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## Contours of virtual enfreakment in fighting game characters

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### ABSTRACT

Characters in fighting videogames<sup>1</sup> such as *Street Fighter V* and *Tekken7* typically reveal a phenomenon that we define as virtual enfreakment: their bodies, costumes, and fighting styles are exaggerated (1) in a manner that emphasizes perceived exoticism and (2) to enable them to be easily visually and conceptually distinguishable from one another. Here, using both quantitative and qualitative methods, including crowd-sourced surveys and analyses of game mechanics, we report on the contours of virtual enfreakment in those games. We specifically examine differences in character design across gender, national-origin, and skin-color lines. Disappointingly but not surprisingly, we find racism and sexism manifest as stark differences in character design by gender and skin color. This has strong implications because taking on the roles of these characters can have impacts on users in the physical world, e.g., performance and engagement, behavior, and understandings of others (Lim and Harrell 2015; Şengün 2015; Yee et al. 2012, Şengün et al. 2022a; Harrell and Veeragoudar Harrell 2012; Kao and Harrell 2015; Şengün 2014; Kocur et al. 2020). Although the differences are not always straightforward, female characters and darker-skinned characters (typically, characters of color) are enfreaked differently than their light-skinned male counterparts. Our results also reveal the strategic use of “unknown” as a country of origin for villainous characters. Through our mixed-methods analysis, we examine in detail how virtual enfreakment is influenced by sexism and racism, and our findings are compatible with information about the development history of the *Street Fighter* and *Tekken* franchises. However, we also find that recent characters designed in dialogue with developers from their regions of origin are some of the least enfreaked and most positively portrayed—suggesting the possibility of designing and deploying such characters for implementing anti-bias character designs within popular videos..

### 1. Introduction

Fighting games, in which two players (or teams) compete using avatars<sup>2</sup> locked in virtual combat, have developed dedicated competitive communities and have created broader cultural impacts through spin-off

media such as movies and comics (e.g., Kanzaki 1993; *Street Fighter* 1994; *Tekken* 2010), as well as live broadcast tournaments that reach a considerable number of viewers (Martin 2017). These games are often fast-paced and strategically deep, while remaining accessible to novices, and also featured more diverse casts than contemporary games in other

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<sup>1</sup> Hereafter we refer to videogames in the fighting genre as “fighting games.”

<sup>2</sup> We choose and understand the term “avatar” in a broad sense as the intermediary tool that governs the interaction between the player and the videogame. In this paper’s context, we use the term interchangeably with “character” or “fighter” in regard to the ways (1) they employ embedded algorithmic processes that provide affordances to the player, and (2) they merge with and exist on an intersection of historical and cultural understanding of physical world ethnicities and identities.

genres during their early years. At the same time, these games have often stereotyped races, genders, ethnicities, and other groups (see e.g., Leone 2014 and D'Anastasio 2018 featuring some developer attitudes, Ashcraft 2015 on a particular instance of flat design, or Hutchinson 2007 for an academic discussion), reinforcing simplistic and negative notions of gender roles and racial differences. This focus on skewed representations is especially problematic in the context of the broader games medium, which has a very diverse range of players across genders, age groups, and ethnic origins.<sup>3</sup> Although there have been recent positive examples of videogame representation in terms of gender, age, and ethnic identity (see Hawreliak and Lemieux 2020 for an analysis of diversity in *Overwatch* and *Apex: Legends*; or Ruberg 2018 for an analysis of how videogames increasingly intersect with LGBTQ players, characters, and queerness in general), the issue of narrow and stereotyped representation remains prevalent for games that have a crowded roster of characters such as fighting games. Commenting on diversity among fighting game players, in the Polygon article “Why the Fighting Game Community is Color Blind,” Bowman (2014) quotes a player:

*Honestly, one of [the reasons for diversity in the FGC] I think is the representation of people of color in the games themselves. [...] We'll joke about how crazy essentialist and stereotypical a lot of the characters are, but at the end of the day, I'm pretty sure there weren't that many Indian characters until Dhalsim, or Russian characters until Zangief, or Brazilian characters until Blanka. ... The first Filipino character [I ever saw] in a game was Talim from Soulcalibur 2. I was really stoked to see that ... I like having those points of identification; [that's] probably one of the things that made it much easier to bring people into the community. They see that and they think, 'These are all really fascinating characters. I kind of like this guy. I kind of identify with this guy. I'm gonna go play as him.*

To paraphrase, even stereotypical representation is a welcome contrast to no representation at all. Of course, this is not true in every dimension: the hyper sexualization of women in these games has contributed to a culture that excludes women from these same spaces despite a similar rarity of playable female characters in other genres during the late 1980's and early 1990's when fighting games were becoming popular, as the same article explains.

Avatar features are characteristically limited by the parameters set by developers, who often fail to root computational identity structures within social and cultural discourses that challenge detrimental *phantasms*—ideological content semi visibly blended into dynamic signifiers (Harrell 2013). Moreover, the importance of spectacle in the genre encourages stereotypical tendencies in character design (Hutchinson 2007; Surman 2007), in part because characters are presented as super- or sub-human in order to make the combat more spectacular (cf. Bogdan 1990; Thomson 1996). In this study, we will refer to this process as *virtual enfreakment* or simply *enfreakment*. We recognize that, per e.g., Durbach 2014, the term “enfreakment” has a very specific meaning relating to ostracizing and objectifying physical differences for entertainment

<sup>3</sup> 2015 and 2018 reports from Pew Research Center that study the households in the United States found that 49% of women, 72% of men, 53% of “Black, non-Hispanic,” 51% of “Hispanic,” and 48% of “White, non-Hispanic” adults “play video games on a computer, TV, game console, or portable device like a cellphone” (Duggan 2015; Perrin 2018). According to a recent report of Entertainment Software Association, 63% of households in US have at least one person who plays video games regularly and 48% of households own a dedicated videogame console (Entertainment Software Association 2018). The report also portrays a similarly broad distribution of gamers across gender (59% male, 41% female) and age groups (27% under 18 years, 29% 18-35 years, 18% 36-49 years, and 26% 50+ years). Two reports, published by The Kaiser Family Foundation for children aged between 8 and 18, both assert that across all platforms Hispanic and African American youth spend more time playing video games than white youth (Kaiser Family Foundation 2002, 2010).

purposes in a “freak show.” Some research around comic books and superheroes previously mobilized the terms “super freaks” (Knopf 2021) or “freaked [bodies]” (Diamond and Poharec 2017) while discussing idealized or hybridized character constructs. Other research draws these connections with muscular identities and body building (Staszal 2009), as well as other forms of sports, especially the spectacle and presentation of Olympics as a possible freak-show and body theme park (Tomlinson 2020). While the characters in fighting games are virtual, making the issues of consent or self-identification complicated, this doesn't diminish the status of these games as “freak shows” with the attendant cultural and identity-related baggage in terms of representation.

Based on prior work on inequity in videogame identity representations (Harrell 2009, 2010a), we began this project aiming to explore this enfreakment in order to both highlight (and thereby challenge) the ways that it reinforces harmful cultural norms, and to attempt to identify any positive patterns in character design that could serve as examples for future developers. Our core research questions were:

- 1 How do these patterns of enfreakment manifest at the code level? Do the statistics and mechanics of the characters differ systemically according to the aforementioned categories?
- 2 How does enfreakment differ among characters with different racial, ethnic, and national identities?
- 3 How does enfreakment differ across gender identities? Are male-identified and female-identified characters enfreaked in the same or in different ways?
- 4 Which characters stand apart from the usual stereotypes, and what factors contribute to their uniqueness?

Using both crowd-sourced survey data and information about game mechanics, we found systematic differences according to the gender and race/ethnicity of characters. These differences mostly lined up with common stereotypes, and to that degree the design in these games perpetuates sexist and racist myths about body types and behaviors. However, there were some unexpected surprises, and even encouraging patterns; in particular, we found that when designers showed cultural sensitivity (and when they designed characters from their own culture), the results tended to be less stereotypical.

The following sections describe related scholarly work in more depth, explain our experimental methodology, present our results, and discuss the implications of our findings.

## 2. Related work & secondary sources

### 2.1. Representation issues in videogames

Previous studies highlighted how media representation and communication affects social policy making in particular (Hajiyev 2019) and public sphere, culture, and democracy in general (Barnett 2003). Media representation is especially crucial for minorities and typically under-represented communities (especially gender- and race-related communities, see Brooks and Hébert 2006, and immigrant communities, see Brouwer et al. 2017) who without representation can find it hard to participate in policy making, elections, etc. (Schäfer and Debus 2018). However, minorities and underrepresented communities can also “increasingly communicate interests, make claims, and mobilize identities” (Georgiou 2013) through new forms of media including social media and virtual environments such as videogames. Kidd (2016) asserts that media representation can create archetypes and stereotypes, especially in multi-cultural societies, that essentialize individuals from certain groups, often emphasizing negative characteristics. Mastro and Kopacz's (2006) research on African American and Latine communities in the US revealed that stereotypical representations can affect policy decisions and voting behaviors. Their research is based on Tan et al.'s (2000) model that describes media use (hence, exposure to media representations) as an exogenous predictor for race-based policy perceptions.

The pervasive issues surrounding identity representation in video-games have been studied from multiple perspectives, with both under-representation of minority/devalued identities and stereotyping arising as persistent themes in the literature (e.g., Dietrich 2013; Gardner and Tanenbaum 2018; Leonard 2003, 2006, 2009; Patterson 2020; Passmore et al. 2018; Şisler 2008; Tompkins et al. 2020; Williams et al. 2009). Nakamura (1995) has identified “identity tourism” and “racial passing” in digital environments and highlighted racialization of other gaming-related phenomena (2009; 2012). Other research underscores the effects of portrayal and performance of race in video games specifically on young people (Everett and Watkins 2008). Feminist literature on virtual environments and games has also described the harmful effects of stereotyping and erasure in detail, and how even when female protagonists are included in games, their roles are often limited (e.g., Şengün et al. 2022b; Beck and Rose 2021; Behm-Morawitz and Mastro 2009; Perreault et al. 2016; *Reload: Rethinking Women + Cyberculture* 2002). Content analysis of male and female game characters (Martins et al. 2009, 2011) identifies gender disparities in representation which relate back to the gamer communities of said games (Ratan et al. 2015). A comprehensive census of video game characters by Williams et al. (2009) cements the disparity between video game characters and gamer demographics. Fron et al. (2007) have identified the “hegemony of play” as one cause of these inequities: ways in which “[the game industry is] a predominantly white, and secondarily Asian, male-dominated corporate and creative elite [that determines] which games will be made [by] which designers, which players are important to design for, and which play styles will be supported.” Obmann (2020) also identified the production context as a possible element that reflects on the gender portrayals in the medium.

