
Left-Handed Control Configuration for Side-Scrolling Games

Alain Maubert Crotte

Department of Computer Science
University of Regina
Regina, SK, Canada
mauberta@uregina.ca

Daryl H. Hepting

Department of Computer Science
University of Regina
Regina, SK, Canada
hepting@cs.uregina.ca

Anastasia Roshchina

Centre for Continuing Education
University of Regina
Regina, SK, Canada
anastasia.roshchina@uregina.ca

ABSTRACT

Nowadays video games are more inclusive: children, disabled people, and seniors are considered. However, there are players that require special configuration so they could enjoy playing equally. One of these types of players is left-handed players. In order to determine whether to create a special configuration designed for the needs of left-handed audience, we carried out a study where left-handed players were targeted and offered to play with two types of control: a standard right-handed and a customized left-handed configuration. A significant main effect on player experience on the left-handed control configuration was demonstrated. The study reveals the importance of a catered control configuration to create a fair, non-stressful and user-friendly environment for players.

KEYWORDS

Left-handedness; online game; games; digital games; player styles; user types

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

CHI'19 Extended Abstracts, May 4–9, 2019, Glasgow, Scotland UK

© 2019 Copyright held by the owner/author(s).

ACM ISBN 978-1-4503-5971-9/19/05.

<https://doi.org/10.1145/3290607.3312777>

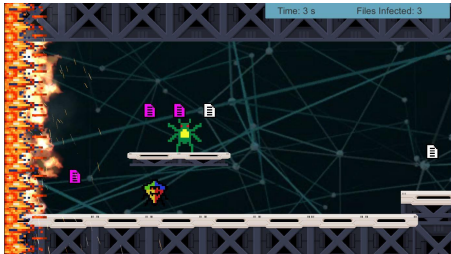


Figure 1: View of the Level 1; the player, the firewall, files, and an anti-virus can be seen; Time elapsed and Files Infected counter are on the top right side of the screen. The game was developed using the UNITY game engine and deployed online using WebGL.

INTRODUCTION

Computer games become more and more popular each year, and the video game industry generates more revenue than music and movies combined [6]. Video game producers constantly upgrade their technologies and try to take into consideration the needs of different groups of players. Nevertheless, there is still much to improve. For example, even though there is a certain percent of left-handed players, several game producers do not improve their equipment to facilitate control configuration for this type of players [14, 15, 18, 21, 22, 24]. We pondered two important research questions: Does using a left-handed control configuration affect performance? Does using a left-handed control configuration affect play experience?

There are papers dedicated to dominant handedness and its influence on hemispheric language lateralization [25] and motor skills [12]. A dominant hand makes more precise sequence manipulations which take longer time to be reproduced by a non-dominant hand [11]. Left-handedness is a preference to use a left hand for major manipulations which is a unique characteristic of humans. Left-handed people are ten percent of the whole population [9]. Many researches explain the phenomenon of left-handedness as a correlation with the asymmetric hemispheric language development [9, 25].

Latest researches found out the connection of cognitive and social skill development stimulated by playing computer video games [16]. At the same time, various articles claim that playing video games in early age as well as adulthood has a positive impact on motor skills development. For example, a number of studies carried on surgeons' performance revealed a higher level of eye-hand coordination, significant improvement on spatial visualization, larger amount of information processed over time, and increased reaction time [8]. Other studies prove the use of video games for training real-life skills, such as driving a car, piloting an airplane or playing golf [7].

STUDY AND METHODOLOGY

We created a study to test and discover if there was a difference in performance and experiential measures between a left- and right-handed control configuration for left-handed participants. The game genre chosen was a side-scrolling platformer. We have taken this decision because the game mechanics in this side-scrolling game are intuitive and easy to use.

