25(3), 255-263 | A pre and posttest deign was used to evaluate the effects of an ergonomic training program on the MSI statistics at a large university. Ergonomic training was given to an experimental group and not to the reference group. Evaluations included direct observation, a self-administered questionnaire and a physical examination of the workstation two (2) weeks prior and six (6) months post. Results concluded that there were improvements in the groups, with the greatest improvements noted in the over 40 age category. |
| Ergonomics S.A. | The impact of trainers on construction ergonomics knowledge and awareness | Smallwood and Ajaya, 2009 | 21(1), 23-38 | A study was carried out in the construction industry due its high number of MSIs. A questionnaire was distributed to participants on perceptions of ergonomics pre and post seminar. The results concluded that there is a need for increased knowledge and raising awareness of |

| Source | Title of Paper | Author, Date | Vol. #, Pages | Evaluation |
|---|---|---|---|---|
| | | | | ergonomics. |
| Applied Ergonomics | The effects of an office ergonomics training and chair intervention on worker knowledge, behavior and musculoskeletal risk | Robertson Amick, DeRango, Rooney, Bazzani, Harrist, & Moore, 2009 | 40, 124-135 | In the study, participants were divided into three (3) groups: a group receiving ergonomics training and an adjustable chair, a group receiving only training, and a control group. Pre and post training was one of the evaluation methods (in addition to observational technique) used to evaluate the training. A significant increase in ergonomic knowledge resulted in the intervention groups. |
| The Malaysian Journal of Medical Sciences | Ergonomic training reduces musculoskeletal disorders among office workers: results from the 6-month follow-up | Mahmud, Kenny, Zein and Hassan, 2011 | 18(2), 16-26 | Musculoskeletal disorders (MSDs) are prevalent among computer users. In this study, participants were divided into two (2) groups: those that received intervention and training and the other that received only a leaflet. Results of the pre and post testing found significant reduction in MSDs, except for the neck regions which showed a non-significant difference, less time away from work |

| Source | Title of Paper | Author, Date | Vol. #, Pages | Evaluation |
|---|---|---|---|---|
| | | | | and lower psychological discomforts. |
| The Journal of Occupational Rehabilitation | Efficacy of office ergonomics education | Bohr, 2002 | 10(4), 243-255 | A study was conducted to assess whether ergonomic education is successful in reducing MSIs. Participants were divided into three (3) groups: control, participatory and traditional. Data was collected using self-report surveys and observational checklists pre, post at 3 months, 6 months and 12 months. Results indicated that those that received education, experienced less pain/discomfort than those that did not receive the training. |
| Work | Office ergonomics education: a comparison of traditional and participatory methods | Bohr, 2002 | (19), 185-191 | In a study the participants were divided into two (2) groups: group 1 was a lecture and discussion group and group 2 was an active learning group incorporating discussions and problem solving exercises. Results from the pre and post surveys and observational checklists concluded that there is no difference between groups regarding |

| Source | Title of Paper | Author, Date | Vol. #, Pages | Evaluation |
|---|---|---|---|---|
| | | | | maintaining good working postures and proper organization of workstations. |
| International Journal of Computer Information Systems and Industrial Management Applications | The effectiveness of a web based office ergonomics training intervention in Jamaica | Jacob, L. and Taveira, A., 2011 | (3), 886-893 | This study used pre and post data to examine if web based training increased ergonomic knowledge to employees at an insurance company. Results indicated that the knowledge level increased among the workers and, in turn, changed ergonomic behaviors. |
| Doctoral dissertation: Texas A&M University, College Station, Texas | Efficacy of office ergonomics training: an evaluation and comparison of instructor and web-based training | Rucker, N.P., 2004 | | Pre and post testing method was used to test the effectiveness of online vs. classroom lecture style delivery of ergonomics training. This assessment method verified that both delivery methods increased ergonomic knowledge, with web based training participants showing a greater increase. |
| Washington State | Evaluation of Ergonomic Training Workshops, Washington | Shah, S., Silverstein, B., and Snow, P., | | To evaluate workshop success, this study compared ergonomic knowledge using pre and post test scores, without a control group. Significant improvements resulted and confirmed |

| Source | Title of Paper | Author, Date | Vol. #, Pages | Evaluation |
|---|---|---|---|---|
| | State, 2001 | 2001 | | with testing. |

Measuring the effectiveness is essential to ensure the quality of the training program and to determine whether knowledge was increased according to the initial objective of the study. In this review the pre and post evaluation design proved to be an adequate evaluation technique to determine success or failure in the ergonomic training according to assessment of knowledge levels.

A literature review was also conducted to assist in the development of a rubric to evaluate the introductory training programs. A rubric is defined as "a scoring tool that lays out the expectations for an assignment" (Stephens & Levi, 2005, p. 3). Articles confirm that an important principle in the evaluation of programs is the need for consistency and coherency of the assessment tool (Stevens & Levi, 2005). Overall, rubrics promote consistency in scoring, encourage self-improvement and self-assessment, motivate learners to achieve the next level, provide timely feedback, and improve instruction (Allen & Turner, 2006; Brown, Conway & Sorenson, 2006). This is achieved for rubrics are divided into evaluation criteria components and provides a scale for each section on what constitutes various levels of acceptable and unacceptable work (Boateng, Bass, Blaszak, & Farrar, 2009).

### 2.3 Determination of Effective Ergonomic Program Delivery Method

Research on learning acquisition of ergonomic principles is non-existent in the Middle Eastern population; a primary reason for carrying out the present study. However, in other parts of the world, research has been carried out on online versus classroom instruction to determine which method of delivery results in the highest knowledge gain. Online training offers numerous benefits over face-to-face instruction. Students who use a computer as a learning tool often find technology more accessible, faster and more convenient due to its flexibility of use (Gratton-Lavoie & Stanley, 2009). As well, in a society that has a large proportion of laborers living below the poverty line, many find this style of learning much more affordable than paying high tuition costs (Qatar Statistics, 2012). As on-line training is believed to be a more efficient use of resources, there are less time pressures that are of importance in a culture that is very family oriented, a fast moving and fast growing economy where change is constant (Lyke & Frank, 2012). Finally, it is believed that computer based learning is beneficial for it is more likely to have current materials readily available to a much greater audience that the mere classroom (Gratton-Lavoie and Stanley, 2009).

There are drawbacks to computer-based learning. From a social perspective, students often feel a disconnect with fellow students due to their physical absence (Hashim, Ahmad, & Abdullah, (2010). The feelings of isolation are often strong. This can lead to a lack of engagement between the students and the information that is being presented (Ya, 2013). In addition, technical support available to the learner may be limited. This may lead to confusion and frustration, not merely due to the information that is being presented, but may be compounded by a lack of available support. From a more personal perspective, students who learn online are required to take the initiative to begin the process of learning, and to continue to keep their interest throughout the education period (Toth, Amrein-Beardsley, & Foulger, 2010).

Findings from the literature review are divided regarding the best teaching tool, i.e. instructor based training or web based training. Historically speaking, some studies found no difference between learning outcomes based on instruction technique (Ya Ni, 2013; Lyke and Frank, 2012; Wagner, Garippo, and Lovaas, 2011; Zieffler, et al.; and Schenker, 2007). However, other studies demonstrated otherwise (Vernadakis et al., 2011; Toth, Amrein-Beardsley & Foulger, 2010; Dillon, Dworkin, Gengler and Olson, 2008; Thompson, Knavel and Ross, 2008; and Utts, Sommer, Acredolo, Maher, & Matthews, 2003). Studies that validated the significance of lecture style teaching showed that the ability to ask questions, to share opinions, or verbally participate in discussions are important when learning. Figlio, Rush, and Yin (2010) conducted a study at a university comparing online with lecture style presentation. Results found that those who attended lectures scored higher; an indicator of successful learning transfer. However, in a study that validated web based style learning, students taking courses online achieved higher grades and spent less time studying than those students that received the same training in the classroom (Brown and Liedholm, 2002). Conversely, in a study by Hashim, Ahmad, and Abdullah (2010), adult learners interviewed were dissatisfied with online education, due mainly due to their lack of confidence using computer technology.

As the present study was conducted in the Gulf region, where English is not the first language of a large majority of students, and the student body is multi-national, the researcher also sought articles on the success of online versus lecture style training evaluating characteristics of the

student body. However, no relevant articles were found. Nevertheless, Navarro (2000) found that when completing on-line studies, students lacked motivation and exhibited limited self-direction. Keri (2003) found that students with limited educational experience were more successful learning in the classroom. Brown and Liedholm (2002) found that there was no significant difference between the scores of either men or women in online courses. Shoemaker and Navarro (2000), however, found that gender, ethnicity, and previous accumulated knowledge on the subject did not affect test scores. However, Howsen and Lile (2008) found that older females scored significantly higher than men regardless of the style of learning chosen.

As a summary of the Effectiveness of Classroom and Online Learning: Teaching Research Methods, Ya Ni (2013), in the Journal of Journal of Public Affairs Education, presented the following table:

**Table 2: Comparison of Interaction between Online and Face to Face Settings**

| Comparison of Interaction Between Online and Face-to-Face Settings | | |
|---|---|---|
| | Online | Face-to Face |
| **Mode** | 1. Discussions through text only;<br>2. Can be structured;<br>3. Dense;<br>4. Permanent;<br>5. Limited;<br>6. Stark. | 1. Verbal discussions;<br>2. A more common mode;<br>3. But impermanent. |
| **Sense of instructor control** | 1. Less sense of instructor control;<br>2. Easier for participants to ignore instructor. | 1. More sense of leadership from instructor;<br>2. Not so easy to ignore instructor. |
| **Discussion** | 1. Group contact continually maintained;<br>2. Depth of analysis often increased;<br>3. Discussion often stops for periods of time, then is picked up and restarted;<br>4. Level of reflection is high;<br>5. Able to reshape conversation on basis of ongoing understandings and reflection. | 1. Little group contact between meetings;<br>2. Analysis varies, dependent on time available;<br>3. Discussion occur within a set timeframe;<br>4. Often little time for reflection during meetings;<br>5. Conversations are less likely being shaped during meeting. |

| | | |
|---|---|---|
| **Group Dynamics** | 1. Less sense of anxiety;<br>2. More equal participation;<br>3. Less hierarchies;<br>4. Dynamics are 'hidden' but traceable;<br>5. No breaks, constantly in meeting;<br>6. Can be active listening, without participation;<br>7. Medium (technology) has an impact;<br>8. Different expectation about participation;<br>9. Slower, time delays in interactions or discussions. | 1. Anxiety at beginning/during meetings;<br>2. Participation unequal;<br>3. More chance of hierarchies;<br>4. Dynamics evident but lost after the event;<br>5. Breaks between meetings;<br>6. Listing without participation maybe frowned upon;<br>7. Medium (room) may have less impact;<br>8. Certain expectations about participation;<br>9. Quicker, immediacy of interactions or discussions. |
| **Rejoining** | 1. High psychological/emotional stress of rejoining. | 1. Stress of rejoining not so high. |
| **Feedback** | 1. Feedback on each piece of work very detailed and focused;<br>2. Whole group | 1. Less likely to cover as much detail, often more general discussion;<br>2. Group hears feedback;<br>3. Verbal/visual feedback;<br>4. Possible to "free ride" and avoid giving feedback;<br>5. No permanent record of feedback;<br>6. Immediate reactions to feedback possible; |

| | | |
|---|---|---|
| | | 7. Usually some discussion after feedback, looking at wider issues;<br>8. Group looks at one participant's work at a time. |
| **Divergence** | 1. Loose-bound nature encourages divergent talk and adventitious learning;<br>2. Medium frees the sender but may restrict the other participants (receivers) by increasing their uncertainty. | 1. More tightly bound, requiring adherence to accepted protocols;<br>2. Uncertainty less likely due to common understandings about how to take part in discussions. |

## Chapter 3: Methodology

A study was carried out at the College of the North Atlantic, Qatar campus (CNA-Q): 1) to determine mobility usage prevalence and associated musculoskeletal risk factors, 2) identification of a suitable introductory ergonomics training program, and 3) identification of a suitable delivery method of the ergonomics training program (instructor-led versus web-based learning). This educational institution teaches 2100 students, with the majority between the ages of 18-30 (College of the North Atlantic, 2014). Copies of ethics approvals from Memorial University of Newfoundland (MUN) and CNAQ are in Appendix 1.

The study was divided into three (3) stages. They were:

Stage 1: Mobile usage study at CNAQ (questionnaire and direct observation)

Stage 2: Assessment and identification of an appropriate introductory Ergonomics course

Stage 3: Comparison of instructional delivery methods through experimental design: instructor led or computer based training

See Figure 1 outlines the sequence of the study:

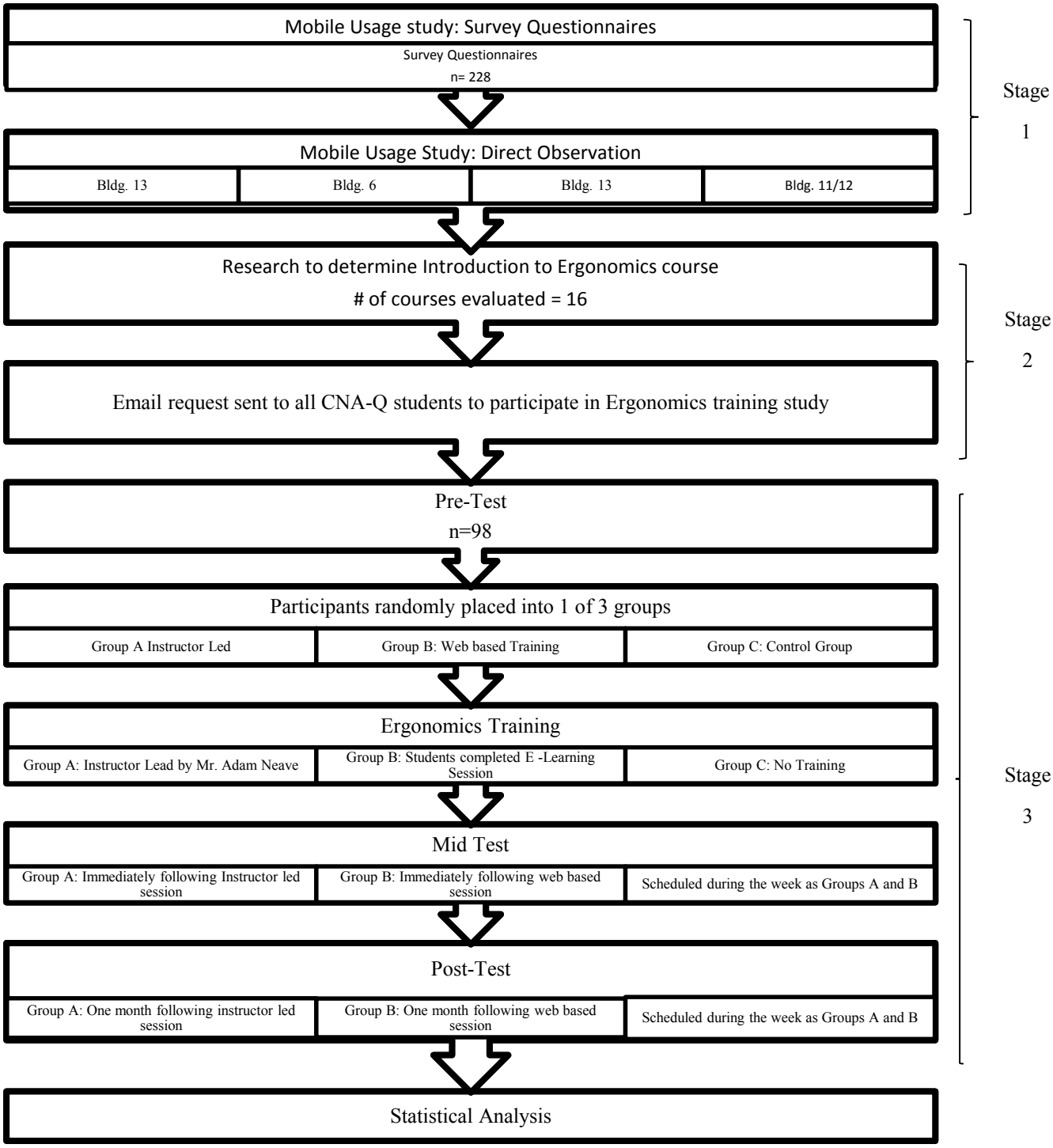



**Figure 1: Sequence of Study Flow Chart**

## 3.1 Stage 1: Mobile Usage Study

A study was carried out among the student population at CNA-Q to determine the extent of mobile technology usage. The aims of this study were to:

1. To identify if mobility usage is prevalent among the students; and
2. To identify risk factors that may be associated with the use of hand-held mobile devices

Two methods of data collection were used. They were:

1. Survey Questionnaires (*n*=228)
2. Direct observation (*n*=113)

### 3.1.1 Survey Questionnaire

The first method of data collection was completed using the following procedure:

1. Mobile Technology Usage Questionnaire was developed (see Appendix 2). Questions included were:
    a. Duration of mobile usage
    b. Frequency of mobile usage
    c. Pain experienced after mobile usage
    d. Priorities when buying a cell phone
    e. Size preferences of mobile technology
    f. Usage patterns of mobile technology
    g. Difficulties after usage of mobile technology
    h. Position of mobile technology while sitting

    The questions were developed by the researcher seeking specific information among the students population regarding the risk factors of developing an MSI. A number of sources of information were used for background information, including the Harvard School of Public Health. Ketola's dissertation (2003) and the University of Wisconsin summary results paper from a survey titled "A Survey of Computer Usage and Ergonomic Practices among Faculty at a University with a Mandatory Mobile PC Program.

2. Instructors were contacted by the researcher to ask permission to request their students complete the questionnaire. All students met the minimum selection criteria, including: International English Language Testing System (IELTS) of 5.0, student at CNA-Q, living in the Middle East and full time student. Students were instructed that participation was voluntary and they could withdraw at any time.

3. Instructors in the individual classrooms distributed the questionnaires. An "Informed Consent" form was distributed and collected. It was read and reviewed at the beginning of the classroom session (see Appendix 3). 100% participation occurred.
4. Upon collection, an analysis of the results was completed (see Appendix 4). Results found provided the foundation (in addition to the direct observation results) to begin Stage 2: Ergonomic course selection.

### 3.1.2 Direct Observation

The second method of data collection employed was direct observation. The objective of this portion of the study was to observe student postures and finger and thumb positions while using mobile technology. The four volunteer observers were CNA-Q students studying Ergonomics in the Environmental Health Program. Each was stationed at one of four locations throughout CNA-Q as noted on the following diagram.


**Figure 2: College of the North Atlantic – Qatar Campus: Observation Locations**

Locations for the observational survey were decided based on the fact that each of these places on campus are prominent gathering points of students while not in class.

An observation survey was developed (see Appendix 5) based on the information collected in Stage 1 of the study (Mobile Usage questionnaire). The observers were requested to document whether the students seen were using their mobile phones either speaking or keying, positions of the neck, elbows back, fingers and wrist/hands, and finally the accessories used by the sample population. Observers were trained by the researcher on the contents of the checklist to ensure consistent evaluation. This session reviewed observational techniques, definitions of flexion and extension, and photos were viewed of various positions that the observers may encounter. The observations took place during the week of March 2-6, 2014.

## 3.2 Stage 2: Ergonomics Course Selection

Upon ascertaining mobility use, frequency and postural form of sample students on campus, an appropriate introductory ergonomics instructional program was sought for delivery in Stage 3 of the study.

To evaluate preexisting ergonomics programs, a rubric was developed with the assistance of the Teaching and Learning Centre at CNA-Q. Using the experience of the Program Development Team successful training program elements were identified. According to the Reproductive Health Response in Conflict Consortium (RHRC) Consortium Monitoring and Evaluation Toolkit (2004), a rubric is an evaluation tool used to standardize evaluative criteria. See table 3 for the evaluation rubric developed:

**Table 3: Evaluation Rubric for Introductory Rubric**

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| Company: | | | | | |
| Title of Presentation: | | | | | |
| | 3 | 2 | 1 | 0 | Total |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | |

| | | | | | |
|---|---|---|---|---|---|
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | |
| Teaching tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | |

| | | | | | |
|---|---|---|---|---|---|
| positioning best practice) | | | | | |
| Total | | | | | |

The rubric was used to evaluate the following 19 ergonomic training programs. Table 4 presents a list of each of the PowerPoint presentations evaluated along with the title of each training program. Parameters for selection include the following requirements: 1) PowerPoint presentation format, 2) the course must be presented with a great emphasis on graphics, since the great majority of participants in the current study are EFL students, 3) the course format must be 2-8 hours in duration and 4) at least 75% of the presentations evaluated must come from an accredited institution.

**Table 4: Ergonomic Courses Evaluated in the Study**

| Institution | Ergonomic Training Program Title |
|---|---|
| McMaster University (1) | Best Practices Lifting Tips and Techniques |
| Government of Louisiana | Ergonomics for the 21st Century |
| University of Oregon | Introduction to Ergonomics and Cumulative Trauma |
| Albuquerque Public Schools | Office Ergonomics |
| Texas Engineering | Office Ergonomics: Prevention |
| McMaster University (2) | Best Practices Lifting Tips and Best Practices (Online) |
| University of Western Australia | No Title |
| East Carolina University | Ergonomics and Safety Responsibilities |
| University of Kentucky | Office Ergonomics |
| University of Rochester | Computer Workstations and Body Safety |
| George Washington University | Office Ergonomic Awareness |
| Oklahoma State University | Adjusting your Workstation to Fit your Body |
| US Mine Rescue Association | Office Ergonomics |
| Zettl Group | Ergonomics |
| Naval Facilities Engineering Command | Ergonomics Awareness Training |
| Georgia Technical College | Introduction to Ergonomics |

### 3.3 Stage 3: Determination of Effective Ergonomic Program Delivery

Following identification of an appropriate Ergonomics training program, a study was carried out to quantitatively determine the most effective delivery method of the Introduction to Ergonomics course. Effectiveness was to be determined by measuring both short- and long-term knowledge retention among the students at CNA-Q participating in this study. An email was sent to all students enrolled at CNA-Q requesting participation (see Appendix 8). The sample size was dependent on the English proficiency of the student population. As such, only those students entered into departments (i.e. Health Science, Engineering, IT, Business and Academics) and thus had an IELTS 5.0 bandscore were permitted to participate.

Instructional sessions began with a questionnaire completed by the participant to determine individual mobile usage patterns and frequency (see Appendix 9). All sessions were located in the pre-selected classrooms/computer labs during the Fall 2014 semester to assist in creating a comfortable learning environment and a known area for the students.

Participants were then divided into three groups. Individual participants were not randomly assigned to delivery method groups. Rather, classes were assigned as per the following: Group A: Instructor-directed training, Group B: Self-directed training (via McMaster University Introduction to Ergonomics video training (see Appendix 10) and Group C: No intervention (control group). All students were asked to complete an ergonomics knowledge test to assess baseline ergonomic knowledge prior to training (pre-test). Approximately 1 week later, Group A was presented with the Introduction to Ergonomics training program by an instructor at CNA-Q, Group B completed the Introduction to Ergonomics program on the computer and Group C did not complete the training session. At the conclusion of each training session, the same knowledge test was completed (mid test). This evaluation was to determine short-term knowledge acquisition and retention. The same test was completed 1 month following the training to determine long-term knowledge retention (post-test) (see appendix 11).

The instructor presenting to Group A was told the information to present. It was at the discretion of the instructor the amount of discussion and hands on participation to be incorporated. He was permitted to include such teaching tools as stretching exercises, lifting scenarios and hands on computer workstation layout evaluations. In addition, the instructor was permitted to use own

professional discretion when dealing with interpretation of ergonomic concepts unknown to the students, particularly since many of the participants were EFL students.

The web-based training presented to Group B was carried out in various language labs throughout the campus. To reduce stress, classroom locations remained the same as throughout the semester. The course materials for Group B were transmitted via the internet through headphones (see Appendix 10). Students were permitted to review sections of the material at any time during the session. At no time, however, were students permitted to converse with each other, thus ensuring ergonomic information as not transferred from person to person. Group C (control group) did not receive any ergonomic training throughout the study period.

The timeframe of the study was determined based in the duration of CNA-Q semesters. Since the training was carried out during class time and to ensure participant groups stayed assembled, the study was required to be completed over one complete term. For continuity, the study was carried out during the Fall 2014 semester.

Following accumulation of test information, a statistical analysis was undertaken to determine the group that obtained the highest scores to establish the most successful training method. The analysis was conducted on the test results, comparing the data of the 3 groups using an analysis of variance (ANOVA) and appropriate post hoc tests should main effects be identified. Upon completion of the study, a debriefing session was arranged to ensure all participants were told of the test results (see Appendix 13).

# Chapter 4: Results

## 4.1 Stage 1: Mobile Usage Study

### 4.1.1 Questionnaire

Of the total number of students surveyed via the questionnaire (*n*=228), 39.0% were male and 61.0% were female, with the majority of the participants (83.7%) between the ages of 16-24 years. Of the sample, 100% owned at least 1 piece of mobile technology, with 3.1% owning 4 or more.

Regarding brand of mobile devices, 33.7 % of participants used an IPhone©, 27.7% a Blackberry©, and 26.3% owned a Samsung galaxy©. Particular information was also requested on physical specifications of the phones used by the students. The analysis rated the top 5 requirements of students when buying a cell phone. Features, in rank order were speed of information, comfort in hand, touchscreen, color and the presence of a keypad. When contemplating purchasing a mobile phone, the students were asked to rank purchase preferences. Results concluded that speed of information ranked #1, while comfort in hand ranked #2. When requesting screen size preferences, a large majority (75.4%) of respondents responded that they preferred a medium size screen and a medium size handset (79.9%), and preferred a touchscreen as the mode of transmission (57.5%).

A majority of students observed (89.0%) used some form of an accessory. Accessory items included earphones, microphones and cases. Research of mobile phone accessories among a student population states that many teenagers use such attachments as fashion accessories, rather than tools to assist in reducing the probability and/or severity of musculoskeletal disorders.

Questions were also presented concerning length of time using the phone and the frequency of use. Upon reviewing the data results, it was not surprising to the researcher that just over 50% of the respondents used their mobile phones more than 120 minutes per day (56.1%) and more than five times daily (83.0%).

Upon questioning of pain immediately after mobile phone usage, 33.1% of the students responded feeling pain the neck region, 21.8% in the wrist and hand region, 14.0% in the shoulders, while only 11.6% felt no pain after usage. Included on the questionnaire were questions regarding other

physical factors such as sleep disturbances (86.0% experienced some degree of sleeping problems) and psychological consequences such as feelings of depression and hopelessness (59.2%) and loss of interest in present activities (64.0%). Though these symptoms were reported by the participants in this study, they cannot be directly correlated to mobile usage.

Finally, positioning of the mobile technology, while sitting, was questioned. This portion of the questionnaire was similar to a study carried out by the Harvard School of Public Health in an attempt to verify if results would be similar (Young, Trudeau, Odell, Marinelli and Dennerlein, 2012). Pictures were included in the present study to aid participants with answering the question on positioning of their mobile technology while viewing the screen in the "landscape viewing" mode. 65.4% of respondents place their tablets in the lap-hand position (tablet held on lap), while 3.5% placed the tablet in the table – movie position, a favorable position for the tablet is positioned at a high angle, thus the head is more aligned with the spine (see Appendix 4).

### 4.1.2 Direct Observation

Data were also collected at CNA-Q using a direct observation technique. In total, 113 observations were made by 4 observers (see Table 5). See section 3.1.2 for a map noting observation locations. For a statistical analysis of the observational survey, see Appendix 6.

**Table 5: Observation Results of Mobile Usage among CNA-Q Students**

| Location | | # of Observations | % of Sample Population |
|---|---|---|---|
| 1 | Bldg. 3 Cafeteria | 32 | 31.1% |
| 2 | In front of Bldg. 6 | 17 | 16.5% |
| 3 | Bldg. 13 Cafeteria | 43 | 41.7% |
| 4 | In front of Bldg. 11/12 | 11 | 10.7% |

Results from these observations concluded that the majority of the students were verbally talking on their smartphones (89.3%), while 10.7% were not. At various times throughout the observation period, students were seen keying (44.7%). Postures were one of the main focuses of the

observations. Results indicated that 47.8% of necks were bent slightly forward (with neck bent in front of the shoulders), 10.4% slightly bent back (with neck bent behind the shoulders), 9.0% in neutral posture (the neck is directly in line with the spine, not bent nor rotated sideways) and finally, 17.9% of students' necks were twisted out of neutral posture to some degree over their shoulders. Elbows of 73.7% were extended away from their bodies while 26.3% had their elbows positioned close to the sides of the body. Almost half of the participants (45.6%) had their backs slightly flexed forward while only 21.1% held their backs in a neutral posture.

Of all the observations, viewing the hand and wrist postures was the most challenging. It was surprising that only 31.6% of students maintained a neutral wrist/hand posture. However, more than half (63.2%) were using some form of accessories that aided in obtaining correct postures. In a meeting of the participant observers after the observation period, it was stated that accessories students used to maintain neutral wrist postures and neck postures included microphones, earplugs and hand held cases.

After analysis of the interviews and observations, it is clear that a general student population would benefit from increased ergonomics-related knowledge that might eventually reduce individual risk for musculoskeletal disorders related to mobile technology usage. As such, a search was conducted to identify an introductory ergonomics course.

### 4.2 Stage 2: Ergonomics Course Selection

Upon evaluation of the rubric used to assess existing relevant introductory ergonomics courses, the following rankings were determined (see Table 6). For each individual course evaluation, see Appendix 7. Of the 16 program evaluated, the highest scoring program, McMaster University (see Appendix 10), was chosen as the Ergonomics course best meeting the evaluation criteria.

**Table 6: Score and Ranking of Ergonomic Training**

| Teaching Institution | Score | Ranking |
|---|---|---|
| McMaster University* | 19 | 1 |
| Government of Louisiana | 18 | 2 |
| University of Oregon | | |

| | | |
|---|---|---|
| APS | 17 | 3 |
| Texas Engineering | | |
| McMaster University** | 16 | 4 |
| University of Western Sydney | | |
| East Carolina University | 14 | 5 |
| University of Kentucky | | |
| University of Rochester | | |
| George Washington University | 13 | 6 |
| Oklahoma State University | | |
| US Mine Rescue Association | | |
| Zettl Group | | |
| Naval Facilities Engineering Command | 12 | 7 |
| Georgia Technical College | 9 | 8 |

*Ergonomics Training Program by McMaster University titled "Best Practices and Lifting Tips and Techniques" Online.
**Ergonomics Training Program by McMaster University titled "Ergonomics: Best Practices and Lifting Tips and Techniques".

### 4.3 Stage 3: Determination of Effective Ergonomic Program Delivery

The McMaster University program was presented to students at CNA-Q via a teacher led class (Group A) and on-line delivery (Group B) (see Appendix 10). The control group (Group C) did not receive the ergonomics training. Informed consent forms were received from all original participants (see Appendix 3). However, not all participants fully completed all three tests (58% completed all 3 tests). Sample sizes, participant demographics and device use frequency are reported in Tables 7 and 8.