In contrast to previous perspectives that expose “whitewashing” in videogame worlds (Dietrich 2013), we propose that enfreakment affects even the portrayals of overrepresented genders, races, and ethnicities in a detrimental fashion that have the potential to change the ways people think and collaborate across cultures (Shliakhovchuk and García 2020). Consider the examples of avatars like Bass Armstrong (*Dead or Alive*), Fang Wei (*Tekken*), Johnny Cage (*Mortal Kombat*), or Guile (*Street Fighter*) who stand in a power position within the hegemony of play (white, male, primarily Western, and secondarily Asian), but also are exaggerated or stereotyped in their ethnic identities anyway with hyper-charged cues such as body type, attire, aggressiveness, stern demeanor, combat accessories, brutal fighting techniques, and tattoos. Fighting games exhibit a particular subset of these issues: they tend to have diverse casts, but mainly in service of a kind of exoticism that relies heavily on stereotypes (see e.g., Hutchinson 2007; Surman 2007, and more broadly Said 1978). Fans and critics recognize these design patterns (see Bowman 2014 quoted above, as well as Ashcraft 2015), and are increasingly speaking out about issues of representation, which has led to at least some engagement from developers (e.g., Ishaan 2014; Khan 2018). Our work here aims to supplement this critical literature with survey data that represents how the audience actually perceives these characters, in order to both identify nuances in the stereotyping that occurs and understand how it is perceived.

## 2.2. The impact of avatars

While critical games literature has identified issues of representation, the impact of these issues has been traced by sociologists, psychologists, and cognitive scientists who study games. Not only does one’s choice of avatar potentially reflect one’s real-world identity (Lim and Harrell 2015; Şengün 2015; Yee et al. 2012), but it may also influence one’s behavior (Şengün et al. 2022a; Harrell and Veeragoudar Harrell 2012; Kao and Harrell 2015; Şengün 2014; Kocur et al. 2020), including post-game behavior in the real world (Yee et al. 2009; Hawkins et al. 2021). Studies that have examined the effects of racialized avatars have identified both potentially positive (Groom et al. 2009) and potentially negative (Peck et al. 2013; Seitz et al. 2020) effects of embodiment but

have consistently found that race-based cues and behaviors persist in virtual worlds (Eastwick and Gardner 2009; McCall et al. 2009) and affect real-world behavior (Everett and Watkins 2008). These findings underscore the important role that avatars have to play in influencing self-conception and ideas about the world, which is why understanding the biases encoded in stereotypical avatars like those of fighting games is important. When fighting games offer an opportunity for genuine self-expression via more diverse avatars than other games provide, the exaggerations and biases encoded in these avatars become especially noteworthy, and the ways in which communities built around these games have been inclusive to some demographics while exclusive of others reinforce this importance (see again Bowman 2014, and also Fecher 2012).

## 2.3. Secondary sources

To address our research questions, we focus specifically on two recent fighting games: *Street Fighter V* (SF5) and *Tekken 7* (T7) (*Street Fighter V* 2016; *Tekken 7* 2015). We chose these games because they are both the most recent installments in their respective popular franchises,<sup>4</sup> have been played competitively in top fighting game tournaments (USD 2017), and have rosters of mostly human characters with explicit nationalities and genders. Besides the games themselves, we reference several important scholarly and journalistic secondary sources concerning the games’ development, popular reception, and fan communities. Bowman’s (2014) news article “Why the Fighting Game Community is Color Blind” on diversity in the fighting game community has already been mentioned several times, but another useful resource regarding fan activity and cultural issues is the work of Ng (2006) on fighting games in Hong Kong. Additionally, the article “Street Fighter II: An Oral History” by Leone (2014) has provided useful insight into developer motives and thought processes that are usually inaccessible to critics. Leone’s article is noteworthy in that it captures the explicitly sexist attitudes of the original designers of the *Street Fighter* characters, for example in this response from *Street Fighter II*’s composer Yoko Shimomura<sup>5</sup> on an interaction with designer and artist Akira Yasuda:

*Chun-Li has big thighs, right? So back in the day, I asked Mr. Yasuda, “Why does she have such big thighs?” And he started shouting and went off and was like, “I can’t believe you don’t understand the appeal.” And he started explaining the attraction. And you know, I’m a woman and I asked the question but it kind of got awkward when he started explaining his fetishes. I mean, he has really strong feelings toward his creations. There’s a reason for everything being the way that it is. When I heard that, I thought maybe that’s something that everybody thinks, but everybody doesn’t go out telling everybody. But he just told me.*

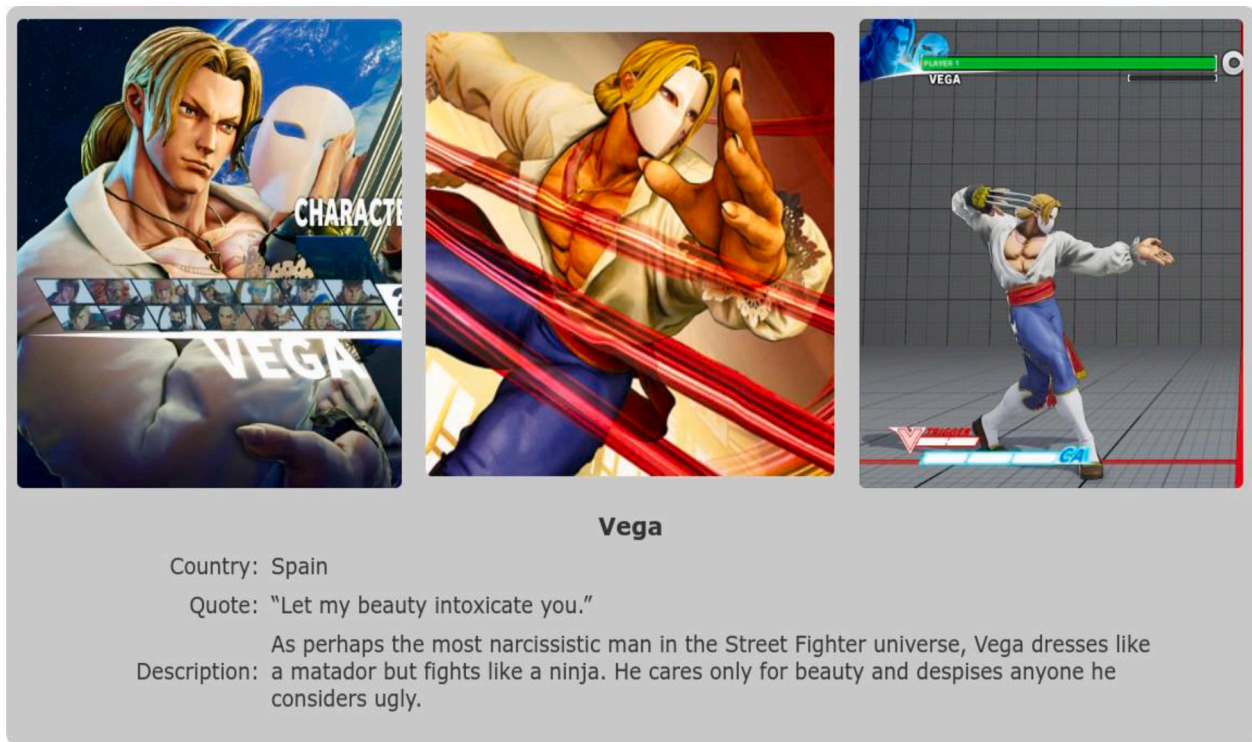
Not only do such attitudes influence character designs, but these in turn (among other factors) influence fan communities, empowering fans like Aris Bakhtanians to state (Klepek 2012; also quoted in Bowman 2014):

*The sexual harassment is part of the culture. [...] If you remove that from the fighting game community, it’s not the fighting game community... it doesn’t make sense to have that attitude. These things have been established for years.*

While such a bold statement of explicit sexism is not representative of the whole community (see e.g. inkblot 2012a, b), this kind of thing does illustrate how the attitudes of developers and those of some fans both echo the sexist designs of the characters. Taken together, these secondary sources connect our isolated statistical analysis of character designs with broader issues of attitudes and representation within fan

<sup>4</sup> See e.g., franchise sales estimates at [http://vgsales.wikia.com/wiki/Best\\_selling\\_fighting\\_games](http://vgsales.wikia.com/wiki/Best_selling_fighting_games)

<sup>5</sup> A recent study from Lemon and Rietveld (2020) outline how, as a female composer, Yoko Shimomura stayed visible to the rest of the game’s production team.



**Fig. 1.** An example from our survey showing SF5's Vega. The left-hand image is from the character select screen, the middle image is official art from the game website, and the right-hand image is an in-game screenshot. Vega's official country (Spain), intro quote ("Let my beauty intoxicate you.") and official description ("As perhaps the most narcissistic man in the Street Fighter universe, Vega dresses like a matador but fights like a ninja. He cares only for beauty and despises anyone he considers ugly.") are displayed below the images. A full example of the entire survey is available at: <https://solsword.github.io/enfreakment-study/>.

and developer communities.

### 3. Methodology

We wanted to understand how the characters in these games were viewed from an audience perspective, so our primary tool for quantifying enfreakment was a survey instrument designed to ask about the perceptions of design choices, using questions such as "[To what extent do you agree that] [character] is designed to appear attractive[?]" Using these subjective responses, we were able to map the perceived qualities of each character, and contrast these between different groups of characters in order to affirm our personal observations about design trends.

To select the avatar features focused on, we applied insights from cognitive linguistics accounts of categorization (Lakoff 1987), categorization theory (Bowker and Star 1999) and applications of the cognitive linguistics-based studies of racial and ethnic representations in media (Harrell 2010b; Santa Ana 2002). In addition to survey data, we also analyzed the "frame data" from SF5 (gathered via O'Shea 2018; officially available with login at Capcom 2018), which specifies the detailed game mechanics of each different attack, such as how quickly the attack happens and how much damage it deals.

#### 3.1. Characters and groupings

We limited our analysis to original characters plus characters from seasons 1 and 2 of SF5, as well as the non-DLC characters from T7.<sup>6</sup> This left us with a roster of 28 SF5 characters plus 36 T7 characters, from which we excluded four T7 characters that were neither human nor

<sup>6</sup> 1 character, Akuma, appears in both games, with slightly different art and descriptions. We treated these instances as separate characters, except we also ensured that no single rater would be asked to rate both profiles to avoid confusion.

human-enough to have distinguishable genders or ethnicities (Gigas, Kuma, Panda, and Yoshimitsu). Of the 28 SF5 characters, 9 were female and the other 19 were male (with no obvious instances of ambiguity or nonbinary gender), while 10 of the 32 T7 characters were female and 21 were male, with one ambiguous character (Leo).<sup>7</sup>

To investigate potential biases regarding national origins, we noted the official nationalities of each character (which in some cases were simply listed as "unknown") and developed three grouping strategies. The simplest was comparing explicitly Japanese characters (the national origin of the majority of the game developers for both games) with all other characters. There were 6 Japanese SF5 characters and 7 Japanese T7 characters, with one of the T7 characters (Lee) being adopted, which we still counted given his official country of origin was listed as Japan. Our second grouping counted the number of characters of each nationality and classified each nationality as either a "Token" group (two or fewer representatives; and all "unknown"-nationality characters), a "Minority" group (between three and five representatives), or a

<sup>7</sup> We treated Leo's official gender as "ambiguous" for analysis purposes, and so Leo's data was not included in either male or female statistical averages. However, in our study we presented Leo as male (e.g., we asked participants whether Leo was a positive representation of "men" instead of "women" or "nonbinary people") because the use of male pronouns in Leo's official English character biography gives that impression to players who are not otherwise familiar with the character. On the official website, Leo is highlighted when either the 'male' or the 'female' filter is applied, and Leo can equip both male and female accessories in the game, but neither of these is obvious to a first-time player. Other than gendered pronouns (which are not present in the original Japanese), Leo's bio makes no mention of their gender (cf. Fecher 2012).