The experiment was conducted with the assistance of the Amazon Mechanical Turk (MTurk) [23]. The workers self-declared in MTurk to be left-handed before knowing about our study. We paid extra to Amazon to provide the Left-Handed Premium Qualification, which only allows self-declared left-handed participants to see our study. Fifty paid workers participated in the investigation, where 38 were male, 11 female, and one did not provide his/her gender. To ensure sufficient statistical power, Simmons et al. [20] recommends a minimum of $n = 20$ participants per condition. The University of

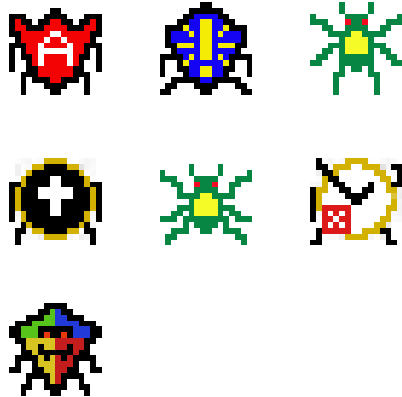


Figure 2: Characters of the game (from left to right, from top to bottom): Final Boss, Minion, MegaByte (standing), Protector, MegaByte (jumping), Morton, and Defender.

Regina Research Ethics Board has given approval on ethical grounds. The participants were requested to give informed consent and be over 18 years old.

A total of 25 participants were asked to play the game (see Figure 1) using a right-handed control configuration, and 25 of them were offered an adjusted left-handed control configuration. In order to reduce the presence of a placebo effect, the participants were unaware of the handedness of their control configuration. Completion time and files infected were recorded. Subsequently, all the participants filled out an online questionnaire using standard instruments employed by other researchers in HCI [3, 4, 10]. When they finished, they were offered a possibility to share their experience, comment and provide feedback on the game design, control configuration, etc. All the information collected was sorted according to the experiential measures shown in Figure 4. Participants were rewarded with 4 USD for their contribution to the research experiment.

For the *Left-Handed Control Configuration* we have chosen an “IJKL” control configuration for left-handed players as it mirrors the standard PC control scheme “WASD” for the right-handed players. This decision was made based on left-handed players’ comments found on Twitter [21, 22]. Thus, “J” - moving left, “L” - moving right, “A” - jumping. For the *Right-Handed Control Configuration*, the controls were “A” - moving left, “D” - moving right, “L” - jumping. The game mission for the participant (the player controls a virus called “MegaByte” as seen in Figure 2) is to infect as many files as possible (score), at the same time escaping from enemies (anti-viruses) and the screen (firewall) that are following the player.

Dependent Measures: To analyze the empirical results of our investigation, we looked at two performance measures (Files Infected as a total score and Elapsed Time) and ten experiential measures (see Table 1) retrieved by a post-game questionnaire consisting of 37 questions.

RESULTS

Performance and experiential measurements were done using Independent-Samples T Test evaluations. Levene’s test for equality of variances [2] was satisfied. In our study, all variances are assumed to be equal or homogeneous. Our research used a between-subjects design to see the differences between left-handed players that used a different set of control configuration. All data was analyzed using SPSS 21 (IBM, 2012).

Did Using a Left-Handed Control Configuration Affect Performance? When analyzing the participants, the performance measures indicated that there was a numerical difference when using a right-handed or left-handed control configuration, but that difference was not statistically significant (see Figure 3).

Did Using a Left-Handed Control Configuration Affect Play Experience? We performed several Independent-Samples T Test evaluations (see Figure 4), which showed us that there was a statistically significant effect observed on PENS: Competence with measurements between the left-handed ($M=4.41$, $SD=1.307$) and right-handed ($M=3.60$, $SD=1.309$) control configuration; $t(48)=2.190$, $p=.033$,



Figure 3: Mean \pm SE files infected (score) and elapsed time spent to complete the game. We found no statistically-significant differences on performance between right-handed and left-handed participants.

an effect was also present in PENS: Controls for the left-handed ($M=5.58$, $SD=1.316$) and right-handed ($M=4.16$, $SD=1.748$) control configuration; $t(47)=3.209$, $p=.002$, finally, a significant effect was seen in Player Attribution scale between left-handed ($M=4.67$, $SD=1.007$) and right-handed ($M=3.86$, $SD=1.245$) control configuration; $t(48)=2.504$, $p=.016$.

