The impact of video games on manual dexterity

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Abstract

The impact of video games on adolescent behaviour is well studied, with literature reporting both negative and positive relationships. This paper demonstrates a link between video game playing and time to complete a manual task. We conclude that the playing of 1 hour of video games has a dramatic effect on assembly time, more than halving the time to assemble the equipment, from 8 seconds to 4 seconds.

Introduction

The impact of video games on adolescent behaviour traits is well studied and reported in the media and peer reviewed journals. (Gentile, 2004) reported that adolescent boys played on “average” 13 hours per week, with most parents not regulating the daily or weekly amount of “game time”. The authors reported that those teens who played for the longest periods of time:

- Tend to be more aggressive
- Are more prone to confrontation with their teachers
- May engage in fights with their peers
- See a decline in school achievements.

Interestingly, (Weis, 2010) shows a negative correlation between duration of game play and academic attainment. The negative correlation was most significant for the boys in the study and they had lower reading and writing scores and greater teacher-reported academic problems at follow-up than comparison female group.

Whilst the negative effects of video game playing are well reported in the media, positive benefits to general health and well being are often overlooked. However, (Kato, 2010) reports measurable health benefits in patients and health care professionals:

- Nausea reduction in cancer patients
- Anxiety management
- Physical theory and general fitness
- Pain reduction
- Surgical skills
- Improved memory and spatial awareness

The impact of video games on memory and visual processing of information is also widely studied and (Ferguson, 2008) reports a positive correlation between duration of game play and visual spatial performance, eye - hand coordination, fine motor control, and reaction time. In addition to this, (Green, 2007) reports a causal link between game play and improved visual spatial performance.

(Rosser, 2007) reports that surgeons who play >5hrs per week make 37% less errors in laparoscopic surgery compared to their non game playing colleagues. This work has been extended by (Schlickum, 2009) who demonstrate that medical

students who played the first person-shooter "*Half Life*" for 1 hour per day, for 5 days a week, for 5 weeks, showed significant improvement in their laparoscopic skills compared to a control group who refrained from playing any computer games for the same duration.

Btec L3 Applied Science

For this study, a group of Year 12 & 13 students (16-18 years old) where asked to keep a game playing log over a seven day period - specifically, to log duration of first person shooters, such as the popular "*Call of Duty*". Once the log was completed, a controlled test to assess their manual dexterity was carried out.

Experimental Technique

Students were given the task of timing themselves assembling a piece of scientific equipment in a specific configuration.