**Table 7: Group Sizes of Each Training Group**

| | Group A: Teacher Led | | Group B: Computer Based | | Group C: Control group | |
|---|---|---|---|---|---|---|
| Test | Original # | # that Completed all Testing | Original # | # that Completed all Testing | Original # | # that Completed all Testing |
| Pre Assessment | 28 | 16 | 24 | 17 | 31 | 15 |
| Mid test | 26 | | 20 | | 29 | |
| Post-test | 24 | | 23 | | 31 | |

**Table 8: Participant Characteristics from each Test Group**

| Personal Characteristics of Original Participants | | | |
|---|---|---|---|
| | Group A: Instructor Led n= 28 | Group B: Computer Based n=24 | Control Group: No Training n= 31 |
| Age | mean = 22 years | mean = 22 years | mean: 20.2 years |
| Standard Deviation | 3.6 | 3.6 | 4.0 |
| Gender | | | |
| Male | 10 (35.7%) | 6 (23.1%) | 10 (32.3%) |
| Female | 18 (64.3%) | 20 (76.9%) | 21 (67.7%) |
| # of Countries* Represented | 6 | 5 | 8 |

*Countries represented in this study included: Qatar, Djibouti, Egypt, India, Ivory Coast, Jordan, Lebanon, Libya, Pakistan, Palestine, Philippines, Somalia, and the Sudan.

The participants were also questioned regarding physical discomfort while using mobile devices. 55.7% replied they felt some degree of discomfort, while 44.3% did not. Of the participants who reported some degree of body discomfort (55.7%), the following is a summary of the locations of pain (see Figure 3).

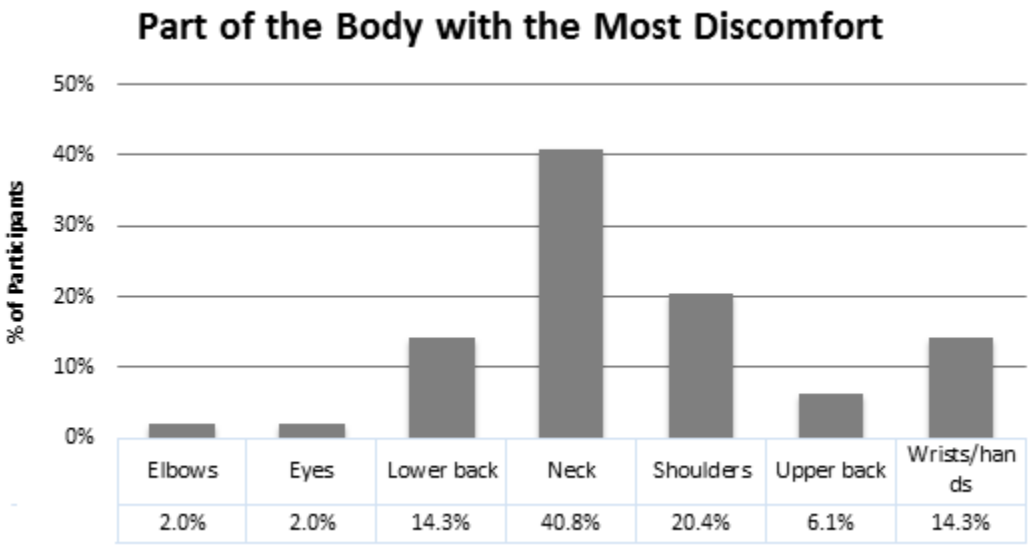



**Figure 3: Part of the Body with the Most Discomfort while Using a Mobile Device**

Immediately following the ergonomic sessions, all participants were asked to complete the same questionnaire (mid test). Final Assessments (post-test) of all three groups were also conducted one month after the training sessions (see Appendix 11). Table 9 presents test scores of each group for pre test, mid test and post test.

**Table 9: Comparison of Test Scores among each Group**

| | Pre-test | Mid test | Post Test | Difference between Pre-test and Mid test | Difference between Pre-test and Post test | Difference between Mid-test and Post test |
|---|---|---|---|---|---|---|
| Group A | 7.7 | 11.1 | 9.7 | +3.4 | +2.0 | -1.4 |
| Group B | 10.0 | 10.5 | 8.7 | +0.5 | -1.3 | -1.8 |
| Group C | 9.4 | 8.9 | 10.2 | -0.5 | +0.8 | +1.3 |

A mixed ANOVA was completed for three groups of students participating in this study to compare the mean differences. Exploratory statistics were conducted in order to determine if the assumptions for Mixed ANOVA were met.

Assumptions for using Mixed ANOVA

1. Outliers. There were no outliers in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box.

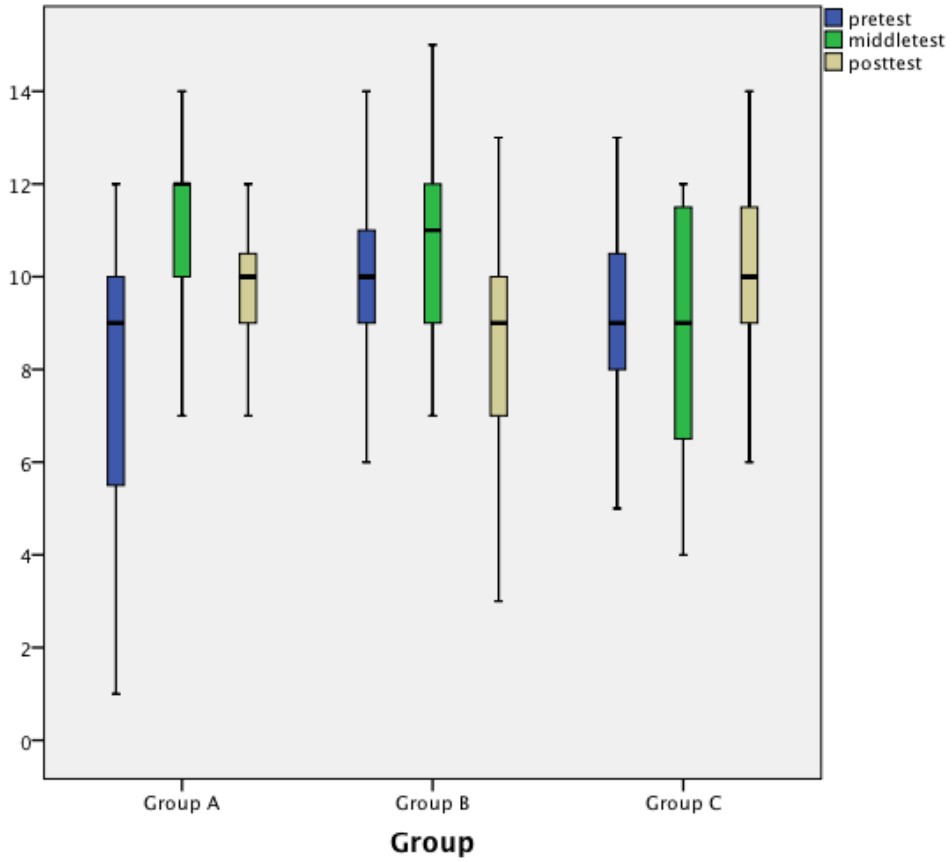



**Figure 4: Outliers**

2. Assumption of Normality: Because the sample size is small, a Shapiro-Wilk test was employed. Test scores were normally distributed for all groups at all-time points, as assessed by Shapiro-Wilk's test ($p > .05$).

**Table 10: Tests of Normality among the 3 Groups**

**Tests of Normality**

| | | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | Group | Statistic | df | Sig. | Statistic | df | Sig. |
| pretest | Group A | .217 | 16 | .042 | .903 | 16 | .088 |
| | Group B | .218 | 17 | .032 | .950 | 17 | .457 |
| | Group C | .137 | 15 | .200* | .958 | 15 | .663 |
| middletest | Group A | .225 | 16 | .030 | .899 | 16 | .078 |
| | Group B | .153 | 17 | .200* | .955 | 17 | .543 |
| | Group C | .144 | 15 | .200* | .906 | 15 | .117 |
| posttest | Group A | .162 | 16 | .200* | .952 | 16 | .516 |
| | Group B | .108 | 17 | .200* | .948 | 17 | .426 |
| | Group C | .176 | 15 | .200* | .941 | 15 | .401 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

3. Assumption of homogeneity of variances: Levene's test of equality of error variances tests the assumption of homogeneity of variances and the results of this test are presented in the Levene's Test of Equality of Error Variances table.

**Table 11: Levene's Test of Equality of Error Variances**

**Levene's Test of Equality of Error Variances[a]**

| | F | df1 | df2 | Sig. |
|---|---|---|---|---|
| pretest | 2.760 | 2 | 45 | .074 |
| middletest | 1.155 | 2 | 45 | .324 |
| posttest | 3.254 | 2 | 45 | .048 |

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + group
Within Subjects Design: time

There was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ($p>.05$). Posttest significant value is .002 below the required .05. Transformations in mixed ANOVA were not robust. Homogeneity of variance has been met.

4. Assumption of homogeneity of covariances: For p>.05, there was not homogeneity of covariances, as shown by the Box Test. The mixed ANOVA was run.

**Table 12: Box's Test of Equality of Covariance Matrices**

**Box's Test of Equality of Covariance Matrices[a]**

| | |
|---|---|
| Box's M | 26.914 |
| F | 2.023 |
| df1 | 12 |
| df2 | 9563.406 |
| Sig. | .019 |

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + group
Within Subjects Design: time

5. Assumption of sphericity: Mauchly's Test of Sphericity is used. Since the significance (p=.910) is less than .05, sphericity has not been violated.

**Table 13: One Way Anova: Mauchly's Test of Sphericity**

**Mauchly's Test of Sphericity[a]**

Measure: Testscore

| Within Subjects Effect | Mauchly's W | Approx. Chi-Square | df | Sig. | Epsilon[b] | | |
|---|---|---|---|---|---|---|---|
| | | | | | Greenhouse-Geisser | Huynh-Feldt | Lower-bound |
| time | .996 | .188 | 2 | .910 | .996 | 1.000 | .500 |

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + group
Within Subjects Design: time

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

**Table 14: Tests Within-Subjects Effects**

**Tests of Within-Subjects Effects**

Measure: Testscore

| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|---|
| time | Sphericity Assumed | 27.014 | 2 | 13.507 | 2.978 | .056 | .062 |
| | Greenhouse-Geisser | 27.014 | 1.992 | 13.564 | 2.978 | .056 | .062 |
| | Huynh-Feldt | 27.014 | 2.000 | 13.507 | 2.978 | .056 | .062 |
| | Lower-bound | 27.014 | 1.000 | 27.014 | 2.978 | .091 | .062 |
| time * group | Sphericity Assumed | 112.019 | 4 | 28.005 | 6.176 | .000 | .215 |
| | Greenhouse-Geisser | 112.019 | 3.983 | 28.124 | 6.176 | .000 | .215 |
| | Huynh-Feldt | 112.019 | 4.000 | 28.005 | 6.176 | .000 | .215 |
| | Lower-bound | 112.019 | 2.000 | 56.010 | 6.176 | .004 | .215 |
| Error(time) | Sphericity Assumed | 408.133 | 90 | 4.535 | | | |
| | Greenhouse-Geisser | 408.133 | 89.618 | 4.554 | | | |
| | Huynh-Feldt | 408.133 | 90.000 | 4.535 | | | |
| | Lower-bound | 408.133 | 45.000 | 9.070 | | | |

There was a statistically significant interaction between the type of instruction and the time from instruction (repeated tests), $F(4,90)=6.175$, $p<.001$, partial $eta^2=.215$ (effect size).

**Table 15: Tests of Between-Subjects Effects: Pre test**

Tests of Between-Subjects Effects

Dependent Variable: pretest

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Corrected Model | 48.834[a] | 2 | 24.417 | 3.639 | .034 | .139 |
| Intercept | 3920.007 | 1 | 3920.007 | 584.148 | .000 | .928 |
| group | 48.834 | 2 | 24.417 | 3.639 | .034 | .139 |
| Error | 301.979 | 45 | 6.711 | | | |
| Total | 4293.000 | 48 | | | | |
| Corrected Total | 350.813 | 47 | | | | |

a. R Squared = .139 (Adjusted R Squared = .101)

There was a statistically significant difference in test performance at the pre-test point between instruction methods, $F(2,45)=3.639$, $p=.034$, partial $eta^2=.139$.

**Table 16: Tests of Between-Subjects Effects: Mid Test**

Tests of Between-Subjects Effects

Dependent Variable: middletest

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 41.594[a] | 2 | 20.797 | 3.496 | .039 |
| Intercept | 4936.156 | 1 | 4936.156 | 829.703 | .000 |
| group | 41.594 | 2 | 20.797 | 3.496 | .039 |
| Error | 267.719 | 45 | 5.949 | | |
| Total | 5291.000 | 48 | | | |
| Corrected Total | 309.313 | 47 | | | |

a. R Squared = .134 (Adjusted R Squared = .096)

There was a statistically significant difference in test performance at the mid test point between instruction methods, $F(2,45)=3.496$, $p=.034$.

**Table 17: Tests of Between-Subjects Effects: Post Test**

**Tests of Between-Subjects Effects**

Dependent Variable: posttest

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 18.633[a] | 2 | 9.317 | 1.681 | .198 |
| Intercept | 4349.065 | 1 | 4349.065 | 784.819 | .000 |
| group | 18.633 | 2 | 9.317 | 1.681 | .198 |
| Error | 249.367 | 45 | 5.541 | | |
| Total | 4600.000 | 48 | | | |
| Corrected Total | 268.000 | 47 | | | |

a. R Squared = .070 (Adjusted R Squared = .028)

There was no statistically significant difference in test performance at the posttest point between instruction methods, F (2,45)=1.681, p=.198.

In conclusion, the one-way repeated measures ANOVA was conducted to determine whether there were statistically significant differences in test scores taken over 6 months among three different instruction methods. There were no outliers as assessed by the boxplot Figure 5. Test scores were normally distributed for all groups at all time points, as assessed by Shapiro-Wilk's test ($p > .05$) in Table 10. There was homogeneity of covariances, as assessed by Box's test of equality of covariance matrices (p=.082). The assumption of sphericity was not violated, as assessed by Mauchly's test of sphericity $X^2(2) = .188$, p=.910 in Table 13.

Test scores increased from the pretest 9.04±2.84 to the middle test 10.19 ± 2.57 and the decreased to the posttest 9.50 ± 2.39. There was a statistically significant interaction between the type of instruction and the time from instruction (repeated tests), F(4,90)=6.175, p<.001, partial $eta^2$=.215 (effect size).

Mean pre-test scores were statistically significantly different for Group B and Group A by 2.31. Mean mid test score were statistically significantly different for Group A and Group C by 2.26.

Mean posttest score was not statistically significantly different for Group A, Group B and Group C.

For a statistical analysis of results, see Appendix 12.

## Chapter 5: Discussion and Conclusions

Mobile usage in the global student population is significant. The results of a study carried out at CNA-Q further substantiates this statement (see Section 3.1). As noted in previous publications, education and training is a powerful administrative control measure in an attempt to reduce the probability and consequence of workplace injuries, particularly MSI. Nevertheless, many people do not recognize that ergonomics training is an effective component to an Occupational Health and Safety program. This study, carried out at CNA-Q, is an attempt to take the first steps in analyzing and laying the groundwork in the Gulf region for the students of today are the workforce of tomorrow.

To begin this current study, an analysis was conducted to confirm if the students at CNA-Q were frequent mobile technology users, the common body positions used while either texting or chatting on the phone and finally to determine the ergonomic knowledge of the student body. It was confirmed, through the use of a survey questionnaire and direct observation, that 100% of the students surveyed owned a mobile device, more than 50% used their phones for more than 120 minutes daily, and 89% felt some form of body discomfort while using the technology, particularly in the neck region (33.1%), wrist and hand region (21.8%) and shoulder region (14.0%) (see Appendix 4). Direct observation of students using mobile devices further confirmed that mobile usage is popular among the younger population, with 91% of the users not in neutral back posture and 68.4% of the users were not using neutral wrist/hand posture while operating their mobile device (see Appendix 6). These results are an indicator that an attempt must be made to effectively reduce the probability and consequence of MSIs.

The second step in this mission was to determine an Introduction to Ergonomics course that could effectively increase the information comprehended by the students and possibly assist in deceasing the probability of developing MSIs in the future. In keeping with this objective, 16 ergonomic presentations were reviewed and the course chosen as an Introductory Ergonomics course to students of CNA-Q was “Best Practices Lifting Tips and Techniques” (online) offered by McMaster University. This course offered the best in terms of ergonomic content, graphics, author competency, clarity (i.e. font, sequencing, and slide background), accuracy of information and

multiple teaching tools (see Appendix 10). However, McMaster University did not receive a perfect score of 100% as per the evaluation criteria noted in the rubric (score of 19/24 = 79.2%) (see Appendix 7). Firstly, the course lost marks in the category of graphics. Visual aids are particularly important in a society that does not have English as a first language and thus depends largely on graphics to properly interpret and comprehend information. Secondly, the course lost marks in the category of content completeness. It did not present a great deal of information on mobile equipment usage, a noted area of ergonomic discomfort among the student population at CNA-Q (Section 4.1). Finally, the chosen course also lacked in the area of author competency. The individual author(s) was not credited on the presentation, but rather simply the organization, McMaster University. As a result of this omission, the authoritative knowledge and credibility of the writer could not be verified.

It was found, however, that when the McMaster University Ergonomics Program was presented in the instructor led group (Group A), that the first and second shortcomings were overcome through verbal conveyance of additional information not formally included in the presentation. Additional explanatory information was presented in the classroom as verified by the Group A instructor which may help explain change in language test scores among the three groups (see Table 17). Group A gained the greatest amount of ergonomic knowledge from pre-test to mid test (+3.4) and between pre-test and posttest (+2.0) among all 3 groups. Interestingly, however, Group C (the control group that received no ergonomic training) saw the only gain in knowledge when comparing mid test with post test scores (+1.3). To further analyze the training results descriptive statistics was used on the individual, group, and overall testing scores to determine which method of teaching was associated with the greatest knowledge retention (see Appendix 12).

To confirm retention scores at different times for the three groups a mixed ANOVA was applied. The results of the mixed ANOVA indicated that mean pre-test score was significantly higher in the computer based learning group (Group B) than the instructor led group (Group A) by 2.31. Although Group B scored significantly higher on the pretest, they did not score higher on either of the following two tests. The mean mid test score was significantly greater in Group A (instructor led group) than Group C (control group) by 2.26. This result suggests that for immediate understanding of the course material, the teacher lead group excelled. Again this may be explained

by the teacher overcoming the difficult language barrier. The mean pre-test score, however, was not statistically different in Group A, Group B or Group C. Thus, the instructor led group (Group A) retained the greatest amount of ergonomic information immediately following the ergonomics training session (mid test). However, the results from the posttest, given after one month showed no significant difference among the three groups. This result indicates that the method of receiving the information had no positive effect on retention.

## 5.1 Bias Control

A number of strategies were taken to reduce prejudice among the study participants. Firstly, to eliminate test bias and instructor bias, an Environmental Health and Safety instructor, other than the researcher, conducted the instructor led training (Group A) and was not privy to quiz information. Such an action eliminated the issue of "teaching to the test" which would have reduced the validity and reliability of the test results when comparing the instructor led group (Group A), the web based group (Group B) and the control group (Group C).

Secondly, to ensure students were capable of reading and comprehending the Introduction to Ergonomics information (and thus reducing the probability of students guessing answers) in the training sessions and on the pre, mid and post-test evaluation documents, all participants were required to have an International English Language Testing System (IELTS) score of at least 5.0 bandwith; a requirement at CNA-Q to enter any academic school. Thus, only students accepted into academic programs were permitted to participate in this study. Acceptance of English proficiency of all participants was further verified through the Registrar's office at CNA-Q.

## 5.2 Limitations of the Study

To improve and to learn from this study, weaknesses must be identified. A notable limitation was the small sample size and short time frame used in stage three of this study (1 month). Of the 2100 students at CNA-Q, only 10.9% participated in the questionnaire portion of Stage 1, 5.4% in the direct observation portion of Stage 1, and 2.3% participated in Stage 3 of the study. This reduced the reliability of the analysis. The question: if a larger sample size was used, would the results be

similar and be a representative sample of the entire student population? In future a larger study should be conducted to increase the reliability and generalizability of test results.

Secondly, one of the most concerning biases is "response shift bias". This concept may be defined as "a change in the participant's metric for answering questions from the pre-test to the post-test to a new understanding of a concept being taught" (Klatt and Taylor-Powell, 2005, p. 3). In this study, Group C (control group that received no ergonomic training) received the highest score in the post test evaluation (as compared to Group A and B). It is questionable if the participants learned from the pre and mid test questions, resulting in a higher grade one month later. To reduce this bias in Stage 3, it is recommended that if training is completed in future studies to change the evaluation of the intervention to a post- then pre- design (rather than a pre then post design). This technique allows greater consistency in assessing knowledge, skills and attitudes, thus eliminating response shift bias (Colosi and Dunifon, 2006). In the pre-then-post design (as in Stage 3 of the current study) measurements are collected before and after the study. In the post-then pre design, both pre and post data are collected at the same time after the training session. The participants would be instructed to rate their current ergonomic knowledge as a result of the training session and then reflect back and rate their knowledge to be before the training session.

Third, it is possible the results of this study are not representative of the entire student population. In Stage 3 of the study, fixed classes were chosen to be test subjects. As such, the results may not be a true representative sample of the entire student population. However, the method of instruction to each group was randomly selected. To improve possible future studies, random selection of participation and random assignment to conditions should be used rather than selecting classes of students. This would allow for more reliable test results.

Fourthly, the McMaster University "Introduction to Ergonomics" course chosen in Stage 2 of the current study may not have been developed for an English as a Foreign Language (EFL) audience (see Appendix 10). As such, this may be seen as a limitation for many of the student participants were EFL learners, and thus may not have been able to fully comprehend the information that was presented. In the future, it is recommended to only evaluate training presentations that are written

for an EFL population. To assist in determining if language was a factor in test scores, it is recommend to replicate this study with students whose first language is English.

Fifthly, merely 58% of the sample population in the study completed all tests, i.e. completed pre, mid and post tests. Numerous reasons were presented to the researcher for non-attendance, including illness, seeing no personal gratification, and personal issues at home. In future studies, the researcher recommends that students who participate be awarded a sign of achievement and be recognized study participant in an important study. Discussion with instructors that permitted the researcher to enter classes also suggested that in future studies grades be assigned to evaluations and participation be mandatory.

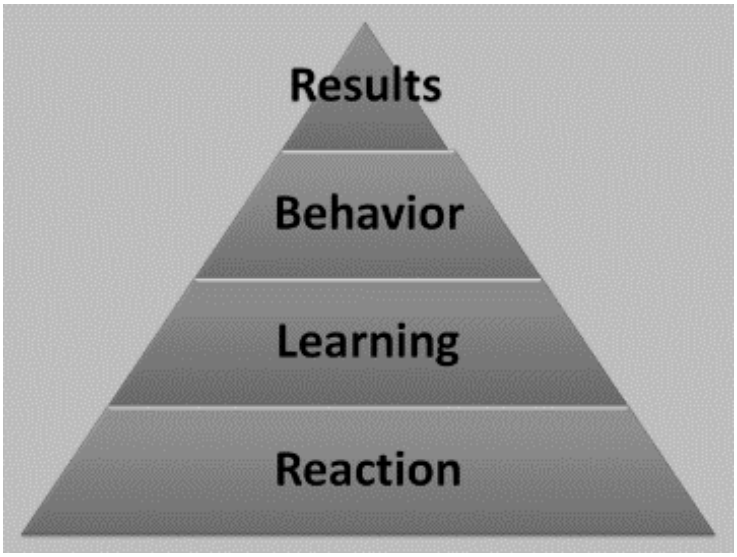
Finally, numerous variables are responsible for the successful achievement of training goals. For example, participant motivation, training expectations, and individual characteristics could not be controlled. In an attempt to compensate, fixed classes were selected, class instructors remained present throughout all training and test taking and time allotted to complete the study was only done during scheduled class time. This allowed for a structured test environment, known to the participants and reduced anxiety which may affect test results.

### 5.3 Future Study

Further study is highly recommended in the field of ergonomics training and knowledge retention with a larger student sample size. Quantitatively, the results would be much more significant and indicative of the college population in the Middle East if the sample size was greater. In addition, a further evaluation of ergonomics training is recommended. According to Kirkpatrick evaluation methodology (1959), it is recommended to test if the information attained during the ergonomic training program is being carried out in day-to-day activities. This may be completed with an evaluation of the student's postures while working with mobile equipment after the ergonomics training. Such an assessment could evaluate if the information attained affected the non-neutral postures previously observed prior to the training (see Appendix 6).

In addition, future studies should not only evaluate test scores to determine success of a training program, it should also evaluate reaction, learning, behavior, and results (Kirkpatrick, 1994: see

Figure 5). The Kirkpatrick model was developed by Donald Kirkpatrick in 1959 and is widely used as an evaluation of training tool. According to this model, training is only successful when it meets all 4 levels.




**(Kirkpatrick, 1959)**

**Figure 5: Representation of Kirkpatrick's Model of Learning**

The present study on ergonomics training merely assessed learning: the extent knowledge, skills and attitudes changed as a result of the training. It is suggested that future ergonomics training programs evaluate success using not merely the learning tool, but also the remaining three tools developed by Kirkpatrick, including:

1. Reaction: the extent the participants found the training useful, challenging, organized and effective;
2. Behavior: the extent participants changed their behavior and continued to practice what is learned as a result of the training; and
3. Results: the measurable benefits resulting from the training

To successfully evaluate a training program the following must be implemented (in addition to learning): a) at level 1 (reaction), participants could complete a feedback questionnaire following training sessions, b) at level 3 (behavior), participants could complete self-assessments or

participate in spot evaluations, and c) level 4 (results), participants could undergo inspections or review of CNA-Q MSI symptom reports.

As the Middle East is lacking ergonomic awareness, it is vital that strategies to improve ergonomic awareness be as influential as possible. To ensure its success and thus improved knowledge, the training program that is recommended must be successful. However, as the results of the present study show, the method of delivery does not affect long term retention.

Research has shown that if an ergonomic program is implemented and successful, the number of MSIs would decrease and the severity of the injuries would be lesser on the human body. It should be noted however, that ergonomics training is not noted in the Qatar Labor Law, and as a result does not have a priority standing among employers in this geographical region. As a result, many employers have not begun to realize its importance in relation to economic, legal and/or moral obligations.

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# Appendix 1: Ethics Approval

COLLEGE OF THE NORTH ATLANTIC QATAR

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Doha-Qatar
E-mail: info@can-qatar.edu.qa
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Main Campus-Duhail
(Next to Qatar University)
Tel: +974 4952222
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Rayyan Campus
Al Forousiya Road
Tel: +974 4825555
Fax: +974 4825500

Pauline Hickey
School of Health Sciences
College of the North Atlantic-Qatar

February 27, 2014

Dear Pauline:

Thank you for submitting your request for ethical review of your planned research on **"A Quantitative Study of the Value of Ergonomic Training at the College of the North Atlantic, Qatar campus"**. Your request was considered on February 26, 2014. The following documents were reviewed:

1. CNA-Q Expedited Ethical Review Application
2. Thesis Proposal
3. Ergonomic Knowledge Questionnaire
4. Consent Form for Research Participants

The College of the North Atlantic-Qatar's IRB exempts this study from ethical review based on Qatar's ***Supreme Council for Health Guidelines, Regulations and Policies for Research Involving Human Subjects***

> *(1) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.*

The College of the North Atlantic-Qatar's IRB approves this study for a one year period. Please inform the College's IRB when the research has been completed. Any adverse events or significant change which occurs in connection with this study and/or which may alter its ethical consideration must be reported immediately to the College's IRB, and be accompanied by a description of those events and/changes. A determination on such a matter will be forthcoming within a two week period after notification of any events and/or changes.

Approval is given on the understanding that the guidelines for ethical research practice, as outlined by Canada's Tri-Council and Qatar's Supreme Council for Health, are adhered to.

We wish you every success with your research program.

Sincerely,

Bruce MacRae
Chair, CNA-Q Institutional Review Board

MEMORIAL UNIVERSITY

Interdisciplinary Committee on
Ethics in Human Research (ICEHR)

[illegible]

| | |
|---|---|
| ICEHR Number: | 20141106-HK |
| Approval Period: | March 14, 2014 – March 31, 2015 |
| Funding Source: | |
| Responsible Faculty: | Dr. Scott MacKinnon<br>School of Human Kinetics and Recreation |
| Title of Project: | *A quantitative study of the value of ergonomic training at the College of the North Atlantic, Qatar campus* |

March 14, 2014

Ms. Pauline Hickey
School of Human Kinetics and Recreation
Memorial University of Newfoundland

Dear Ms. Hickey,

Thank you for your email correspondence of March 9, 2014 addressing the issues raised by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) concerning the above-named research project.

The ICEHR has re-examined the proposal with the clarification and revisions submitted, and is satisfied that the concerns raised by the Committee have been adequately addressed. In accordance with the *Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans (TCPS2)*, the project has been granted *full ethics clearance* to March 31, 2015.

If you need to make changes during the course of the project, which may raise ethical concerns, please forward an amendment request form with a description of these changes to icehr@mun.ca for the Committee's consideration.

The *TCPS2* requires that you submit an annual update form to the ICEHR before March 31, 2015. If you plan to continue the project, you need to request renewal of your ethics clearance, and include a brief summary on the progress of your research. When the project no longer requires contact with human participants, is completed and/or terminated, you need to provide the annual update form with a final brief summary, and your file will be closed.

The annual update form and amendment request form are on the ICEHR website at http://www.mun.ca/research/ethics/humans/icehrapplications/.

We wish you success with your research.

Yours sincerely,

Gail Wideman, Ph.D.
Vice-Chair, Interdisciplinary Committee on
Ethics in Human Research

GW/lb

copy: Supervisor – Dr. Scott MacKinnon, School of Human Kinetics and Recreation

# Appendix 2: Mobile Technology Usage Questionnaire

# Mobile Technology Usage Questionnaire

1. Please select your gender group
   - ☐ Male
   - ☐ Female

2. Please select your marital status
   - ☐ Single
   - ☐ Married

3. What is your age? _____

4. How many phones do you have?
   - ☐ 1
   - ☐ 2
   - ☐ 3
   - ☐ 4
   - ☐ Other: _____

5. What type of phone(s) do you use?
   - ☐ IPhone
   - ☐ Nokia
   - ☐ Samsung galaxy
   - ☐ IPad
   - ☐ Blackberry
   - ☐ Other: _____

6. When choosing to buy a mobile phone for personal use, what parts of the "look and feel" of the cell phone(s) are important to you when choosing? Feel free to rate more than one option.

| | **1 (lowest)** | **2** | **3** | **4** | **5 (highest)** |
|---|---|---|---|---|---|
| Screen size | ☐ | ☐ | ☐ | ☐ | ☐ |
| Buttons | ☐ | ☐ | ☐ | ☐ | ☐ |
| Color | ☐ | ☐ | ☐ | ☐ | ☐ |
| Weight | ☐ | ☐ | ☐ | ☐ | ☐ |
| Keypad | ☐ | ☐ | ☐ | ☐ | ☐ |
| Touchscreen | ☐ | ☐ | ☐ | ☐ | ☐ |
| Comfort in hand | ☐ | ☐ | ☐ | ☐ | ☐ |
| Speed of information | ☐ | ☐ | ☐ | ☐ | ☐ |

7. What size would you prefer the screen to be?
   - Small (2.5-6.0 cm)
   - Medium (6.1-9.0cm)
   - Large (9.1-11cm)

8. What size of the handset would you prefer?
   - Small
   - Medium
   - Large

9. What method of transaction do you prefer when using mobile phones for personal use? Feel free to rate more than one option.