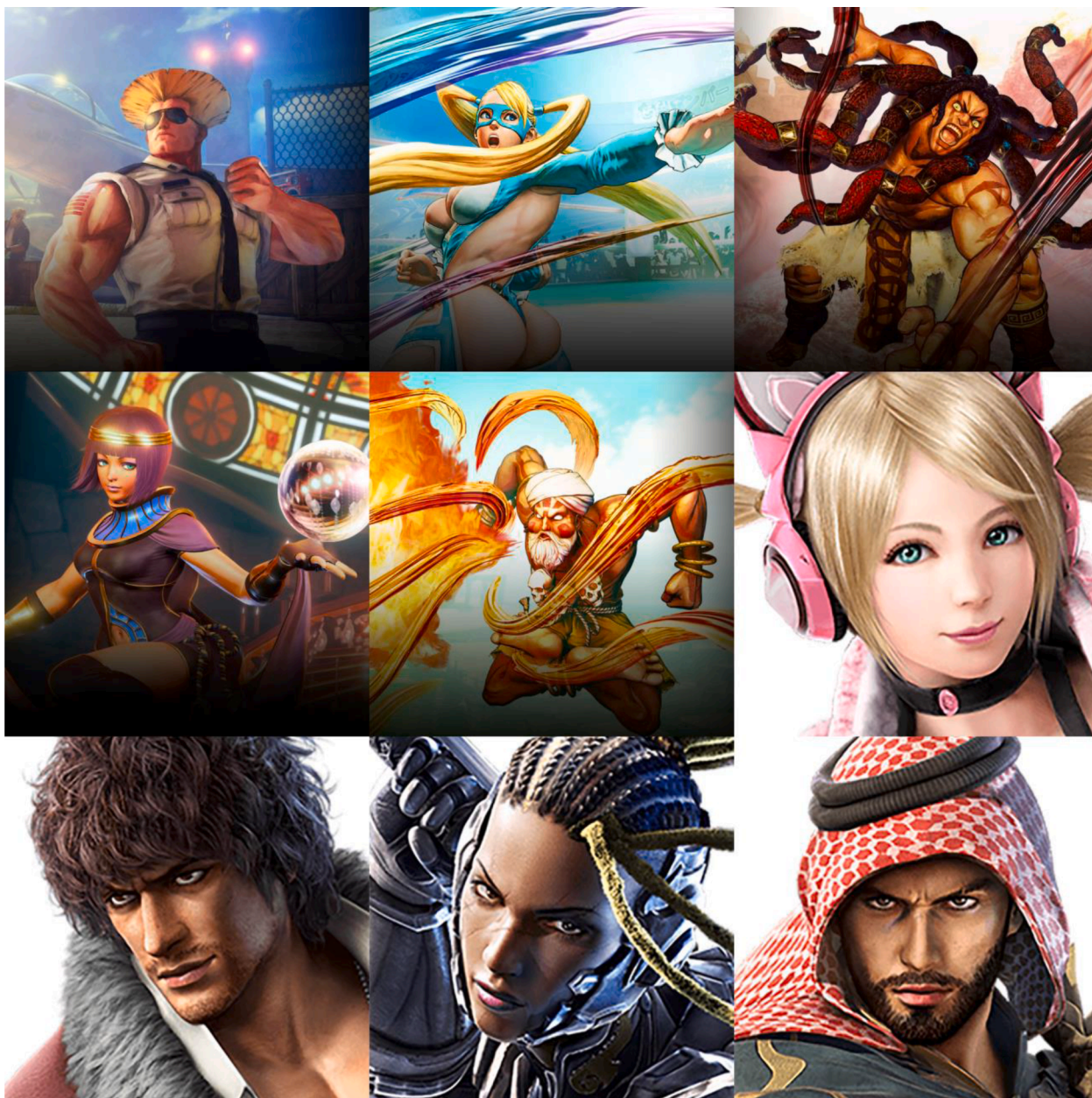


Fig. 2. Official character art for Guile, R. Mika, Necalli, Menat, and Dhalsim (SF5); and Lucky Chloe, Miguel, Master Raven, and Shaheen (T7) demonstrating the diverse but exaggerated designs in each game.

“Majority” group (six or more representatives). The Majority countries were Japan (6/7 SF5/T7 characters) and the U.S.A. (5/4 characters), while the Minority countries were Russia (1/3 characters), China (2/2 characters), Brazil (1/2 characters), and the U.K. (2/1 characters).<sup>8</sup> The only Token countries with two representatives were Spain and South Korea (both having one character from each game), and the remaining 20 characters (9 SF5/11 T7) each came from a unique country (or had a listed national origin of “unknown”).

In addition to biases related to national origin, we wanted to investigate racial/ethnic biases, but there is no official data on character races

<sup>8</sup> The fact that the breakdown of nationalities is so similar between the two games itself suggests that the developers have similar ideas of the relative importance/interest of different countries. There was no country of origin represented by at least two characters which did not have at least one character from each game.

or ethnicities beyond their national origins. As a compromise, and because even within racial groups colorism can be its own bias (Norwood 2013), we hand-coded each character as having either generally “lighter” or “darker” skin. This coding greatly simplifies the different distinctions of skin color present in these games, and of course does not really capture the nuances of the characters’ different racial and ethnic backgrounds. However, even though the racial and ethnic design biases in these games are driven by more complex variables than just skin color, some are presumably correlated with skin color, and therefore our coding can capture them, albeit with reduced precision. To control this distinction for subjectivity, two of the authors coded the skin tones of each character independently, resulting in three groups: the lighter-skinned and darker-skinned groups where both coders agreed, and an “indeterminate” group for characters where the coders disagreed (three characters).

**Table 1**

The results of our 84 construct hypotheses: each row shows one construct, and each column lists a primary group that we compared against all non-members, or in the skin color cases, against darker-skinned characters (of the same gender). The value show whether that group had lower or higher scores as predicted (< / >), or unexpectedly (<! / >!), or whether we made no prediction about those groups for that construct (-). In cases where results were insignificant, the direction of our hypothesis is indicated using (< / >).

|                | Gender Female | Skin Color Lighter-skinned | National Origin |          | Token | Unknown | Intersections  |   | Majority Female | Lighter Male | Majority Male |
|----------------|---------------|----------------------------|-----------------|----------|-------|---------|----------------|---|-----------------|--------------|---------------|
|                |               |                            | Japanese        | Majority |       |         | Lighter Female |   |                 |              |               |
| body realism   | -             | >                          | >               | <!       | -     | <       | >              | > | >               | >            | <!            |
| attire realism | <             | >                          | >               | >        | <     | -       | -              | - | -               | -            | -             |
| ethnic cues    | >             | >!                         | <               | <        | <!    | <!      | -              | - | -               | -            | -             |
| musculature    | <             | <                          | -               | >!       | -     | >       | <              | < | <               | <            | <             |
| body type      | >             | >                          | >               | <!       | -     | <       | >              | > | >               | >            | >             |
| youth          | >             | -                          | -               | -        | -     | <       | <              | < | <               | >!           | <             |
| attractiveness | >             | >                          | >               | <!       | >!    | <       | >              | > | >               | >            | >             |
| sexualization  | >             | -                          | -               | -        | -     | -       | <              | < | <               | -            | -             |
| attire sxlzn.  | >             | -                          | -               | -        | -     | -       | <              | < | <               | -            | -             |
| admirability   | >!            | >                          | >               | >        | -     | <       | >              | > | >               | >            | >             |
| ethnic rep.    | -             | >                          | >               | >        | <     | <       | >              | > | >               | >            | >             |
| gender rep.    | >!            | >                          | -               | >        | -     | <       | >              | > | >               | >            | >             |

**Table 2**

The results of our 7 participant hypotheses: each row shows one hypothesis. The values show whether the listed group had lower or higher scores as predicted (< / >), or unexpectedly (<! / >!), for the listed construct. In cases where results were insignificant, the direction of our hypothesis is indicated using (< / >).

| Construct             | Group                        | Result |
|-----------------------|------------------------------|--------|
| Gender Representation | Women                        | <      |
|                       | Infrequent game-players      | <      |
|                       | Frequent game-players        | >      |
| Ethnic Representation | When ethnicities are similar | <      |
|                       | Nonwhite participants        | <      |
|                       | Infrequent game-players      | <      |
|                       | Frequent game-players        | >      |

3.2. Survey methodology

For a more detailed overview of our survey methodology and statistical approach, consult Appendix A. Fig. 1 shows how characters were presented to participants, and Fig. 2 shows a sample of the range of character designs present in both games. We ran our study as an Amazon Mechanical Turk Human Intelligence Task, and asked participants Likert-item agreement questions about the 13 following character aspects: (1) Body realism; (2) Attire realism; (3) General ethnic cues; (4) Attire ethnic cues; (5) Musculature; (6) Body type; (7) Youth; (8) Attractiveness; (9) Sexualization; (10) Attire sexualization; (11) Admirability; (12) Ethnic representation; and (13) Gender representation.

We also asked questions about how similar each participant felt themselves to be to each character they rated, and questions about the demographics of our participants (see Section A.2 for a discussion and breakdown of our participant demographics).

3.3. Hypotheses

We expressed our research questions and ideas about the hegemony of play as 151 specific hypotheses derived from previous research about how individual character constructs (or in-game properties) would vary between groups. These hypotheses were divided between hypotheses about construct differences between character groups (79 hypotheses), mechanical differences between character groups (65 hypotheses), and construct differences between participant groups (seven hypotheses). Our hypotheses about character groups (see Table 1) fell into the following general categories:

- Gender hypotheses:
  - Female characters will be more sexualized & stereotypically beautiful (e.g., thin, young, not muscular) than male characters (see Lynch et al. 2016; Harper 2019).

