Game on: Sex differences in the production and consumption of video games

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Abstract

Miller's courtship model (Miller, 1999), one of the most prominent theories in evolutionary psychology, proposes that most cultural products are created by young men. The model is based on the assumption that men face a stronger intrasexual selection than women and that human mate choice is mainly a female choice. While the model has received comprehensive empirical support for many traditional cultural phenomena such as music and literature, it has, so far, not been applied systematically to popular culture. In the first study presented in this chapter, the courtship model was tested for the creation of video games. As a large number of games are produced in Japan, we tested the model for Japanese and Non-Japanese video game creators. It was found that, similar to other cultural products, the creation of video games is dominated by young men. There were no noticeable differences between Non-Japanese and Japanese game creators, thus, supporting the idea of video game creation being a phenomenon that is consistent across cultures with respect to the assumptions of the courtship model. In addition, data from a cross-sectional survey study are presented, which shows that, in line with the assumptions of the courtship model, men are more motivated than women to create video games.

Introduction

In the recent past, evolutionary psychological theories in general and sexual selection theory in particular (Darwin, 1871; Trivers, 1972) have been successfully applied to several aspects of human culture and art (for an overview, see Lange, Schwarz, & Euler, 2013; Miller, 2000) as well as media (Hennighausen & Schwab, 2015). Contrary to evolutionary approaches that consider human culture only as the result of natural selection (directly or as a by-product of the naturally-selected cognitive apparatus; see Pinker, 1997), the sexual selection theory of culture emphasizes the fundamental role of sex differences in obligatory parental investment: As women have higher costs in reproduction (Trivers, 1972), they are evolutionarily selected for being more selective in mate choice decisions than men (Buss, 1989, 2016; Buss & Schmitt, 1993; Feingold, 1992; Schwarz & Hassebrauck, 2012). Accordingly, men have to display their qualities to be selected as mates (intersexual selection) and to compete with other men (intrasexual selection) successfully. One proximate mechanism behind this male motivation seems to be testosterone (Archer, 2006; Dabbs, 2000; Hayes, 1989; Lange & Euler, 2014), which indicates that this specific sex difference in motivation might, indeed, be subject to biological selection.

Miller (1999) argued that the production of cultural products might be one way for men to pass the test they are put to by women (and other men) in the sexual selection process. From this perspective, cultural products are a means to increase one's attractiveness by signaling creativity and thus, genetic quality (Lange et al., 2013; Miller, 1999, 2000). In support of this assertion, Miller (1999) showed that most literature, paintings, and jazz albums are produced by men of reproductive age. Kanazawa (2000) showed that Miller's courtship model applies to scientific discoveries as well. Lange and Euler (2014) replicated Miller's findings for literature production. Additionally, similar patterns were discovered for the founding of religions and even for Guinness World Records (Lange et al., 2013).

Whereas most of the aforementioned cultural products are created by relatively young men, many of them seem to be consumed mainly by women (e.g., literature; see Lange, 2011; Lange & Euler, 2014). This is exactly the supply-and-demand principle that sexual selection theory predicts. Despite several advances in the study of the impact of sexual selection on human culture, applying Miller's courtship model to other cultural domains or products is a worthwhile undertaking as it can provide further evidence that mate choice shaped parts of the human capacity for culture and art.

One popular cultural product that has not been studied through the lens of Miller's courtship model is video games. Despite the global popularity of video games, evolutionary research on this issue seems scarce (Mendenhall, Nepomuceno, & Saad, 2010; Mendenhall, Saad, & Nepomuceno, 2010); but see Miller (2000), Ohler and Nieding (2005, 2006) on the evolutionary psychology of play in general.

Mendenhall, Nepomuceno, and Saad (2010) and Mendenhall, Saad, and Nepomuceno (2010) emphasized that by playing a video game, human beings can display their abilities (e.g., by means of high scores) and thus, their social status, which is undoubtedly of evolutionary relevance, especially with respect to sexual selection (Buss, 2016; Miller, 2000). This "digital peacocking" (Mendenhall, Nepomuceno, & Saad, 2010) is in line with the observation that "young people seeking mates are motivated to play competitive sports" (Miller, 2000, p. 254), especially young men. With video games in mind, competitive sports can surely also be e-sports (i.e., playing (semi-)professionally in tournaments and leagues). With respect to the idea of digital peacocking, it has to be noted that women might not find the prototype of a gaming nerd particularly attractive. Still, the mechanisms that evolved to successfully compete with rivals and to be selected as a mate might be in use when peacocking digitally, even if this particular peacocking is not adaptive.