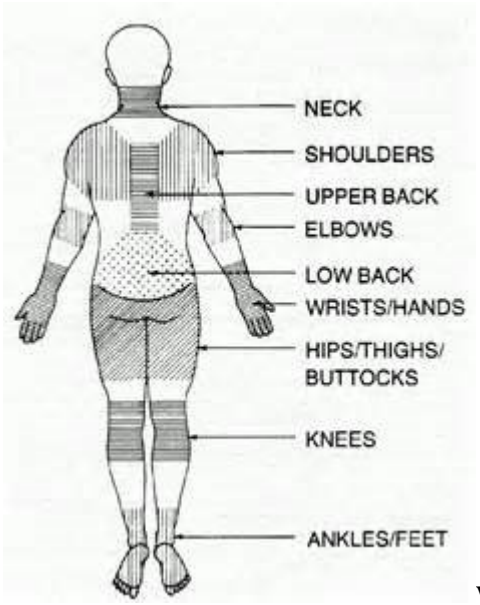
| | **1 (lowest)** | **2** | **3** | **4** | **5 (highest)** |
|---|---|---|---|---|---|
| Touch screen | | | | | |
| Keypad | | | | | |
| Physical button | | | | | |

10. What accessories do you have with your mobile phone(s)?
   - Earplugs
   - Microphone
   - Mounting tray
   - Other: _____

11. How long do you use the phone per day?
   - Less than 30 minutes per day
   - More than 60 minutes per day
   - More than 90 minutes per day
   - More than 120 minutes per day

12. How often do you use the cell phone per day?
   - Never
   - Rarely
   - Sometimes
   - Quite Often
   - Almost always

13. Indicate on the following diagram, where you feel any pain during or immediately after mobile phone use.




www.users.globalnet.co.uk

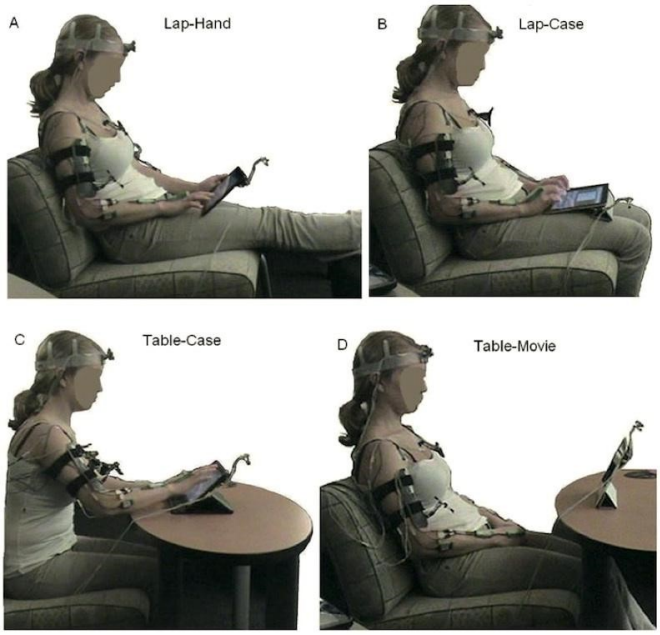
14. When texting on your phone, how do you usually position thumbs and fingers?
    - ☐ With one (1) thumb
    - ☐ With two (2) thumbs
    - ☐ With one (1) finger

15. How often have you had problems with your sleep these past 30 days (e.g. difficulties falling asleep, repeated awakenings, waking up too early)?
    - ☐ Never
    - ☐ Only occasionally
    - ☐ A few times a month
    - ☐ A few times per week
    - ☐ Almost every day

16. During the past month, have you been bothered by little interest or pleasure in doing things
    - ☐ Yes
    - ☐ No

17. During the past month have you been feeling down, depressed or hopeless?
    - ☐ Yes
    - ☐ No

18. When using your mobile technology (i.e. tablet, IPad, etc.), what position is your usual way of positioning the computer? Please circle A, B, C or D.




Harvard School of Public Health

Thank you for completing this questionnaire.

# Appendix 3: Informed Consent

**Informed Consent Form**

Title: **A Quantitative Study of the Value of Ergonomic Training at the College of the North Atlantic, Qatar campus.**

Researcher(s): Pauline Hickey, B.A., B.A.Sc., CRSP, student
Graduate Studies in Biomechanics/Ergonomics
+974 5548 7479
d65pah@mun.ca

You are invited to take part in a research project entitled "**A Quantitative Study of the Value of Ergonomic Training at the College of the North Atlantic, Qatar campus".**

This form is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. It also describes your right to withdraw from the study at any time. In order to decide whether you wish to participate in this research study, you should understand enough about its risks and benefits to be able to make an informed decision. This is the informed consent process. Take time to read this carefully and to understand the information given to you. Please contact the researcher, Pauline Hickey, any questions about the study or for more information not included here before you consent.

It is entirely up to you to decide whether to take part in this research. If you choose not to take part in this research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

**Introduction**

Firstly, I would like to introduce myself. My name is Pauline Hickey and I am an instructor of Environmental Health and Safety at the College of the North Atlantic, Qatar campus. As part of my Master's thesis at Memorial University of Newfoundland, I am conducting research under the supervision of Dr. Scott Mackinnon.

**Purpose of study:**

The purpose of this research is to investigate the effectiveness of ergonomic training and how long the information is retained in the Middle Eastern student population at the College of the North Atlantic - Qatar campus.

**What you will do in this study:**

You have been invited to participate in this research because you, as a student, will be a very valuable asset in determining time requirements in knowledge acquisition in the field of ergonomics.

Throughout the course of this study, you will be asked to participate in 1 of 3 randomly selected groups, either receiving ergonomic training lead by an Occupational Health and Safety instructor, self-directed ergonomic training or receive no training. Pre and post-test scores will be calculated to determine the effectiveness of the training and the extent of knowledge acquisition. During this time, you may be asked questions regarding the extent of mobility usage, frequency, severity and location of musculoskeletal pain.

**Length of time:**

In the Fall 2014 academic semester, specifically during the months of October and November, your time commitment in this study will depend on the group you are assigned. Groups A and B will be asked to dedicate 5 hours to complete both pre and post-testing and participate in the training session. Group C will be requested to dedicate 2 hours to complete the pre and post-testing components.

**Withdrawal from the study:**

You can withdraw your participation in this research at any time. Your data will be destroyed if you withdraw prior to November 9, 2014. If you withdraw after this date, your data will be

included, but will be de-identified (identifying information removed) and in aggregate form. There will be no consequences to you due to your withdrawal from the study.

**Possible benefits:**

The benefits of participating in this research project include providing you, the student, the opportunity to participate in evaluating teaching methods in the field of ergonomics. The results of this study will be instrumental in determining the value of ergonomic training and its effect on short term and long term learning.

**Possible risks:**

Foreseeable risks in participating in this research are minimal. It is possible that participating in testing could be stressful to you. You will always have the option to withdraw from the study at any time. If requested, a meeting with a campus Guidance Counselor will be arranged.

**Confidentiality vs. Anonymity**

There is a difference between confidentiality and anonymity: Confidentiality is ensuring that identities of participants are accessible only to those authorized to have access. Anonymity is a result of not disclosing participant's identifying characteristics (such as name or description of physical appearance).

**Confidentiality and Storage of Data:**

Participation in this study is voluntary and confidential. No one, except the researcher and her supervisor, will be permitted to see any of the pre and post-test results. Hard copies of tests will be stored in a dedicated and locked cabinet off site of the campus. Data will be retained for a minimum of five years, as required by Memorial University policy on Integrity in Scholarly Research.

**Anonymity:**

You will have anonymity through the project. You will be assigned a pseudonym at the beginning of the project and its usage will continue throughout the study. Every reasonable effort will be made to assure your anonymity during testing and at no time will you be identified in any reports and publications without your explicit permission. Pre and post-testing and in person

ergonomics training will be conducted by another Occupational Health and Safety instructor to ensure identity of all participants will be unknown to the researcher.

**Reporting of Results:**

At the end of the research project, a thesis paper will be developed. It will be submitted to Dr. Scott MacKinnon of the School of Human Kinetics and Recreation, Memorial University, Canada.

The thesis paper will quantitatively use the information accumulated throughout the project. At no time will personally identifying information be reported.

**Sharing of Results with Participants:**

At the end of the project, if requested, participants will be provided with the research results, either through hard copy or electronically via College of the North Atlantic - Qatar email.

**Questions:**

You are welcome to ask questions at any time during your participation in this research. If you would like more information about this study, please contact:

Pauline Hickey
Environmental Health and Safety Instructor
School of Health Science
Office 19-2-19
4495-2491 (office) or 5548-7479 (mobile)
d65pah@mun.ca

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca, or by telephone at 001-709-864-2861 or you may contact Mr. Bruce MacRae, Chair, Institutional Review Board at bruce.macrae@cna-qatar.edu.qa or by telephone at 4495-2600.

**Consent:**

Your signature on this form means that:

- You have read the information about the research.
- You have been able to ask questions about this study.
- You are satisfied with the answers to all your questions.
- You understand what the study is about and what you will be doing.
- You understand that you are free to withdraw from the study at any time, without having to give a reason, and that doing so will not affect you now or in the future.
- You understand that any data collected from you up to the point of your withdrawal will be destroyed.

If you sign this form, you do not give up your legal rights and do not release the researchers from their professional responsibilities.

**Your signature:**

I have read what this study is about and understood the risks and benefits. I have had adequate time to think about this and had the opportunity to ask questions and my questions have been answered.

☐ I agree to participate in the research project understanding the risks and contributions of my participation, that my participation is voluntary, and that I may end my participation at any time.

☐ I agree to participate in pre and post testing.

☐ I agree, if applicable, to participate in the ergonomics training session.

A copy of this Informed Consent Form has been given to me for my records.

_____ _____

Signature of Participant Date

**Researcher's Signature:**

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

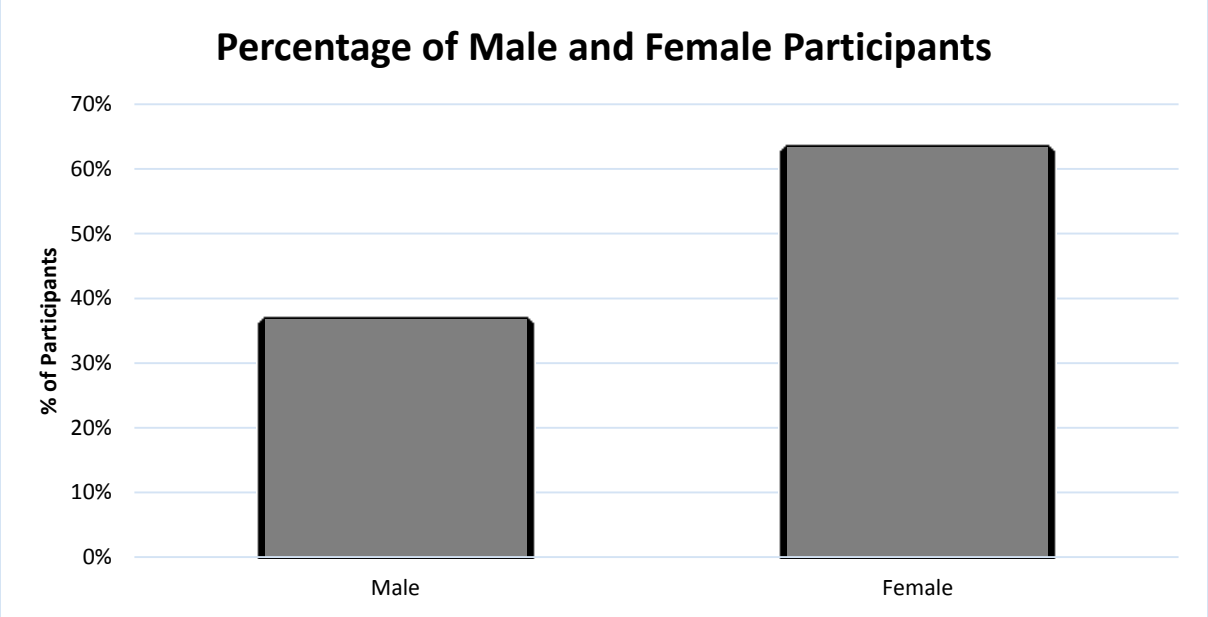
_____ _____

Signature of Principal Investigator Date

# Appendix 4: Statistical Analysis of Mobile Usage Questionnaire

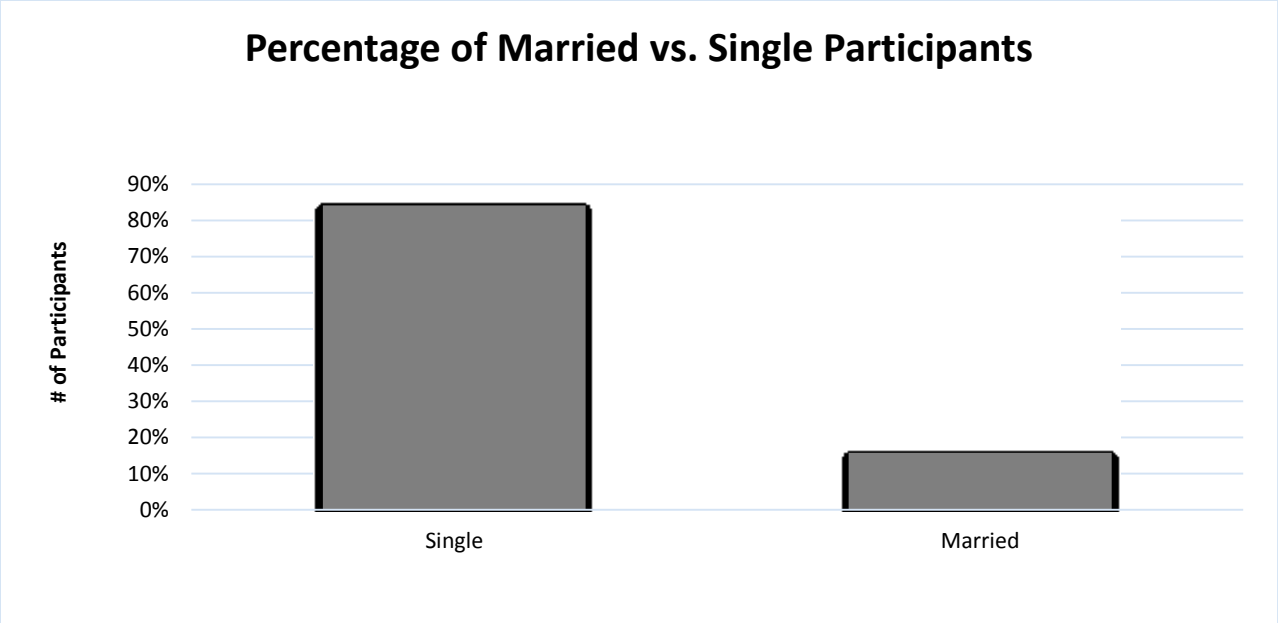
1. Please select your gender group

| Gender | # of Respondents | % of Population |
|---|---|---|
| Male | 89 | 39.0% |
| Female | 139 | 61.0% |



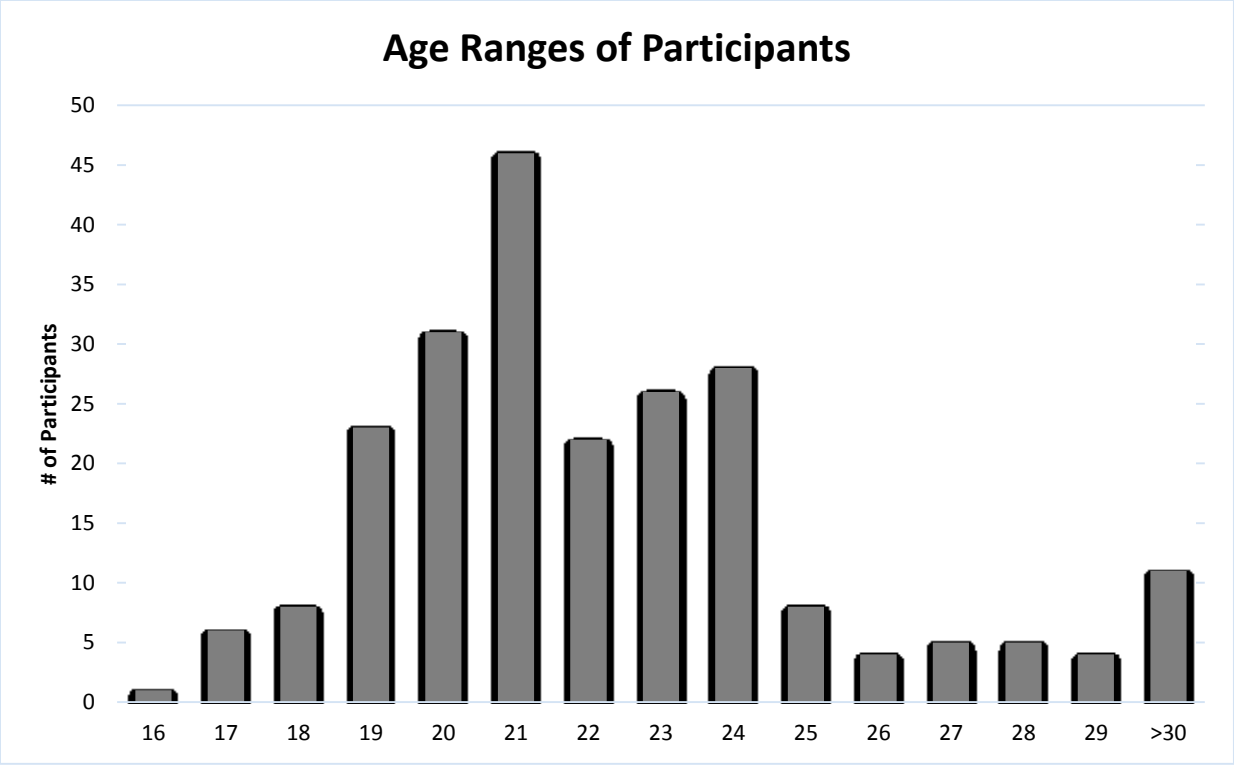

2. Please select your marital status

| Marital Status | # of Respondents | % of Population |
|---|---|---|
| Single | 192 | 84.2% |
| Married | 36 | 15.8% |



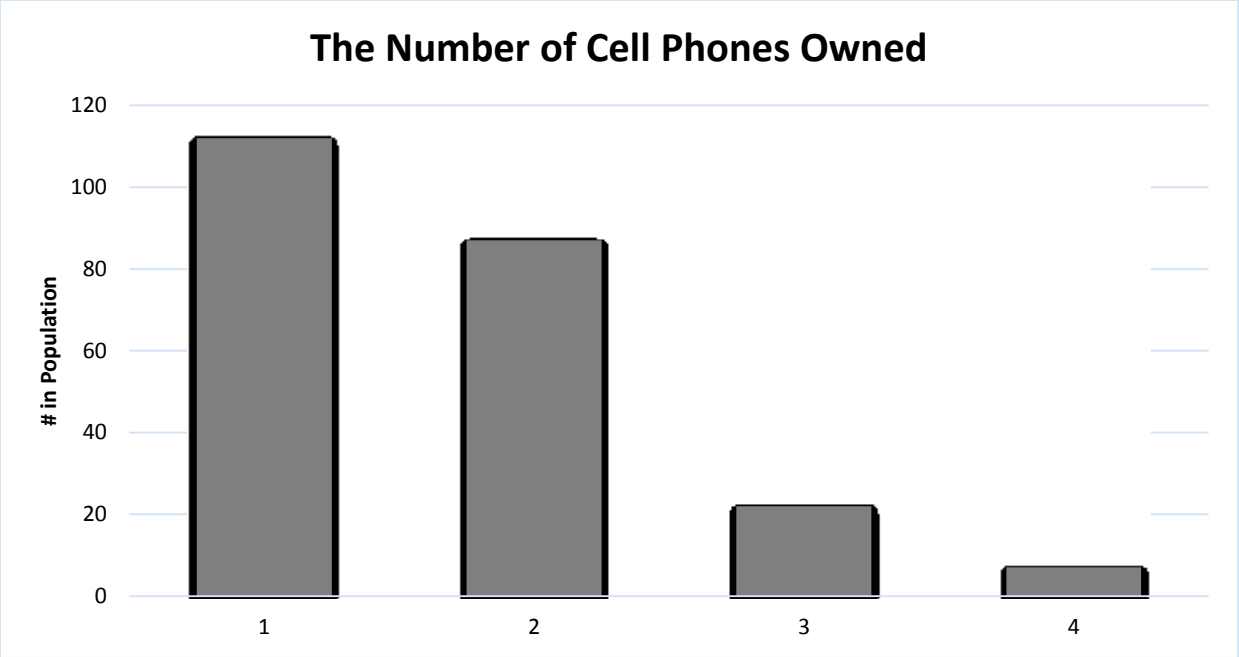

3. What is your age?

| Age | # of Respondents | % of Population |
|---|---|---|
| 16 | 1 | 0.4% |
| 17 | 6 | 2.6% |
| 18 | 8 | 3.5% |
| 19 | 23 | 10.1% |
| 20 | 31 | 13.6% |
| 21 | 46 | 20.2% |
| 22 | 22 | 9.6% |
| 23 | 26 | 11.4% |
| 24 | 28 | 12.3% |
| 25 | 8 | 3.5% |
| 26 | 4 | 1.8% |
| 27 | 5 | 2.2% |
| 28 | 5 | 2.2% |
| 29 | 4 | 1.8% |
| >30 | 11 | 4.8% |



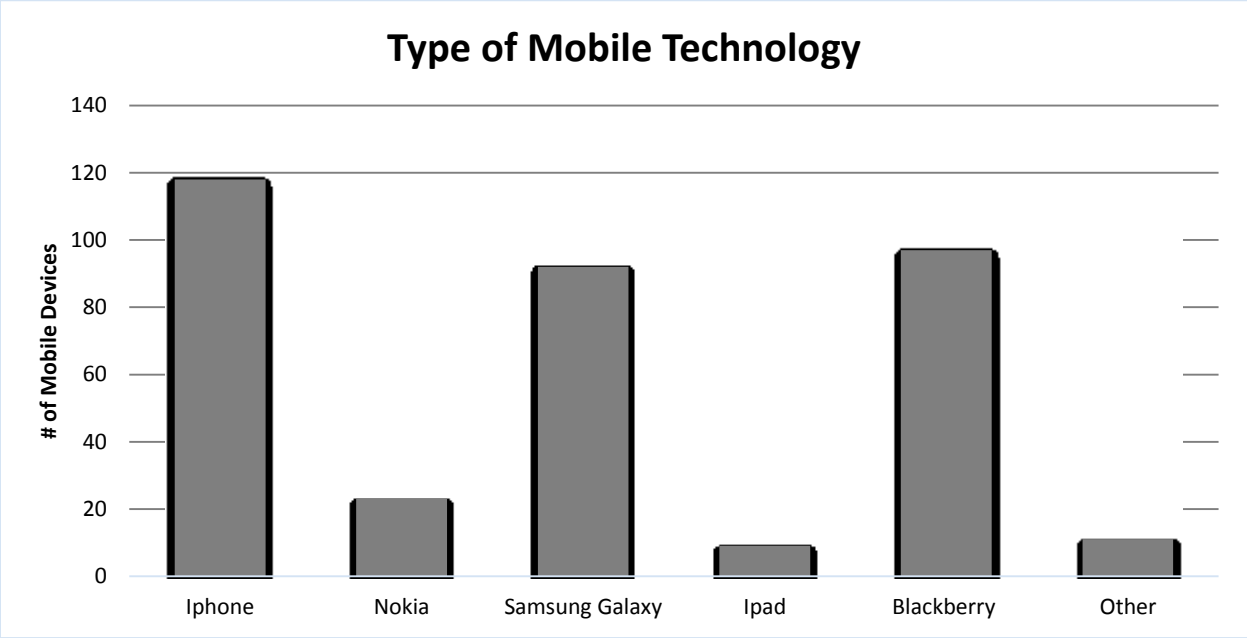

4. How many phones do you have?

| # of Cell Phones | # of Respondents | % of Population |
|---|---|---|
| 1 | 112 | 49.1% |
| 2 | 87 | 38.2% |
| 3 | 22 | 9.6% |
| 4 or more | 7 | 3.1% |


The Number of Cell Phones Owned
# in Population
120
100
80
60
40
20
0
1
2
3
4

5. What type of phone(s) do you use?

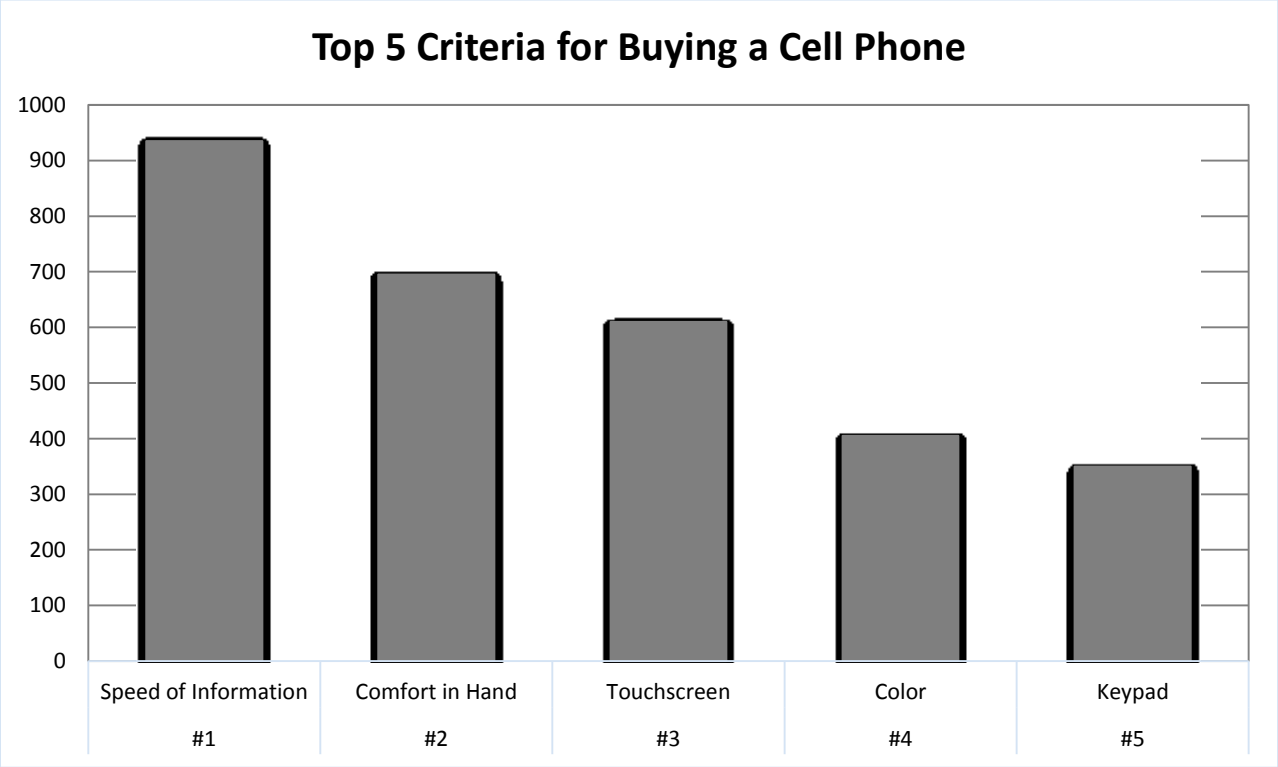
| Cell Phone Manufacturer | # of Respondents | % of Population |
|---|---|---|
| IPhone | 118 | 33.7% |
| Nokia | 23 | 6.6% |
| Samsung Galaxy | 92 | 26.3% |
| IPad | 9 | 2.6% |
| Blackberry | 97 | 27.7% |
| Other | 11 | 3.1% |




6. When choosing to buy a mobile phone for personal use, what parts of the "look and feel" of the cell phone(s) are important to you when choosing? Feel free to rate more than one option.