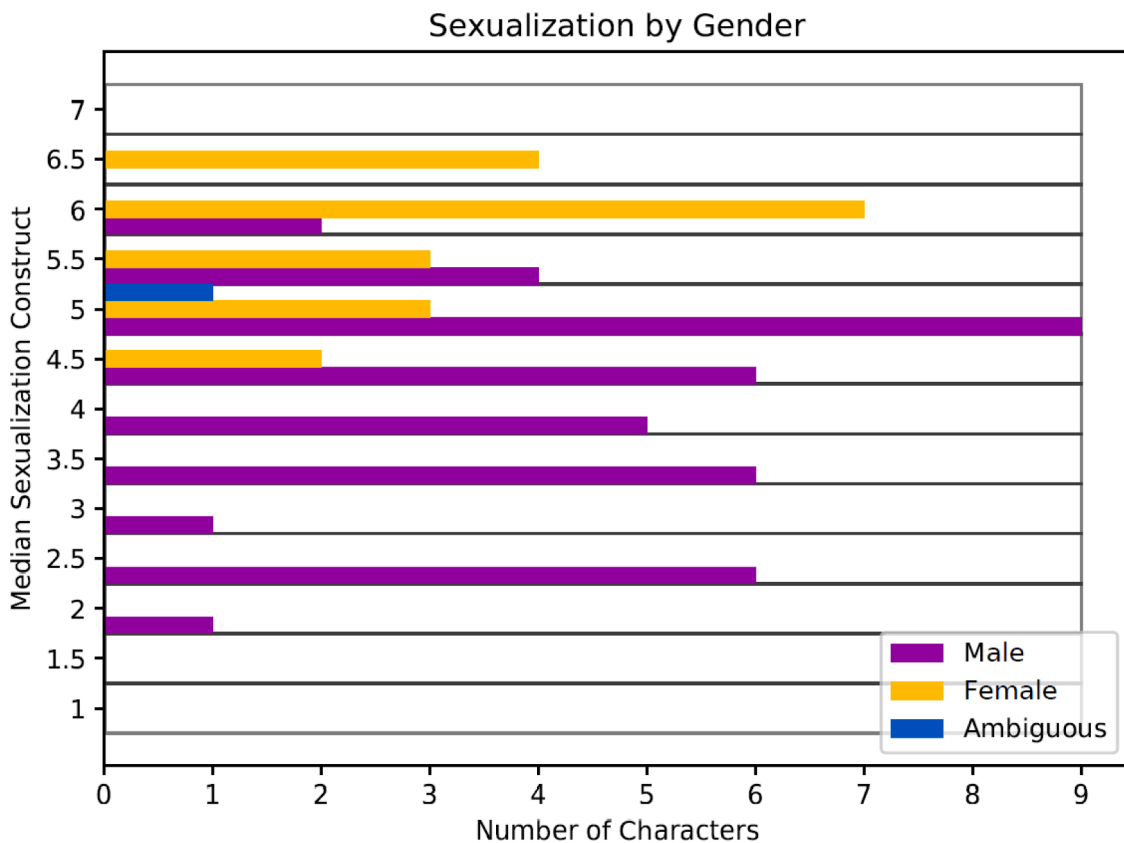
- Female characters’ ethnic cues will be more exaggerated than male characters’ (see Dickerman et al. 2008; and Perreault et al. 2016 for a discussion around “how women’s stories are recorded in society”).
- Female characters will be less admirable and worse representations of their gender than male characters (see Martins et al. 2009; 2011; Tompkins et al. 2020).
- Skin color hypotheses (see Leonard 2006 for a discussion around the representation of white characters as compared to other characters in games):
  - Lighter-skinned characters will be less brutish<sup>9</sup> (more realistic, less muscular, thinner, and more attractive).
  - Lighter-skinned characters will be less villainous (more admirable, and better examples of their ethnic/racial groups and genders).
  - Lighter-skinned characters will have less exaggerated ethnic cues (see Dietrich 2013).
- Nationality hypotheses (see Everett and Watkins 2008; Fron et al. 2007 for discussions around the representation of race in video games—especially Fron et al. 2007 defines the familiar groups through the hegemony of play and how the members of such group are portrayed in games):
  - Familiar groups (Japanese and Majority characters) will be portrayed more positively (more realistically and as better examples of their ethnic/racial groups and their genders).
  - Familiar groups will be less brutish (less muscular, thinner, and more attractive) (see Leonard 2003 for a discussion around white characters being portrayed as more innocent).
  - Familiar groups will have less exaggerated ethnic cues (Leonard 2003).

Our hypotheses about mechanics (see Table 2) can be summarized as:

- Gender hypotheses (see Lim and Harrell 2015 on male characters representing “more archetypal representations of each [videogame] race than females across attributes”):

<sup>9</sup> Note that patterns such as coding ugly or overweight characters as bad are themselves problematic, so assuming that e.g., lighter-skinned characters being thinner means that the designers are exhibiting negative racial bias is an oversimplification (such a pattern is a race-based bias, but its evaluation might be complex). Our explicit questions about characters being a positive/negative example of their ethnicity/gender, while still being filtered through the presumably dominant cultural understanding of our participants, should be more indicative of designer value judgements (or at least, what the designers end up communicating to their audiences, regardless of intent).





**Fig. 3.** A histogram of per-character median sexualization scores by character gender. Note that all female characters are above 4.0 (neutral) and that the male characters are not just lower on average but span a much greater range of scores.

- Female characters will be more agile and less durable than male characters (e.g., lower health pools, faster move speed and higher jumps).
- Female characters' attacks will be quicker/lighter, dealing less damage per attack but hitting faster and allowing for more combos or multi-hit moves.
- More of male characters' attacks will be safe (i.e., will prevent the defender from safely retaliating even when blocked).
- Skin color hypotheses (see [Leonard 2006](#) for examples of racial character design especially highlighting lighter-skinned characters as having more finesse and others performing as more savage; also see [Lim and Harrell 2015](#) on how race and skin color of characters affect the game mechanics in *The Elder Scrolls IV: Oblivion* and *Ultima IV*):
  - Lighter-skinned characters will be more frail and agile than darker skinned characters.
  - Lighter-skinned characters' attacks will be quicker/lighter.

Note that these hypotheses are not about game balance, but about systemic differences in design that make up part of the player experience; average stats like these have little to do with balance, even for novice players, but they make a visual and tactile difference to the play experience. Frame data “gives you all the information you need to know about any given attack” and is defined as pieces of information “that advanced players use to help improve their skills [...] and] take [their] game to the next level” ([Dawson 2016](#)). For details on the meaning of the frame data items, consult [Dawson 2016](#), as well as the Official *Street Fighter V* Strategy Guide linked there. We rely on frame data to develop the above hypotheses since it (1) is an official source, (2) is open to the public and published by the developers (as opposed to scraped or crawled), and (3) is widely used in the professional esports and gaming circles for strategy-making.

Finally, our hypotheses about participant differences were as follows (for hypotheses regarding play times, we position frequent players as a member of dedicated player-base who might have a less critical view of the media they are interacting with—see [Badrinarayanan et al. 2014](#) for a discussion around online brand tribalism around videogames, as well as [Fuschillo 2020](#) and [Plante et al. 2020](#) for fandoms, gamer communities, and gatekeeping; however, also see [Tuunanen and Hamari 2012](#) for a criticism of segmenting players through their status as hardcore versus casual play patterns; thus, future research can mobilize more fine-grained segmentation criteria for in- and out-community players):

- Male participants and frequent players would be less perceptive of negative gender representations (see [Behm-Morawitz and Mastro 2009](#) for an example of rating differences for video game characters based on gender of the participant).
  - Female raters would give lower ratings (to the same characters) for our *gender representation* construct than non-female raters.
  - Participants who played games “infrequently” or “never” would give lower ratings for *gender representation* compared to those who played “daily,” “weekly,” or “monthly.”
  - Participants who played games “daily” or “weekly” would give higher ratings for *gender representation* compared to other groups (note the slight asymmetry in the treatment of the “monthly” group).
- Participants who rated themselves as ethnically similar to a character they rated, nonwhite participants, and infrequent players would be more perceptive of negative ethnic representations (see [Groom et al. 2009](#); [Hawkins et al. 2021](#); [Kao and Harrell 2015](#) on behavior interactions between avatar and user racial identity; also see [Passmore et al. 2018](#) analysis that finds “significant differences between players of color and White players on perception of racial norms in gaming”).

- Participants who agreed (“somewhat” or more strongly) with the *ethnic match* question would give lower *ethnic representation* scores.
- Participants who hadn’t included “White” or “Caucasian” in their ethnicity description would give lower *ethnic representation* scores.
- Participants who played games “infrequently” or “never” would give lower *ethnic representation* scores.
- Participants who played games “daily” or “weekly” would give higher *ethnic representation* scores.

These hypotheses were designed to explore questions about whether participant identity as a member of a group being portrayed negatively might influence perceptions of design choices. Additionally, they included (admittedly crude) tests of whether exposure to these kinds of stereotypes (proxied using play frequency across any kind of game) might normalize them (although there are other explanations for any observed differences across the play frequency groups, including alternate directions of causality and unmeasured confounding factors).

#### 4. Results

Of our 151 hypotheses, 65 were significant, although 12 of those exhibited the opposite of the effect we predicted. Accordingly, some of our hypothesis groups were supported, and others were unsupported or even reversed. The following sections outline our expected and unexpected results.

##### 4.1. Gender

The most striking (although not surprising) group of results came from our hypotheses about the design of female characters. Per the first column of [Table 1](#), we found that female characters were less muscular, younger, thinner, more attractive, more sexualized, and had more sexualizing attire (each effect resulting in a mean difference of more than a full rating category). This is in line with previous research results from [Lynch et al. 2016](#); [Beasley and Standley 2009](#); [Martins et al. 2009](#); and [Downs and Smith 2010](#). Focusing on *sexualization* as an example, although some male characters were quite sexualized (e.g., SF5’s Vega shown in [Fig. 1](#) or T7’s Miguel), the female characters were more sexualized than the male characters, with more extreme examples and a narrower range. [Fig. 3](#) shows the breakdown of per-character median *sexualization* scores by gender, grouped into 0.5-point bins. Note in particular that all of the female characters had median *sexualization* scores of 4.25 or above, while 4 was the neutral answer on our 7-point agreement scale.

There are two important aspects of this difference: first, our statistical test over possible worlds shows that the difference in this case is *systematic*: the chance that an equivalent-or-greater difference in scores might arise by chance given designers were sexualizing characters randomly regardless of gender was less than 0.01%. So, we know that whether via conscious or unconscious bias, the designers are sexualizing the female characters more than the male characters, and, even more specifically, that the audience is picking up on this. Second, the difference is not only systemic, but in this case, the range of expression is narrower for one group (female characters) than another (male characters). This implies that the design differences are not only perceptible, but consistent enough to send a message: in this case that women’s and men’s sexual availability is different.

While all our hypotheses about female characters’ aspect scores were confirmed, our hypotheses about exaggeration were not significant, and both of our hypotheses about affect scores were reversed unexpectedly. These reversals signaled that more overtly negative characteristics were concentrated among male characters, not female characters.

##### 4.2. Skin color

All our hypotheses regarding differences based on skin color were

confirmed except two. Lighter-skinned characters were less muscular, thinner, and more attractive; they also had more realistic bodies and were more admirable and better representatives of their gender and ethnic groups. This is in line with previous research results from [Behm-Morawitz and Ta 2014](#); [Leonard 2003](#); [2006](#); and [Burgess et al. 2011](#). As an unexpected result, instead of having less obvious ethnic cues, however, the lighter-skinned characters had more obvious cues, which reversed our prediction, and there was no significant difference in terms of the realism of their clothing. This reversal might be a result of our participant group who self-reported ethnic identities closer to the character group. As a result, the participants could have found it harder to recognize ethnic clues from other character categories, and easier from this category. For the differences we confirmed, the effect sizes ranged from 0.24 to 0.63 of a rating category; much more modest than the gender-based effects, likely as a result of our simplification of complex racial categories into a single lighter/darker distinction.

