

ORIGINAL ARTICLE

COMPUTER MOUSE USAGE AMONG COMPUTER GAMERS AND ITS ASSOCIATION WITH TRIGGER FINGER AND CARPAL TUNNEL SYNDROME

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ABSTRACT

Computer mouse design has evolved throughout generation. Most people are using computer mouse to do work and for entertainment. However, due to repetitive actions involving hand, it could lead to Trigger Finger and Carpal Tunnel syndromes. Objectives of the study are: (i) to evaluate the relationship between computer mouse's usage during playing online games - number of keystroke, number of buttons clicking, distance of computer mouse dragging, and duration of active on game - and Trigger Finger syndrome via Trigger Finger test; and (ii) to evaluate the relationship between computer mouse's usage during playing online games - number of keystroke, number of buttons clicking, distance of computer mouse dragging, and duration of active on game - and Carpal Tunnel syndrome via Phalen's test. Thirty participants are recruited for the study. A participant are asked to download a software called 'Mousotron' on his computer system that provide data of his or her pattern of computer mouse usage - number of keystroke, number of buttons clicking, distance of computer mouse dragging, and duration of active on game. After that, participants are required to come to the laboratory for the assessment phase in which the Trigger Finger and Phalen's tests are assessed. The interactions between the variables are analyzed and the results show a positive correlation for all interactions. The findings show how spending time playing video games will affect one's health - specifically the hands.

Keywords: Trigger Finger test, Phalen's test, computer mouse usage, mousotron

INTRODUCTION

Play online games requires users to utilize the most general input controls on the computer mouse such as left button, right button, and several extra buttons. The controls are activated by clicking the buttons and scrolling the wheel. In addition, moving the computer mouse around - by dragging the mouse - also could activate several functions. Normally, gamers spend about 6-8 hours daily to play the game (Maiberg, 2015). Thus, exposure to the long duration and repetitive actions of clicking, scrolling, and dragging the computer mouse during playing online games may or may not result several hand problems - trigger finger and carpal tunnel syndrome to name a few. Trigger finger symptom is when a user experiences a finger lock - cramp - in which make the user difficult to straighten the fingers again after period of bending. Normally, snapping or popping sound will appear when the finger does finally straighten again (Rehman, 2014). Carpal tunnel syndrome is a compression neuropathy of the median nerve as it passes through the carpal tunnel that caused by increased pressure in the carpal tunnel (Thomsen, Gerr, & Atroshi, 2008).

METHODS

Thirty participants were recruited for the study. They are :(i) undergraduate students from

International Islamic University Malaysia, (ii) between 18-25 years of age, (iii) must own a computer system - laptop or desktop, and (iv) actively playing online games on daily basis. The apparatus and stimuli are classified into three categories: (i) laptop/computer desktop and app, (ii) assessment tools, and (iii) administrative documents. All participants need to install a software call Mousotron. This software used for collecting data of computer mouse usage. Then, after a month participant sent the data of the computer me via print screen and experimeter recorded the data. Participant was informed to come for do the test at IUM Ergonomic Lab and administrative documents like consent informed form and questionnaire was provided for participant to be fill in.

There are two assessments will be done in this experiment - trigger finger test and phalen's test. Figure 1 shows the procedure of trigger finger test. For trigger finger test, experimenter will give pressure of the finger and participant need to try bend straight his or her finger and then participant need to level the difficulty of the bend by fill up the data form prepared by experimenter. . According to Ekman, Anderson, Hagberg, & Hjelm (2000), RSI (repetitive stress injury) comes from repetitive motions issue and static muscular tension. Musculoskeletal

symptoms are often indicated as the main cause in psychosocial factors.

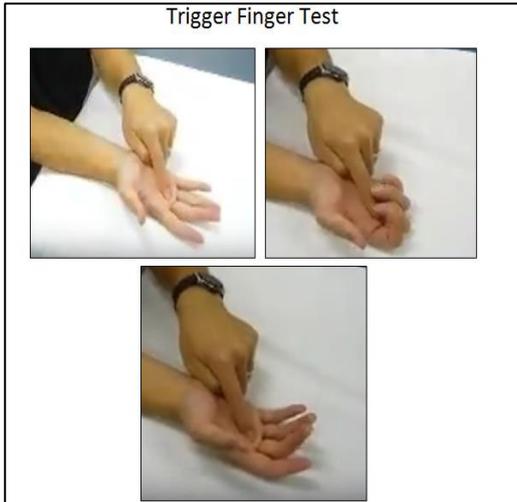


Figure 1: Trigger Finger Test

Figure 2 illustrate procedure of Phalen’s test for carpal tunnel syndrome. In Phalen’s test, participants will be asked to hold in force flexion for 60 seconds. Responses to Phalen’s test, the symptoms that may or may not appear during the test are burning, tingling or numb sensation around the wrist as a positive test result.