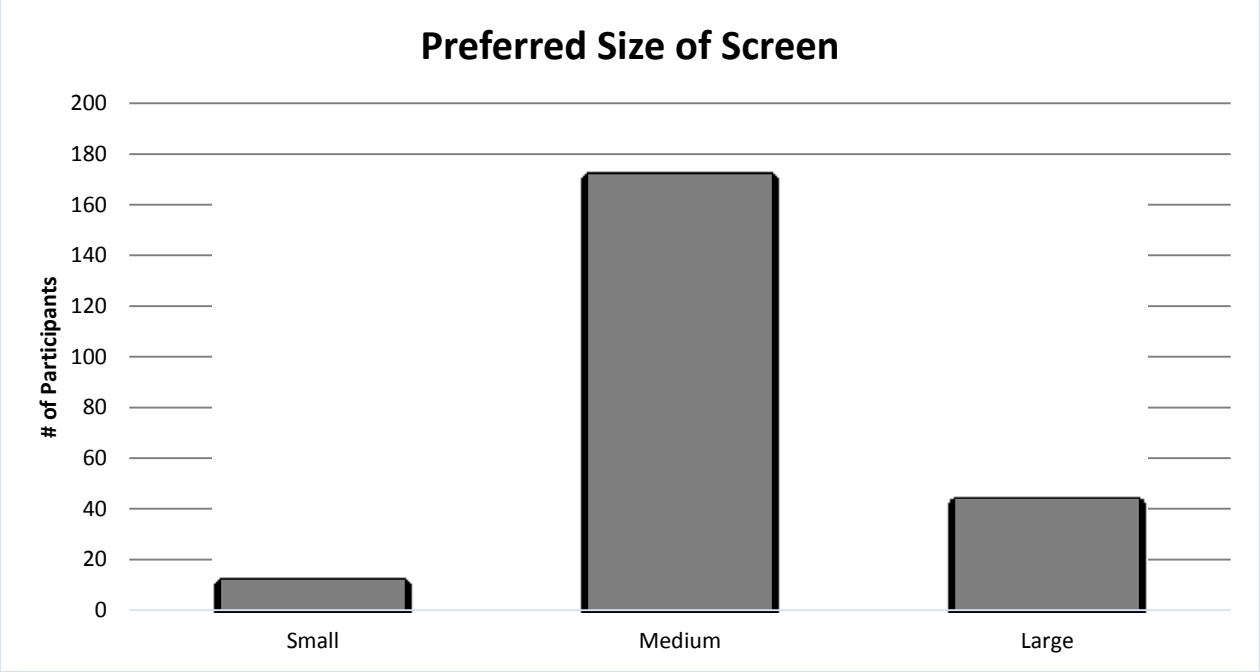
| | # | | Weight | # | | Weight | # | | Weight | # | | Weight | # | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | % of Pop. | Cat. Weight | 2 | % of Pop. | Cat. Weight | 3 | % of Pop. | Cat. Weight | 4 | % of Pop. | Cat. Weight | 5 | % of Pop. | Cat. Weight |
| Screen size | 6 | 2.6% | 6 | 13 | 5.7% | 26 | 61 | 26.8% | 183 | 70 | 30.7% | 280 | 77 | 33.8% | 385 |
| **Buttons** | **25** | **11.0%** | **25** | **26** | **11.4%** | **52** | **59** | **25.9%** | **177** | **59** | **25.9%** | **236** | **58** | **25.4%** | **290** |
| Color | 26 | 11.4% | 26 | 30 | 13.2% | 60 | 37 | 16.2% | 111 | 53 | 23.2% | 212 | 81 | 35.5% | 405 |
| **Weight** | **2** | **0.9%** | **2** | **36** | **15.8%** | **72** | **68** | **29.8%** | **204** | **59** | **25.9%** | **236** | **62** | **27.2%** | **310** |
| Keypad | 21 | 9.2% | 21 | 31 | 13.6% | 62 | 54 | 23.7% | 162 | 51 | 22.4% | 204 | 70 | 30.7% | 350 |
| **Touchscreen** | **6** | **2.6%** | **6** | **15** | **6.6%** | **30** | **39** | **17.1%** | **117** | **45** | **19.7%** | **180** | **122** | **53.5%** | **610** |
| Comfort in hand | 3 | 1.3% | 3 | 4 | 1.8% | 8 | 28 | 12.3% | 84 | 53 | 23.2% | 212 | 139 | 61.0% | 695 |
| **Speed of information** | **3** | **1.3%** | **3** | **2** | **0.9%** | **4** | **12** | **5.3%** | **36** | **23** | **10.1%** | **92** | **187** | **82.0%** | **935** |
| | 93 | 40.4% | 92 | 159 | 68.9% | 314 | 361 | 157.0% | 1074 | 417 | 181.1% | 1652 | 801 | 349.1% | 3980 |

| Ranking | Category | Weighted Score |
|---|---|---|
| #1 | Speed of Information | 935 |
| #2 | Comfort in Hand | 695 |
| #3 | Touchscreen | 610 |
| #4 | Color | 405 |
| #5 | Keypad | 350 |



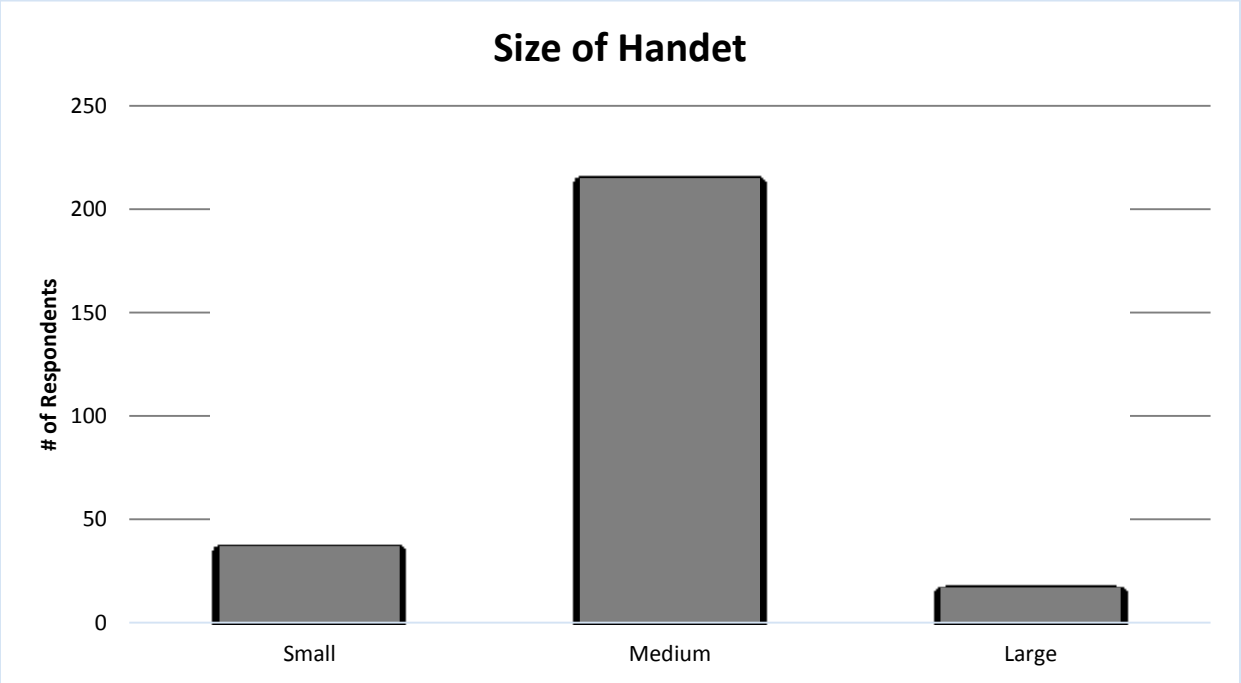

7. What size would you prefer the screen to be?

| Size of the Screen | # of Respondents | % of Population |
|---|---|---|
| Small (2.5-6.0cm) | 12 | 5.3% |
| Medium (6.1-9.0cm) | 172 | 75.4% |
| Large (9.1-11cm) | 44 | 19.3% |



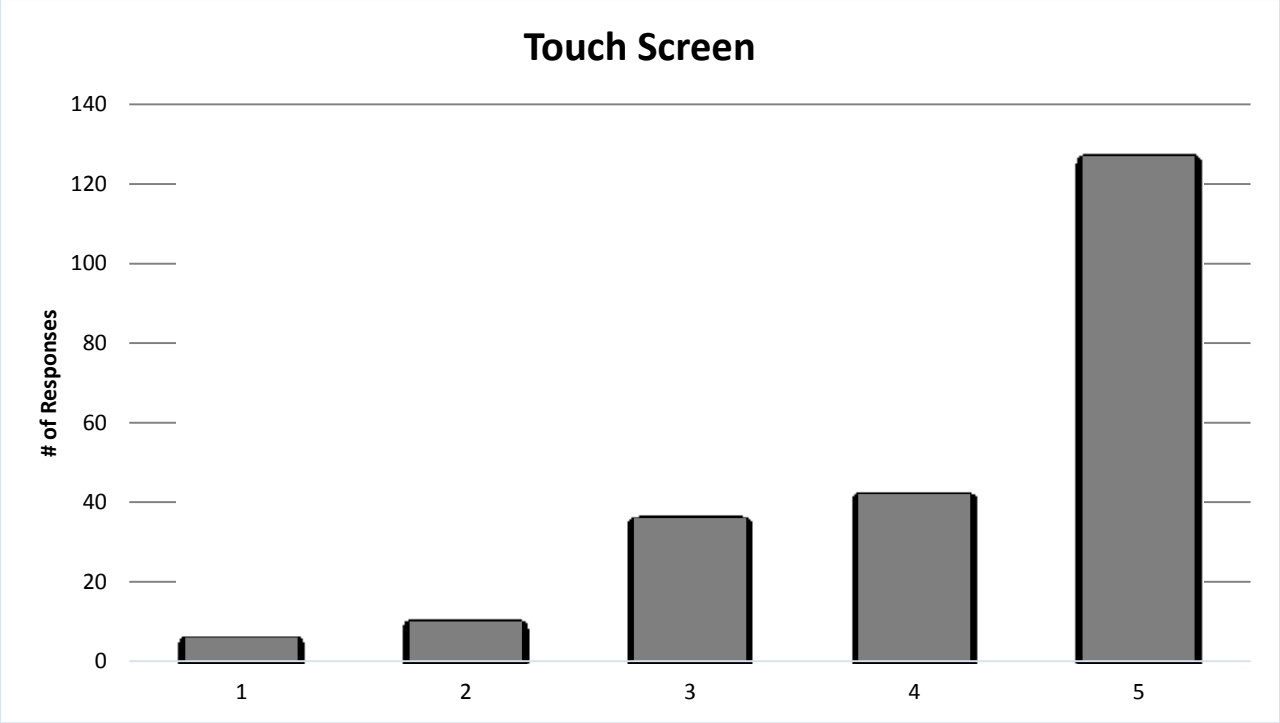

8. What size of the handset would you prefer?

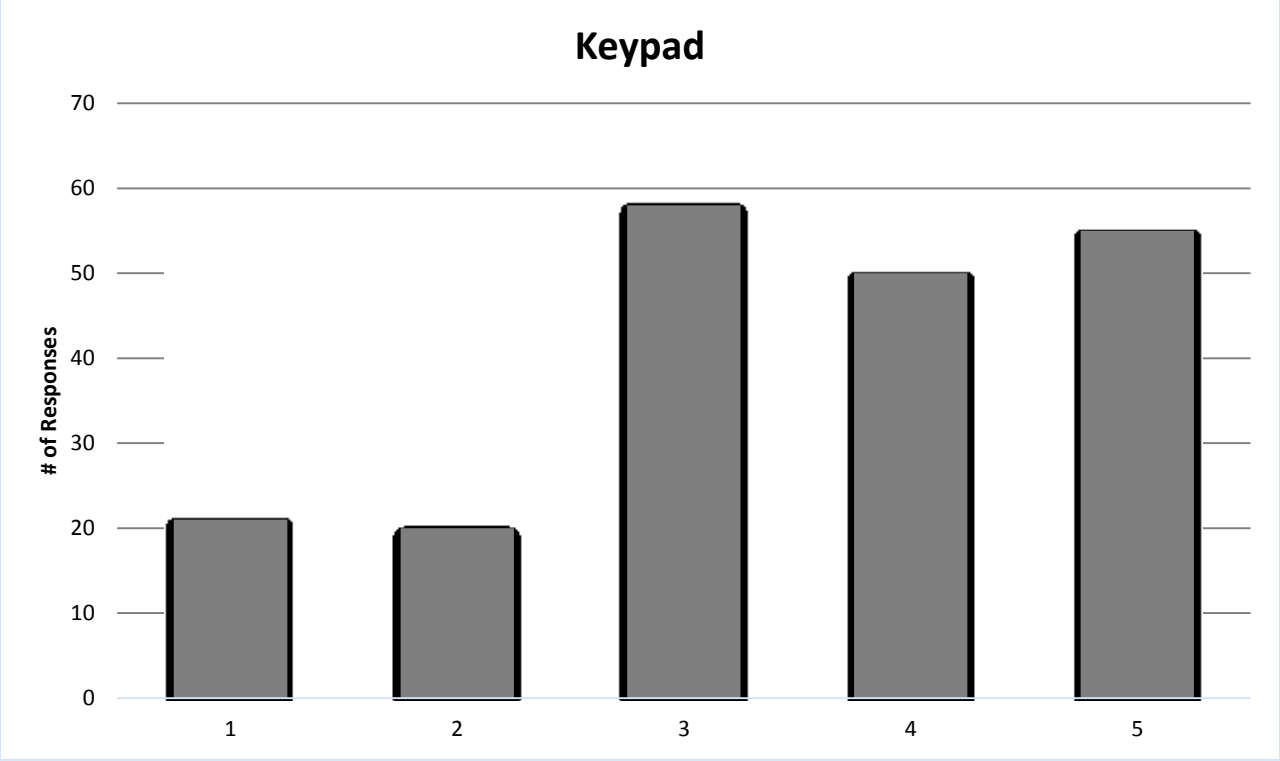
| Size of Handset | # of Respondents | % of Population |
|---|---|---|
| Small | 37 | 13.8% |
| Medium | 215 | 79.9% |
| Large | 17 | 6.3% |

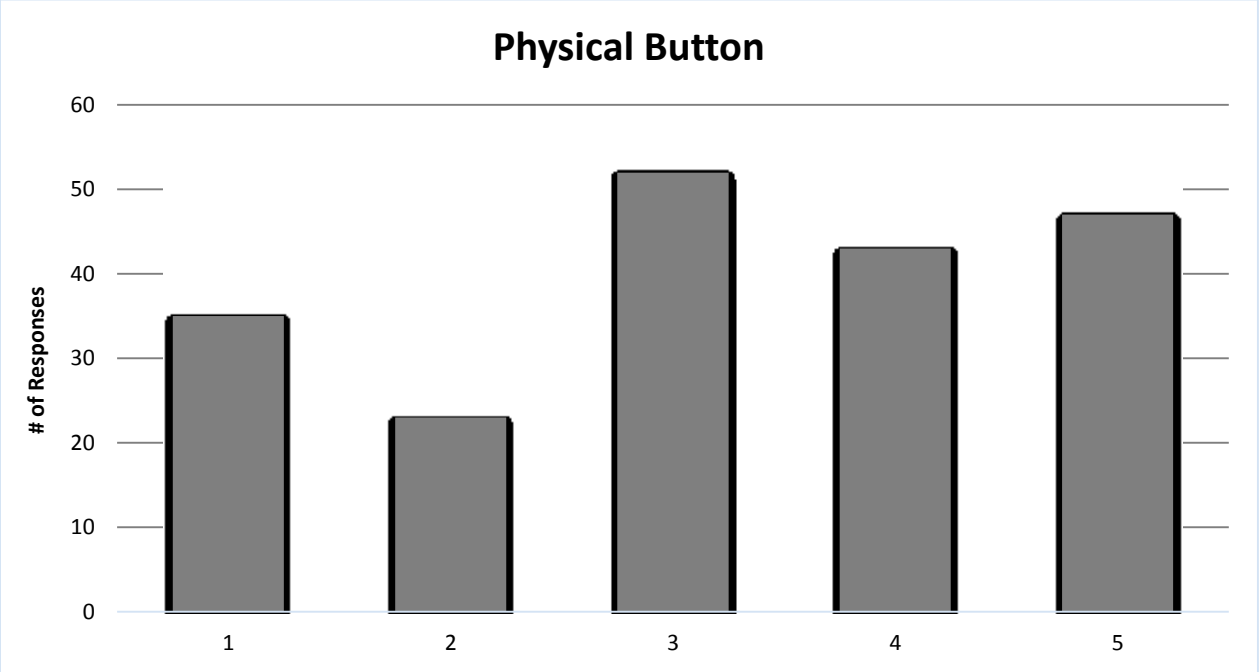


9. What method of transaction do you prefer when using mobile phones for personal use? Feel free to rate more than one option.

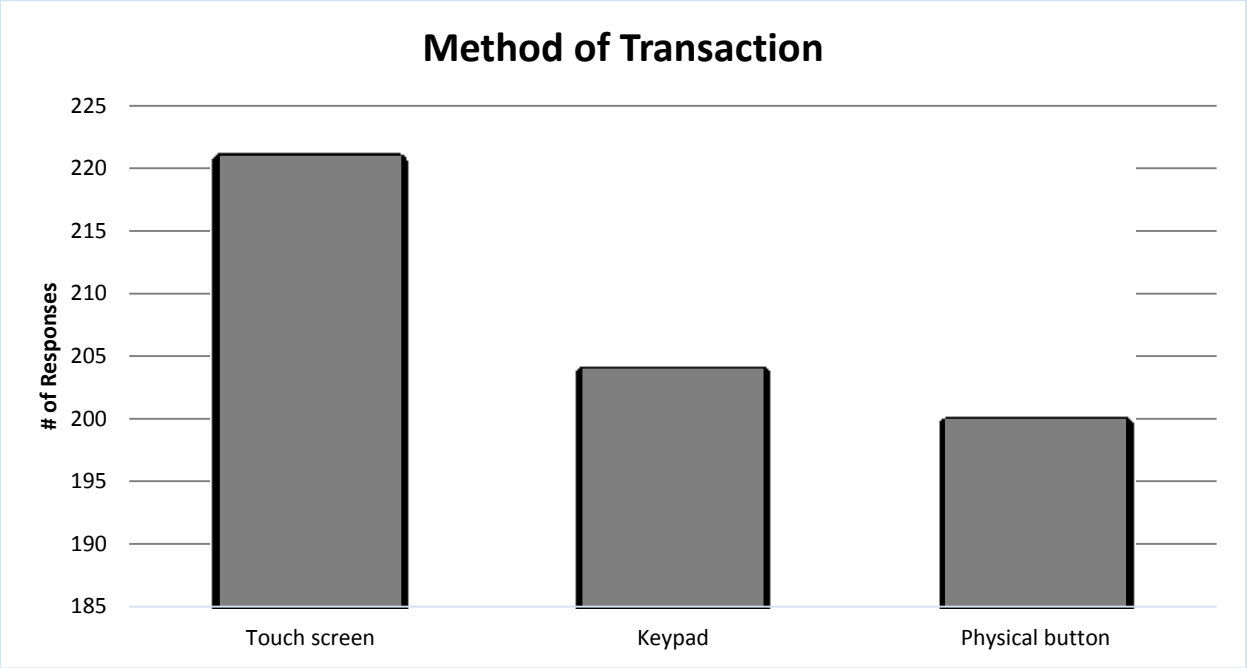
| | 1 (lowest) | % of Pop. | 2 | % of Pop. | 3 | % of Pop. | 4 | % of Pop. | 5 (highest) | % of Pop. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Touch screen** | **6** | **2.7%** | **10** | **4.5%** | **36** | **16.3%** | **42** | **19.0%** | **127** | **57.5%** | **221** |
| Keypad | 21 | 10.3% | 20 | 9.8% | 58 | 28.4% | 50 | 24.5% | 55 | 27.0% | 204 |
| **Physical button** | **35** | **17.5%** | **23** | **11.5%** | **52** | **26.0%** | **43** | **21.5%** | **47** | **23.5%** | **200** |
| | 62 | 30.5% | 53 | 25.8% | 146 | 70.7% | 135 | 65.0% | 229 | 107.9% | |

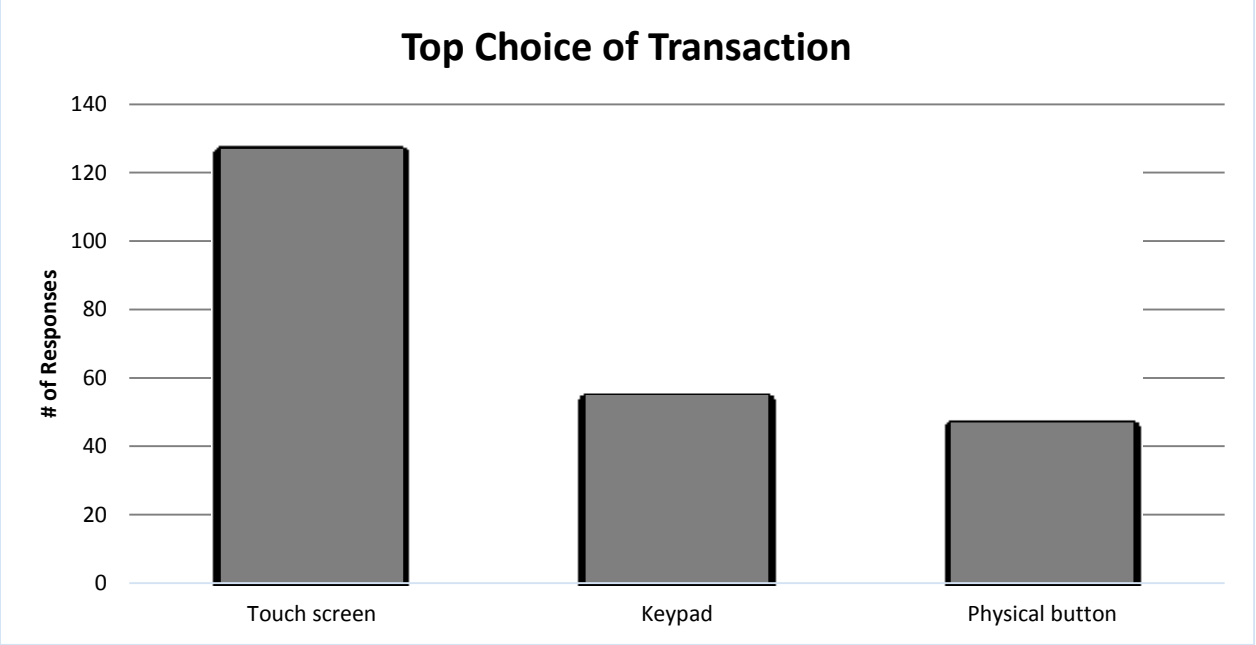




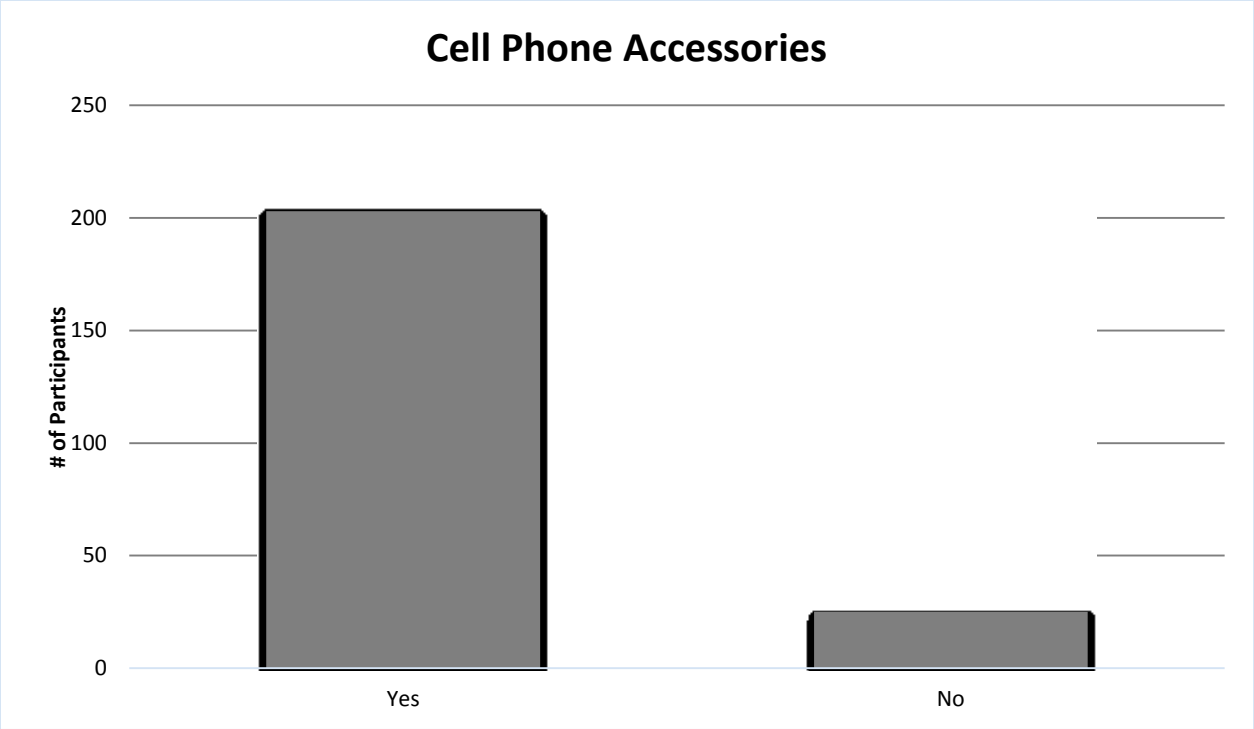

| Method of Transaction | Top Choice |
|---|---|
| Touch screen | 127 |
| Keypad | 55 |
| Physical button | 47 |



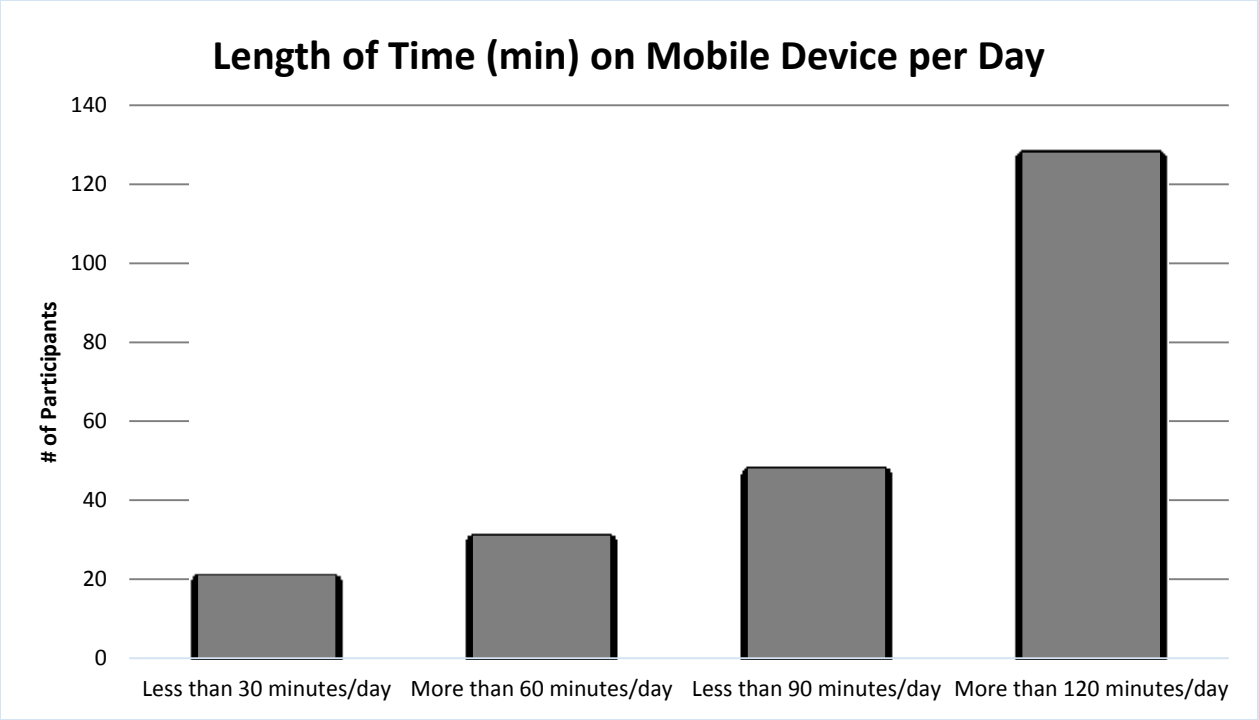

10. What accessories do you have with your mobile phone(s)?

| Accessories | # of Respondents | % of Population |
|---|---|---|
| Yes | 203 | 89.0% |
| No | 25 | 11.0% |



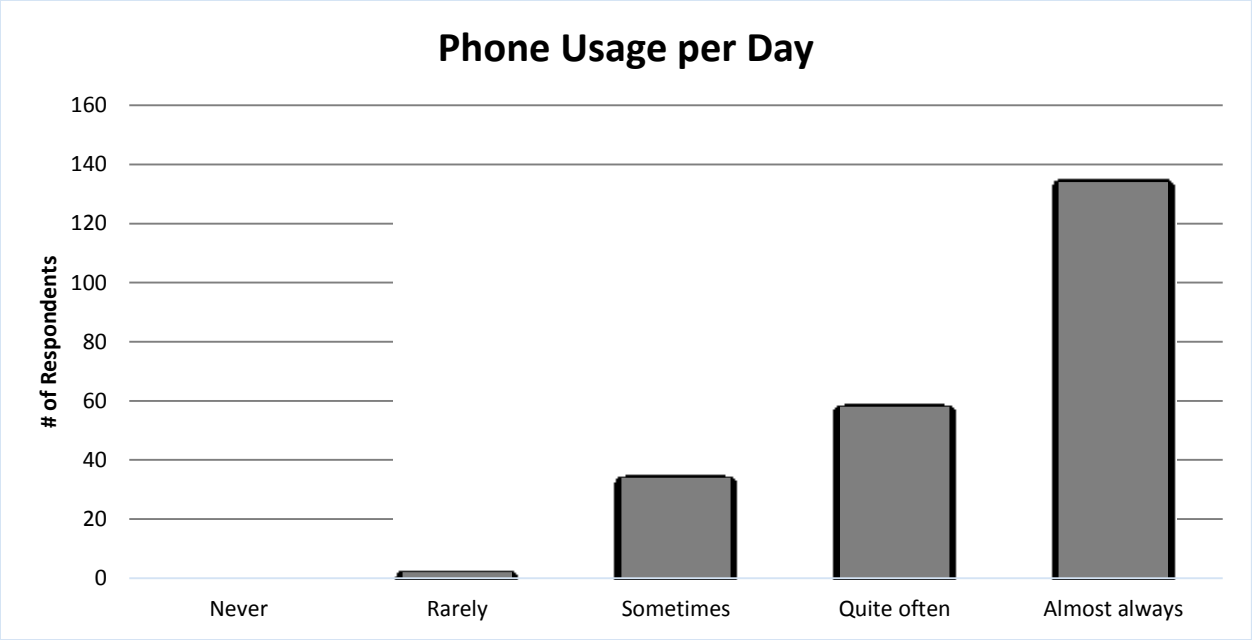

11. How long do you use the mobile phone per day?

| Length of Time on Phone per day | # of Respondents | % of Population |
|---|---|---|
| Less than 30 minutes/day | 21 | 9.2% |
| More than 60 minutes/day | 31 | 13.6% |
| Less than 90 minutes/day | 48 | 21.1% |
| More than 120 minutes/day | 128 | 56.1% |

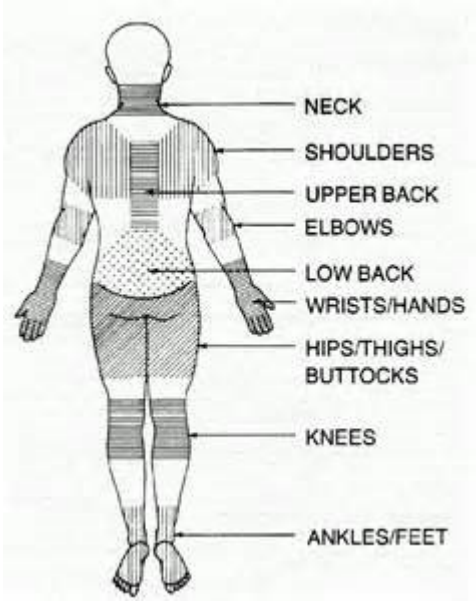



12. How often do you use the cell phone per day?

| Use of Phone per day | # of Respondents | % of Population |
|---|---|---|
| Never | 0 | 0.0% |
| Rarely | 2 | 0.9% |
| Sometimes | 34 | 14.9% |
| Quite often | 58 | 25.4% |
| Almost always | 134 | 58.8% |