##### 4.3. Nationality

Our results based on nationality distinctions were mixed (columns 3–7 in [Table 1](#)). Our two main distinctions, based on Japanese national origin and majority/minority/token groups, were different attempts to guess favored and unfavored group status based on national origins (see [Section 3.1](#)). Japanese characters as a group were more realistic, had more realistic attire, were thinner, and were more admirable and more positive representatives of their ethnicities. Meanwhile, majority-nationality characters had unexpectedly less-realistic bodies, were unexpectedly more muscular, were unexpectedly more heavysset, and were unexpectedly less attractive than their minority and token counterparts, although their attire was more realistic. Although these results were unexpected, they are actually in line with our previous observation that the phenomenon of enfreakment can easily affect even the over-represented characters. We touch upon this briefly in the discussion section and offer how it can be a future research direction. Finally, for token-nationality characters, attire was less realistic as expected, but ethnic cues were unexpectedly weaker, and attractiveness was unexpectedly greater than for their minority- and majority-nationality counterparts. Effect sizes among these groups ranged from 0.13 to 0.41 of a rating category, so these effects were also subtle.

These mixed results suggest that design differences by national origin are nuanced. Our final distinction for national origin focused on the “unknown” category, where we found mixed results, although notably all of our hypotheses about general representation (admirability, and positive gender/ethnic representation) were supported; effect sizes ranged from 0.24 to 0.74 of a rating category. Overall, while there are specific aspects like youth or attractiveness may not vary systematically by national origin as much as by gender, affect scores do differ significantly.

To the best of our knowledge, videogame character research based on nationality is rare and this makes it hard for us to compare our results with previous research. Works like [Šisler \(2008\)](#) (looks at the representation of Arabs in games) and [Bayeck et al. 2018](#) or [Harrell et al. 2021](#) (looks at the representation of Africa/Africans in games) handle identity from a wider range than nationality. Others (for example see [Song 2019](#) for representation of Japanese and Chinese women in *Azur Lane*; [Barreto and Jensen 2020](#) for representations of Brazilians) almost always highlight stereotypes and misconceptions.

##### 4.4. Intersections

Although not all our intersectional<sup>10</sup> hypotheses were supported (see columns 8–11 of [Table 1](#)), we did find some systematic differences

<sup>10</sup> In this context, by ‘intersectional’ we simply mean hypotheses that posed questions about two or more categories at once

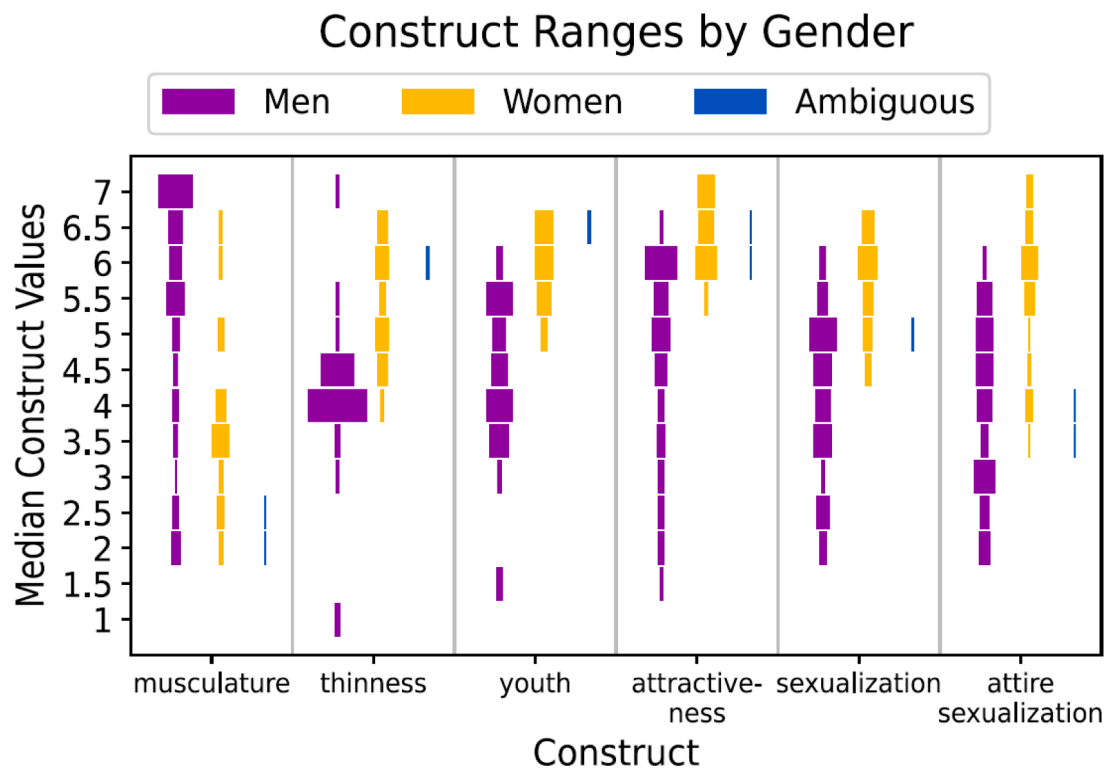


Fig. 4. A plot of the distribution of each of the aspect constructs separated by gender: each column is a histogram showing the distribution of characters of a certain gender according to their median construct rating. Note the smaller (and offset) ranges of the distributions for female characters.

within genders based on skin color and/or majority-nationality status. Lighter-skinned female characters were less muscular, thinner, and less sexualized than their darker-skinned counterparts, while majority-nationality female characters had more realistic bodies and were less sexualized than female characters from other countries (effect sizes were between 0.28 and 0.68 of a rating category). Similarly, lighter-skinned male characters had more realistic bodies, were less muscular, and were more attractive than their darker-skinned male counterparts, although they were unexpectedly portrayed as younger, not older (by 0.33-0.58 of a rating category). Also, majority nationality male characters had unexpectedly less-realistic bodies (by 0.37 of a rating category), while our hypotheses about that group's appearance characteristics were not confirmed. Finally, for both lighter-skinned male characters and majority-nationality male characters, our hypotheses about valorization were all confirmed: those two categories were favored in terms of admirability and positive ethnic/gender representation compared to darker-skinned and non-majority nationality male characters respectively (with effect sizes between 0.15 and 0.55 of a rating category).

#### 4.5. Frame data

The overwhelming majority of our hypotheses about the frame data values were not statistically supported, largely because the statistical standard that we used is much too strict to acknowledge subtle design differences. This is also a function of the smaller data pool for these tests: for the frame data, we used only SF5 characters and had only a single value per character, for a total of just 28 data points. Although we could not conclusively demonstrate systematic design differences in most cases, a few did stand out. On average, female characters had lower health totals (43.6 hit points), fewer frames of stun when their attacks were blocked (1.26 frames), and a smaller percentage of their normal attacks were safe (9.7% less of their normals were safe on block). Additionally, lighter-skinned characters had a higher proportion of

multi-hit moves in their entire move sets (a 12.8% difference).

#### 4.6. Participant groups

For our hypotheses about participant groups (see Table 2), we found that women did indeed give significantly lower scores for *gender representation*, and although infrequent players weren't significantly different from more-frequent players, frequent players (daily and weekly players) gave significantly higher scores. In terms of ethnicity, our tests for differences based on self-identified ethnic similarity and frequency of play (in both directions) were not significant, but non-white raters (those whose self-described ethnicity did not contain either 'white' or 'Caucasian') did give significantly lower ratings for ethnic representation.

### 5. Discussion

#### 5.1. Gender

While not every relationship we investigated had such stark distinctions as sexualization by gender, that distinction (see Fig. 3) illustrates a simple design principle: *narrow representation is bad representation*, from which follows the principle that *token representation is bad representation*. In other words, when the range of expression along a particular axis is constrained for a group of characters, that sends a message and helps construct or perpetuate a stereotype. Fig. 4 shows the range of each aspect construct by gender, revealing how female characters are given a much narrower range of expression than male characters, and the singular ambiguous-gendered character results in no ranges at all for that category. Even when there are two or three characters from a particular group, the range of expression along some axes will inevitably be small, meaning that token representation inevitably creates stereotypes.

Plots like Figs. 3 and 4 directly reveal how female characters are stereotyped in these games, and we found similarly restricted expression

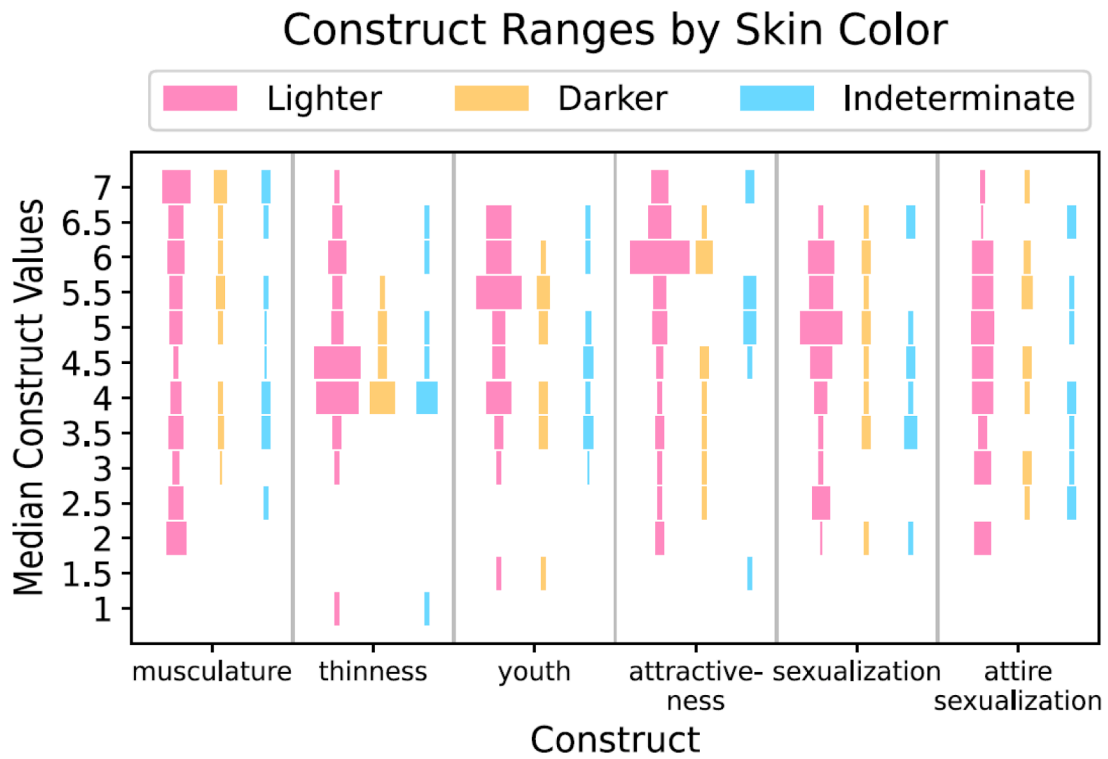


Fig. 5. A plot of the distribution of each of the aspect constructs separated by skin color. Note that unlike Fig. 4, the ranges are relatively even for most aspects across skin color groups, although the specific distributions differ somewhat.