Mendenhall, Nepomuceno, and Saad (2010) are right in that evolutionary theory would predict sex differences in gaming (with regard to use and skills), but the same can also be said

for the creation of the games. Just like the creator of a poem or a novel (Lange & Euler, 2014) or the creator of visual art (Clegg, Nettle, & Miell, 2011; Miller, 1999) shows his reproductive fitness with his respective art, a creator of a video game might do so as well. When creating a video game, one has to think about environments, characters, tasks, and plots. Hence, there is a story to be invented and possibly even dialogues to be written. In that sense, a video game creator can be, among other things, a kind of literary writer (Mendenhall, Saad, & Nepomuceno, 2010; Sherman, 1997). Moreover, music and elements of visual art are part of video games too. Therefore, in video games, different cultural products and media elements or types are combined (see also Aoyama & Izushi, 2003). This supports the idea that the creation of video games can be studied in a similar way as the creation of literature or other cultural products (Lange & Euler, 2014; Miller, 1999).[1]

In order to test the courtship model for the creation of video games, in study 1, we applied the same method to video games that Miller (1999) has employed for other cultural products (e.g., paintings).[2] In accordance with Miller's courtship model and previous research (e.g., Lange & Euler, 2014), the main hypothesis of study 1 was that the majority of successful video games would be created by men and not by women and that the creators would not only be male but moreover, be relatively young (i.e., of reproductive age). While Miller (1999) and Lange and Euler (2014) focused on Western cultures (Germany, Great Britain, the United States, etc.), our study focused on a cultural product that has strong roots

[1] However, compared to video games, literature and music have a very long history. Additionally, there are, of course, other crucial differences between video games and other cultural products. Books, for instance, are more an individual product, whereas games typically are produced by teams of specialists (e.g., programmers, writers, artists, etc.). On the other hand, jazz albums that have been successfully studied from the courtship model perspective are not the product of one individual person either. Moreover, as true as it may be that games are the products of teams, the main game creators and producers (usually the directors) are typically individual persons. Game creators like Shigeru Miyamoto (the creator of the *Super Mario* and *The Legend of Zelda* series), Ben Chichoski (the creator of the *Call of Duty* series), Yuji Naka (the main creator and programmer of the classic *Sonic* series), Hideo Kojima (the mastermind behind the *Metal Gear* series), or Yu Suzuki (the creator of numerous arcade games like *Virtua Fighter*) are individuals that are well-known in the gaming world. Miyamoto, Suzuki, and Kojima are also members of the Hall of Fame of the Academy of Interactive Arts & Sciences.

[2] The same methodological approach was also used by Kanazawa (2000) to study scientific achievements and by Lange and Euler (2014) for literature.

in Japan (Aoyama & Izushi, 2003). Hence, we decided to compare data from Western countries and Japan to probe whether the patterns that have been found for Western countries might be culturally universal.

Study 1

Method

Study 1 (Lange & Schwab, 2015) was mainly conducted in 2014. First, we identified the most successful video game series using a list from Wikipedia (2014). We decided to include all game series that sold at least 10 Million copies, resulting in a list of 132 video game series. Additional research (e.g., by means of internet search engines) was conducted to retrieve the most proper and up-to-date data on sales.[3] The list covered more than three decades of video game history.[4] In the next step, the original creators of each video game (series) were identified.[5] In order to gather information about their sex and their age when they created the respective game or the first game of the series, the Wikipedia sites of the game/game series and their creators were consulted. When possible, we also contacted the creators via e-mail or LinkedIn to verify the information gathered from Wikipedia. We were not able to obtain valid information on the year of birth for all video game creators on our list. Hence, the final list consisted of 125 video game creators.[6] Among those, the most common nationalities were

[3] The most successful video game series in 2014 were (million units sold in parentheses): *Super Mario* (262), *Pokémon* (245), *The Sims* (175), *Grand Theft Auto* (150), *The Need for Speed* (150), *Sonic the Hedgehog* (140), *Tetris* (140), *Call of Duty* (120), *Wii Sports* (110), *Final Fantasy* (102).