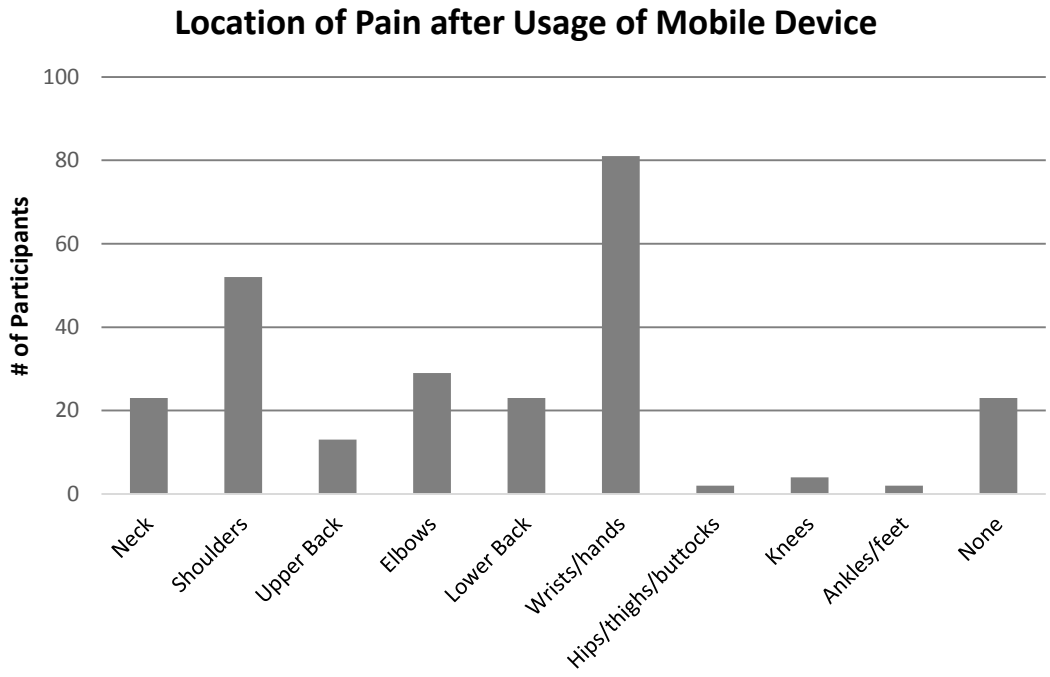

13. Indicate on the following diagram, where you feel any pain during or immediately after mobile phone use.




www.users.globalnet.co.uk

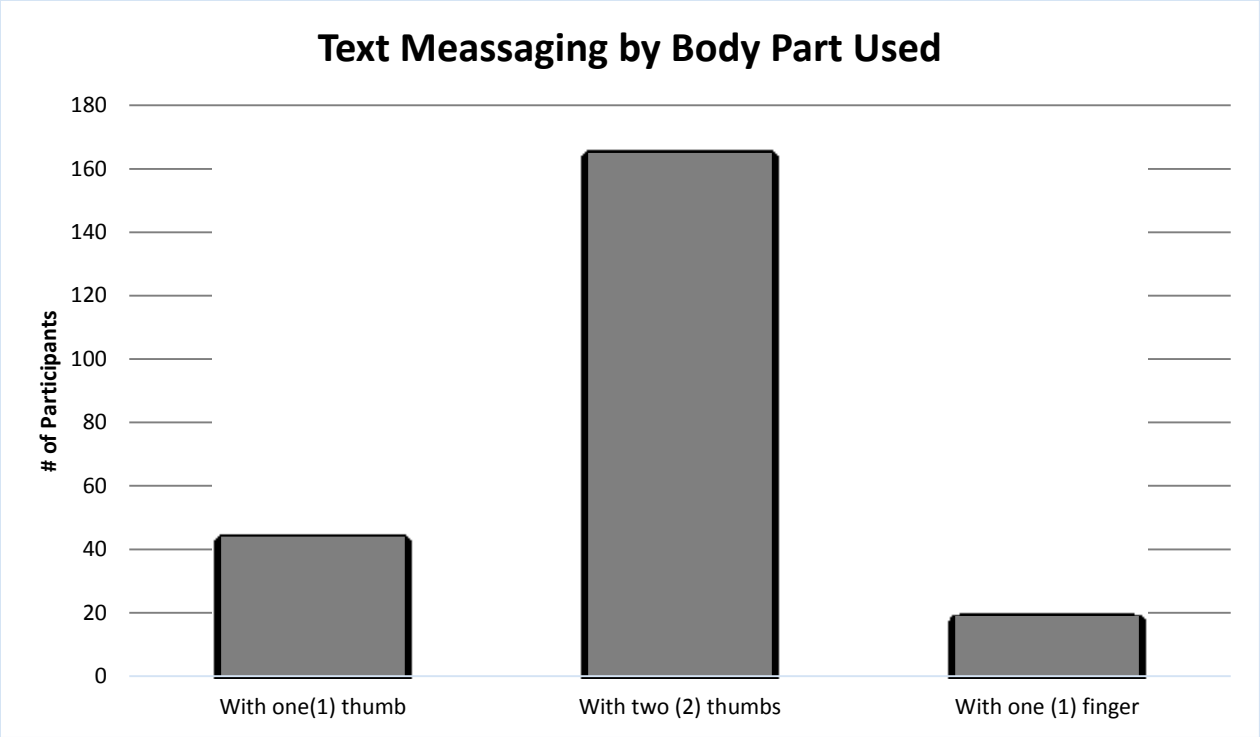
| Body part feeling pain | # of Respondents | % of Population |
|---|---|---|
| Neck | 123 | 33.1% |
| Shoulders | 52 | 14.0% |
| Upper back | 13 | 3.5% |
| Elbows | 29 | 7.8% |

| | | |
|---|---|---|
| Low back | 23 | 6.2% |
| Wrists/hands | 81 | 21.8% |
| Hips/thighs/buttocks | 2 | 0.5% |
| Knees | 4 | 1.1% |
| Ankles/feet | 2 | 0.5% |
| None | 43 | 11.6% |



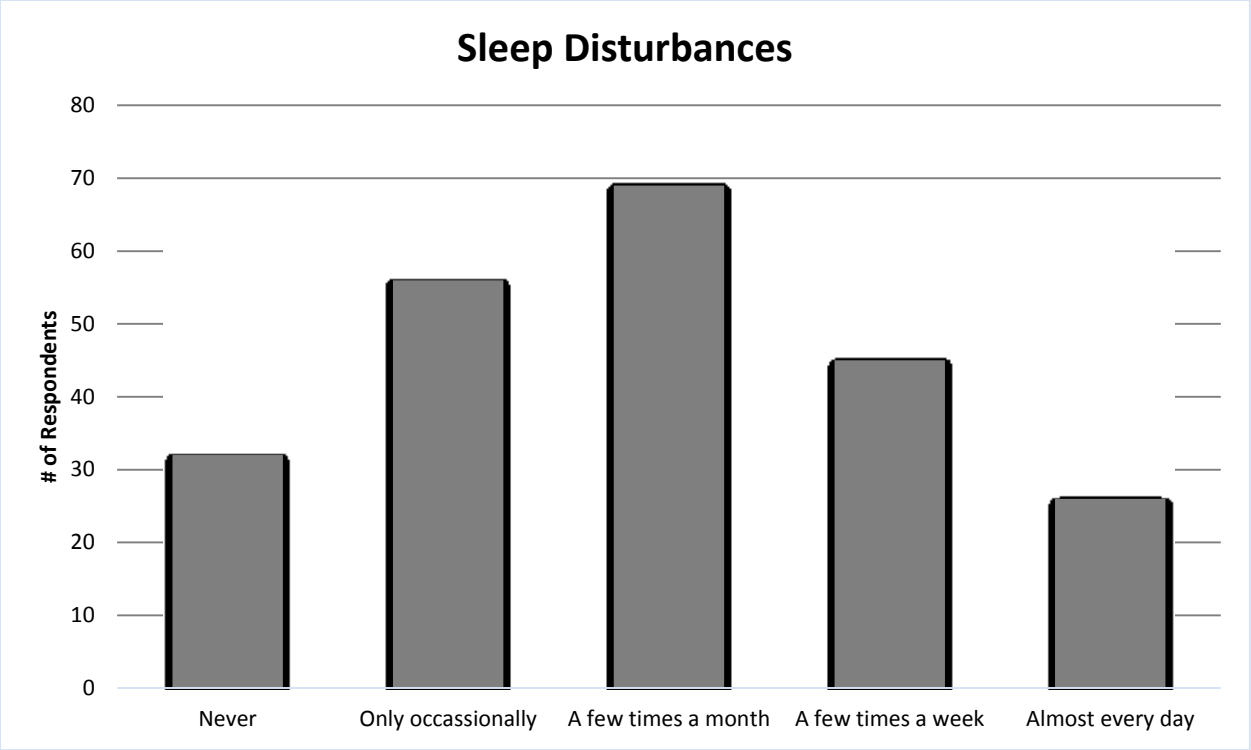

14. When texting on your phone, how do you usually position thumbs and fingers?

| **Position Thumb and Finger** | **# of Respondents** | **% of Population** |
|---|---|---|
| With one(1) thumb | 44 | 19.3% |
| With two (2) thumbs | 165 | 72.4% |
| With one (1) finger | 19 | 8.3% |



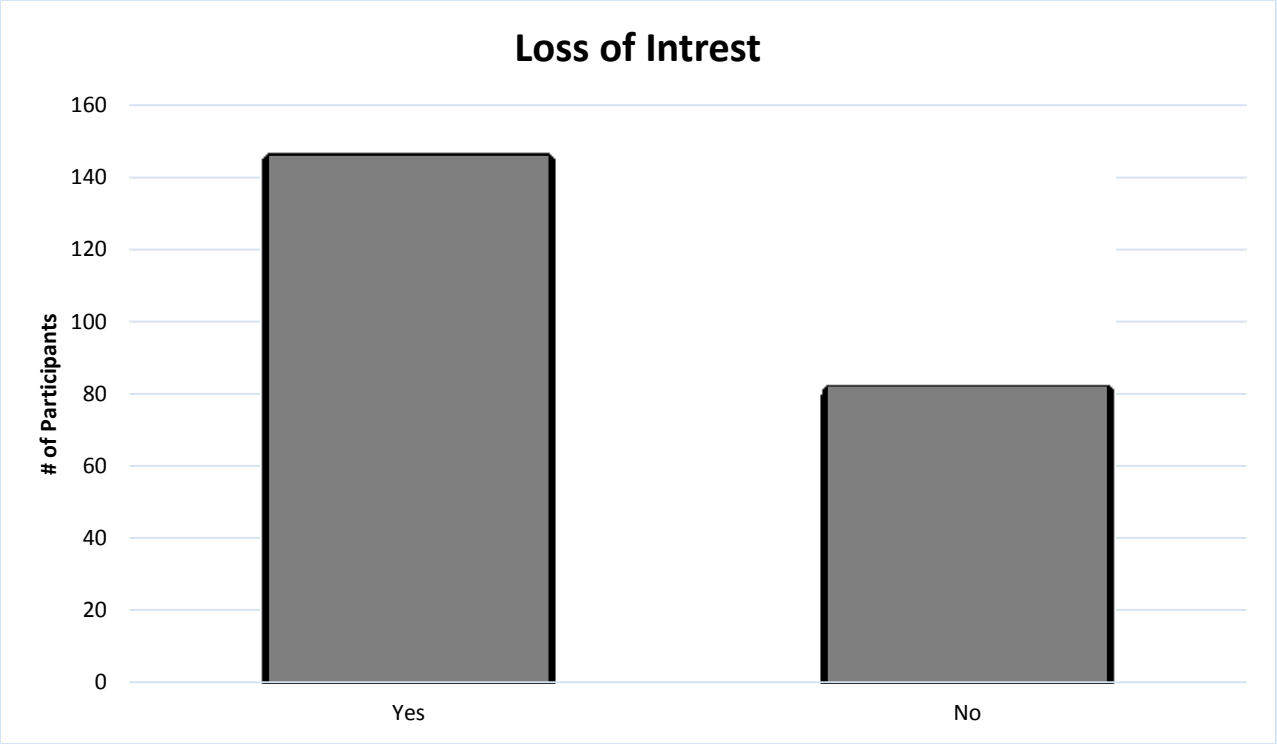

15. How often have you had problems with your sleep these past 30 days (e.g. difficulties falling asleep, repeated awakenings, waking up too early)?

| Sleep Problems over the past 30 days | # of Respondents | % of Population |
|---|---|---|
| Never | 32 | 14.0% |
| Only occasionally | 56 | 24.6% |
| A few times a month | 69 | 30.3% |
| A few times a week | 45 | 19.7% |
| Almost every day | 26 | 11.4% |



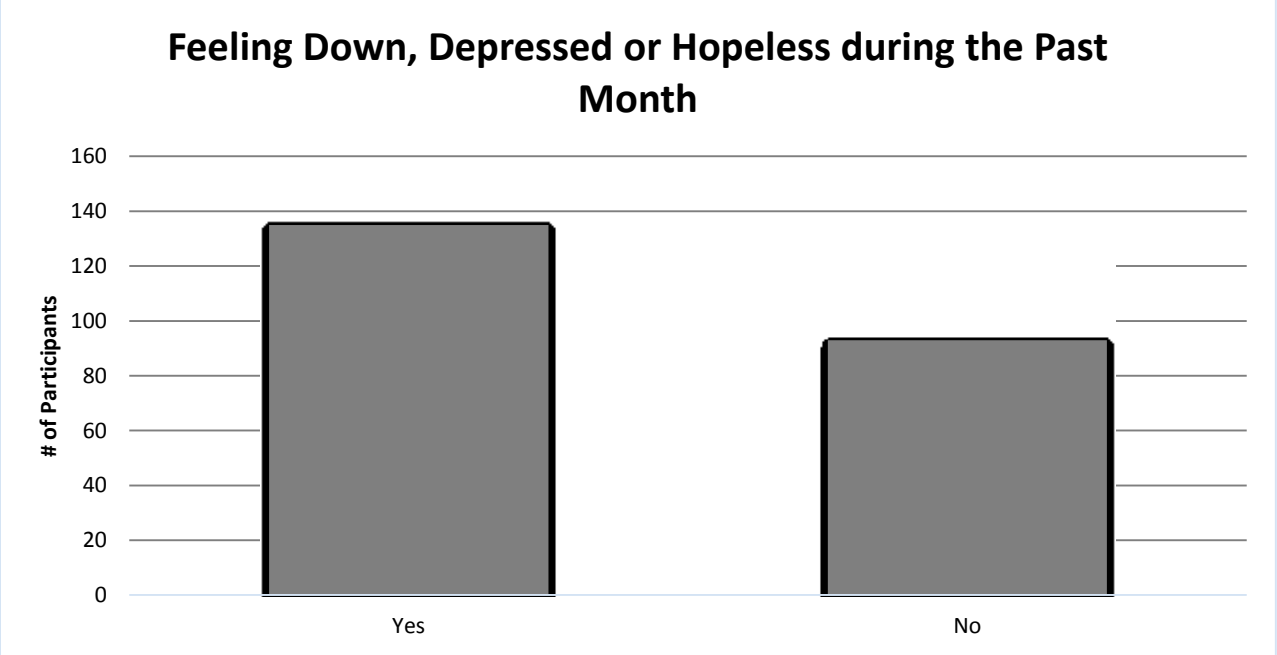

16. During the past month, have you been bothered by little interest or pleasure in doing things

| Loss of Interest or pleasure | # of Respondents | % of Population |
|---|---|---|
| Yes | 146 | 64.0% |
| No | 82 | 36.0% |

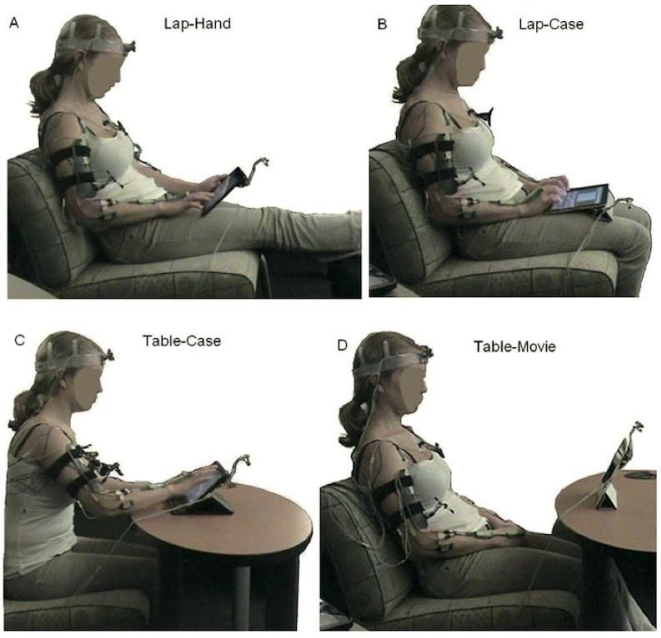



17. During the past month have you been feeling down, depressed or hopeless?

| Feeling down, depressed | # of Respondents | % of Population |
|---|---|---|
| Yes | 135 | 59.2% |
| No | 93 | 40.8% |

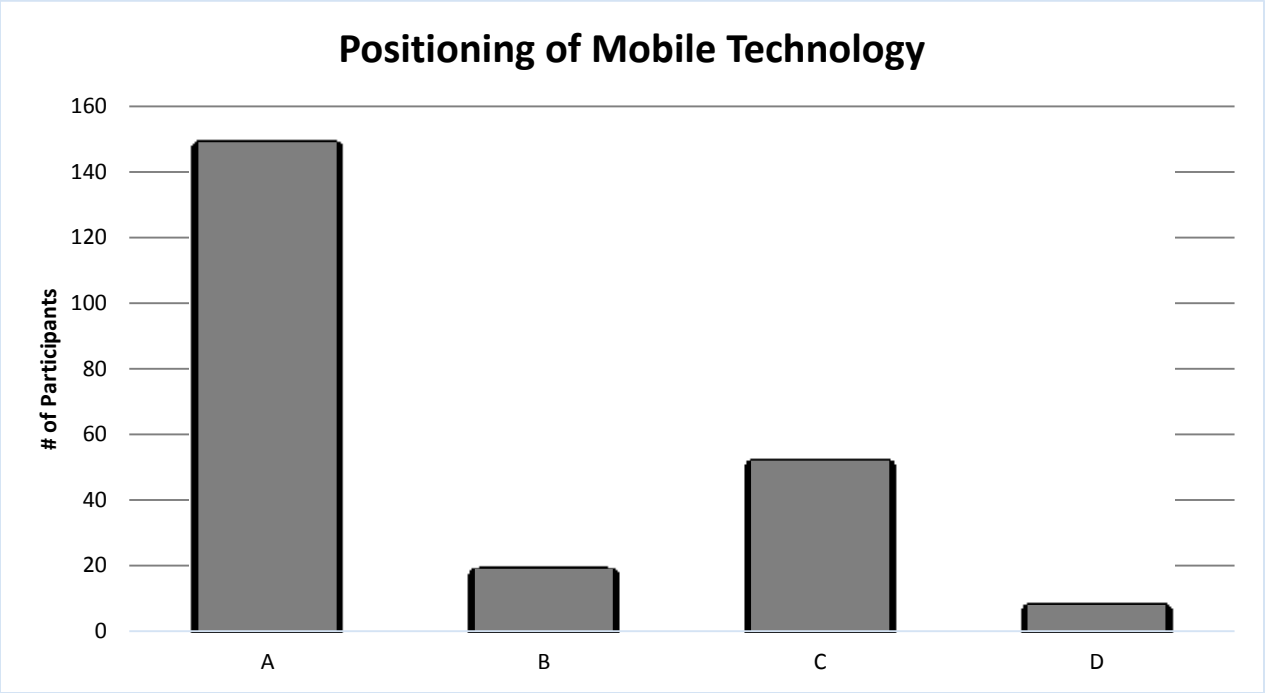


18. When using your mobile technology (i.e. tablet, IPad, etc.), what position is your usual way of positioning the computer? Please circle A, B, C or D.




Harvard School of Public Health

| Position of Device | # of Respondents | % of Population |
|---|---|---|
| A | 149 | 65.4% |
| B | 19 | 8.3% |
| C | 52 | 22.8% |
| D | 8 | 3.5% |



# Appendix 5: Observation Survey of Mobile Usage

Date: _____

Location: _____

1. The person is verbally talking on the phone:
    a. Yes
    b. No

2. The person is keying:
    a. Yes
    b. No

3. Neck is:
    a. Bent slightly forward
    b. Bent slightly back
    c. Neutral (directly over the shoulders)
    d. Neck is twisted to either side over the shoulders

4. Elbows are:
    a. Both are positioned to the sides of the body
    b. Both are extended away from the body

5. Back is:
    a. Bent slightly forward
    b. Bent slightly backwards
    c. Neutral position
    d. Bent to either side

6. While keying/swiping, the person is using:
    a. 1 finger
    b. More than 1 finger
    c. 1 thumb
    d. 2 thumbs

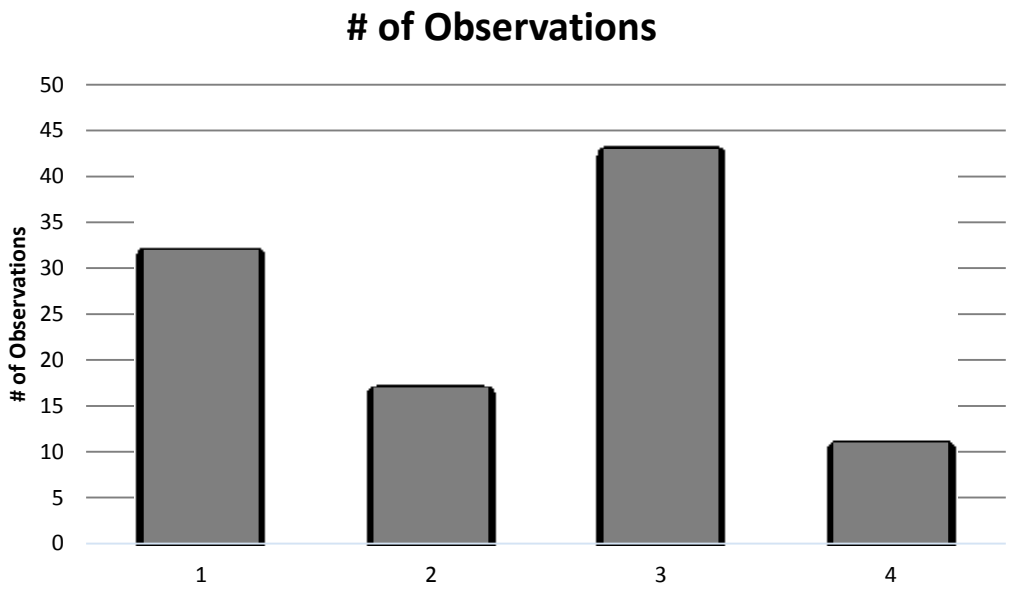
7. The person's wrist/hand is:
    a. Neutral
    b. Flexed $30^0$
    c. Bent $30^0$
    d. Turned sideways $20^0$
    e. Turned sideways $5^0$

8. The person is using the following accessories
    a. 0
    b. Earphones/microphone
    c. Earplugs
    d. Other: _____

# Appendix 6: Statistical Analysis of Observation Surveys on Mobile Usage

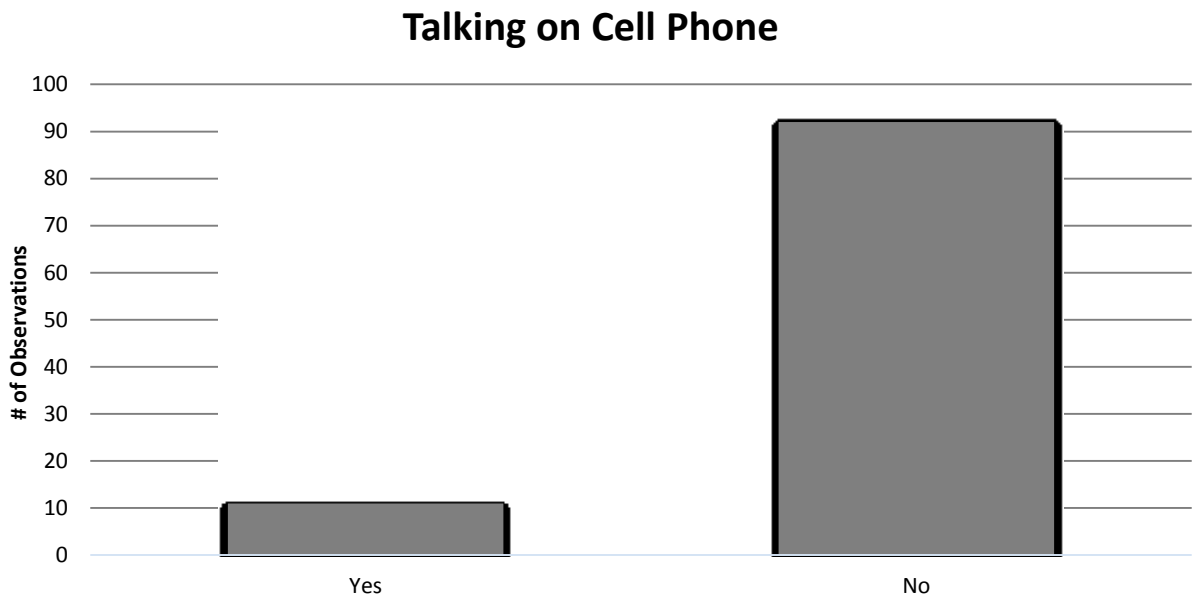
**Observation Surveys**

| Location | | # of Observations | % of Population |
|---|---|---|---|
| 1 | Bldg. 3 Cafeteria | 32 | 31.1% |
| 2 | In front of Bldg. 9 | 17 | 16.5% |
| 3 | Bldg. 13 Cafeteria | 43 | 41.7% |
| 4 | In front of Bldg. 11/12 | 11 | 10.7% |



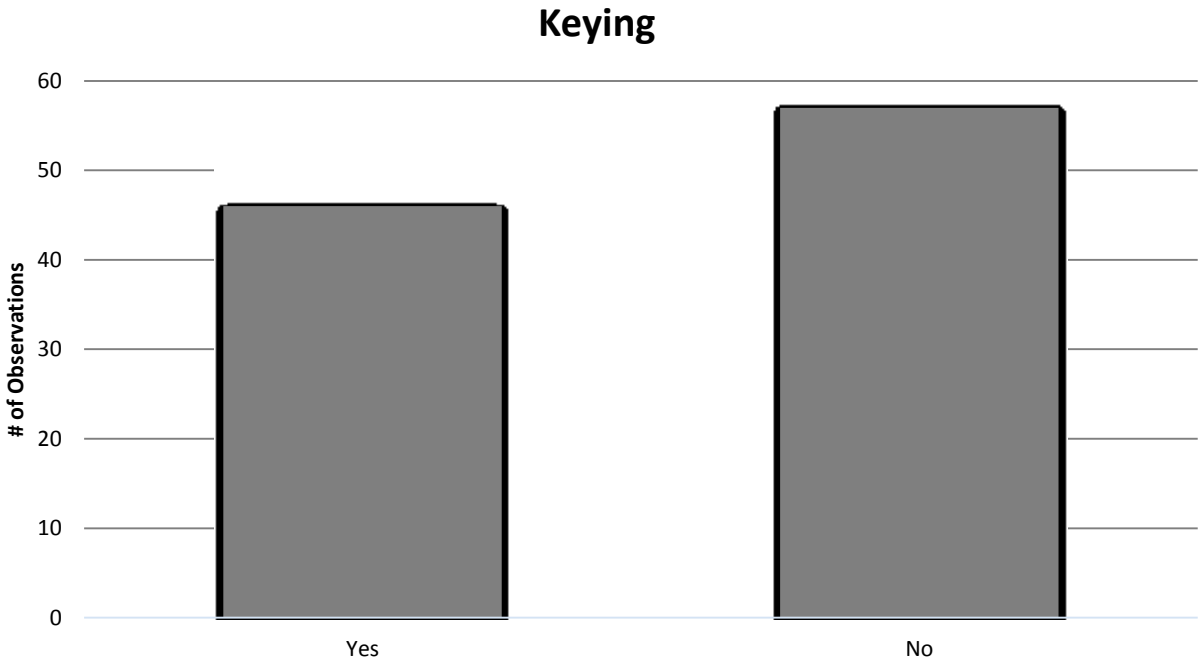

1. The person is verbally talking on the phone:

| | # of Observations | % of Population |
|---|---|---|
| Yes | 11 | 10.7% |
| No | 92 | 89.3% |



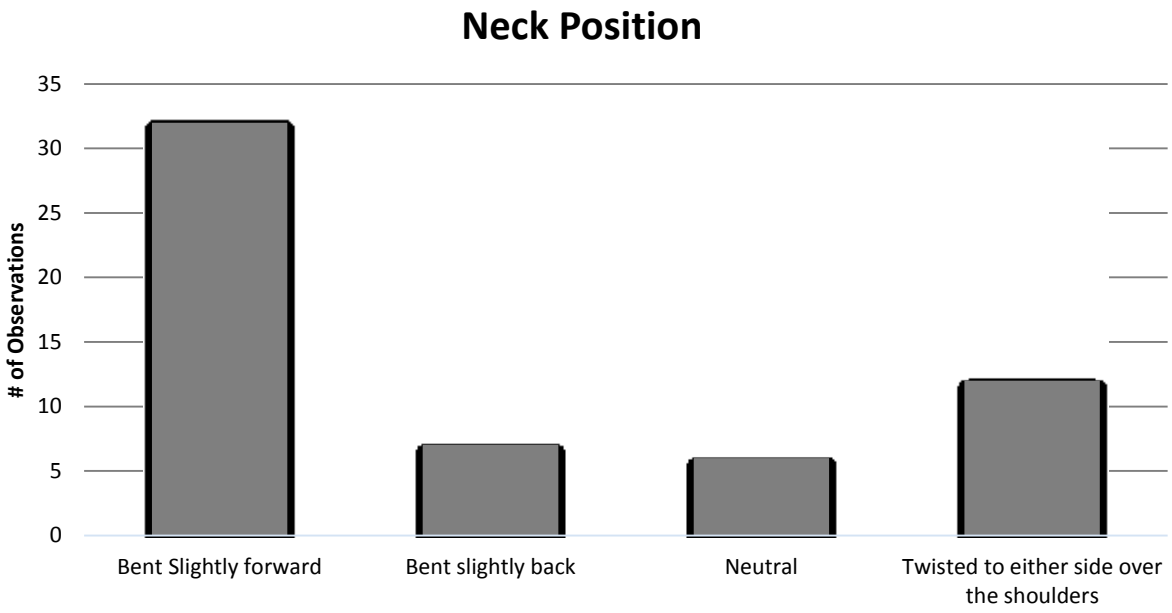

2. The person is keying:

| | # of Observations | % of Pop. |
|---|---|---|
| Yes | 46 | 44.7% |
| No | 57 | 55.3% |