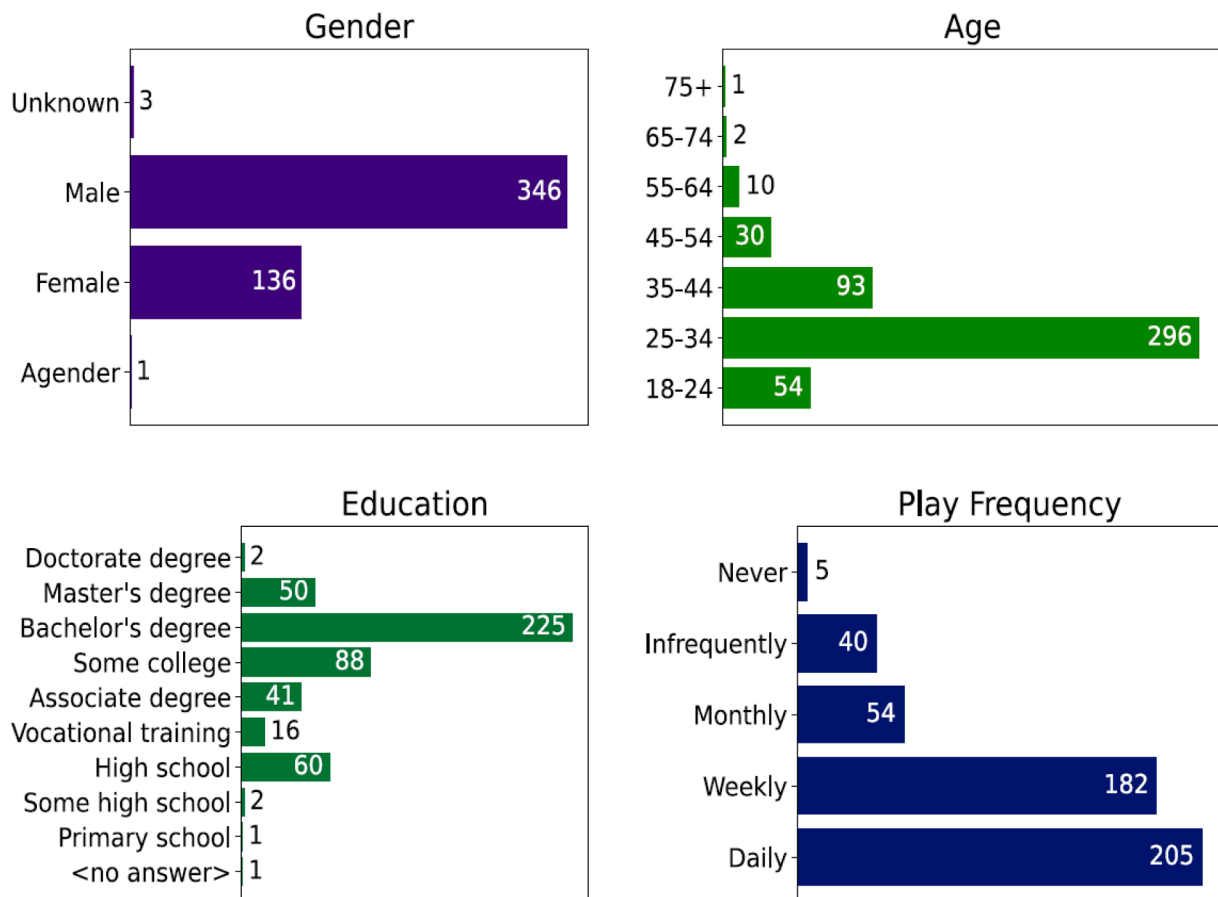


Fig. 6. The demographics of the participants.

among female (but not male) characters for the *body type*, *youth*, *attractiveness*, and *attire sexualization* constructs. In contrast, despite a systematic difference in *musculature*, characters like Chun Li, Cammy, Laura, and R. Mika (notably all from SF5) broke the mold and scored median ratings above neutral, giving female characters almost as wide a range as male characters for this construct.

Despite their stereotypical visual attributes, female characters ended up being considered more admirable and better representations of their gender than male characters. While in part this simply reflects on our raters, and the way that society tends to ignore the harmful effects of stereotypical beauty standards for women in particular, there are also fewer female characters that are portrayed as evil. Of the 14 characters that scored below 4 for median admirability, only one was female (R. Mika, who is extremely sexualized), and of the 13 characters below 4 for median gender representation only two were female (Lucky Chloe and R. Mika). Meanwhile, characters like the dictatorial M. Bison (SF5), and violent Bryan (T7) were assigned sub-4 median scores for both admirability and representation (although Bryan scored a 4 for ethnic representation).

The villains of both games (to the degree that such exist) are overwhelmingly male, as are most characters assigned negatively perceived traits such as laziness, low intelligence, or sadism.<sup>11</sup> Female villains are without exception subordinate to a male mastermind, and some, like SF5's Juri, have been (partially) redeemed in the course of their franchise development. Thus, the irredeemably bad characters are never female (at least by this point in the respective franchises), which is perhaps still a reflection of gendered ideas of female virtue or innocence.

Besides our opinion results, we also hypothesized that female characters would play differently from male characters, but most trends in the frame data were not strong enough to provide conclusive evidence of systemic differences. The three relationships that were significant were health pools (female characters had lower average health totals), frames of blockstun for normals (female characters had fewer on average), and proportion of safe moves (female characters also had fewer on average). Even these three relationships do suggest some systematic differences in design, however. The lower health pools mean that female characters have to hit harder and/or more often to take down their male opponents. Blockstun refers to the amount of time the opponent is unable to act after blocking an attack, and in high level play it is a critical factor in a character's ability to continue a string of attacks.

Female characters' normals having less blockstun means that their opponents will be able to counterattack more quickly, and from a thematic perspective, it suggests that their hits are lighter than those of their male counterparts (although we found no significant difference in damage done when a hit landed). The difference in blockstun leads directly to the fact that female characters have fewer moves that are safe on block. These so-called 'safe on block' attacks allow a player who can attack before their opponent to continue with a second attack even if their opponent blocks, potentially forcing the opponent into a defensive guessing game of whether to block low or high, thus giving the attacker a sustained advantage. While having fewer of these is not necessarily a disadvantage if the remaining safe moves are still good ones, thematically this implies that the female fighters have less sustained aggression, and that their attacks are riskier. Interestingly, most female characters' moves are not unsafe because they are heavy-hitting moves with a long recovery time, but rather even light hits are less safe simply because they have less blockstun, allowing opponents to recover in time to counterattack.

<sup>11</sup> Again, we want to emphasize that although we might take issue with some of these associations, the designers and our participants are likely on the same page when it comes to labelling characters as being admirable or positive representatives of their gender/ethnicity.

## 5.2. Skin color

Again, disappointingly but not surprisingly, systematic differences based on skin color were common and mostly predictable. Characters like Balrog and Necalli (SF5), and Akuma (both games) are darker-skinned and evil with lower-than neutral *admirability* and/or representation scores. While they have some light-skinned counterparts, such as Abigail (SF5), and there are some more positive examples such as Laura (SF5) and Master Raven and Eddy (T7), the bias in terms of each of the affective scores is systematic. None of the highest-scoring characters for admirability, gender representation, or ethnic representation had darker skin.

These affective biases are matched by aspectual differences: lighter-skinned characters are less muscular, thinner, and more attractive than their darker-skinned counterparts, and their bodies are less exaggerated overall. These confirmed predictions, made in reference to persistent cultural stereotypes about skin color, show that the colorism (and racism) exhibited in the designs can be measured as perceived by the game's audience. The one surprising result was that lighter-skinned characters actually had more obvious ethnic cues, which was the opposite of our hypothesis that the darker-skinned characters would be more obviously marked.

To explain this unexpected result, we observe that while several darker-skinned characters are clearly marked, others are ambiguous, and many light-skinned characters are also marked. Balrog, Dhalsim, Laura, and Menat (all SF5) all had median ethnic cues scores above 4, but Necalli and Urien (SF5), and Master Raven (T7) had scores below 4, and light-skinned characters like Ibuki (SF5) and Feng and Xiaoyu (T7) had scores just as high as the highest darker-skinned characters. Of the 13 characters with scores above 4 for both component questions of the ethnic cues construct (one about overall ethnic cues and one focused on attire), only two were darker-skinned (Dhalsim and Menat from SF5, who are from India and Egypt), and two were indeterminate (Rashid from SF5 and Shaheen from T7, both of Middle Eastern origin, and who each notably involved some form of regional participation in their design). Of the nine light-skinned characters in that group, four were Chinese and three were Japanese, while the remaining characters were Spanish (Vega from SF5) and of unknown origin (Kolin from SF5, who is clearly Eastern European).

Given this distribution, it seems clear that designer and/or audience familiarity with cultures (or at least cultural tropes) is playing a greater role in the detail and/or salience of ethnic cues than any other kind of bias. This would also explain our similarly unexpected results regarding *ethnic cues* across national origins. If this explanation is correct, it underscores the importance of diverse design teams: designers more familiar with other cultures would be able to more authentically represent those groups, and ideally would also be more likely to balance their representations in terms of character aspects.

Another interesting trend related to ethnic cues is the intentional ambiguity of villains. This plays into nationality as well, and is discussed below, but in terms of skin tone, villainous characters with darker skin like Necalli and Urien have some of the lowest *ethnic cues* scores (2.75 and 2.5 respectively), whereas Balrog, a notable exception to this trend with a score of 4.5, also happens to be one of the characters designed for the original *Street Fighter*, when designs were noticeably more racist. Akuma (both versions have a score of 4) is a middle ground here but represents explicit colorism. As a demonic character of Japanese origin, his darker skin constitutes a well-studied component of colorism in which darker skin is associated with evil even in settings where race or ethnicity are entirely fictional (Norwood 2013). Akuma's neutral *ethnic cues* score is likely the result of our largely U.S.-based participants being unfamiliar with the specific elements of Japanese mythology that are part of his design, but it is interesting that his ethnicity is left more ambiguous than that of other Japanese characters like Ryu (4.5), Kazumi (5), or Ibuki (5.5), although there are other Japanese characters like Asuka, Jin, and Zeku who also have neutral *ethnic cues* scores. Obviously,

replicating this study with Japanese participants would provide an interesting window into issues like these.

Despite our many predictions, almost none of our hypotheses about the SF5 frame data based on skin color were significant, and the one that was (proportion of all moves that hit more than once) does not seem to suggest a particular story by itself. However, the lack of mechanical differences based on skin color compared to those based on gender may in part reflect the fact that the ranges of aspect values for darker-skinned characters are not substantially different from those for lighter-skinned characters, as shown in Fig. 5 (in contrast to Fig. 4).

### 5.3. Nationality

As already discussed, *ethnic cues* behaved unexpectedly with regards to nationality, but many of our other predictions were confirmed. In particular, Japanese characters had mostly greater affective scores, as well as being generally more realistic. However, differences in aspect scores were mostly not significant or unexpected. Broadly, these trends show that while there are few specific aspects associated with particular national groups, broad affective perceptions are influenced by systematic design trends. These influences work especially in the favor of Japanese characters (who are more admirable and have better *ethnic representation*).

