NORTHWESTERN UNIVERSITY

Anxious to Play:

Social and Emotional Forces that Restrict Women's Video Game Skill Development

A DISSERTATION

SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

for the degree

DOCTOR OF PHILOSOPHY

Field of Psychology

By

Kyle Nolla

EVANSTON, ILLINOIS

September 2021

Abstract

Competitive gaming, or esports, is a high-skill endeavor embedded in a highly gendered social context. Using multiple methodological approaches, this dissertation argues that gender-gaming inequality is a result of changeable stereotypes that impact women throughout their lives. Specifically, gender-gaming stereotypes limit women's initial access to gaming, discourage their continued interest due to identity conflict compounded by gender-based harassment, and harm performance through anxiety and stereotype threat.

First, we conducted a field study with competitors at national *Super Smash Bros* tournaments to establish typical skill outcomes and confirm that anxiety harms esports performance. In these tournaments, the few non-men competitors consistently underperform compared to men despite equal engagement, competitiveness, and average number of years playing. Next, we manipulate the gender ratio of in-lab competitive tournaments to induce gender-gaming stereotype threat in novice women. We find performance decrements specifically when they compete against men. Then, we survey people within and outside of gaming and find individual differences in gaming access, interest, and experience in women. These differences suggest that women have fewer opportunities to access gaming, women are forced to choose between a feminine gender identity and a gamer identity, and women who do end up as gamers in adulthood experience active stereotyping and erasure despite similar motivations and beliefs about gaming.

Acknowledgements

I would like to express my deepest gratitude for my advisors, Mark Beeman and Paul Reber. Although each of you specializes in fields that are distinct from gender and gaming, you've nevertheless provided me with infinite guidance, scientific wisdom, and support both structural and emotional. Without your patience and flexibility, I would never have been able to explore the issues at the center of this dissertation. I'm also extremely grateful to my committee members Alice Eagly and Wendi Gardner, whose expertise in issues of gender, identity, and equality elevated my work to new heights. I am especially grateful to Alice for providing me with consistent and high-quality feedback on my writing and for always engaging seriously with my work and its weaknesses.

Aside from my committee, I am deeply indebted to my spouse, who not only put up with my ridiculous schedule as I wrote this dissertation ("Did you know that Starbucks opens at 5am?"), but also is directly responsible for my entry into esports. Even as a lifelong gamer, I was too nervous to enter the Smash scene myself until he inspired me with his own high-level play and his awareness of emotion's role in expert performance. His patience while introducing me to this world, and the kindness of many other Chicagoland Smash community members, also demonstrated to me how an inclusive gaming community can elevate and support its members.

I would like to thank several research assistants whose work directly impacted my ability to finish this dissertation and whose company kept me motivated, including Jon, Sabren, and Miriam. I wish you each success in your endeavors. I'm also grateful to the participants in my research, some of whom gave several hours and several days' worth of cortisol samples to further our scientific understanding of esports skill. (Don't worry, that paper is in the works too, I promise I didn't ask you to spit in tubes for nothing!) Each person who took time to fill out a survey, sat down with me in the corner of a crowded venue for an interview, or asked about the poster I was presenting at a tournament reaffirmed to me that esports research will be a valuable and productive field despite its relative infancy in psychology.

Many thanks go to the family and friends who cheered me on throughout this process, including but not limited to my mom, sister, my biweekly grad student Dungeons & Dragons group, Nat, Ray, Jacob, and my Faire family. These people were cheerleaders and shoulders to cry on, and I could not have pushed through the uncertainty, stress, and challenges without them.

I would like to thank the members of the international Smash community who work to improve the community and make it a safer, more equal place for its players. For each person who has spoken up about their experiences of harassment and abuse, for each volunteer who has spent hours reviewing individual cases of misconduct to make formal ban recommendation, for each tournament organizer who has made spaces that are safe for femmes and queers, for each high-profile player or community leader who uses their platform to advocate for positive change, I thank you for trying to make this chaotic, grassroots world a little more welcoming and just. I especially send much love and respect to my fellow women, gender nonconforming folks, and queer folks in the scene who demonstrate every day that hypermasculinity is not a prerequisite for loving games and competing in them.

Table of Contents

List of Tables and Graphs

Chapter 1

Background

As of 2020, 66% of American adults and 70% of American children play video games and about 55% of these gamers are men (Entertainment Software Association or "ESA", 2021). Gender differences in video gaming behaviors also extend to genre and platform: while both men and women most frequently play casual games on their smartphones, men are more likely to play action and shooting games on consoles which requires an investment of several hundred dollars (ESA, 2020; Limelight, 2020). Men also play more than women, both on average by about one hour and particularly at the highest frequencies of gaming (19.6% of men and 14.4% of women play more than 12 hours per week; Limelight, 2020). In terms of skill, men are more likely than women to describe themselves as expert-level or aspiring professional gamers (27.7% of men vs 14.2% of women; Limelight, 2019), and in terms of interest, men are more likely to say they would quit their job if they could support themselves as a professional gamer (41.2% of men versus 29.1% of women; Limelight, 2020). In sum, most men and women play casual games for fun, but the realm of "hardcore" or dedicated gaming is dominated by men.