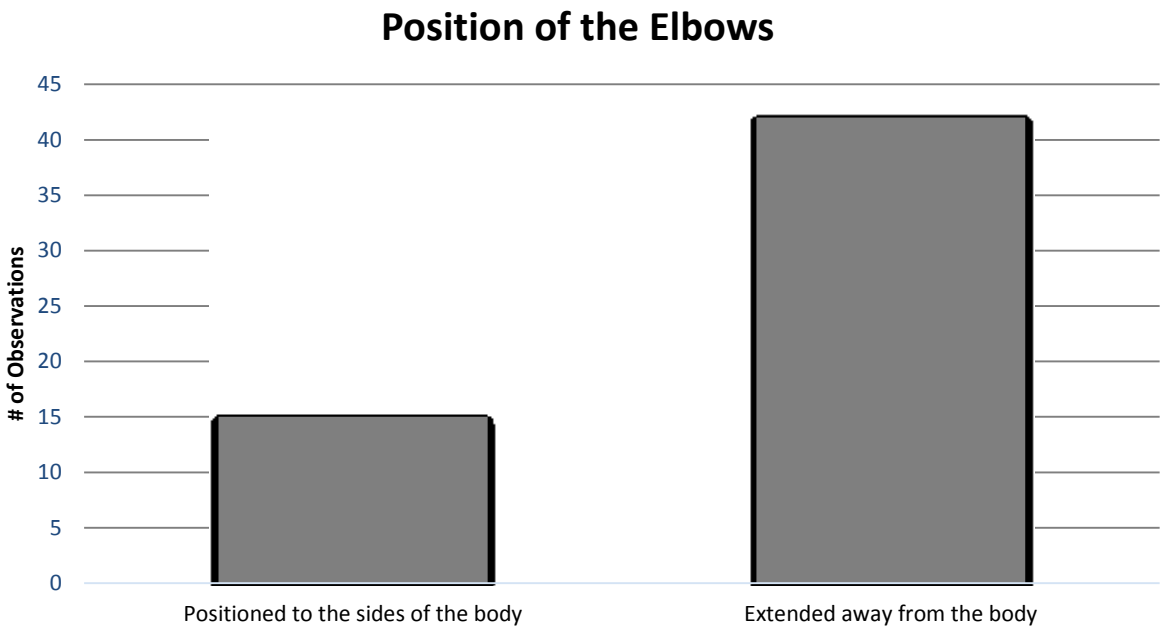
Neck is:

| | # of Observations | % of Pop. |
|---|---|---|
| Bent Slightly forward | 32 | 47.8% |
| Bent slightly back | 7 | 10.4% |
| Neutral | 6 | 9.0% |
| Twisted to either side over the shoulders | 12 | 17.9% |



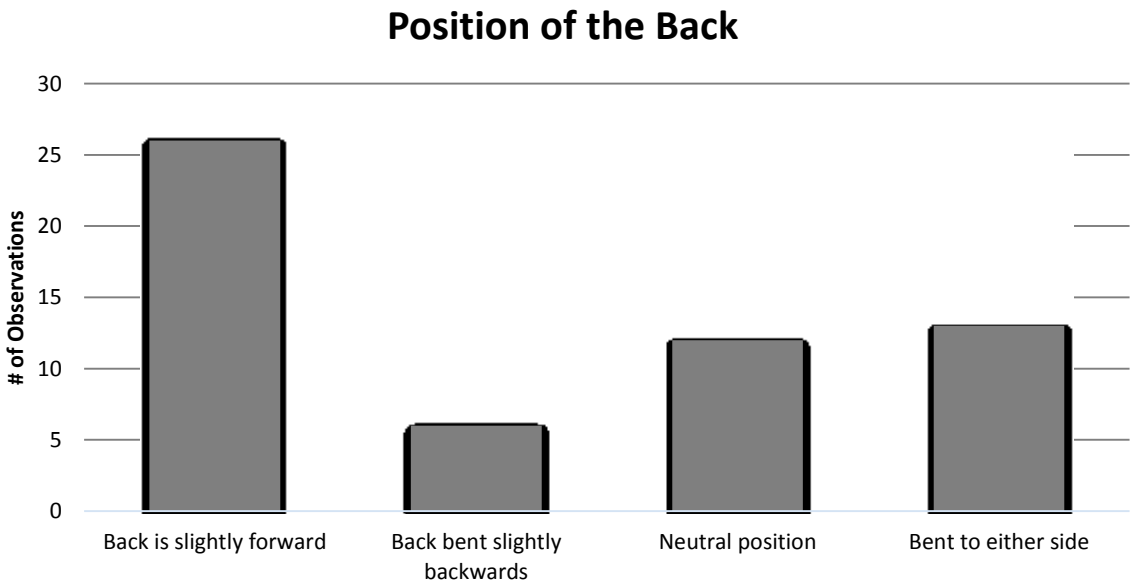

Elbows are:

| | # of Observations | % of Pop. |
|---|---|---|
| Positioned to the sides of the body | 15 | 26.3% |
| Extended away from the body | 42 | 73.7% |



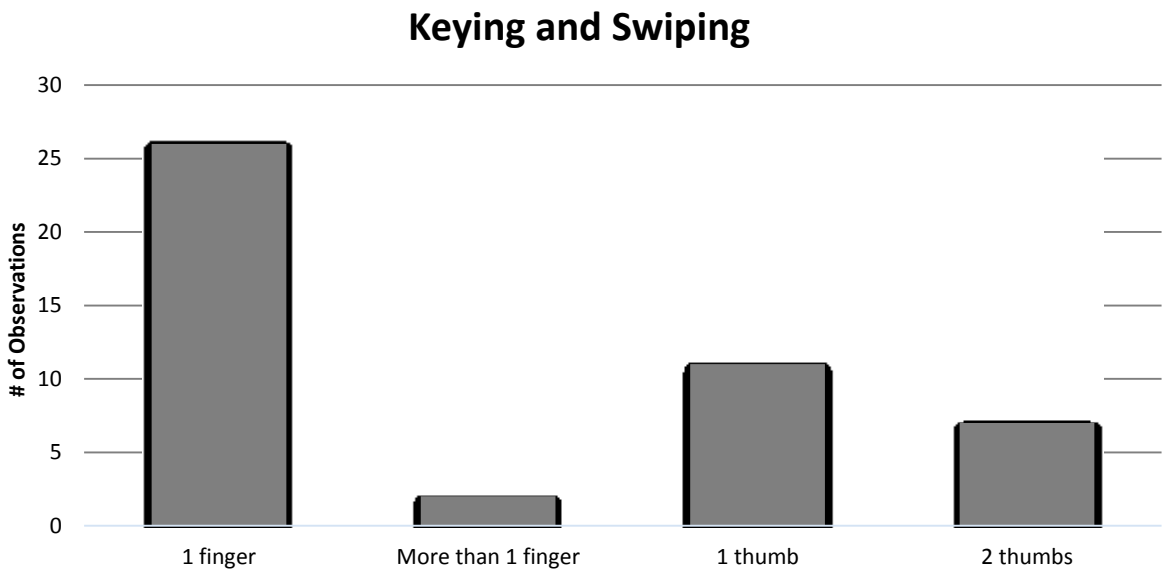

3. Back is:

| | # of Observations | % of Population |
|---|---|---|
| Back is slightly forward | 26 | 45.6% |
| Back bent slightly backwards | 6 | 10.5% |
| Neutral position | 12 | 21.1% |
| Bent to either side | 13 | 22.8% |



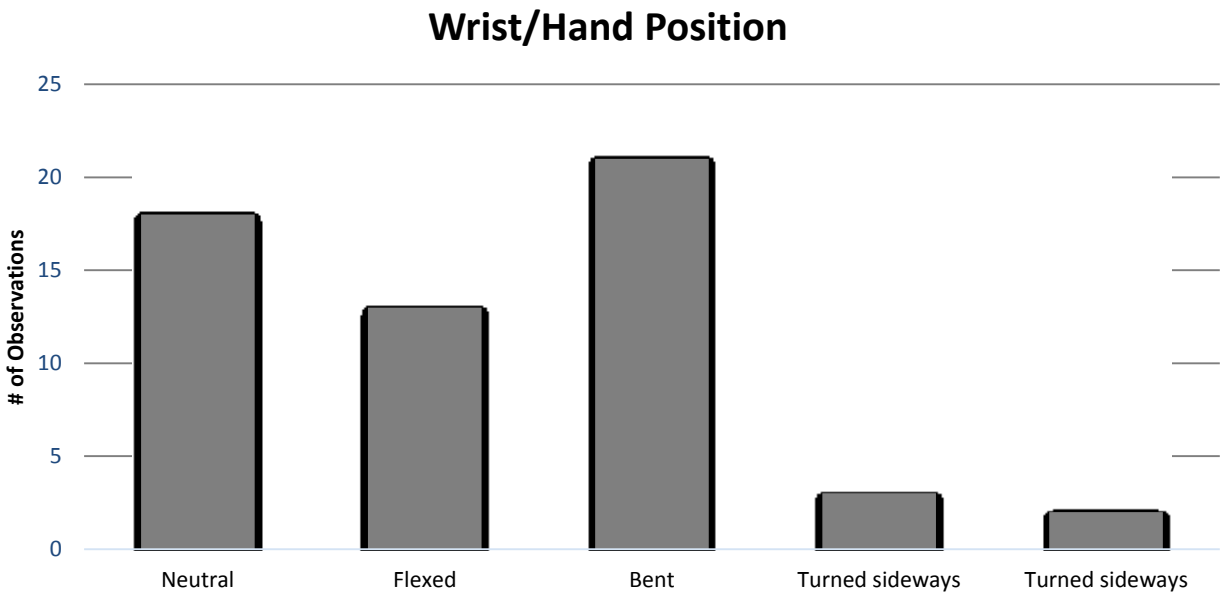
While keying/swiping, the person is using:

| | # of Observations | % of Populations |
|---|---|---|
| 1 finger | 26 | 56.5% |
| More than 1 finger | 2 | 4.3% |
| 1 thumb | 11 | 23.9% |
| 2 thumbs | 7 | 15.2% |



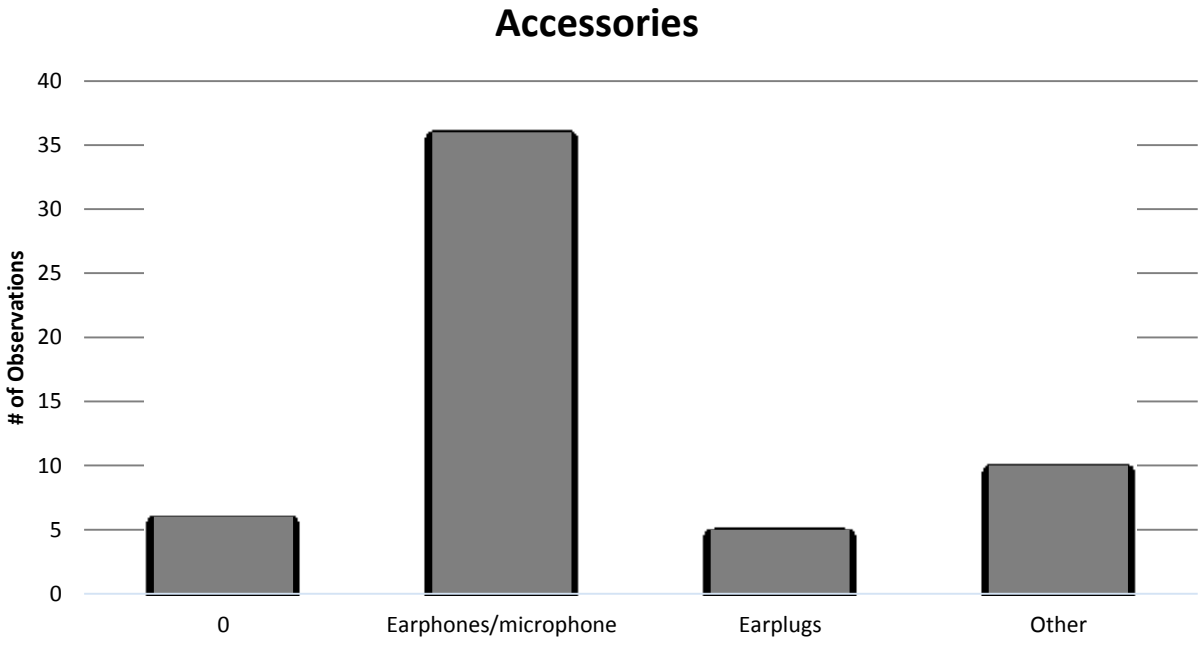

4. The person's wrist/hand is:

| | # of Observations | % of Population |
|---|---|---|
| Neutral | 18 | 31.6% |
| Flexed | 13 | 22.8% |
| Bent | 21 | 36.8% |
| Turned sideways | 3 | 5.3% |
| Turned sideways | 2 | 3.5% |




5. The person is using the following accessories

| | # of Observations | % of Pop. |
|---|---|---|
| No accessories | 6 | 10.5% |
| Earphones/microphone | 36 | 63.2% |
| Earplugs | 5 | 8.8% |
| Other | 10 | 17.5% |



# Appendix 7: Individual Course Evaluation Results

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| Company: **APS**, Risk Management Department | | | | | |
| Title of Presentation: Office Ergonomics | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 3 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 2 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 3 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 1 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 2 |
| | | | | **Total** | 17 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: Oklahoma State University, Environmental Health and Safety Department** | | | | | |
| Title of Presentation: Adjusting Your Workstation to Fit Your Body | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 3 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 2 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 0 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 0 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted, personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 2 |
| | | | | **Total** | 13 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: George Washington University, Office of Risk Management** | | | | | |
| Title of Presentation: Office Ergonomics Awareness | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 2 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 1 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 2 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
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| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 1 |
| **Total** | | | | | 13 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: Naval Facilities Engineering Command** | | | | | |
| Title of Presentation: Ergonomics Awareness Training | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 1 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 1 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 2 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 2 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 1 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 2 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 1 |
| | | | | **Total** | 12 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: University of Western Australia, Occupational, Health, Safety and Risk Unit** | | | | | |
| Title of Presentation: No Title | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 2 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 2 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 3 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 2 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 2 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 2 |
| | | | | **Total** | 16 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: United States Mine Rescue Association** | | | | | |
| Title of Presentation: Office Ergonomics | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 1 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 1 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 3 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 2 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 2 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 1 |
| | | | | **Total** | 13 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: East Carolina University** | | | | | |
| Title of Presentation: Ergonomics and Safety Responsibilities | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 1 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 3 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 2 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 2 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 1 |
| | | | | **Total** | 14 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: University of Oregon, Labor Education and Research Center** | | | | | |
| Title of Presentation: introduction to Ergonomics and Cumulative Trauma | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 3 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 3 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 3 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 2 |
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| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 1 |
| | | | | **Total** | 18 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: University of Kentucky** | | | | | |
| Title of Presentation: Office Ergonomics | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 1 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 2 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 2 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 1 |
| | | | | **Total** | 14 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: University of Rochester** | | | | | |
| Title of Presentation: Computer Workstations & Body Safety | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 2 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 2 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 1 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 1 |
| | | | | **Total** | 14 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: McMaster University (1)** | | | | | |
| Title of Presentation: Ergonomics: Best Practices Lifting Tips and Techniques | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 2 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 2 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 2 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 2 |
| | | | | **Total** | 16 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: Georgia Institute of Technology** | | | | | |
| Title of Presentation: Introduction to Ergonomics | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 2 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 1 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 1 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 1 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 1 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 1 |
| | | | | **Total** | 9 |

Literature Review Rubric

## Company: McMaster University (11)

Title of Presentation: Best Practices Lifting Tips and Techniques (online)

| *Category* | *3* | *2* | *1* | *0* | *Total* |
|---|---|---|---|---|---|
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 3 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 3 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 3 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 2 |
| | | | | **Total** | 19 |

**Literature Review Rubric**

## Company: Texas Engineering Station & the Dwight Look College of Engineering

Title of Presentation: Office Ergonomics: Prevention

| *Category* | *3* | *2* | *1* | *0* | *Total* |
|---|---|---|---|---|---|
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 3 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 2 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 2 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
| Content accuracy (current information is presented and correct) | All of the content throughout the presentation is accurate. There are no factual errors. | Most of the content throughout the presentation is accurate but there is one piece of information that might be inaccurate. | The content is generally accurate but there is more than one piece of information is flawed or inaccurate. | All of the content is flawed or inaccurate. | 3 |
| Teaching Tools (e.g. video, pictures, examples, activities, voice, graphs, discussion, graphics) | 5 or more teaching tools are included in the presentation to engage learners | 3-4 teaching tools are included in the presentation to engage learners. | 1- 2 teaching tools are included in the presentation to engage learners. | 0 teaching tools are included in the presentation to engage learners. | 2 |
| Author(s) competency (e.g. qualifications, experience, education) | Author(s) is fully competent. The author(s) name is presented with qualifications noted; personal history is presented giving information on experience and education. | Author(s) is partially "competent": 2 of the 3 identified criteria: qualified, experienced, educated | Author(s) is partially "competent": have 1 of the 3 identified criteria: qualified, experienced, educated | Author qualifications, experience or education are not identified. | 0 |
| Content - Completeness (content must include the following: definition of ergonomics, assessment techniques, preventative actions, exercises, reporting, best practices, office equipment positioning, mobile equipment positioning best practice) | Presentation includes all 10 elements needed to gain a comfortable understanding of ergonomics and prevention techniques. | Presentation includes 6-9 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes 1-5 of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | Presentation includes none of the required elements needed to gain a comfortable understanding of ergonomics and injury prevention techniques. | 2 |
| | | | | **Total** | 17 |

| Literature Review Rubric | | | | | |
|---|---|---|---|---|---|
| **Company: Government of Louisiana, Office of Risk Management, Loss Prevention Unit** | | | | | |
| Title of Presentation: Office Ergonomics for the 21st Century | | | | | |
| ***Category*** | ***3*** | ***2*** | ***1*** | ***0*** | ***Total*** |
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 3 |
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| | | | | **Total** | 18 |

**Literature Review Rubric**

## Company: Zettl Group

Title of Presentation: Ergonomics

| *Category* | *3* | *2* | *1* | *0* | *Total* |
|---|---|---|---|---|---|
| Text - font choice and page layout | Font and page layout enhances readability and content. | Most of the font and page layout enhances readability and content. | Some of the font and page layout enhances readability and content. | None of the font and page layout enhances readability and content. | 2 |
| Sequencing of information (Title page, objectives (outcomes), information, conclusion (summary), reporting issues procedure, question and answer) | All Information is organized in a clear, logical way. | Most information is organized in a clear, logical way. | Some information is organized in a clear, logical way. | None of the information is organized in a clear, logical way. | 1 |
| Use of graphics | All graphics enhance and support the theme/content of the presentation. | Most of the graphics enhance and support the theme/content of the presentation. | Some of the graphics enhance and support the theme/content of the presentation. | None of the graphics enhance and support the theme/content of the presentation. | 1 |
| Background of the PowerPoint presentation | Background does not detract from the text or other graphics. | Most of the time the background does not detract from the text or other graphics. | Many times the background detracts from the text or other graphics. | Background consistently detracts from the text or other graphics. | 3 |
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| | | | | **Total** | 13 |

# Appendix 8: Email Request for Course Participation

To: All students
Fr: Pauline Hickey

Good morning,

I am currently completing my masters in Biomechanics and Ergonomics from Memorial University of Newfoundland, and I am looking for volunteers to participate in my research this semester.

My general area of interest is in the value of ergonomics training, noting retention and knowledge acquisition.

If you have been accepted into a program at the college, then you are eligible and welcome to participate in this project.

My research involves testing ergonomic knowledge. Should you choose to participate, you will be randomly assigned to 1 of 3 groups. They are:

Group A: Training led by myself, Pauline Hickey

Group B: Training without an instructor

Group C: No training

Tests will be conducted before and after the training session to all 3 groups. I am interested in learning about the extent your ergonomic knowledge has changed as a result of the training.

These activities may require a 5 hour commitment (depending on which group you are assigned) during the Fall 2014 semester.

Your participation in this project is completely voluntary and will be kept confidential.

To volunteer (or to learn more about the project), please contact me directly by email or telephone: pauline.hickey@cna-qatar.edu.qa; ext. 2491. I hope to hear from you by **Sunday, September 28, 2014.**

Thanks very much! I appreciate your support!

# Appendix 9: Ergonomic Usage Pattern Questionnaire

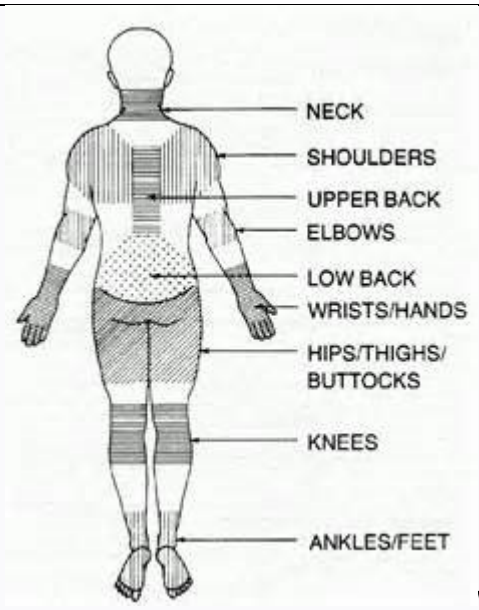
ID #: _____

Country of Origin: _____

# Ergonomic Usage Pattern Questionnaire

The following is an ergonomic test that will be administered to you 3 times. Please answer all the questions. Please answer to the best of your ability.

| | |
|---|---|
| Date: | |
| Age: | |
| ☐ Male<br>☐ Female | |
| Please answer the following information gathering questions: | |
| 1. | Do you own any mobile equipment (including such items as mobile phone, laptop, Ipad, blackberry)? |
| | |
| 2. | Approximately how often do you use any of these devices? |
| | ☐ More than 5 times daily<br>☐ 1-4 times daily<br>☐ Once per day<br>☐ Many times during the week<br>☐ Only once per week |
| 3. | Do you feel any physical discomfort in the shoulders or back when using these devices? |
| | ☐ Yes<br>☐ No<br><br>If yes, where do you feel discomfort? Please indicate on the figure the area(s) you feel the discomfort. |

| | |
|---|---|
| |  <br>www.users.globalnet.co.uk |
| 4. | If you indicated more than 1 area of discomfort in question #3, which area do you experience the most discomfort?<br>_____ |
| 5. | Have you received ergonomic training or information in the past?<br>☐ Yes<br>☐ No |

# Appendix 10: McMaster University: Introduction to Ergonomics Training Program

The following Ergonomics Training Program has been downloaded and will be used in this experiment. The content was downloaded from the following site (including verbalization of content):

http://cll.mcmaster.ca/articulate/eohss/Ergonomics%20Training/player.html


# Ergonomics

## Best Practices

## Lifting Tips and Techniques


## Ergonomics: Agenda

- Ergonomics Definition and Application
- Legislation
- RMM# 405: Ergonomics Safety Program
- Musculoskeletal Disorders (MSDs)
- Symptoms and Risk Factors
- Injury Statistics
- Ergonomic Awareness and Controls
- Tips for Working on the Computer or Laptop
- Back Pain: Safe Lifting Best Practices
- Stretches
- Resources: How to Request an Ergonomic Assessment

McMaster University

# What is Ergonomics?

The applied science and art that seeks to fit the job to the worker through the evaluation and design of work environment in relation to human characteristics and interactions in the workplace.

**" Adjusting the workspace to best fit the employee"**

McMaster University

# Ergonomics Applies to…

- **Workstation Design**—(desks, chairs, space, layout)
- **Work Postures** (sitting, standing, reaching, lifting)
- **Work Organization** (Pace, Breaks, Variety)
- **Tools, Equipment, and Furniture Design**---(body size, height, gender, promoting neutral postures, reduced vibration, exposure to acceptable lighting, noise, temperature)
- **Manual Materials Handling**—(lifting, lowering, pulling, pushing, carrying and holding materials)
- **Work Environment**—(ventilation, noise, temperature & humidity, lighting and vision)

McMaster University

# The Legislation

- **Occupational Health and Safety Act, (OHSA)**

  ' take every precaution reasonable in the circumstances for the protection of the worker'

McMaster University

## Ergonomics Safety Program

- To provide direction for safe and efficient ergonomic design with the goal of eliminating all work related musculoskeletal disorders (MSDs)
- Applies to all work areas and work stations utilized by faculty, staff and students
- Supervisors shall ensure ergonomics are considered in the design of present and new work tasks and work locations
- Workers shall participate in ergonomic education programs and report ergonomic concerns to supervisor
- JHSC shall receive copies of incident reports including ergonomic concerns/injuries and report all concerns noted during routine workplace inspections

McMaster University

## Signs and Symptoms of MSDs

- Muscle fatigue, aches which subside during rest
- Tight band of pain across shoulders or back
- Pain or stiffness when changing positions or rising from bed in the morning
- Difficulty in finger, thumb or hand movement
- Difficulty gripping things
- Loss of sensitivity to touch or to temperature extremes
- Numbness, tingling, burning, weakness and pain

McMaster University

# MSDs

- **Joints** (connect bone to bone)--repetitive forceful movements can result in softened cartilage which can lead to growths, degenerative disc disease, osteoarthritis
- **Muscles** (provide the force to perform a task—squeeze and relax)-if contraction is prolonged, blood flow is reduced and waste is not removed fast enough or if not enough rest---muscle irritation, injury and pain
- **Tendons** (fiber muscles attaching muscles to bones)—(hand, wrist, forearm, elbow, shoulder i.e. tendonitis, ganglion cyst, bursitis)
- **Nerves** (surrounded by muscles, tendons, ligaments and blood vessels and carry signals from brain to control muscle activity, temperature, pain,)---tissues surrounding nerves swell and squeeze or compress nerves; e.g. thoracic outlet syndrome and carpal tunnel

McMaster University

# Primary Risk Factors

**Repetitive Movements**

- Leading cause of MSDs
- Same joints /muscle groups (keyboarding, mousing)

**Forceful Movements**

- Excessive movements for long periods of time (e.g. extended reach)

**Fixed or Awkward Postures**

- Cause fatigue (sitting rigidly for long periods; reaching above shoulder)

**Bending, Twisting and Heavy Lifting**

McMaster University

## Secondary Risk Factors

- Contact Pressure (holding tools, stapling, resting wrists while typing)
- Cold Exposure (working outside)
- Infrequent, heavy lifting (picking up a water jug; box of paper for photocopier)

- *Remember Frequency and Duration are key*

McMaster University

## Ergonomic Awareness

Starts with you and your supervisor:

- Learn to recognize potential work -specific ergonomic hazards through additional training and/or workplace inspections. If you are a computer user, ask yourself the following:

- Are office chairs height adjustable? Do the chair's armrests interfere with the keyboard tray? Is the seat pan long enough to fully support the legs, but not dig into the back of the knees?

- Is the computer mouse resting on the keyboard tray? Are telephone headsets available for frequent telephone users?
- Are laptops fully retrofitted?

- Remember to report signs or symptoms of MSDs by completing an injury/incident report

McMaster University

# Tips for Working on the Computer

- **Head:** held straight & squarely over shoulders
- **Eyes:** top of computer screen should be at or slightly below eye level
- **Shoulders:** relaxed, not raised or hunched
- **Arms:** supported comfortably & close to the body
- **Wrists:** naturally straight and flat
- **Elbows:** bent approximately 90 degrees and positioned close to the body
- **Back:** sufficiently supported to maintain its natural curve
- **Hips:** bent approximately 90 degrees
- **Knees:** bent approximately 90 degrees. There should be two to three finger space between edge of seat and back of knees
- **Feet:** placed flat on the floor or supported by a footrest

McMaster University


*CCOHS Office Ergonomics Safety Guide 2002*

McMaster University

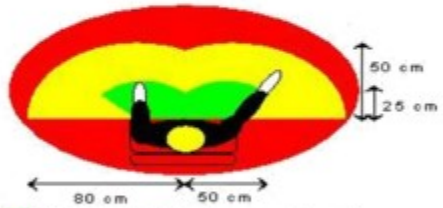
## Laptops: The New Hazard?