The lack of a significant admirability effect associated with majority nationalities, as well as the unexpectedly greater attractiveness of token characters above majority characters runs counter to this narrative but admits a coherent explanation. Our final category tested the hypothesis, already mentioned in terms of ethnic cues associated with skin color, that less attractive and more villainous characters might be made intentionally ambiguous to avoid explicit negative stereotypes.

Whether consciously or unconsciously, the vilest characters, like M. Bison, Necalli, and Urien (SF5), and Devil Jin (T7) tend to have more ambiguous ethnic cues as well as officially “unknown” origins. Unsurprisingly therefore, characters with unknown origins are more exaggerated, less admirable, and are worse examples of their genders and ethnicities than other characters. While most of our predictions about specific aspects associated with this did not hold up, the “unknown” characters were less thin on average.

Other characters are portrayed negatively, such as Abigail, Balrog, Birdie, and F.A.N.G. (all SF5), and Bryan (T7) but these characters come from non-token countries (Canada, the U.S., the U.K., China, and the U.S. respectively). One explanation for this is that designers are hesitant to make characters that create too negative a stereotype for any specific group. If a game’s only character from a particular country is a villain, that could create negative press in that country for that game. The evil characters are thus left ambiguous and declared to have unknown origins or are associated with countries that already have other more positive characters associated with them, so that the representations balance out. T7’s Kazuya is a great example of this pattern: a mostly adversarial character in the story, his official nationality is “unknown (revoked his Japanese nationality),” thereby explicitly distancing his antagonistic actions from Japan as a country.

### 5.4. Participant groups

While our results concerning differences in ratings across participants had modest effect sizes (between about 0.1 and 0.2 of a rating category), they indicated that women recognize sexist representation more than men, and that frequent players, whether through exposure, by predilection, or through some other effect, are less aware of negative gender representation. Furthermore, non-white participants recognized poor ethnic representation better than white participants, although play frequency did not have any effect on recognition of ethnic

representation. While our study was not primarily designed to investigate this kind of effect, these results point towards a potentially productive avenue of further investigation.

Presumably, the fact that those with more lived experiences of negative stereotyping can recognize it more easily is part of these effects, although again further investigation would be required to pin down a mechanism. It is interesting to note that per Bowman 2014, the fighting game community is much more accepting of racial diversity than gender diversity, and we found that play frequency influenced perceptions of gender representation but not necessarily ethnic representation (although our insignificant results do not conclusively show that there were no relationships there). This distinction also plays out in the relatively restricted ranges for female characters compared to male characters, but not darker-skinned characters compared to lighter-skinned characters, as shown in Figs. 4 and 5. These results agree with other research on how sexist representations in games affect the socialization of gender roles (Behm-Morawitz and Mastro 2009), and a more detailed investigation of effects based on skin color is probably in order (especially given our relatively crude coding).

### 5.5. Intersections

Although there are many potential identity intersections that could be examined, we chose to focus on the intersections of gender with skin color and national origin. Comparing lighter- darker-skinned female characters, we found a few predicted aspect differences, indicating that these groups are portrayed differently, although these differences did not also manifest as significant affective distinctions. Comparing female characters across national origins, we found that non-majority nationality female characters were more sexualized and were seen as poorer representations of their gender.

For male characters, we found similar trends across both national origins and skin tones, with much more consistent results in terms of affective constructs. Some of our trait predictions about youth and body type were reversed, but these reversals are in line with our earlier observation about the concentration of characters with negatively perceived traits in over-represented demographics. Once again, it seems designers have become self-conscious enough not to lump overtly negatively perceived traits onto minority characters, but they still end up portraying those characters in a more negative light on average.

## 6. Conclusion

Fighting videogames may seem like an escapist pastime with no to little physical world repercussions, but because of their popularity and success, millions of users from different ethnic and national backgrounds interact with their characters daily, learning and reinforcing the cultural stereotypes these videogames encourage. Gender expressions, body types, ethnicities—and even in-game abilities—all contribute to a player’s ability to relate to a character and project their own identity onto a virtual one.

This study analyzed 64 characters who had ties to physical world nationalities and ethnicities from the popular fighting videogames *Street Fighter V* and *Tekken 7*. Combining crowd-sourced data on how these characters are perceived with in-game character stats, we identified several systematic biases in character design:

- Female characters are given a much narrower range of expression than male characters.
- Token representations inevitably create stereotypes.
- Darker-skinned characters are systematically designed as less admirable and attractive.

- Japanese characters are, unsurprisingly, better representations of their ethnicities and genders.
- By design, female characters have to hit harder and/or more often to take down a male opponent and have less sustained and more risky aggressive options.<sup>12</sup>

By examining how different study participants perceived the same character, we also identified trends in how characters are perceived:

- Female participants recognize sexist representation more easily than male participants.
- Frequent players are less aware of sexist representation.
- Non-white participants recognize racist stereotypes more easily than others.

Surman (2007) asserts through the *Street Fighter* franchise that these videogames were designed for spectacle of representation and fast play that “continually act as foil to one another, oscillating between a harmony and cacophony.” Through our analysis we also conclude that the distinct appearances, costumes, attitudes, and powers of these characters often result in a systematic process that we call virtual enfreakment—the grotesque amplification of identity attributes based on cultural, ethnic, and gender prejudices, which objectifies and demeans some groups for the pleasure and consumption of others. We propose that enfreakment not only affects the portrayals of underrepresented gender and ethnicities in a detrimental fashion but also that characters who stand in a power position within the hegemony of play (white, male, primarily Western, and secondarily Asian) can become exaggerated or stereotyped in their gender or ethnic identities. We identify this as a future research direction. Although our data contains only characters from *Street Fighter V* and *Tekken 7*, we argue that the phenomenon of enfreakment can be observed in other games and genres with crowded rosters of characters such as fighting games, looter shooters, multiplayer online battle arenas (MOBAs), and first-person shooter MOBAs.

While most of our results pertain to negative aspects of representation in the games we studied, there is some evidence that the studios involved are not completely ignoring the criticism they have received for their designs. Both of the games that we studied included an Arab character (Rashid from SF5 and Shaheen from T7), and in both instances, the developers worked in consultation with fans and/or staff from the Middle East to approve the designs (M. Williams 2015). The results of that process appear to have been successful, because those characters were each seen as less exaggerated, less sexualized, and more admirable than most of the cast, in contrast to “exotic” characters designed without such local consultation like Necalli (SF5) or Josie (T7; see Ashcraft 2015). Accordingly, despite finding much to take issue with regarding character design in these games, we can see that they also offer some positive examples regarding the design process and cultural sensitivity, and our data show that the audience finds these designs more respectful.

For character designers our results suggest two principles: (1) better character designs with diverse design teams can challenge the idea of a “normal” character type for any virtual representation of race, ethnicity, and gender (even in genres like fighting games where exoticism is perceived to be sought after by players); and (2) higher levels of user

customization in character creation can facilitate phasing out the socially detrimental depictions of characters in the medium. While we recognize that roster-based games would inevitably need to employ characters with canonical properties, there is also growing evidence that diverse skin, equipment, and body type customization options (see Tani, 2011 and Harper 2020 for an explanation of character customization in *Soul Calibur*, as well as Kordyaka and Hribersek 2019 for a discussion on identity building through the use of skins in *League of Legends*) pave the way for more inclusive player bases. Eventually, characters serving a more comprehensive range of user needs and values—including those whose identities are marginalized, disempowered, subaltern, or transgressive are recognized and welcomed.

While crowd-sourced coding of fighting videogame avatars has its subjective limitations, we propose it as an initial step in formulating how avatar designs in these games are determined and constrained by ethnic, national, cultural, and gender features. We suggest that developers and users work in parallel: to de-couple ethnic, racial, national, gender, and other categories from the abilities and powers of virtual characters on the developer side; and to continue to evaluate and suggest alternatives to videogame characters which do not accurately represent their target demographic, on the user side. Dynamic, idiosyncratic, and user-customized characters will ultimately drive sales for videogame developers, while also appealing to a more powerfully diverse global group of videogame enthusiasts. We believe that such characters can enable better perspective-taking and anti-bias designs at a popular scale.

#### Author statement

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#### Appendix A. Survey methodology

For our survey, we presented each character using three images, including official online game art,<sup>13</sup> a screenshot of their in-game character selection screen image, and a screenshot of the character alone in a practice match in an idle pose. It should also be noted that although game play in these videogames is also staged against background environments with architecture and/or artifacts that can convey additional racial/ethnic stereotyping, we avoided showing those within the survey images and instead focused primarily on characters.<sup>14</sup>

Besides images, we listed their official country of origin (both SF5 and T7 characters had this information listed on their online character description pages), their default characterization quote (usually spoken by the character at the start of a match in-game, as well as listed in online material), and an official description (again found in official online material, on character pages for T7 and transcribed from

<sup>12</sup> Although our hypotheses about the frame data did not produce statistically significant results as to provide evidence of systematic bias, we would still like to acknowledge the differences in descriptive results coming from comparing the means of this data as to provide an opportunity for game designers to explore implicit biases behind things like why, on average, female characters have less hit point totals, or why lighter-skinned characters have a higher proportion of multi-hit moves in their entire move sets. We propose that, for future research, more quantitative data on game mechanics could be generated or extracted. See Section 4.5. for additional discussions.

<sup>13</sup> All material was collected either in-game or from an official English-language game website. For SF5, we referenced <http://streetfighter.com/ch/characters>, while for T7 we referenced <http://tk7.tekken.com/fighters>.

<sup>14</sup> Nevertheless, a perfunctory glance at background and space designs for the stages further cements the enfreakment of the characters.

character introduction videos for SF5). Fig. 1 shows how this information was displayed, and an example of a full survey is available at <https://solsword.github.io/enfreakment-study/>. For each survey, we included only 5 of the 60 characters to avoid rater fatigue; each survey took an estimated 25-35 minutes to complete at normal pace (we did not measure actual completion rates, due to technical difficulties in determining how long a participant spends actually engaged with the survey).

To balance the presentation of characters, we used a constraint solver to produce 84 groupings of five of our 60 characters such that:

- Every group contained at least one male character and at least one female character (Leo was counted as neither, so any group with Leo had to also include at least one (other) male character and at least one (other) female character).
- Every group contained at least one character from each game.
- Every group contained characters with at least two different national origins.
- No group contained both the SF5 and T7 versions of Akuma.
- Each character appeared in exactly seven groups:  $(84 \times 5)/7 = 60$
- For every possible pair of characters, that pair was grouped together no more than once (to minimize any possible interaction biases).

The final constraint was the one that necessitated the use of a constraint solver rather than a simple shuffle. Based on this grouping scheme, we obtain seven ratings (from different participants) for each character for every 84 subjects that take a survey (where each subject rates five characters). In total, we ran a pilot batch of 84 participants that we used to tune the questions (we didn't use this data in our analysis), and three more batches, each using a different grouping solution. For the first two batches, we ran 84 participants, while for the third batch we ran  $84 \times 4 = 336$  participants, for a total target of 504 participants and 42 ratings per character. Due to incomplete (we threw out responses where more than 15% of the survey questions were left blank) and repeat responses (unfortunately, our automated system for preventing repeats broke down during the survey, although we could still detect them), we actually received a total of 486 usable responses, with the number of ratings per character ranging from 37 to 43 (mean 40.9).