Our study shows that, in general, the left-handed players benefited from the adjusted control configuration. From the questionnaire offered to the players after the completion of the game, we received various positive responses to the questions (here and further original orthography and punctuation of the authors are kept): “*Absolutely! I think there should be more left-handed options*”, “*yes, the opposite controls to right handers is better design*”, and “*the navigation keys J and L is good selection. because mostly i use this keys frequently. so easy to navigate*”...

DISCUSSION

Why PENS: Controls Measurement had a Significant Effect? We hypothesize that the significant main effect on the Player Experience of Need Satisfaction (PENS): Intuitive Controls [19] was possible due to the fact that left-handed players remembered easier the location on the keyboard of the action button “A” for jumping, specially during dire circumstances where jumping was needed with higher frequency to evade hordes of enemies.

Why Player Attribution Presented a Significant Effect? Depping et al. [4] proposed a game-specific questionnaire to measure attributional characteristics in order to determine how intrinsically a player credits their in-game success internally in contrast to external factors. Based on that scale, our research demonstrates a noticeably main effect on a player ascribing their achievements to their own merits, and not an external factor. We showed that there is a tendency for left-handed participants employing a left-handed control configuration to feel that their success was attributed to themselves.

CONCLUSIONS AND FUTURE WORK

Further investigation that will embrace novice participants will be conducted. Furthermore, due to the fact that a computer keyboard lacks an ergonomic design for playing games, the next step will be doing an experimental research using a video game hand-held controller with the configuration adjustable for left-handed players [1].

The relevance of developing a configuration for left-handed players is proved by recent requests. For example, in December 2017 @DOOM announced in Twitter that they were working on additional control schemes, including left-handed support [5]. However, to date it is not yet fully implemented what provokes dissatisfaction of left-handed players [14, 15, 18, 21, 22, 24].

It was not known whether performance and player experience will be felt differently in case of using right- and left-handed controllers. To study this question, we performed a research that compared a right-handed control configuration with a left-handed one using performance and experiential

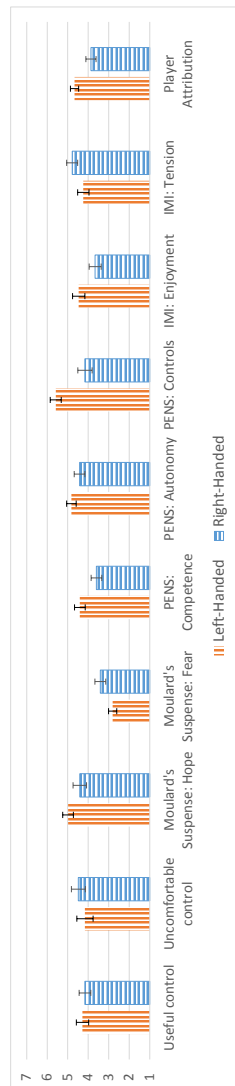


Figure 4: Mean \pm SE ratings on the experiential measures (scale 1-7, where 7 denotes strong agreement).

measurements. Our research on the participants that used a left-handed controller configuration showed that a statistically significant effect was clearly seen on PENS Competence, PENS Controls, and Player Attribution. This study is a pioneer work in the field of player-computer interaction that points out the importance of adjusting the controls to promote inclusiveness and create equal possibilities for left-handers whose interests till nowadays are vulnerable due to their minority.

ACKNOWLEDGMENTS


The authors would like to thank the participants for the study and the support of the Computer Science Department at the University of Regina, Regina, Saskatchewan, Canada.