- Laptops should only be used for short periods of time if not ergonomically retrofitted
- Retrofitting means adding a full size keyboard, external mouse and raising the laptop to eye level to promote neutral body postures
- Consider transporting your laptop in a roller cart, or ergonomically designed bag

McMaster University

## Guidelines for Reaches

### Reach Requirements




USUAL WORK : Forearm Length

OCCASIONAL WORK : Full Arm Length

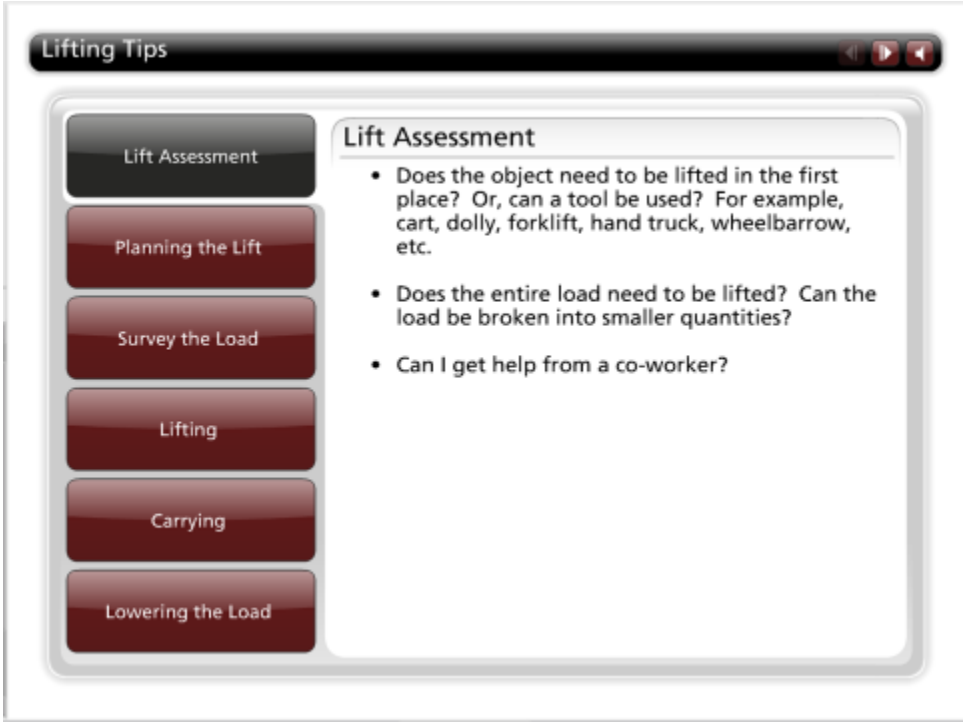
NON-WORK AREA : Beyond Arm Length

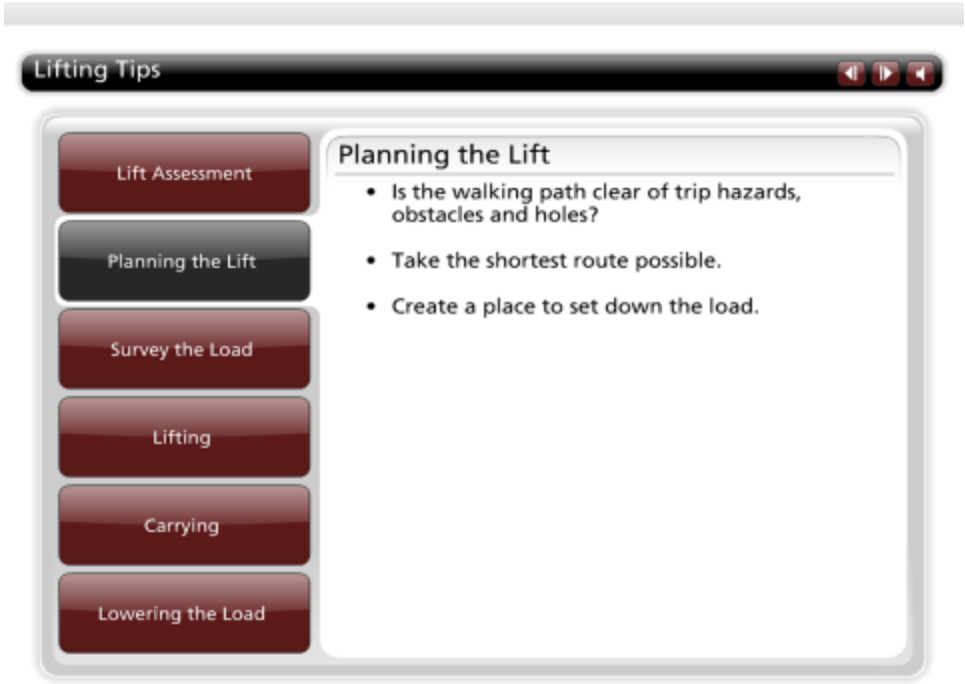
adapted from : CCOHS Ergonomic Infogram E-A01

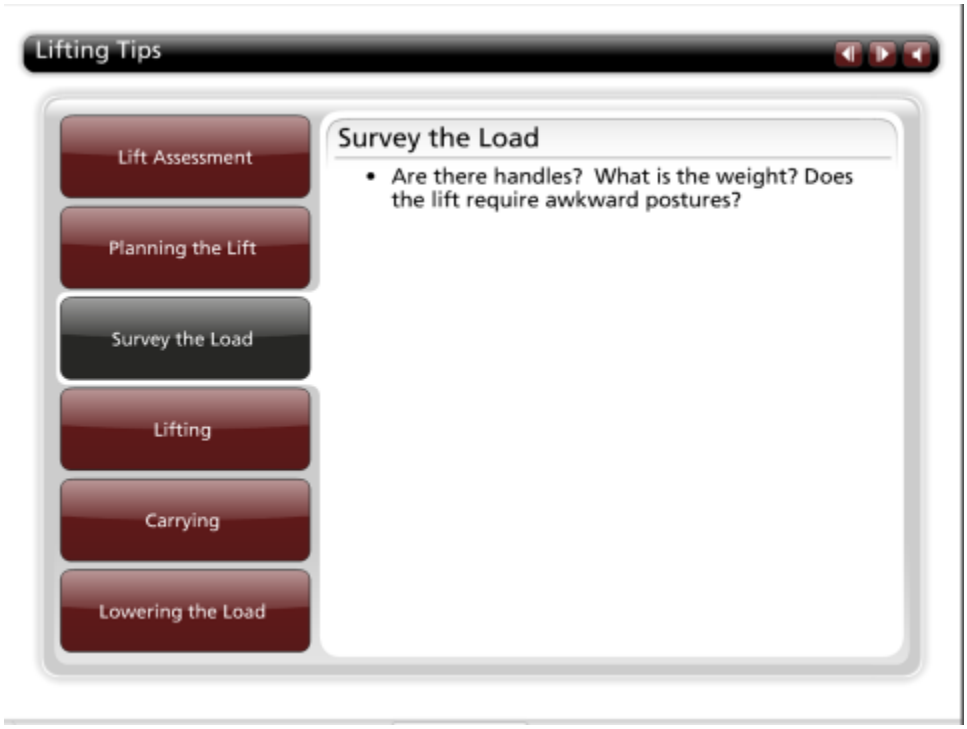
McMaster University

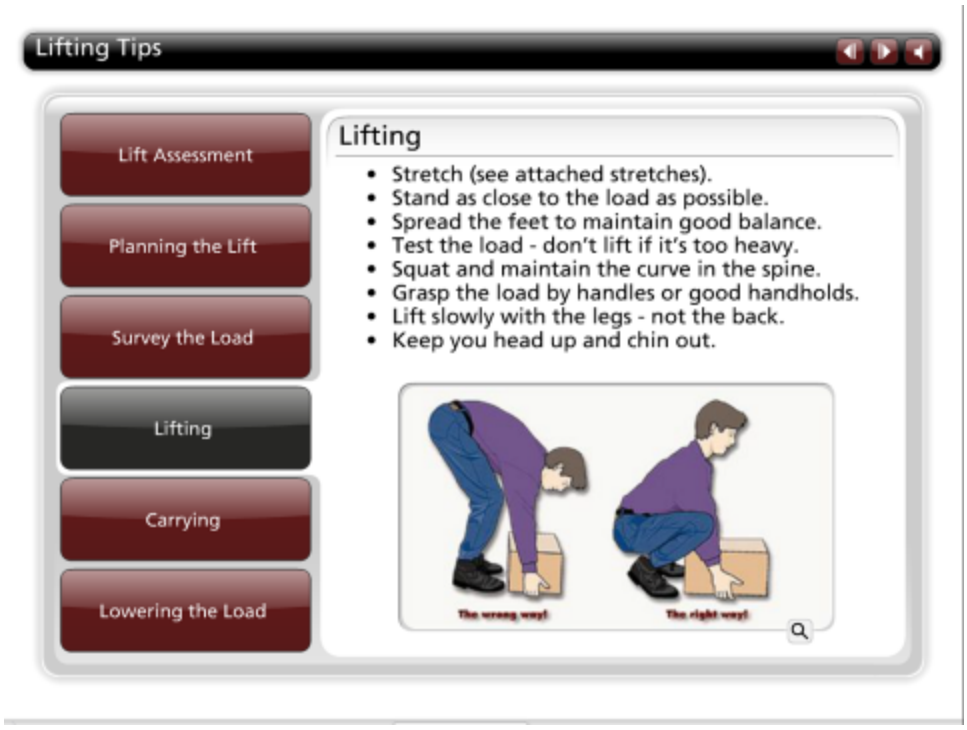
# Back Pain

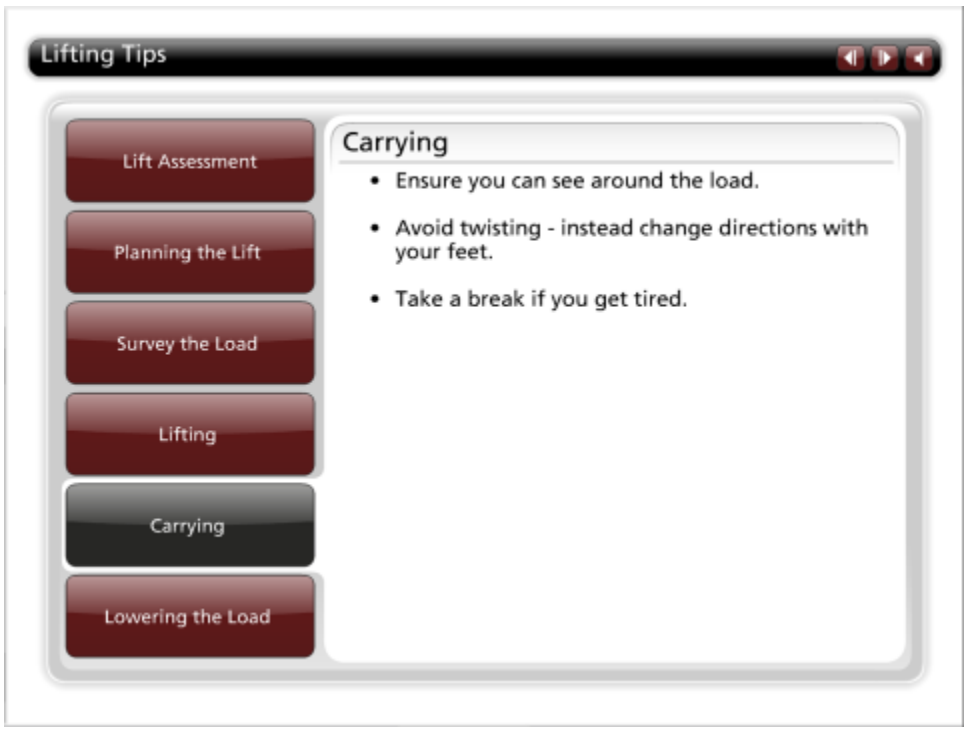
- **Acute (immediate) versus Chronic (over time)**
- **Causes:**
  - Poor body posture (working in a stooped position, prolonged sitting in fixed position, etc.)
  - Lifting and handling heavy loads
  - Forceful pushing or pulling
  - Bending or twisting
  - Psychological stress
  - Inadequate rest periods
  - Poor fitness level
- **Prevention:**
  - Neutral postures
  - Using appropriate lifting techniques
  - Alternating work activities
  - Adequate rest periods

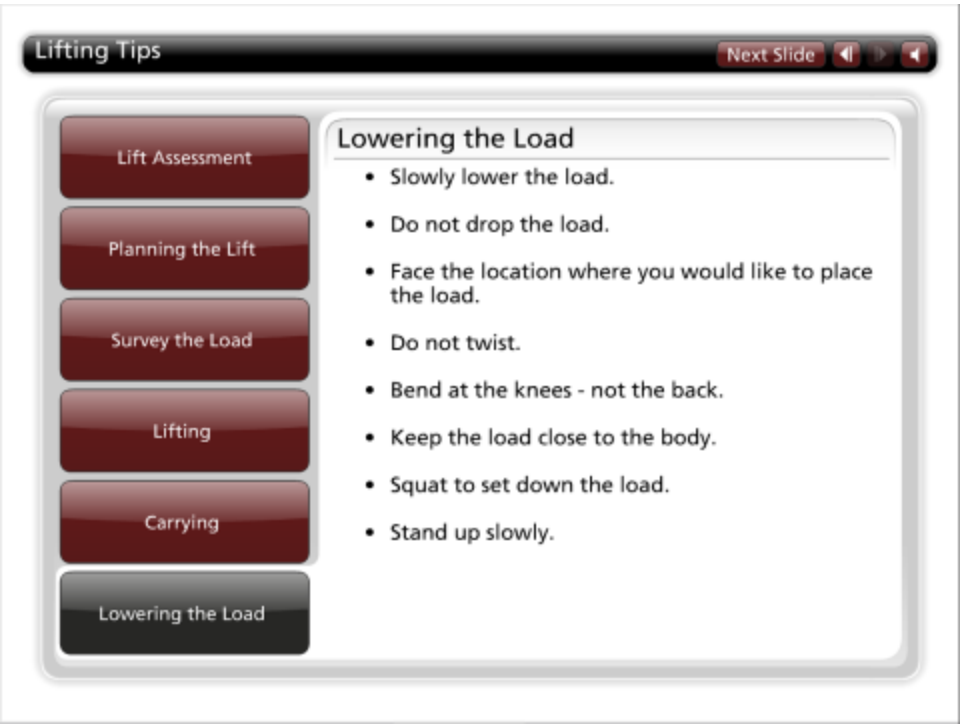


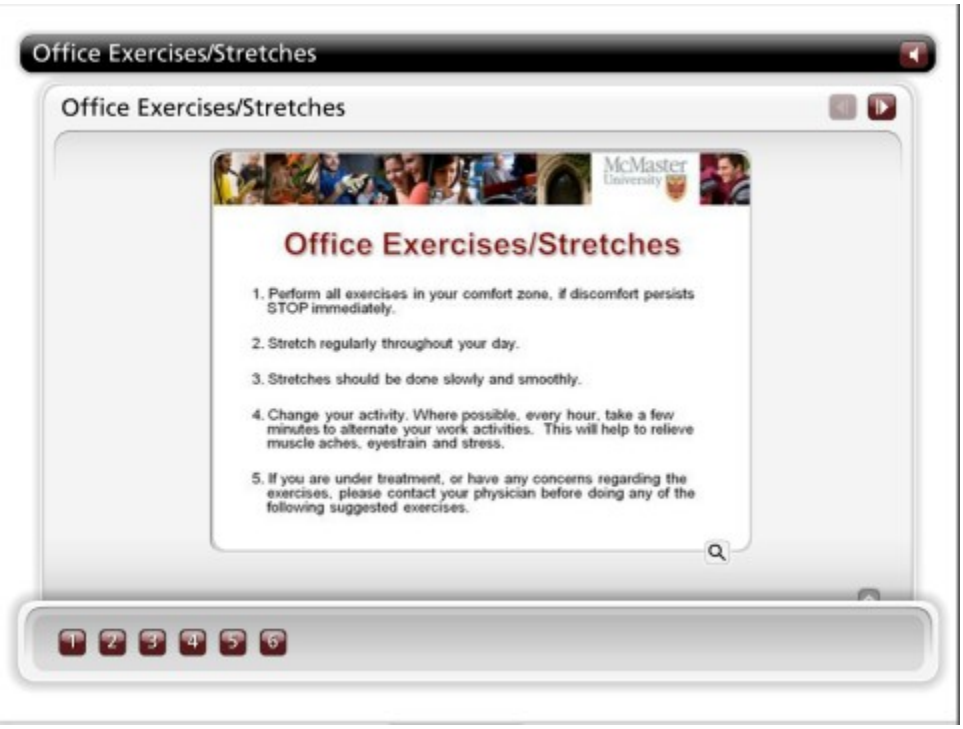

Lifting Tips
Lift Assessment
Planning the Lift
Survey the Load
Lifting
Carrying
Lowering the Load
Planning the Lift
• Is the walking path clear of trip hazards, obstacles and holes?
• Take the shortest route possible.
• Create a place to set down the load.


Lifting Tips
Lift Assessment
Planning the Lift
Survey the Load
Lifting
Carrying
Lowering the Load
Survey the Load
• Are there handles? What is the weight? Does the lift require awkward postures?

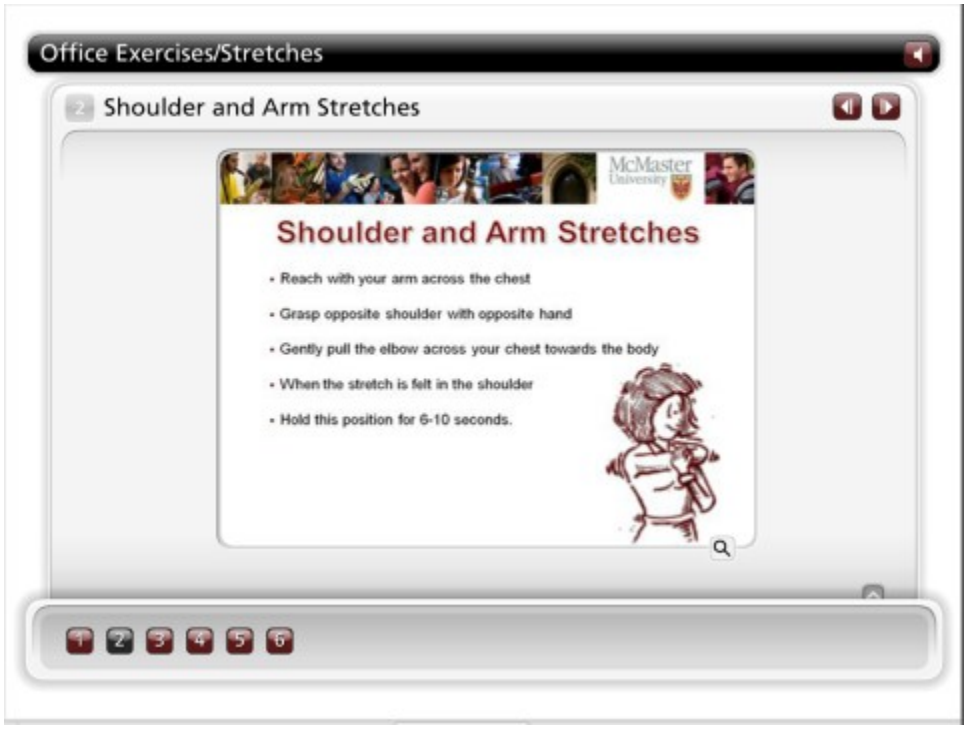

Lifting Tips
Lift Assessment
Planning the Lift
Survey the Load
Lifting
Carrying
Lowering the Load
Lifting
• Stretch (see attached stretches).
• Stand as close to the load as possible.
• Spread the feet to maintain good balance.
• Test the load - don't lift if it's too heavy.
• Squat and maintain the curve in the spine.
• Grasp the load by handles or good handholds.
• Lift slowly with the legs - not the back.
• Keep you head up and chin out.


Lifting Tips
Lift Assessment
Planning the Lift
Survey the Load
Lifting
Carrying
Lowering the Load
Carrying
• Ensure you can see around the load.
• Avoid twisting - instead change directions with your feet.
• Take a break if you get tired.


Lifting Tips
Next Slide
Lift Assessment
Planning the Lift
Survey the Load
Lifting
Carrying
Lowering the Load
Lowering the Load
• Slowly lower the load.
• Do not drop the load.
• Face the location where you would like to place the load.
• Do not twist.
• Bend at the knees - not the back.
• Keep the load close to the body.
• Squat to set down the load.
• Stand up slowly.


Office Exercises/Stretches
Office Exercises/Stretches
McMaster University
Office Exercises/Stretches
1. Perform all exercises in your comfort zone, if discomfort persists STOP immediately.
2. Stretch regularly throughout your day.
3. Stretches should be done slowly and smoothly.
4. Change your activity. Where possible, every hour, take a few minutes to alternate your work activities. This will help to relieve muscle aches, eyestrain and stress.
5. If you are under treatment, or have any concerns regarding the exercises, please contact your physician before doing any of the following suggested exercises.
1 2 3 4 5 6

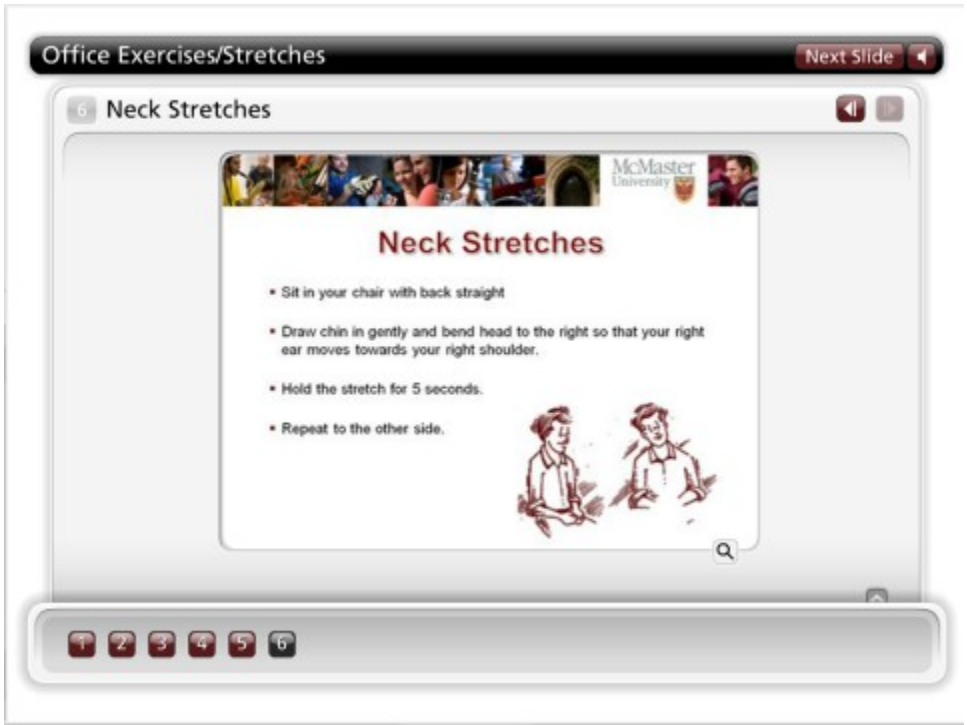

Office Exercises/Stretches
1 Wrist and Forearm Stretches
McMaster University
Wrist and Forearm Stretches
a) Shake your arms
• Drop your arms and hands to your side
• Shake them gently for a few seconds
b) Wrist stretches
• Keep your elbows straight, grasp hand and slowly bend wrist until you feel a stretch
• Hold stretch for 6-10 seconds.
1 2 3 4 5 6

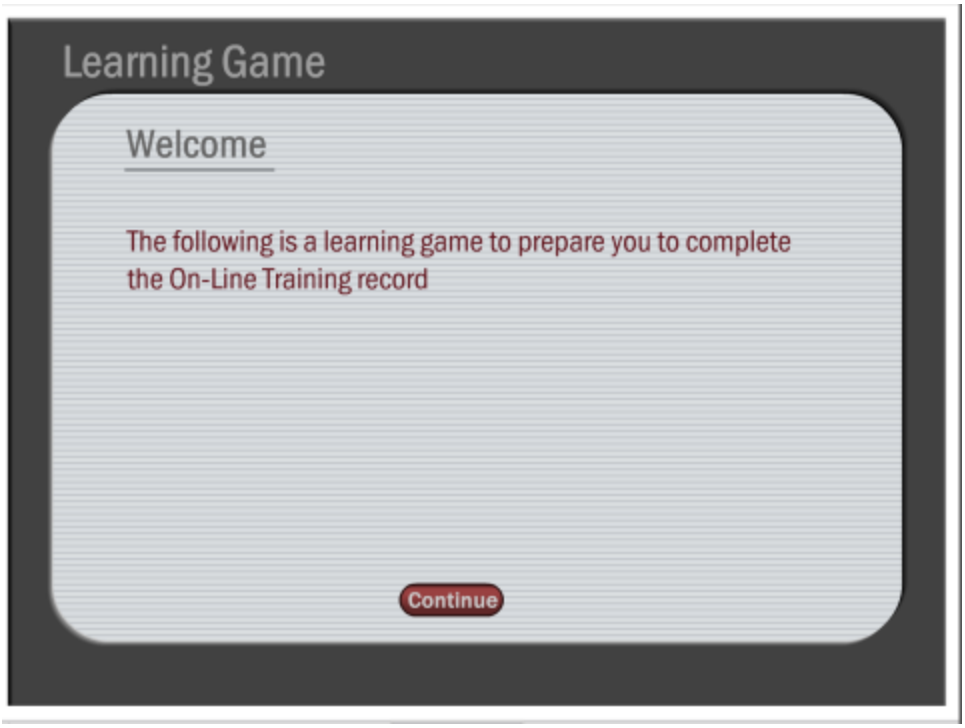

Office Exercises/Stretches
2 Shoulder and Arm Stretches
McMaster University
Shoulder and Arm Stretches
• Reach with your arm across the chest
• Grasp opposite shoulder with opposite hand
• Gently pull the elbow across your chest towards the body
• When the stretch is felt in the shoulder
• Hold this position for 6-10 seconds.
1 2 3 4 5 6

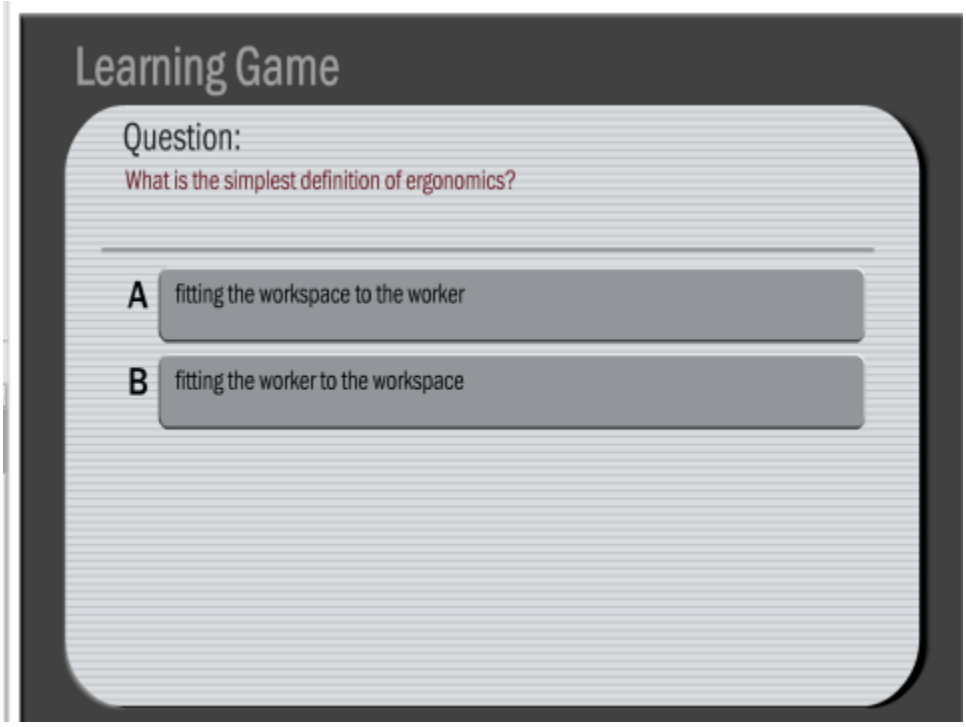

Office Exercises/Stretches
3 Shoulder Shrug
McMaster University
Shoulder Shrug
• Sit in the chair with your back straight against the backrest.
• Let your head relax.
• Squeeze your shoulders up to your ears.
• Follow by stretching shoulders down with fingers pointing to the floor, draw chin in gently.
• Slowly change from one position to another.
1 2 3 4 5 6

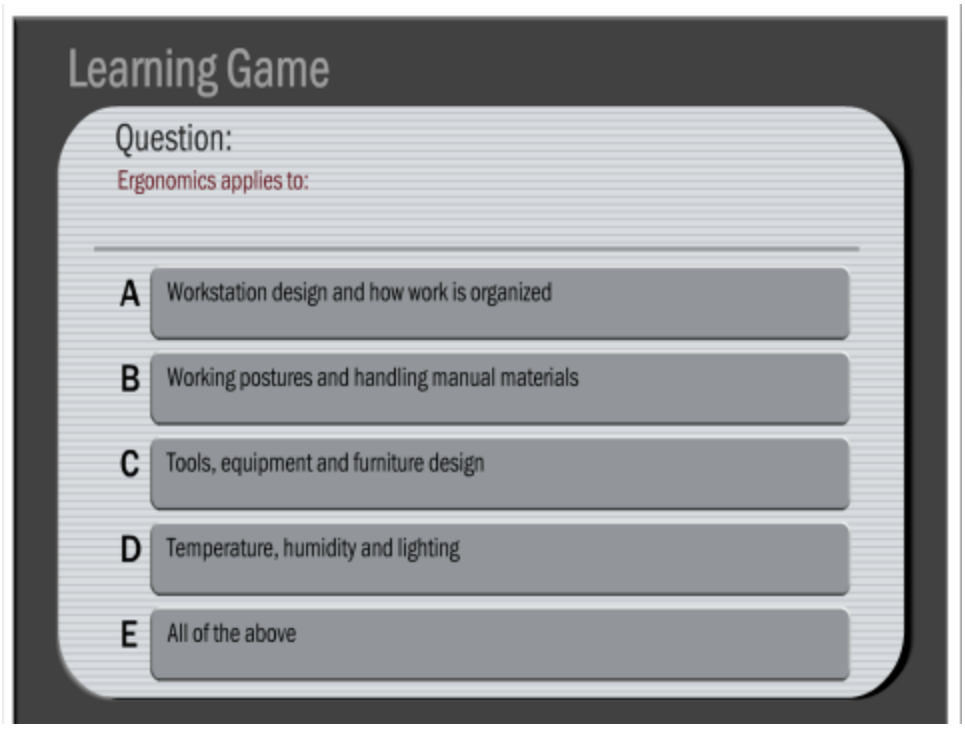

Office Exercises/Stretches
4 Executive Stretch
McMaster University
Executive Stretch
• Lock your hands behind your head.
• Stretch slowly backwards in your chair.
• Arch your back slightly and gently.
• Hold stretch for 6-10 seconds.
• Repeat 5 times with 5-10 second rest period between stretches.
1 2 3 4 5 6

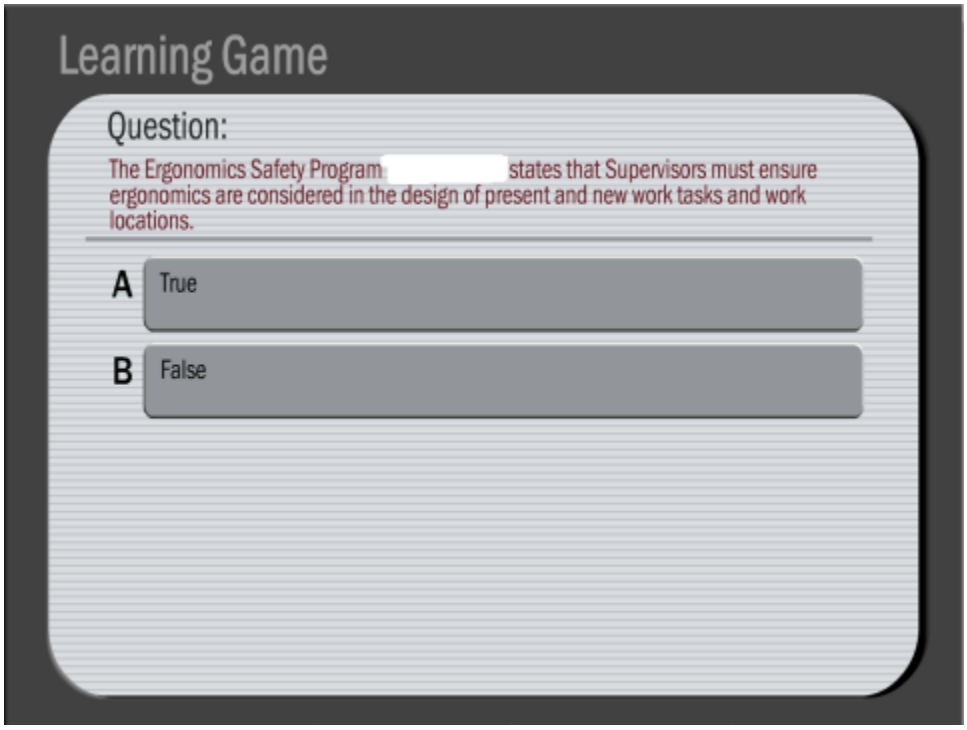

Office Exercises/Stretches
5 Upper Back Stretch
McMaster University
Upper Back Stretch
• Extend your arms out in front of chest, keeping them at shoulder height.
• Interlock fingers with palms facing away from your body.
• Keep elbows straight, do not over-extend.
• Reach forward while maintaining an upright posture.
• Hold stomach muscles tight to avoid arching your lower back.
• Hold this stretch position for 6-10 seconds.
• Raise your arms over your head and hold this position for 10 seconds.
• Repeat 5 times.
1 2 3 4 5 6


Office Exercises/Stretches
Next Slide
6 Neck Stretches
McMaster University
Neck Stretches
• Sit in your chair with back straight
• Draw chin in gently and bend head to the right so that your right ear moves towards your right shoulder.
• Hold the stretch for 5 seconds.
• Repeat to the other side.
1 2 3 4 5 6


Learning Game
Welcome
The following is a learning game to prepare you to complete the On-Line Training record
Continue


Learning Game
Question:
What is the simplest definition of ergonomics?
A
fitting the workspace to the worker
B
fitting the worker to the workspace


Learning Game
Question:
Ergonomics applies to:
A
Workstation design and how work is organized
B
Working postures and handling manual materials
C
Tools, equipment and furniture design
D
Temperature, humidity and lighting
E
All of the above


Learning Game
Question:
The Ergonomics Safety Program states that Supervisors must ensure ergonomics are considered in the design of present and new work tasks and work locations.
A
True
B
False

# Appendix 11: Pre, Mid and Post Test

ID #: _____

Country of Origin: _____

## Pre and Mid and Post Test

### Multiple Choice

1. Ergonomics applies to:
   - A. Working postures
   - B. Tools, equipment and furniture design
   - C. Temperature, humidity and lighting
   - D. All of the above

2. Signs and symptoms of musculoskeletal disorders (MSIs) include:
   - A. Vomiting
   - B. Heart fluctuations
   - C. Pain or stiffness in muscles
   - D. Blood pressure fluctuations

3. The primary risk factors of developing **MSIs** are:
   - A. Repetitive movements
   - B. Forceful movements
   - C. Bending, twisting and heavy lifting
   - D. All of the above

4. When ergonomically evaluating the a workstation, the following is required to assist in preventing **MSI**s:
   - A. The closer the computer screen to you, the better
   - B. The desk chair should be bent backwards to ensure a relaxed posture
   - C. The best position for wrists is to always relax them on the desk while typing
   - D. The inward curve of the chair should be located in the lumbar region of the back

5. Good prevention for back pain includes:
   - A. Short, frequent rest periods
   - B. Constantly lifting heavy materials to assist in muscle development
   - C. Maintaining a posture with shoulders bent forward and neck slightly bent forward
   - D. Repeatedly doing the same activity, thus ensuring good muscle development in that area

6. One of the ways I can protect myself from back injury is by
   - A. Testing the object before lifting
   - B. Keeping the load close to my body
   - C. Not twisting at the waist when lifting
   - D. All of the above.