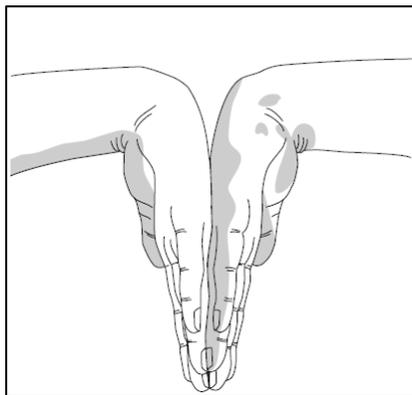


Figure 2: Phalen's Test (L. Urbano, 2000)

RESULTS

Using the Microsoft Excel, the linear trend line was drawn on a plotted scattered diagram. The trend line equation, coefficient of determination (R²), and the correlation coefficient (R) were obtained. The data was also analyzed by using the regression analysis tool, and the summary outputs of the analysis were acquired. The data was also analyzed by using the regression analysis tool, and the summary outputs of the analysis were acquired. The result of the relationship between the computer mouse usage during playing online games - number left click, number of right click, number of keystroke, number of mouse yards (mouse dragging) and duration of playing games.

Table 1: Summary of Trigger Finger Test Result

Hand	Right	Left
Mouse Usage		
Left Click	$F(1, 20) = 0.8482, p < 0.071$ $R^2 = 0.1541$ $R = 0.3923$ $y = 497.26x + 636.07$ y = number of left click X = difficulty level • Moderate positive correlation • Significant	$F(1, 20) = 0.8771, p < 0.3602$ $R^2 = 0.042$ $R = 0.2023$ $y = 219.6x + 1266.5$ y = number of left click X = difficulty level • Moderate positive correlation • Significant
Right Click	$F(1, 20) = 1.0299, p < 0.0294$ $R^2 = 0.2387$ $R = 0.4894$ $y = 2611.2x + 1241.8$ y = number of right click X = difficulty level • Moderate positive correlation • Significant	$F(1, 20) = 0.8712, p < 0.0194$ $R^2 = 0.2387$ $R = 0.4897$ $y = 2226.2x + 296.42$ y = number of right click X = difficulty level • Moderate positive correlation • Significant
Keystroke	$F(1, 20) = 1.0292, p < 0.0294$ $R^2 = 0.1305$ $R = 0.3613$ $y = 669.62x + 706.42$ y = number of keystroke X = difficulty level • Moderate positive correlation • Significant	$F(1, 20) = 0.5962, p < 0.3373$ $R^2 = 0.0178$ $R = 0.1322$ $y = 253.11 + 1600.8$ y = duration of active screen X = difficulty level • Low positive correlation • Not significant
Distance of yards (mouse dragging)	$F(1, 20) = 0.3927, p < 0.0282$ $R^2 = 0.1285$ $R = 0.3574$ $y = 451.75x + 61.955$ y = distance of yards X = difficulty level • Moderate positive correlation • Significant	$F(1, 20) = 0.6296, p < 0.3306$ $R^2 = 0.028$ $R = 0.1680$ $y = 287.5x + 433.55$ y = distance of yards X = difficulty level • Low positive correlation • Not significant
Duration of playing games	$F(1, 20) = 0.8482, p < 0.071$ $R^2 = 0.2766$ $R = 0.5259$ $y = 12.25x + 65.65$ y = duration of playing games X = difficulty level • Moderate positive correlation • Significant	$F(1, 20) = 0.8482, p < 0.1707$ $R^2 = 0.0285$ $R = 0.1675$ $y = 11.24x + 67.339$ y = duration of playing games X = difficulty level • Low positive correlation • Not significant