REFERENCES

- [1] Michael S. Ambinder, Steven J. Bond, and Scott Dalton. 2012. Video Game Controller Having User Swappable Control Components. US Patent 8,241,126. Filed August 14, 2012.
- [2] Raymond J. Carroll and Helmut Schneider. 1985. A Note on Levene's Tests for Equality of Variances. *Statistics & Probability Letters* 3, 4 (1985), 191 – 194. [https://doi.org/10.1016/0167-7152\(85\)90016-1](https://doi.org/10.1016/0167-7152(85)90016-1)
- [3] Ansgar E. Depping and Regan L. Mandryk. 2017. Cooperation and Interdependence: How Multiplayer Games Increase Social Closeness. In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '17)*. ACM, New York, NY, USA, 449–461. <https://doi.org/10.1145/3116595.3116639>
- [4] Ansgar E. Depping, Regan L. Mandryk, Chengzhao Li, Carl Gutwin, and Rodrigo Vicencio-Moreira. 2016. How Disclosing Skill Assistance Affects Play Experience in a Multiplayer First-Person Shooter Game. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. ACM, New York, NY, USA, 3462–3472. <https://doi.org/10.1145/2858036.2858156>
- [5] @DOOM. 2017. #DOOMVFR offers several control schemes, including smooth movement controls on both HTC VIVE and PSVR using gamepads, and with the PSVR Aim controller on PSVR. We're looking into adding additional control schemes, including left-handed support. Thanks for the early feedback!  Tweet. Retrieved February 15, 2019 from <https://twitter.com/doom/status/936641046469120001>.
- [6] Christopher Dring. 2015. More money is spent on games than movies and music combined, says IHS. Retrieved February 15, 2019 from <https://goo.gl/rG5tmG>.
- [7] Yves-Andre Fery and Sylvain Ponserrre. 2001. Enhancing the Control of Force in Putting by Video Game Training. *Ergonomics* 44, 12 (2001), 1025–1037. <https://doi.org/10.1080/00140130110084773>
- [8] C. Shawn Green and Daphne Bavelier. 2003. Action Video Game Modifies Visual Selective Attention. *Nature* 423, 6939 (2003), 534–537. <https://doi.org/10.1038/nature01647>
- [9] George Grouios, Haralambos Tsorbatzoudis, Konstantinos Alexandris, and Vassilis Barkoukis. 2000. Do Left-Handed Competitors Have an Innate Superiority in Sports? *Perceptual and Motor Skills* 90, 3 Pt 2 (2000), 1273–1282. <https://doi.org/10.2466/PMS.90.3.1273-1282>
- [10] Carl Gutwin, Rodrigo Vicencio-Moreira, and Regan L. Mandryk. 2016. Does Helping Hurt?: Aiming Assistance and Skill Development in a First-Person Shooter Game. In *Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '16)*. ACM, New York, NY, USA, 338–349. <https://doi.org/10.1145/2967934.2968101>
- [11] Geoffrey Hammond. 2002. Correlates of Human Handedness in Primary Motor Cortex: A Review and Hypothesis. *Neuroscience & Biobehavioral Reviews* 26, 3 (2002), 285–292. [https://doi.org/10.1016/S0149-7634\(02\)00003-9](https://doi.org/10.1016/S0149-7634(02)00003-9)

Table 1: The post-game questionnaire consisted of ten measures. The participants provided their answers using a 7-point Likert-scale.

Experiential Measures	Sample Statements within the Post-Game Questionnaire
Useful Control	"I found the control layout to be useful for my task of completing the levels of this game."
Uncomfortable Control	"This control layout was uncomfortable for me to use properly for my task of completing the levels of this game."
Moulard's Suspense Scale: Hope [17]	"I felt enthusiastic," or "I felt excited."
Moulard's Suspense Scale: Fear [17]	"I was afraid."
PENS: Competence [19]	"I felt very capable and effective."
PENS: Autonomy [19]	"I did things in the game because they interested me."
PENS: Controls [19]	"When I wanted to do something in the game it was easy to remember the corresponding control."
IMI: Enjoyment [13]	"Playing this game was fun."
IMI: Tension [13]	"I was anxious while playing this game."
Player Attribution [4]	"My effort and ability determined the score of this game," or "The score of the game was mostly caused by things other than myself."