[4] The oldest video game series on the list was *Pac-Man* which was first released in 1980. The newest game on the list was *Minecraft* was first released in 2011.

[5] As a game creator, every person was counted who contributed considerably to making a game / game series in at least one of the following domains: idea for the game and / or the main character of a game, main story / plot, main programming, level design, music / main score, and visual art. It might not be clear in some cases whether someone should be counted as a creator or not. We used search engines to investigate which persons are generally considered as a creator of a game / game series based on the criteria outlined above. See footnote 1 for examples of game creators.

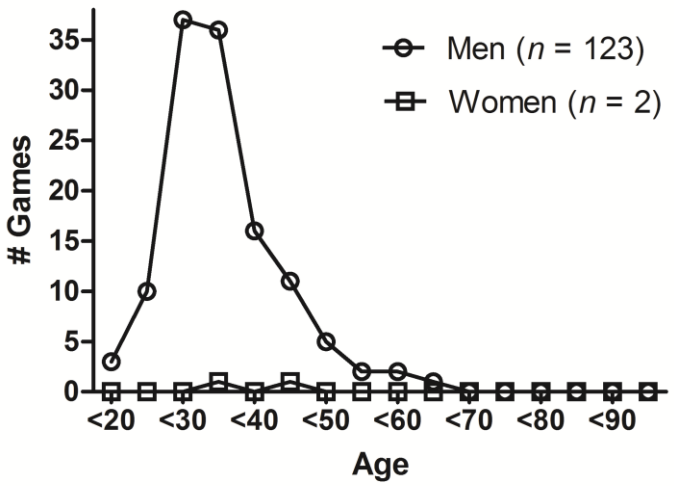
[6] It is notable that some video game creators on the list created more than one video game (series). Shigeru Miyamoto, for instance, co-created the *Mario* and the *Zelda* series.

Japanese (39.2%), US-American (35%), British (9.8%), Canadian (3.3%), French (3.3%), Swedish (2.4%), and German (2.4%).

Results

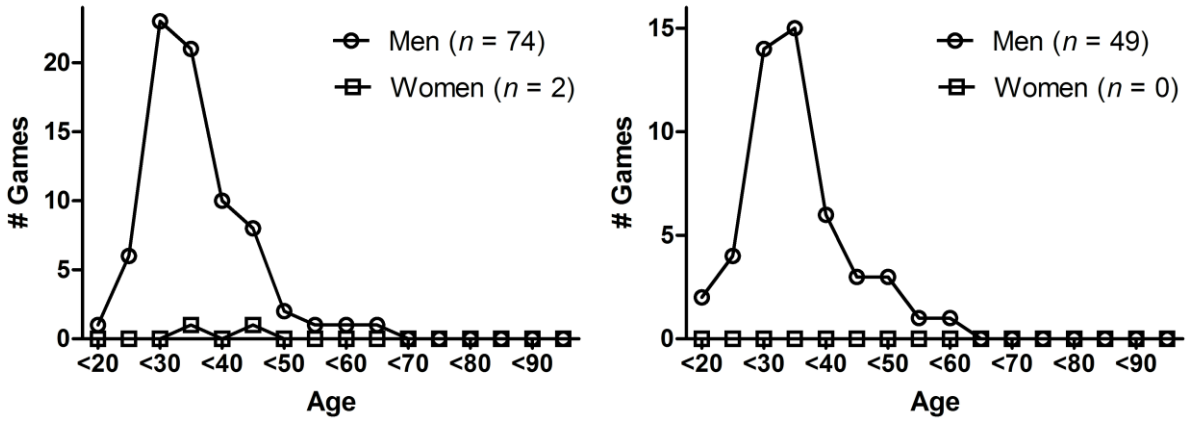
Figure 1 shows the distribution of sex and age for all of the 125 video game creators. In line with Miller's (1999) findings on the evolution of culture, the majority of game creators were male (98.4%), and most of them were relatively young. The mean age of male game creators (n = 123) at the time of publication of the game (or the first game of the series, respectively) was 32.42 years (SD = 8.15, median and mode = 31). The interquartile range was between 26 and 37 years.