Table 2: Summary of Phalen's Test

Hand	Right	Left
Mouse Usage		
Left Click	$F(1, 20) = 0.5897, p < 0.008$ $R^2 = 0.4387$ $R = 0.6624$ $y = 256.32x + 694.21$ y = number of left click X = pain level • Moderate positive correlation • Significant	$F(1, 20) = 0.3514, p < 0.070$ $R^2 = 0.0205$ $R = 0.0404$ $y = 7.74x + 1561.7$ y = number of left click X = pain level • Very low positive correlation • Not Significant
Right Click	$F(1, 20) = 0.667, p < 0.04$ $R^2 = 0.3125$ $R = 0.5594$ $y = 1471.2x + 1009.4$ y = number of right click X = pain level • High positive correlation • Significant	$F(1, 20) = 0.974, p < 0.1735$ $R^2 = 0.0385$ $R = 0.1997$ $y = 1154.6x + 1244.9$ y = number of right click X = pain level • Weak positive correlation • Not Significant
Keystroke	$F(1, 20) = 1.7676, p < 0.00019$ $R^2 = 0.3896$ $R = 0.6242$ $y = 421.38x + 496.56$ y = number of keystroke X = pain level • Moderate positive correlation • Significant	$F(1, 20) = 0.1772, p < 0.6782$ $R^2 = 0.0086$ $R = 0.09277$ $y = 151.52x + 1709.9$ y = distance of yards X = pain level • Low positive correlation • Not significant
Distance of yards (mouse dragging)	$F(1, 20) = 0.3924, p < 0.008$ $R^2 = 0.3896$ $R = 0.6244$ $y = 251.55x + 91.025$ y = distance of yards X = pain level • Moderate positive correlation • Significant	$F(1, 20) = 0.3514, p < 0.0702$ $R^2 = 0.0207$ $R = 0.0285$ $y = 7.182x + 936.54$ y = distance of yards X = pain level • Very low positive correlation • Not significant
Duration of playing games	$F(1, 20) = 0.5441, p < 0.0040$ $R^2 = 0.3463$ $R = 0.5875$ $y = 8.0157x + 76.289$ y = duration of playing games X = pain level • Moderate positive correlation • Significant	$F(1, 20) = 0.3622, p < 0.11011$ $R^2 = 0.1356$ $R = 0.3686$ $y = 11.54x + 64.408$ y = duration of playing games X = pain level • Moderate positive correlation • Significant

The coefficient of correlation was used to analyze the relationship of the two variables (variable 1: number of left click, number of right click, number of keystroke, distance of yards and duration of playing games; variable 2: Trigger Finger test - based on the difficulty level - and the pain level of Phalen’s test that are known to be affected by the excessive use of computer mouse because they are neither independent variables nor dependent variables. One important issue that needs to be aware is that the correlation is different with regression, does not indicate causation (Ott & Longnecker, 2016).

CONCLUSION

The objectives of the study is to evaluate if there is association between the computer mouse usage during playing online game - number of keystroke, number of buttons clicking, distance of computer mouse dragging and duration of active game - with the tests that associate with Trigger Finger syndrome and Carpal Tunnel syndrome - Trigger Finger test and Phalen’s test that can be affected by the excessive use of computer mouse usage. Table All the objectives are obtained where the finding have shown that there are positive correlations in all the interactions between the variables.

Table 3: Summary of the Obejectives Achievement

Objective	Finding		Significance		Achieved?
	Right	Left	Right	Left	
To evaluate the relationship between the number of left click and the Trigger Finger test.	Moderate positive correlation	Low positive correlation	Yes	No	Yes
To evaluate the relationship between the number of left click and the Phalen’s test.	Moderate positive correlation	Low positive correlation	Yes	No	Yes
To evaluate the relationship between the number of right click and the Trigger Finger test.	Moderate positive correlation	Moderate positive correlation	Yes	Yes	Yes
To evaluate the relationship between the number of right click and the Phalen’s test.	Moderate positive correlation	Low positive correlation	Yes	No	Yes
To evaluate the relationship between the number of keystroke and the Trigger Finger test.	Moderate positive correlation	Low positive correlation	Yes	No	Yes
To evaluate the relationship between the number of keystroke and the Phalen’s test.	Moderate positive correlation	Low positive correlation	Yes	No	Yes
To evaluate the relationship between the distance of yards and the Trigger Finger test.	Moderate positive correlation	Low positive correlation	Yes	No	Yes
To evaluate the relationship between the distance of yards and the Phalen’s test.	Moderate positive correlation	Low positive correlation	Yes	No	Yes
To evaluate the relationship between duration of playing games and the Trigger Finger test.	Moderate positive correlation	Low positive correlation	Yes	No	Yes
To evaluate the relationship between duration of playing games and the Phalen’s test.	Moderate positive correlation	Moderate positive correlation	Yes	Yes	Yes

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