Development of Repetitive Strain Injuries in Leap Motion Control Based System

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STATEMENT OF THE PROBLEM
The repetitive strain injuries (RSIs) are becoming an increasingly important issue due to the surging need for people to spend more hours on computer for office and leisure. RSIs are very damaging for both physical and mental health. Many studies have been contacted to identify and reduce the risks of developing RSIs. Nowadays developers have been putting great efforts in creating gesture motion based systems in order to bring more creativity and flexibility in the ways we control our devices. The gesture based interfaces are certainly becoming more affordable. Leap motion control is one of the recently introduced gesture motion based system which has capability to replace the traditional keyboard and mouse control setup. The Leap motion control has multiple different gesture commands, thus the user is required to make different motion to navigate the system. This motion variety is what the researches have shown to Lower the risk and severity of RSIs. Therefore it is interesting to research the possible implication of this new way of controlling computer on development of RSIs.

RESEARCH QUESTIONS AND/OR HYPOTHESES
The research question of this study is to examine how the introduction of Leap Motion Technology affects the risk of RSIs.

METHODS AND PROCEDURES
This study will be in an experimental setting, in order to better control and randomize the variables that may influence the results. Also the study is planned to be a longitude research, since the syndromes of RSIs require longer observation and rich data to identify.

In the beginning of the study, participants will be checked by physicians about their health conditions, and introduced to the Leap motion system. Then participants will be given a set of tasks consisting average office computer procedures such as typing, navigation though the interface, drawing, and internet browsing. The participants will perform the set of tasks with Leap Motion Control with guidance of assistants. Moreover, the participants will be required to perform this set for everyday in the following three months.

The length of the set of task for each participant group is different and can be divided into three categories:
1. Short task: 3 hours
2. Average task: 5 hours
3. Long task: 7 hours

During the study, the physical health of each participant will be annually accessed by professional physicians for every half month. Every month, an interview will be held where participants can individually reflect his or her experience. The research question can be then evaluated based on the records of physicians and interviews with the participants.

Variables
The dependent variable of this study is symptoms of RSIs both reported by the physicians and participants. The symptoms consists pain, tightness, dull ache, throbbing, numbness, or/and tingling in areas such as arm, wrist, shoulder, or/and hand. Each symptoms will be categories from 0 - 10 depending on the severity.

This study has one independent variable which is the length of the task. The implication of the variable is to further investigate will the degree of exposure to the task affects severity of RSIs.

This research also aimed to control the amount of sports exercises participants do. Sports activities are known to have prevailing effects on RSIs. Thus to avoid distortion, the participants will be asked to not partake any sports during the research.

We will try to randomize the age groups of the participants, because elderly people have been studied to have greater risk develop RSIs than youngsters. This is archived by sampling across different age groups.

Furthermore it is known vulnerability of RSIs for each individuals varies. Therefore we will try to randomize this effects through a large sample size of 60 persons.

Sampling
The sampling method of this study will be self-selected sampling. Questionnaires with briefing of the study will be handed out. In pursuance of obtaining participants from
different age groups, sampling will be spread across different institutes e.g. High schools, universities, office firms etc.

As an incentive, financial rewards are promised for the every hour of participation into the research. The aim is to attract 60 participants in the study.

When the participants are gathered, they will be randomly assigned into the three groups which will have different length of tasks.

**Instrumentation**
A questionnaire consisting briefing of the study, authentication, and agreement of participation will be constructed for the purpose of sampling.

For the lab set up, iMacs will be set up for use. Leap motion controls will be connected and installed. Appropriate application will be used for each designed task, for instance Photoshop CC for drawing, Safari for browsing websites etc.

Interview guidelines will be designed for the participant reflection. The guidelines will have questions about different syndromes of RSIs, and overall opinions of the physical conditions.

**Data collection**
Addition to what have been stated in Methods and Procedures. Participants’ self-reflections on their symptoms will be recorded similarly to physician assessment in the scale of 0 - 10.

**Data analysis**
The collection of physician reports will be analyzed to see whether there is a significant evidence for the development of RSIs with Leap motion control system. Every annual report including the initial health evaluation are compared to see the changes in participants condition. The results and conclusion will be peer reviewed by using the self-reflections from the interviews of participants.

**LIMITATIONS AND DELIMITATIONS**
The study is limited to Leap Motion Control, which means the findings may not be generalizable to other gesture based motion control interfaces. However futures studies can provide cross references on this matter.

The gender and ethnicity of participants will be not controlled, because no previous studies have determined them to be risk factors in RSIs, therefore they are not concerns of this study. Nevertheless it would be preferable to randomize those two variables during sampling if possible.

Moreover this research disregards the amount of previous knowledge and experience of gesture motion based technology the participants have. This is because this study focuses on the physical changes.

**SIGNIFICANCE**
It is important to provide knowledge and attention on the issue of RSIs in order to maintain the direction of technology development towards better comfort and physical health.

**REFERENCES**