Figure 1. Number of video games created by age and sex of the game creator.



The patterns found when examining Non-Japanese and Japanese game creators separately were basically identical (see Figure 2).

Figure 2. Number of video games created by age and sex of the game creator in Japan (right) and Western countries (left).



Mean age for males in the Non-Japanese subsample was 32.76 (*SD* = 8.23, median = 31, modus = 26; interquartile range = 26–37) compared to 31.92 (*SD* = 8.09, median and modus = 31; interquartile range = 25.5–36.5) in the Japanese subsample.

Discussion

Almost all the games we examined were created by young men (see Figure 1). This is extremely similar to what has been found for several other cultural products (cf. Kanazawa, 2000, pp. 319–320; Lange & Euler, 2014, p. 24; Miller, 1999, p. 85).

In addition, we found no differences between cultures (Japan vs. Western cultures; see Figure 2). This suggests that the makeup of the population of video game creators is consistent across cultures. With regard to age, our findings are similar to the ones by Lange and Euler (2014) for literature production. The pattern obtained here (see Figure 1), as well as the pattern found for other cultural products, also correspond to sex differences in testosterone levels across the life span (Dabbs, 2000). However, video game creation seems to be much more male-dominated than other cultural products (cf. Miller, 1999).

Although what we found is generally in accordance with other evolutionary psychology research on cultural displays, a male-dominated production tells only one part of the story. If the differences in the production and consumption of video games were truly similar to those that have been found for literature, for instance, one would also expect females to consume them more, as could be predicted from parental investment theory. In a similar vein, as mentioned earlier, most books are written by young men, but women are more avid readers (Lange, 2011; Lange & Euler, 2014). Contrary to that, males not only produce but also consume more video games. However, the gender gap in gaming is not as large as common clichés might suggest. Already in 2014 (i.e., the year in which we collected the data on video game creators), 45 % of all players in the United States were female (Entertainment Software Association, 2014). Hence, surprisingly, there is a relative equality between the sexes in gaming. Such sex differences, of course, also depend on the game genre. First-person shooters (FPS; e.g., *Call of Duty*) are mostly played by men, while women prefer platformers (e.g., *Super Mario*) or life simulation games (e.g., *The Sims*; Nepomuceno, Saad, Stenstrom, & Mendenhall, 2009; see also Hartmann & Klimmt, 2006). Thus, as is the case for movie genres (Wühr, Lange, & Schwarz, 2017), men prefer action, whereas women prefer dealing with social issues (see also Su, Rounds, & Armstrong, 2009). The best-selling FPS from our list for this study (see Footnote 3) was *Call of Duty* (ranking 7th in the sales charts in our list), which is preferred by men. The platformer series *Super Mario* ranks 1st in total sales and the life simulation series *The Sims* ranks 3rd. Both series are preferred by women but are created by young men. In view of this, it might be premature to assume that for video games, the evolutionarily expected principle of male supply and female demand is not valid at all. The creation of (successful) video games might increase the social status of their creators.[7] It is one of the most robust findings in the evolutionary behavioral sciences that women, across

[7] For instance, the fortune of Ben Chichoski, the creator of the *Call of Duty* series, is estimated to be about 120 million $ (Celebrity Net Worth, 2014).

cultures, generally tend to prefer men with good financial resources and a high social status as their mates. However, for women, having a high social status and substantial financial resources does not translate into mating opportunities to the same degree (Buss, 2003, 2016). Additionally, it could be that the very basic mechanisms behind the creation of cultural products, and also of video games, are shaped more by intrasexual selection than by intersexual selection (as might be the case for many phenomena in human sexual selection; see Puts, 2010). In order to further investigate the motivation for creating video games as well as the perception of video game creators, we conducted a second study.

Study 2

As in study 1, we tested the hypothesis that men are more motivated than women to create video games. Furthermore, we investigated sex differences in the reception and consumption of video games. The latter was investigated in an online survey.