We ran the study as an *Amazon Mechanical Turk* (AMT) *Human Intelligence Task* (HIT). This meant that we paid participants (our rate was \$6 for the ~30minute survey) to complete the survey, resulting in an interest- and internet-user (among others)-biased sample. Given the responses to our questions about game play (see below), this bias was useful in a way, because our respondents were much more likely to be people who had played one of the games we asked about (or at least games from one of the respective franchises) than the general population. Our only prerequisite on AMT was a 97% or higher acceptance threshold, although our survey asked participants to return the HIT if they could not understand the questions, could not view the embedded images, or if they were under 18 years of age. We did reject some HITs that were clearly incomplete, or where participants did not follow very basic instructions (e.g., did not fill out the consent question), and we suspect that even some accepted responses may have been from participants who did not fill out the survey in earnest. However, our analysis methods were tolerant of some noise in the responses, and we have no reason to believe that a significant number of responses were nonsense. Replication of our results with other study populations would be a welcome extension of this research.

### A.1. Survey content

For a full list of the questions we asked, consult the example survey at <https://solsword.github.io/enfreakment-study/>. All of our per-character questions were seven-point Likert items (we did not combine items to form a Likert scale); participants were asked about their level of agreement on a scale using “Strongly disagree,” “Disagree,”

“Somewhat disagree,” “Neutral,” “Somewhat agree,” “Agree,” and “Strongly agree.” Our questions were designed to investigate design dimensions rather than personal opinions and to construct an etic perspective which “involves the evaluation of phenomena using more culturally neutral or objective constructs” (Margarita et al. 2004). Based on previous studies which suggest that the perceptions of some personal aspects, such as the emic “sexual appeal” category, may exhibit cross-cultural agreement (Albright et al. 1997), we felt confident that our data would be able to distinguish between characters with significantly different designs even if subtler trends might not be detectable. The design constructs we focused on were specific to fighting games and included the following questions (each actually probed via two opposite-coded items):

- Exaggeration scores (how much does the character stand out?):
  - (*body realism*) Is the character's body designed to appear realistic or exaggerated?
  - (*attire realism*) Is the character's clothing realistic or exaggerated?
  - (*general cues*) Is the character designed to make her/their/his race/ethnicity obvious?
  - (*attire cues*) Is the character's clothing designed to make her/their/his race/ethnicity obvious?
- Aspect scores (which aspects of a character are emphasized?):
  - (*musculature*) Is the character designed to appear muscular or not?
  - (*body type*) Is the character designed to appear thin, or overweight?
  - (*youth*) Is the character designed to appear young, or old?
  - (*attractiveness*) Is the character designed to appear attractive, or ugly?
  - (*sexualization*) Is the character sexualized or not?
  - (*attire sexualization*) Is the character's clothing designed to sexualize her/him or not?
- Affect scores (is the design generally positive or negative?):
  - (*admirability*) Is the character designed to be admirable, or detestable?
  - (*ethnic representation*) Is the character a positive or negative representative of her/their/his racial/ethnic group?
  - (*gender representation*) Is the character a positive or negative representative of her/their/his gender group (men or women)?

Note that the items were not always strictly exclusive; for example, SF5's Zeku is a character that transforms between old and young versions, so his design emphasizes both his youth and his old age. For analysis, we ended up combining the general cues and attire cues questions into a single ethnic cues item by averaging all four responses instead of just two.

Besides questions about design, we used three statements per character to assess participant familiarity/identification rather than relying on attempts to match demographic information:

- (*similarity*) “[Character] is similar to me.”
- (*ethnic match*) “My race/ethnicity is similar to [Character's].”
- (*ethnic familiarity*) “I am very familiar with [Character's] racial/ethnic group.”

These three questions were all positively coded and combined into a single measure of identification.

After filling out five survey sections for different characters, participants were finally asked demographic questions, including seven questions about playing and/ or watching videogames, one general feedback question, and the following questions about personal attributes (see the example survey for details):

- “How old are you?” (seven decade-binned options from “18–24 years old” to “75 years old or older”)
- “What is the highest degree or level of school you have completed?” (10 different levels)



- “What language(s) do you use for everyday conversation in your community, home, school, and/or workplace? (please list in order of frequency of use)” (three slots plus a text box for “Additional language(s)”)”
- “What is your gender?” (free-text response)
- “What racial/ethnic group(s) do you consider yourself a part of? (Be as specific as possible, and list multiple if appropriate.)” (free-text response)
- “What is your nationality?” (free-text response)

We used free-text response for the gender, ethnicity, and nationality questions because we wanted to avoid the problems of othering and inaccurate binning that tend to happen with fixed-response options for these questions (see e.g., [Burton et al. 2010](#); [Goins and Pye 2013](#)). However, one of the authors also hand-categorized each reply to create normalized versions of each response for the purposes of potential cross-group comparisons. This coding resulted in three genders (“Male,” “Female,” and “Agender”<sup>15</sup>), 38 ethnicities (including nation-based, religion-based, and heritage-based ethnicities; many participants claimed more than one), and 17 nationalities (five participants listed multiple nationalities). One of the ethnicities (“ASIS”) and two of the nationalities (“HISPANIC” and “white”) were left uncoded and may represent participant confusion; a few participants left some of these fields blank and were coded as “unknown.”

## A.2. Demographics

Gender ([Ogletree and Drake 2007](#); [Bonanno and Kommers 2005](#)) and age ([Greenberg et al. 2010](#)) are well documented player categories that have been mobilized to explore differences in behaviors and perceptions around games. Although there is no direct measure to test a player’s experience level with games in general (in fact, categories like hardcore or casual players have been argued to be faulty or poorly differentiated, see [Poels et al. 2012](#)), play time and play frequency has been a widely used data point to categorize players ([Juul 2010](#)).

[Fig. 6](#) shows the breakdowns of our participants by gender, age, education, and gameplay frequency. Our median participant was a 25-34-year-old white U.S. American male with a bachelor’s degree who played games daily, and who had played some game from either the Street Fighter or Tekken franchises (or both). 17 (3.5%) of our 486 participants had all of these traits, while 368 (75.7%) had more than half of them; considering just gender, ethnicity, national origin, and education, there were 79 (16.3%) white U.S. American men with bachelor’s degrees among our participants.

In terms of ethnicities, because we allowed self-identification, there were a total of 37 different ethnic groups that participants identified, plus some responses categorized as “Unknown.” Self-identified categories included broad racial categories (e.g., “White” and “Asian”), geographic categories (e.g., “American,” “African,” “Southeast Asian,” and “Hawaiian”), religious categories (e.g., “Jewish,” “Hindu,” and “Protestant”), ethnic categories (e.g., “Hispanic” and “Latinx”), and national categories (in some but not all cases clearly based on ancestry rather than citizenship; examples include “German,” “Filipino,” and “Mexican”). Ethnic categories listed by at least 10 participants were: White (313 participants of which 38 listed at least one other ethnicity), Asian (75 participants, 10 multi-ethnic), American (41 participants; 31 multi-ethnic), Black (34 participants; 25 multi-ethnic), Hispanic (28 participants; 9 multi-ethnic; note that ethnicities like “Latinx” and “Mexican” were also listed), European (14 participants; 4 multi-ethnic), Unknown (15 participants), German (11 participants, all multi-ethnic), and Native American (10 participants, 6 multi-ethnic). Because of their common association, we did not count “White” as a second

ethnicity when either “American” or “European” was listed as well (so if you listed just “White” and “European” as your ethnicities, you were counted under both of those categories, but not as multi-ethnic, but if you listed “White,” “American,” and “Finnish,” you were counted as multi-ethnic). The 29 ethnic categories not listed above each had fewer than 10 participants, with European and Asian geographic groups being the most prominent. In total, 79 of our 486 participants (16.3%) listed more than one ethnicity, even after collapsing “American” and “European” with “White.”

The most interesting aspect of our demographics was the intersection with interest in the games we studied. 478 (98.4%) of our participants played video games, 445 (91.6%) had played fighting games, and 399 (82.1%) had played a game from either the Street Fighter or Tekken franchises, while 247 (50.8%) had played SF5, T7, or both. Furthermore, 444 (91.4%) of our participants watched other people play fighting games at least occasionally, while 412 (84.8%) watched games from one of the two franchises at least occasionally. Needless to say, these demographics don’t reflect the general population in terms of game play, and our skewed gender, age, and education distributions likely reflect interest in the games we were studying as a driving factor in participants’ decisions to participate in our study (the study was titled “Survey on Fighting Games”). To some degree these biases actually lend more weight to our results: the ratings we gathered represent not the views of the general public, but views of people who are actually engaged with these games as audience members (with the obvious caveat that the very enfreakment we are studying ends up affecting who feels comfortable being part of that audience). They also back up our claim that SF5 and T7 are broadly popular games that are culturally influential: at least among the population of Amazon Mechanical Turk workers, there are enough interested fans to quickly fill up our survey slots (for each batch of results, all tasks were claimed within 12 hours of posting, and we did not use any forum posts or other advertisements to promote our surveys outside of posting them on AMT).

## A.3. Statistical methodology

To test hypotheses concerning group differences on our non-parametric response data where an assumption of normality is obviously false (at the very least because our scale is discrete and bounded), we used a Monte Carlo permutation test procedure. Effectively, we simulated multiple possible worlds in which the participants had assigned the same set of scores to characters at random (instead of intentionally) and asked the question: in what percentage of those worlds was the difference in mean values between the two groups in question at least as large as the difference we observed. These percentages became our p-values (chances that despite there being no actual relationship, we observed one due to “lucky” data), and we used the Benjamini-Hochberg procedure to control our false discovery rate ([Benjamini and Hochberg 1995](#)) and determine which hypotheses were supported by the data. In all cases, we used a two-sided test, and we set our base threshold for acceptance at  $p = 0.05$ . In other words, if the likelihood of our data given no actual relationship was less than 5%, we would presume a relationship existed, with that threshold made stricter to account for the fact that we did lots of tests (essentially, we used the procedure described in *ibid.* to ensure that statistically, no more than 5% of cases where we presumed a relationship should have been false positives).

We used 15000 permutations for each hypothesis test, and used Python 3.5’s built-in *random.shuffle* algorithm to shuffle responses to construct each permutation. Due to our design, we had no direct control over how many participants of which genders/ethnicities/nationalities saw which characters, so we controlled for these factors. When testing hypotheses about character attributes, we controlled for participant properties by shuffling assigned scores within each participant, so we essentially constructed alternate worlds where participants assigned the same five scores randomly across the characters they saw instead of as

<sup>15</sup> The only participant who didn’t specify some variant of ‘male’ or ‘female’ stated their gender as “Agender.”

they had in our results. That way, if, for example, female participants assigned higher sexualization scores than male participants, that difference would also be reflected in our alternate worlds and our judgement of the likelihood of the actual world would not be affected if some group of characters happened to be rated more or less frequently by female participants. Similarly, when testing hypotheses about participants, we controlled for character attributes by shuffling scores within those assigned to each character.

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