- [12] Pierre-Yves Hervé, Gabriel Leonard, Michel Perron, Bruce Pike, Alain Pitiot, Louis Richer, Suzanne Veillette, Zdenka Pausova, and Tomáš Paus. 2009. Handedness, Motor Skills and Maturation of the Corticospinal Tract in the Adolescent Brain. *Human Brain Mapping* 30, 10 (2009), 3151–3162. <https://doi.org/10.1002/hbm.20734>
- [13] Edward McAuley, Terry Duncan, and Vance V. Tammen. 1989. Psychometric Properties of the Intrinsic Motivation Inventory in a Competitive Sport Setting: A Confirmatory Factor Analysis. *Research Quarterly for Exercise and Sport* 60, 1 (1989), 48–58. <https://doi.org/10.1080/02701367.1989.10607413>
- [14] @MerkDev. 2017. @BattleRoyaleMod Tried with game acc and support with no luck. You are my last chance. Any plan to allow left handed ppl to bind hold breath? Tweet. Retrieved February 15, 2019 from <https://twitter.com/MerkDev/status/856808014887747586>.
- [15] @mgs_cobra. 2018. Can we have left handed support when using a psvr aim controller in Doom VFR next please. Such a great game but feels so weird being forced to play right handed. Tweet. Retrieved February 15, 2019 from https://twitter.com/mgs_cobra/status/966361845325066240.
- [16] Alice Mitchell and Carol Savill-Smith. 2004. *The Use of Computer and Video Games for Learning: A Review of the Literature*. Learning and Skills Development Agency, London, UK.
- [17] Julie Guidry Moulard, Michael W. Kroff, and Judith Anne Garretson Folse. 2012. Unraveling Consumer Suspense: The Role of Hope, Fear, and Probability Fluctuations. *Journal of Business Research* 65, 3 (2012), 340–346. <https://doi.org/10.1016/j.jbusres.2011.04.011>
- [18] @PrefectEmerl. 2018. Too bad this game didn't support left handed people :/. Tweet. Retrieved February 15, 2019 from <https://twitter.com/PrefectEmerl/status/954092666207309824>.
- [19] Richard M. Ryan, C. Scott Rigby, and Andrew Przybylski. 2006. The Motivational Pull of Video Games: A Self-Determination Theory Approach. *Motivation and Emotion* 30, 4 (2006), 344–360. <https://doi.org/10.1007/s11031-006-9051-8>
- [20] Joseph P. Simmons, Leif D. Nelson, and Uri Simonsohn. 2011. False-Positive Psychology: Undisclosed Flexibility in Data Collection and Analysis Allows Presenting Anything as Significant. *Psychological Science* 22, 11 (2011), 1359–1366. <https://doi.org/10.1177/0956797611417632>
- [21] @SnakeLordMax. 2018. You know what the worst thing is? It's hard to find a really good left handed mouse for games, and nobody ever natively makes support for left handed gamers, like using IJKL as default movement keys. It kinda sucks, from the perspective of someone who played fpses competitively. Tweet. Retrieved February 15, 2019 from <https://twitter.com/SnakeLordMax/status/1029175228239241216>.
- [22] @tiedtiger. 2017. Does anyone know of a game that provides an IJKL keyboard profile, as it does WASD? Just wondering if any games support left-handed gamers. Tweet. Retrieved February 15, 2019 from <https://twitter.com/tiedtiger/status/874654787568099328>.
- [23] Amazon Mechanical Turk. 2018. Human Intelligence Through an API. <https://www.mturk.com/>.
- [24] @unnoticedmusic. 2018. Sooo 4 months later and we still don't have left handed support smh  this why I still can't play the game. Tweet. Retrieved February 15, 2019 from <https://twitter.com/unnoticedmusic/status/976152618635616266>.
- [25] M. W. Vernooij, Marion Smits, P. A. Wielopolski, G. C. Houston, G. P. Krestin, and Aad van der Lugt. 2007. Fiber Density Asymmetry of the Arcuate Fasciculus in Relation to Functional Hemispheric Language Lateralization in Both Right- and Left-Handed Healthy Subjects: A Combined fMRI and DTI Study. *NeuroImage* 35, 3 (2007), 1064–1076. <https://doi.org/10.1016/j.neuroimage.2006.12.041>