Method

The study was conducted between February 2014 and August 2015. A total number of 484 participants (203 women and 281 men) between the age of 14 to 64 years (*M* = 23.9, *SD* = 5.4) filled out an online survey in German. They were recruited by postings on social network sites. Participation was voluntary and not compensated.

The questionnaire included items on sociodemographics, video game use (Do you consider yourself a video gamer? If so, at what age did you start playing video games? How many hours per week do you spend playing video games?), ownership (How many video game consoles do you own? How many video games do you own approximately?), motivation to create a video game (I could imagine creating a video game myself, from 1= disagree to 5 = agree), and reception of game creators (When I play a video game, or after having just played a video game, I admire the creativity of the person(s) who created the game, from 1= disagree

to 5 = agree). The full questionnaire is available from the first author upon request. As not all items were mandatory, sample sizes slightly differed for the individual analyses (see next section).

Results

Only 45.8 % of the female participants, as compared to 85.4 % of the male participants considered themselves video game players ($\chi^2_{(1)} = 86.087$, $p < .001$). Among those who considered themselves video game players, both women and men started playing games when they were between 9 and 10 years old ($M_{♀} = 9.57$, $M_{♂} = 9.56$, $t_{(327)} = 0.034$, $p = .973$). Men owned significantly more consoles (Ms$_{♂} = 3.04$, Ms$_{♀} = 1.71$, $t_{(464)} = 2.487$, $p = .013$, $d = 0.25$) and games (Ms$_{♂} = 91.06$, Ms$_{♀} = 28.41$, $t_{(461)} = 2.487$, $p = .020$, $d = 0.23$) than women, and played video games for more hours per week ($M_{♂} = 11.89$, $M_{♀} = 4.91$, $t_{(460)} = 6.466$, $p < .001$, $d = 0.63$).

More interestingly, male participants in our study agreed more with the statement that they could imagine creating a video game themselves ($M_{♂} = 3.30$, $M_{♀} = 2.57$, $t_{(473)} = 5.769$, $p < .001$, $d = 0.53$). The interest in creating a game correlated negatively with the age when the participants started playing video games ($r = -.151$, $p = .003$) and positively with the number of games owned ($r = .107$, $p = .022$) and playing time in hours per week ($r = .150$, $p = .001$). However, when examining male and female participants separately, it became evident that these were significant only for female participants (age when they started playing games: $r = -.263$, $p = .004$ / # of games: $r = .201$, $p = .006$ / playing time $r = .247$, $p = .001$ / # of consoles: $r = .147$, $p = .042$). These differences suggest that the male motivation for creating a video game is largely independent of personal gaming habits.

The courtship model (Miller, 1999) and previous research based on it (e.g., Lange & Euler, 2014) would not only predict that men are more motivated to create video games but also that women show more admiration for a game creator than men. However, in contrast to

that, our data show that men admire (the creativity of) game creators more than women ($M_{♂}$ = 3.93, $M_{♀}$ = 3.65, p = .009, d = 0.25). Interestingly, both the motivation for game creation and the admiration for a game creator are not entirely distinct phenomena, as they were correlated in our sample (r = .260, p < .001). As many variables correlated with the two production/consumption items (see above), we additionally conducted an ANOVA with the admiration item as the DV, sex as the IV, and the remaining variables mentioned above (i.e., age when they started playing, # games, # consoles, playing time, and motivation for creating a game) as control variables. The result was that sex was not a significant predictor of admiration anymore: $F_{(1, 347)}$ = 1.487, p = .223, η_p^2 = .004. This means that when controlling for relevant variables, men and women showed similar admiration for game creators ($M_{♂}$ = 3.92, $M_{♀}$ = 4.06).

Discussion

Overall, results from study 2 are in line with those from study 1: Men are generally more motivated to create video games. Additionally, male motivation for creating a video game seems to be independent of personal gaming habits and other relevant social factors. However, the hypothesis based on evolutionary principles was twofold (males are more motivated to create a game and women show more admiration for these creations), and only the first part received empirical support. This seems to contradict the classical evolutionary assumptions about human intersexual selection that follow a males-compete/females-choose logic. Hence, the results presented here might be best explained by male intrasexual selection: Games are created by men at an age when not only the intersexual (i.e., the actual mate choice) but also the intrasexual (i.e., same-sex competition) selection is strongest. Indeed, before intersexual selection can occur, one has to succeed in intrasexual selection first. Therefore, it could be that men are sensitive to the creative strengths of potential rivals (e.g., the ability to create a game), which is then expressed in their high admiration for game