Results & Discussion

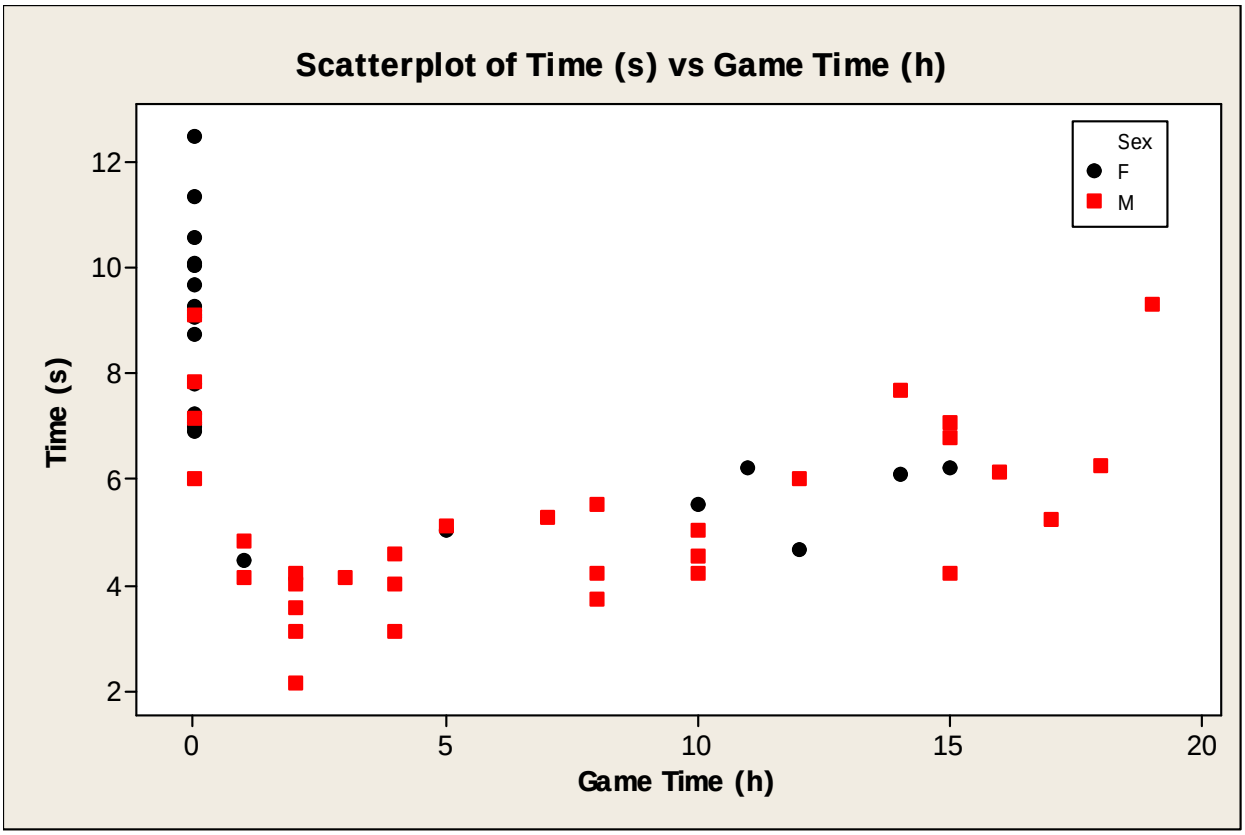

Figure 1: Time to assemble equipment

Game playing time ranged from 0 to 18 hours, whilst the time to complete the task ranged from 2 to 13 seconds.

Figure 1 clearly demonstrates three outcomes:

1. Those students reporting 0 game play appear to have a higher task completion time that those who play
2. As game play increases, certainly beyond 5 hours per week, the data seems to indicate a negative impact on time to assemble the equipment - the most avid game players report the longest times
3. Performance times of boys seems to be lower than for girls - however, this could be confounded by boys having a higher game play time.

To assess the impact on game play, the data is grouped and coded as follows:

Raw game play hours	Coded "group"
0	0
1-5	1
6-10	2
11-15	3
16-20	4

Figure 2: Coding the game play

Once the data was coded ANOVA was run to determine the significance of game play duration on assembly time:

One-way ANOVA: Time (s) versus Coded

```
Source  DF      SS     MS      F      P
Coded    4  211.94  52.99  31.40  0.000
Error   51   86.07   1.69
Total   55  298.01

S = 1.299   R-Sq = 71.12%   R-Sq(adj) = 68.85%

                          Individual 95% CIs For Mean Based on
                          Pooled StDev
Level   N   Mean  StDev  --------+---------+---------+---------+-
0      21  8.694  1.660                                  (---*---)
1      14  4.033  0.822  (----*----)
2       8  4.750  0.676      (-----*-----)
3       9  6.107  1.089               (-----*-----)
4       4  6.738  1.779                (--------*--------)
                          --------+---------+---------+---------+-
                                4.5       6.0       7.5       9.0

Pooled StDev = 1.299
```

The p-value of p=0.000 indicates a strong significance of game play duration on assembly time. The ANOVA also clearly shows the impact of moving from 0 hours to the first group of 1-5. Sub sequentially, the means of each group increases - however, the final group mean of 6.738 is still lower than that for the 0 hours.

Why, after the initial dramatic reduction in assembly time, should the time increase for increased game play is unclear, but it has been suggested that these students are deficient in sleep as a result of such game play.

One-way ANOVA: Time (s) versus Sex

```
Source  DF      SS     MS      F      P
Sex      1   98.69  98.69  26.74  0.000
Error   54  199.33   3.69
Total   55  298.01

S = 1.921   R-Sq = 33.11%   R-Sq(adj) = 31.88%

                        Individual 95% CIs For Mean Based on
                        Pooled StDev
Level   N   Mean  StDev  --+---------+---------+---------+-------
F      24  7.943  2.166                      (-----*------)
M      32  5.260  1.718  (-----*-----)
                        --+---------+---------+---------+-------
                        4.8       6.0       7.2       8.4

Pooled StDev = 1.921
```

To clarify the issue of any sex linking of the assembly time data, the ANOVA was re-run for the data split by sex. As can be seen, sex is also statistically significant in determining the outcome. However, the R^2 of 31.88% is less than half the R^2 of game play of 68.55% - so whilst sex and duration are significant, duration is the single most significant factor in determining assembly time.

Extensions

Possible extensions to this project would be to compare other factors such as sleep duration, diet and exercise as these are also likely to be linked to the assembly time.

Conclusions

This paper has presented a link between game play duration and manual dexterity as measured by the assembly of a specific piece of scientific apparatus.

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