**True/False Questions**

7. If no pain is noticed while performing a repetitive task then you do not have to worry about MSIs.
   A. True
   B. False

8. Fatigue increases your risk of a MSIs.
   A. True
   B. False

9. Frequent short breaks are better than infrequent long breaks; for example, a 5 min rest every hour is more helpful than a 20 min rest every 4 hours
   A. True
   B. False

10. Laptops should be only be used for longer periods of work on a computer because they are light and easy to carry.
   A. True
   B. False

11. It is important to determine how much a person can safely lift even if the person lifting the object is very strong and fit.
   A. True
   B. False

12. The best lifting and lowering method to protect back health is to bend at the waist.
   A. True
   B. False

13. Stretching exercises should not be permitted to be done at work.
   A. True
   B. False

14. If your armrests interfere with you typing at your computer then you should consider lowering the armrest to its lowest position or consider removing them.
   A. True
   B. False

15. Place wrists on the wrist rest while working on your computer at all times for proper support to allow wrists to be constantly moving so that they are not always straight.

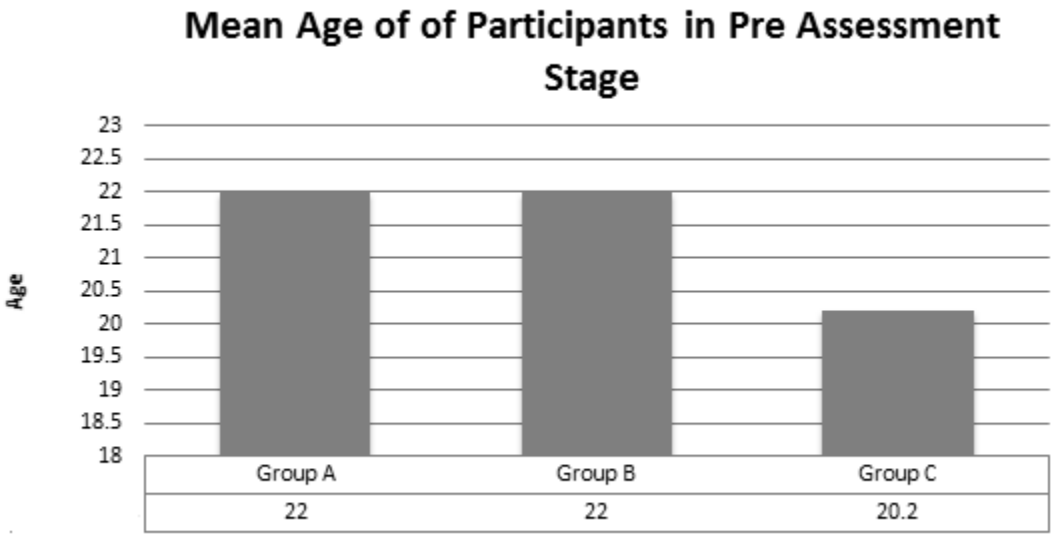
A. True
B. False

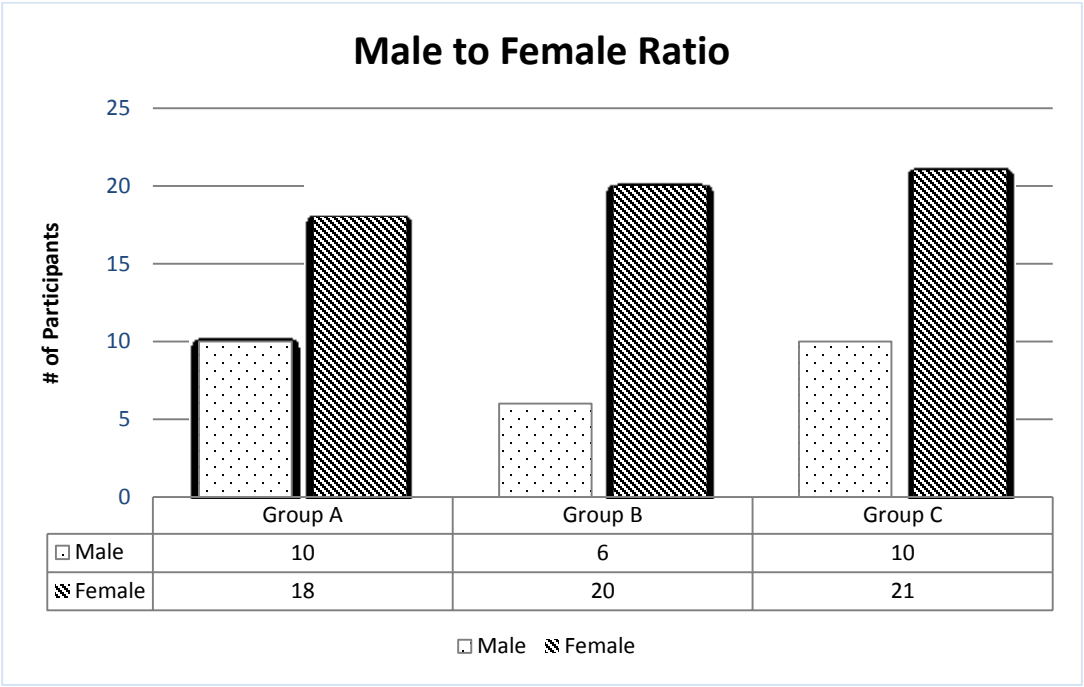
Score: /15 = ____%

Answer Key

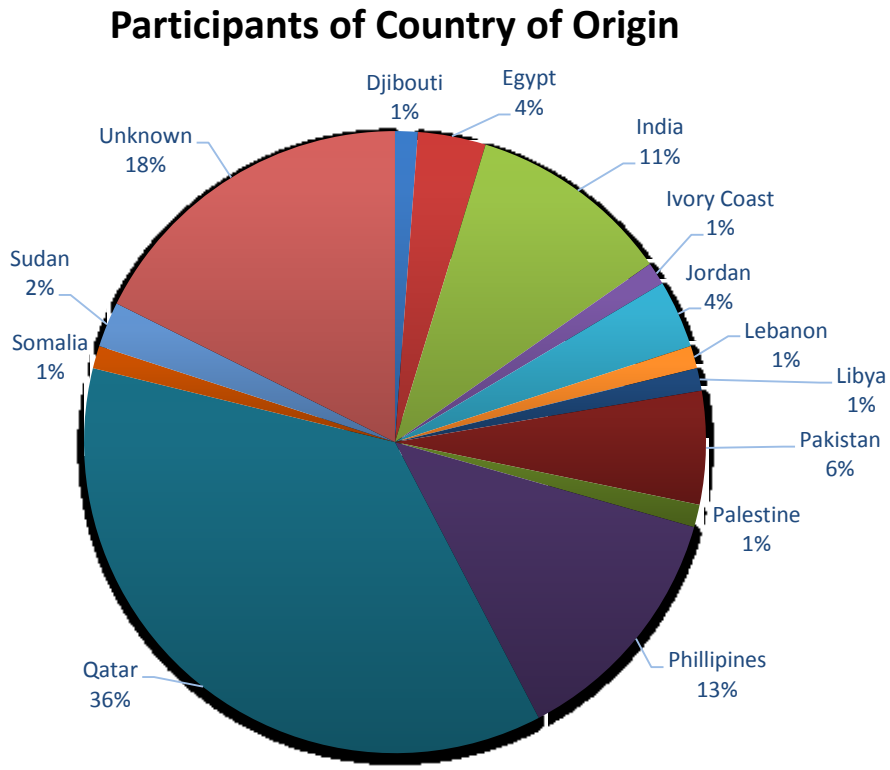
1. D
2. C
3. D
4. D
5. A
6. D
7. B
8. A
9. A
10. B
11. A
12. B
13. B
14. B
15. B

# Appendix 12: Statistical Analysis of Ergonomic Training


Mean Age of of Participants in Pre Assessment Stage
Age
23
22.5
22
21.5
21
20.5
20
19.5
19
18.5
18
Group A
Group B
Group C
22
22
20.2

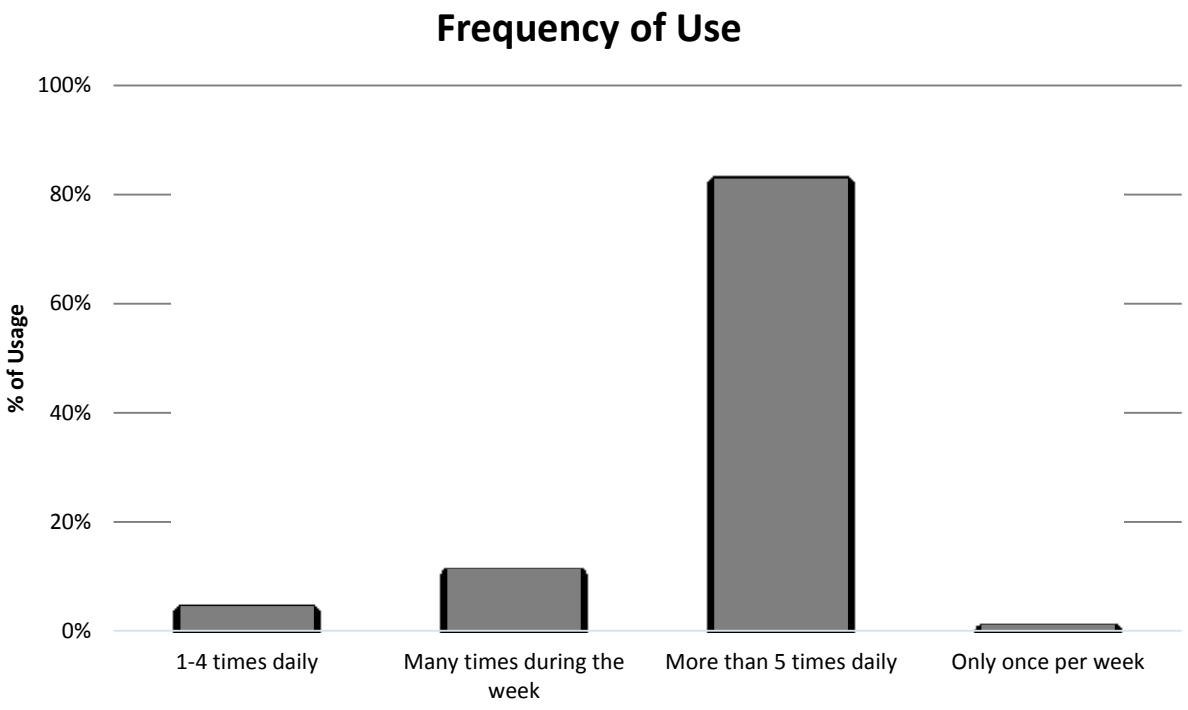

Male to Female Ratio
# of Participants
25
20
15
10
5
0
Group A
Group B
Group C
Male
10
6
10
Female
18
20
21
Male
Female

| Country of Origin | # of Participants |
|---|---|
| Djibouti | 1 |
| Egypt | 3 |
| India | 9 |
| Ivory Coast | 1 |
| Jordan | 3 |
| Lebanon | 1 |
| Libya | 1 |
| Pakistan | 5 |
| Palestine | 1 |
| Philippines | 11 |
| Qatar | 31 |
| Somalia | 1 |
| Sudan | 2 |
| Unknown | 15 |



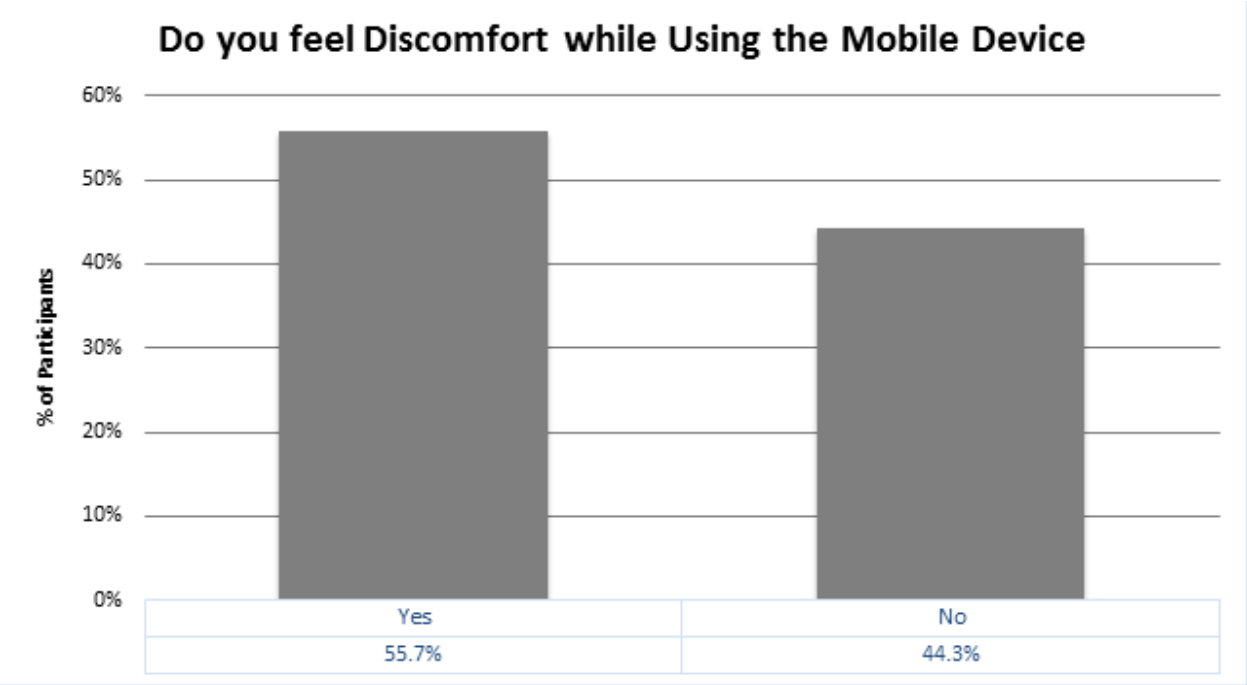
Mobile Usage Frequency

| Frequency of Mobile Technology Use | % of Usage |
|---|---|
| 1-4 times daily | 4.5% |
| Many times during the week | 11.4% |
| More than 5 times daily | 83.0% |
| Only once per week | 1.1% |



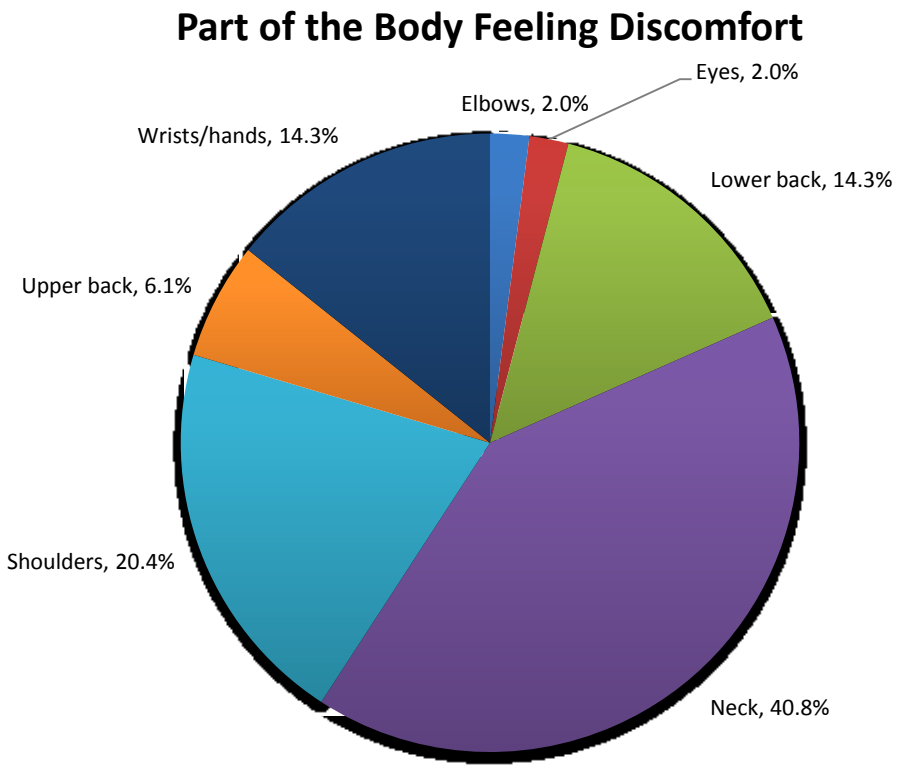
Feelings of Discomfort while Using a Mobile Device

| Feelings of Discomfort | % of Population |
|---|---|
| Yes | 55.7% |
| No | 44.3% |



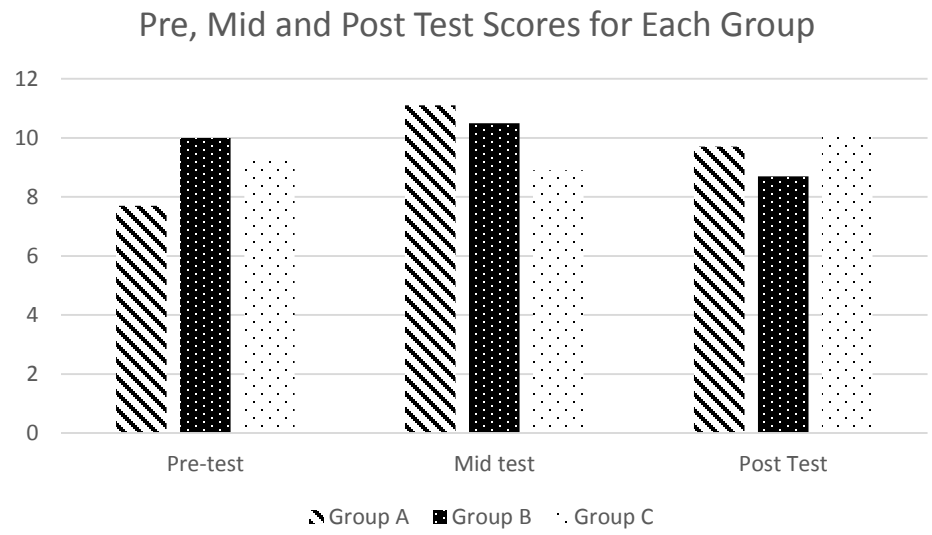
Location of Pain while Using a Mobile Device

| Body Part Feeling Pain | % of Population |
|---|---|
| Elbows | 2.0% |
| Eyes | 2.0% |
| Lower back | 14.3% |
| Neck | 40.8% |
| Shoulders | 20.4% |
| Upper back | 6.1% |
| Wrists/hands | 14.3% |



Mean Scores of Each Group

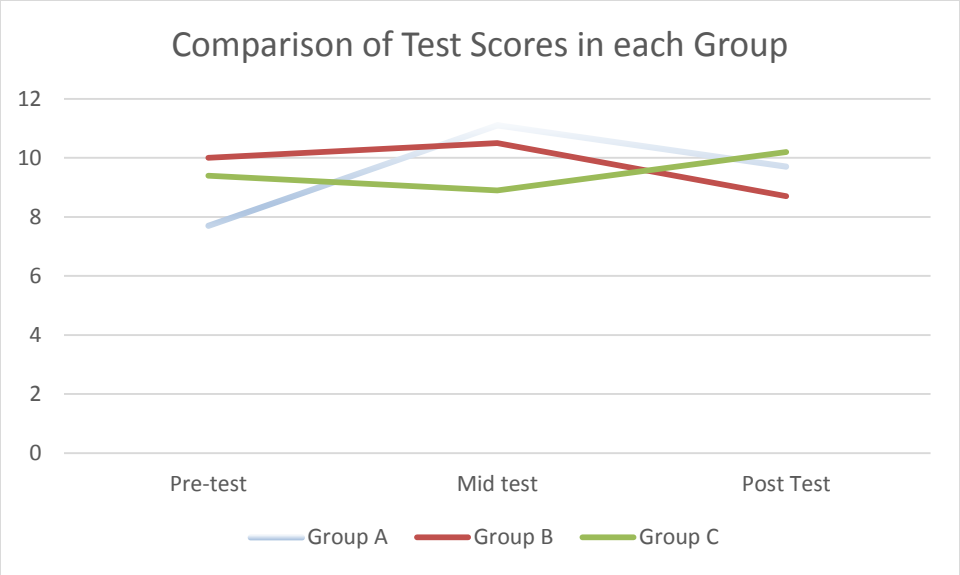
| | Pre-test | Mid test | Post Test |
|---|---|---|---|
| Group A | 7.7 | 11.1 | 9.7 |
| Group B | 10.0 | 10.5 | 8.7 |
| Group C | 9.4 | 8.9 | 10.2 |

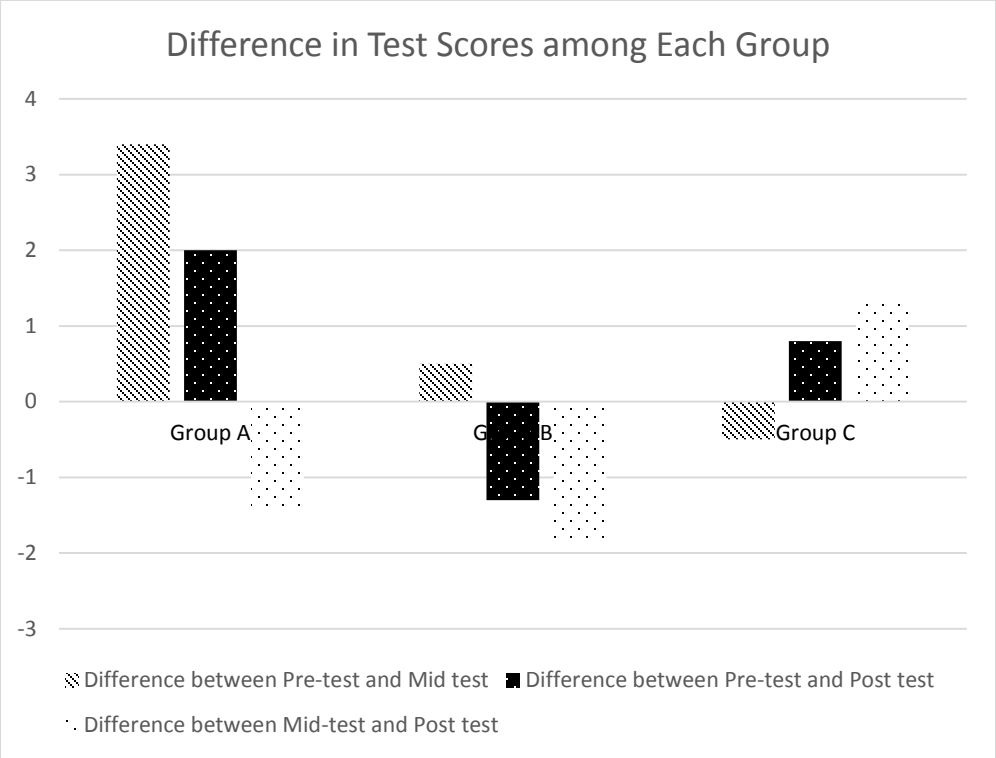


| Group A Pre test | | | Group B Pre test | | | Group C Pre test | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Mean | 7.6875 | | Mean | 10 | | Mean | 9.4 |
| Standard Error | 0.82522093 | | Standard Error | 0.587868 | | Standard Error | 0.59201 |
| Median | 9 | | Median | 10 | | Median | 9 |
| Mode | 9 | | Mode | 10 | | Mode | 8 |
| Standard Deviation | 3.30088372 | | Standard Deviation | 2.42384 | | Standard Deviation | 2.292846 |
| Sample Variance | 10.89583333 | | Sample Variance | 5.875 | | Sample Variance | 5.257143 |
| Kurtosis | -0.291016333 | | Kurtosis | 1.973537 | | Kurtosis | -0.1565 |
| Skewness | -0.841621109 | | Skewness | -0.41784 | | Skewness | -0.11815 |
| Range | 11 | | Range | 11 | | Range | 8 |
| Minimum | 1 | | Minimum | 4 | | Minimum | 5 |
| Maximum | 12 | | Maximum | 15 | | Maximum | 13 |
| Sum | 123 | | Sum | 170 | | Sum | 141 |
| Count | 16 | | Count | 17 | | Count | 15 |
| Largest(1) | 12 | | Largest(1) | 15 | | Largest(1) | 13 |
| Smallest(1) | 1 | | Smallest(1) | 4 | | Smallest(1) | 5 |
| Confidence Level (95.0%) | 1.758916776 | | Confidence Level (95.0%) | 1.246223 | | Confidence Level (95.0%) | 1.269736 |
| | | | | | | | |
| Group A Mid test | | | Group B Mid test | | | Group C Mid test | |
| | | | | | | | |
| Mean | 11.125 | | Mean | 10.47059 | | Mean | 8.866667 |
| Standard Error | 0.523410292 | | Standard Error | 0.549851 | | Standard Error | 0.755089 |
| Median | 12 | | Median | 11 | | Median | 9 |
| Mode | 12 | | Mode | 11 | | Mode | 12 |
| Standard Deviation | 2.093641166 | | Standard Deviation | 2.267092 | | Standard Deviation | 2.924445 |
| Sample Variance | 4.383333333 | | Sample Variance | 5.139706 | | Sample Variance | 8.552381 |
| Kurtosis | 0.207232517 | | Kurtosis | -0.55721 | | Kurtosis | -1.37904 |
| Skewness | -0.786115919 | | Skewness | 0.389854 | | Skewness | -0.32317 |
| Range | 7 | | Range | 8 | | Range | 8 |
| Minimum | 7 | | Minimum | 7 | | Minimum | 4 |
| Maximum | 14 | | Maximum | 15 | | Maximum | 12 |
| Sum | 178 | | Sum | 178 | | Sum | 133 |
| Count | 16 | | Count | 17 | | Count | 15 |
| Largest(1) | 14 | | Largest(1) | 15 | | Largest(1) | 12 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Smallest(1) | 7 | | Smallest(1) | 7 | | Smallest(1) | 4 |
| Confidence Level (95.0%) | 1.115622628 | | Confidence Level (95.0%) | 1.165631 | | Confidence Level (95.0%) | 1.619504 |
| | | | | | | | |
| Group A Post test | | | Group B Post test | | | Group C Post test | |
| | | | | | | | |
| Mean | 9.6875 | | Mean | 8.705882 | | Mean | 10.2 |
| Standard Error | 0.415519253 | | Standard Error | 0.721338 | | Standard Error | 0.562308 |
| Median | 10 | | Median | 9 | | Median | 10 |
| Mode | 10 | | Mode | 13 | | Mode | 9 |
| Standard Deviation | 1.662077014 | | Standard Deviation | 2.974153 | | Standard Deviation | 2.17781 |
| Sample Variance | 2.7625 | | Sample Variance | 8.845588 | | Sample Variance | 4.742857 |
| Kurtosis | 0.951947461 | | Kurtosis | -0.42919 | | Kurtosis | 0.059794 |
| Skewness | -0.127176332 | | Skewness | -0.1284 | | Skewness | 0.231716 |
| Range | 7 | | Range | 10 | | Range | 8 |
| Minimum | 6 | | Minimum | 3 | | Minimum | 6 |
| Maximum | 13 | | Maximum | 13 | | Maximum | 14 |
| Sum | 155 | | Sum | 148 | | Sum | 153 |
| Count | 16 | | Count | 17 | | Count | 15 |
| Largest(1) | 13 | | Largest(1) | 13 | | Largest(1) | 14 |
| Smallest(1) | 6 | | Smallest(1) | 3 | | Smallest(1) | 6 |
| Confidence Level (95.0%) | 0.885658324 | | Confidence Level (95.0%) | 1.529169 | | Confidence Level (95.0%) | 1.206031 |

| | Pre-test | Mid test | Post Test | Difference between Pre-test and Mid test | Difference between Pre-test and Post test | Difference between Mid-test and Post test |
|---|---|---|---|---|---|---|
| Group A | 7.7 | 11.1 | 9.7 | 3.4 | 2 | -1.4 |
| Group B | 10 | 10.5 | 8.7 | 0.5 | -1.3 | -1.8 |
| Group C | 9.4 | 8.9 | 10.2 | -0.5 | 0.8 | +1.3 |




Difference in Test Scores among Each Group
4
3
2
1
0
-1
-2
-3
Group A
Group C
Difference between Pre-test and Mid test
Difference between Pre-test and Post test
Difference between Mid-test and Post test

# Appendix 13: Debriefing Session

**A Quantitative Study of the Value of Ergonomic Training at the College of the North Atlantic, Qatar campus**

I am currently completing my masters in Biomechanics and Ergonomics from Memorial University of Newfoundland, and I am looking for volunteers to participate in my research this semester.

My general area of interest is in the value of ergonomics training, noting retention and knowledge acquisition.

If you have been accepted into a program at the college, then you are eligible and welcome to participate in this project.

My research involves testing ergonomic knowledge. Should you choose to participate, you will be randomly assigned to 1 of 3 groups. They are:

Group A: Training led by Mr. Adam Neave

Group B: Training completed online

Group C: No training (control group)

Tests will be conducted before and after the training session to all 3 groups. I am interested in learning about the extent your ergonomic knowledge has changed as a result of the training.

These activities may require a 5 hour commitment (depending on which group you are assigned) during the Fall 2014 semester.

Your participation in this project is completely voluntary and will be kept confidential. You may withdraw from the study up to, and including November 9, 2014, for at that time all test results will be gathered.

You are welcome to ask questions at any time during your participation in this research. If you would like more information about this study, please contact:

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Thanks very much! I appreciate your support!