creators. This interpretation is basically in line with recent theoretical considerations emphasizing the role of intrasexual selection in human evolution (Puts, 2010). Indeed, empirical research shows that cultural goods or products (e.g., cars) are not only beneficial for being selected as a mate but also can be used to succeed in same-sex competition (e.g., Hennighausen, Hudders, Lange, & Fink, 2016). However, further analyses in study 2 showed that there might be no sex difference regarding the admiration for video game creators after all. When controlling for variables that seem to have an effect on the reception of game creators, the sex difference vanished. This may suggest that the mechanisms involved in creating games and admiring game creators might still be the result of intersexual selection.

General Discussion

The finding that most video games are created by young men is very similar to what has been found in many other cultural products and also congruent with the assumptions made based on the premises of sexual selection. The absence of cultural differences (study 1) further supports the notion of (cross-cultural) universality for this pattern. Since men seem to be more motivated to create video games, and women do not show more admiration for this cultural production than men (study 2), we may conclude that the assumptions of the courtship model (Miller, 1999) are mostly but not entirely valid for video games. Despite some empirical support for the courtship model with respect to games, some critique is still possible.

For instance, male dominance in game creation could also be explained by the exclusion of women from the gaming industry (Kowert, Breuer, & Quandt, 2017; also see the chapter by Melzer in this volume) rather than by understanding the production of games as courtship displays. However, female exclusion and male displays may only be two sides of the same coin because if men are higher motivated to engage in cultural production (e.g., video games) than women (due to evolutionary reasons to some degree), it will necessarily end up in having only a few women in the respective area of cultural production.

Additionally, video games have often been considered to be “boys’ toys” (Kowert, Breuer, & Quandt, 2017; Melzer, this volume). Hence, one might not be surprised to find that men dominate game creation (study 1) and that men show more (or at least equal) admiration for game creators (study 2). Moreover, we found that the interest in creating a game correlated with one’s own gaming experiences. Thus, one might argue that men are more motivated to create games simply because they are socialized to play games to start with. Subsequently, if one is experienced and accustomed to a certain phenomenon, he or she might turn up having the desire to work in this area. To counter this critique, a closer look at our data (study 2) showed that motivation for game creation and personal gaming experiences were only correlated with each other when dealing with women. Hence, male motivation to create games is a relatively robust phenomenon that cannot be explained solely by the fact that boys play more than girls do.

In addition, these possible points of criticisms do not mean that biological and particularly evolutionary factors are not valid for explaining the production and consumption of games. It is more likely that biological and social factors interact. However, one might ask: How can game creation and consumption be influenced by evolutionary processes at all? Of course, video games did not exist in the Pleistocene, nor did books, movies or music records. However, natural and sexual selection has equipped us with mental features (e.g., our preference for fiction that copes with issues that seem relevant to us) that are also in operation when we use modern media or consume or produce cultural products in general (Hennighausen & Schwab, 2015; Miller, 2000).

In line with widespread stereotypes, one might also ask if video game players have much mate choice to begin with. Is a young man who is totally into games an attractive mate for a woman? Even if the answer to these questions are no, it has to be taken into account that we use psychological mechanisms that evolved in the EEA in a modern world. They might not be adaptive anymore; particularly not, when they appear in a rare and extreme form, as

might be the case, when someone is heavily occupied with gaming. Some other research on media use suggests that our evolved mechanisms can turn out to be maladaptive, as is the case for media equation (see Hennighausen & Schwab, 2015, for a short summary).

Several researchers have proposed to consider human cultural production as the so-called leks (e.g., Miller, 2000; Lange et al., 2013; Saad, 2007, 2011). “Lek” is the Swedish term to describe “a playful game” (Miller, 2000, p. 115). In the evolutionary behavioral sciences, it is used as a term for an area where male individuals gather to perform competitive mating displays in order to show off their fitness. They do so because of a particularly strong female mate choice. This means that females watch the male displays in order to decide with whom they will mate. Lek mating is mainly found in bird species, but also in mammals. Indeed, *Homo sapiens* might be a lekking species just as many others. Of course, human mating areas are not (necessarily) specific and fixed places in the “great outdoors”. Human leks are rather, among others, music or art festivals (Miller, 2000), or virtual/symbolic places, such as literature or, maybe more precisely, the literary market, the Guinness World Records (Lange et al., 2013), or video games. Hence, creating a video game (or in the case of e-sports, also playing it) can be considered what Miller (2000, p. 203) calls “public display behavior”. “Lek” refers to play. Moreover, play is what we do with video games. Video games are playful, attractive, creative, and entertaining—and so is sexual selection.

Acknowledgments

We would like to thank Johannes Breuer and Daniel Pietschmann for their valuable feedback on our chapter.

References

Aoyama, Y., & Izushi, H. (2003). Hardware gimmick or cultural innovation? Technological, cultural, and social foundations of the Japanese video game industry. *Research Policy, 32*, 423–444. doi: 10.1016/S0048-7333(02)00016-1

Archer, J. (2006). Testosterone and human aggression: an evaluation of the challenge hypothesis. *Neuroscience and Biobehavioral Reviews, 30*, 319–345. doi:10.1016/j.neubiorev.2004.12.007

Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses testing in 37 cultures. *Behavioral and Brain Sciences, 12*, 1–49. doi:10.1017/S0140525X00023992

Buss, D. M. (2003). *The evolution of desire: strategies of human mating* (2nd ed.). New York, NY: Basic Books.

Buss, D. M. (2016). *Evolutionary psychology. The new science of the mind* (5th ed.). New York: Routledge Publishing.

Buss, D. M., & Schmitt, D. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review, 100*, 204–232. doi:10.1037/0033-295X.100.2.204

Celebrity Net Worth. (2014). Ben Chichoski Net Worth. Retrieved January 16, 2014, from: http://www.celebritynetworth.com/richest-businessmen/richest-designers/ben-chichoski-net-worth/

Clegg, H., Nettle, D., & Miell, D. (2011). Status and mating success amongst visual artists. *Frontiers in Psychology, 2*, 1–4. doi:10.3389/fpsyg.2011.00310

Dabbs, J. M., & Dabbs, M. G. (2000). *Heroes, rogues, and lovers: Testosterone and behavior*. New York, NY: McGraw-Hill.

Darwin, C. R. (1871). *The descent of man and selection in relation to sex*. London: John Murray.

Entertainment Software Association. (2014). Industry Facts. Retrieved January 14, 2014, from: http://www.theesa.com/facts/index.asp

Feingold, A. (1992). Gender differences in mate selection preferences: A test of the parental investment model. *Psychological Bulletin, 112*, 128–139. doi:10.1037/0033-2909.112.1.125

Hartmann, T., & Klimmt, C. (2006). Gender and computer games: Exploring females' dislikes. *Journal of Computer-Mediated Communication, 11*(4), Article 2.

Hayes, J. R. (1989). Cognitive processes in creativity. In J. A. Glover, R. R. Ronning, & C. R. Reynolds (Eds.), *Handbook of creativity* (pp. 135–146). New York: Plenum Press.

Hennighausen, C., Hudders, L., Lange, B. P., & Fink, H. (2016). What if the rival drives a Porsche? Luxury car spending as a costly signal in male intrasexual competition. *Evolutionary Psychology, 14*(4), 1–13. doi:10.1177/1474704916678217.

Hennighausen, C., & Schwab, F. (2015). Evolutionary media psychology and its epistemological foundation. In T. Breyer (Ed.), *Epistemological foundations of evolutionary psychology* (pp. 131–158). New York: Springer.

Kanazawa, S. (2000). Scientific discoveries as cultural displays: A further test of Miller's courtship model. *Evolution and Human Behavior, 21*, 317–321. doi: 10.1016/S1090-5138(00)00051-9

Kowert, R., Breuer, J., & Quandt, T. (2017). Women are from FarmVille, men are from ViceCity. The cycle of exclusion and sexism in video game content and culture. In R. Kowert & T. Quandt (Eds.), *New perspectives on the social aspects of digital gaming*. Multiplayer 2 (pp. 136–150). New York, NY/Oxon, UK: Routledge.

Lange, B. P. (2011). Male proneness to verbal display production. *Acta Linguistica, 5*(2), 97-104.

Lange, B. P., & Euler, H. A. (2014). Writers have groupies, too: High quality literature production and mating success. *Evolutionary Behavioral Sciences, 8*, 20-30. doi:10.1037/h0097246

Lange, B. P., & Schwab, F. (2015). Game on: The creation of video games as a cultural display. Poster at the 9th Conference of the Media Psychology Division of the German Psychological Society. Tübingen, Germany, September 9-11, 2015.

Lange, B. P., Schwarz, S., & Euler, H. A. (2013). The sexual nature of human culture. *The Evolutionary Review: Art, Science, Culture, 4*(1), 76–85.

Mendenhall, Z., Nepomuceno, M., & Saad, G. (2010). Exploring video games from an evolutionary psychological perspective. In I. Lee (Ed.), *Encyclopedia of E-Business development and management in the global economy* (pp. 734–742). Hershey, PA: IGI Global.

Mendenhall, Z., Saad, G., & Nepomuceno (2010). Homo Virtualensis: Evolutionary psychology as a tool for studying videogames. In N. Kock (Ed.), *Evolutionary psychology and information systems research: A new approach to studying the effects of modern technologies on human behavior* (pp. 305–328). Heidelberg: Springer.

Miller, G. F. (1999). Sexual selection for cultural displays. In R. Dunbar, C. Knight & C. Power (Eds.), *The evolution of culture. An interdisciplinary view* (pp. 71–91). Edinburgh: Edinburgh University Press.

Miller, G. F. (2000). *The mating mind. How sexual choice shaped the evolution of human nature*. New York: Doubleday.

Nepomuceno, M.V., Saad, G., Stenstrom, E., & Mendenhall, Z. (2009). Finger length ratio and attitudes towards several product categories. Human Behavior and Evolution Society Meetings, California State University, Fullerton, May 27–31.

Ohler, P., & Nieding, G. (2005). Sexual selection, evolution of play and entertainment. *Journal of Cultural and Evolutionary Psychology, 3*(2), 141–157. doi: 10.1556/JCEP.3.2005.2.3

Ohler, P., & Nieding, G. (2006). Why Play? An evolutionary Perspective. In J. Bryant, & P. Vorderer (Eds.), *Playing computer games: Motives, responses, and consequences* (pp. 101–113). Hillsdale, NJ: Lawrence Erlbaum.

Pinker, S. (1997). *How the mind works*. New York: W. W. Norton & Company.

Puts, D. (2010). Beauty and the beast: mechanisms of sexual selection in humans. *Evolution and Human Behavior, 31*, 157–175. doi: 10.1016/j.evolhumbehav.2010.02.005

Saad, G. (2007). *The evolutionary bases of consumption*. Mahwah, NJ: Lawrence Erlbaum.

Saad, G. (2011). Song lyrics as windows to our evolved human nature. *The Evolutionary Review: Art, Science, Culture, 2*, 127–133.

Schwarz, S., & Hassebrauck, M. (2012). Sex and age differences in mate selection preferences. *Human Nature, 23*, 447–466. doi:10.1007/s12110-012-9152-x

Sherman, S. (1997). The perils of the princess: Gender and genre in video games. *Western Folklore, 56*(3/4), 243–258.

Su, R., Rounds, J., & Armstrong, P. I. (2009). Men and things, women and people: A meta-analysis of sex differences in interests. *Psychological Bulletin, 135*(6), 859–884. doi:10.1037/a0017364

Trivers, R. L. (1972). Parental investment and sexual selection. In B. B. Campbell (Ed.), *Sexual selection and the descent of man* (pp. 136–179). Chicago, IL: Aldine.

Wikipedia. (2014). List of best-selling video game franchises. Retrieved January 12, 2014, from: http://en.wikipedia.org/wiki/List_of_best-selling_video_game_franchises

Wühr, P., Lange, B. P., & Schwarz, S. (2017). Tears or fears? Comparing gender stereotypes about movie preferences to actual preferences. *Frontiers in Psychology, 8*, 428. doi:10.3389/fpsyg.2017.00428