Nevertheless, women who game frequently or greater than five hours per week have similar gaming behaviors to men: a survey of 900 women from the US, China, and Germany found that 88% of women who game frequently play competitive games, including action and survival-based games (75%) and shooter games (65%; Reach3, 2021). Although these dedicated women gamers are playing the same games as men, they are vastly underrepresented in positions of gaming celebrity such as online streaming personalities and professional competitive gamers: for example, only one of the top 10 Twitch streamers by follower count and earnings is a woman (Loadout, 2021) and the first woman to appear on the esports professional earnings list is at spot number 344 (Esports Earnings, 2021). In the competitive gaming community at the focus of this dissertation, *Super Smash Bros Melee,* only one transgender woman has been ranked in the Top 100 and no cisgender women have ever been ranked in the Top 100 throughout the game's 20-year history. Dedicated women gamers are also underrepresented at the everyday level: only 8.2% of collegiate esports competitors are women (Davin, 2021) and 59% of women who play competitive multiplayers games actively conceal their gender (Reach3, 2021). Scholarly sources confirm that women are underrepresented in gaming: previous research estimates that 16 to 29% of gamers in "hardcore" or skill-based games are women (see Paaßen et al, 2017 for summary).

Unlike traditional sports, gender-based differences in physicality are unlikely to impact gaming and esports performance. Instead, gaming performance depends upon cognitive skill. Like most abilities framed as "talent," cognitive skill is determined by nature, nurture, and their interaction. Skill differences that emerge early in development and remain throughout life likely depend on genetic factors or environmental conditions during critical periods of development such as pre-natal androgen exposure. The opportunity and motivation to develop skills is determined by both material and social accessibility in the environment, as well as interest that may be driven by brain-based preference. In short, cognitive skill and thus gaming performance is driven by both talent and practice, which vary with sex-based and social conditions.

In terms of gaming-relevant cognitive skills, some tasks show male advantage, such as spatial navigation. Sex differences in spatial navigation grow from small ($d = 0.15$) to small-moderate (maximum of $d = 0.38$) effect sizes across development and depending on specific task type, the gender equality of the subject's country, and testing conditions (Coutrot et al, 2018; Nazareth et al, 2019). Sex differences in mental rotation follow a similar pattern of male advantage that increases with age ($d = 0.20$ to $d = 0.54$; Lauer et al, 2019). Reaction time tasks also have a small male advantage which has decreased with historical time (d = 0.17; Silverman, 2000). Other gaming-relevant skills show a female advantage, such as processing speed (moderate effect size; Roivainen, 2011), object location memory (d = 0.22 to 0.26; Voyer et al, 2007), and cooperation in mixed-gender settings (d = 0.22; Balliet et al, 2011). Additionally, some of the most encompassing gaming-relevant cognitive skills have little to no sex differences at all, such as general intelligence and executive control (Anderson, 2004; Gaillard et al, 2021). Notably, even medium-sized group differences do not necessarily indicate that most men are better than most women. For example, the largest of these effect sizes (d = 0.5) has an 80% overlap between the sexes which translates to a 64% chance that a randomly picked person of one sex will outperform a randomly picked person of the other sex. Additionally, most of the listed sex differences in cognitive skills are much smaller than the effects of age, education, and prior gaming experience (see Roivainen, 2011 and Coutrot et al, 2018).

Another facet of sex differences in cognitive skills to consider is the relevance of each of these cognitive skills to real-world game performance. In other words, even if men have a small reaction time advantage, such an advantage will not confer performance benefits in every game. For example, a game utilizing randomly generated, three-dimensional maps will demand more navigation and mental rotation (male advantage) compared to a game with static maps and specific landmarks representing common enemy locations or resources (female advantage). Assuming perfect social equality, some games or roles within games theoretically could show a female advantage: for example, analytic shot-callers in fast-paced, team-based games rely on verbal fluency, processing speed, and memory retrieval to make and communicate decisions.

Yet even in “hardcore” games requiring little to no three-dimensional navigation such as platform fighters or competitive card games, or games with a potential female advantage because they have static maps or team-based communication, men vastly outnumber women. In short, known sex differences in cognitive skills cannot account for the scope and magnitude of gender differences we currently observe; while *some* variance in performance or interest in *some* games is accounted for by sex differences in cognitive skills, we must consider social experiences to explain the magnitude of gender differences across gaming *broadly*.

Previous games scholars have argued that changeable social and cultural forces are responsible for the strong gender divide in gaming participation and performance (see Paaßen et al, 2017 for a review). For example, from the perspective of social role theory, the low visibility of women who fill the role of gamer continues a cycle of gendered stereotyping and lowered interest and self-efficacy that normalizes gaming as a male-dominated hobby (Koenig & Eagly, 2014). On top of the lack of real-world role models, video game content itself lacks women characters and objectifies the women who do appear in games (Burgess, Stermer, & Burgess, 2007; Downs & Smith, 2010), signaling to interested women gamers that they do not belong. Even the women who do overcome stereotyping to be dedicated gamers are more likely to experience gender-based harassment than their male peers (Kuznekoff & Rose, 2013) and anxiety-based underperformance associated with stereotype threat (Kaye & Pennington, 2016; Vermeulen et al, 2016). In conclusion, although gaming skill is somewhat arbitrary, social and emotional forces continue to present barriers to acceptance and skill development for dedicated women gamers.

This dissertation explores several causal mechanisms for population-level gender-gaming differences, especially as they apply to the genre of esports. First, I use real-world performance data to establish that anxiety harms esports performance generally. Furthermore, differences between cisgender men and other genders in performance and beliefs about emotion regulation indicate that gender minorities may underperform in esports due to additional anxiety and resulting demands on emotion regulation. Next, I run in-lab tournaments for novice gamers to establish that, from their earliest involvement in esports, women experience gender-based stereotype threat in competitive gaming contexts. In this case, stereotype threat includes the experience of anxiety, lowered self-efficacy, and underperformance against men. Then, I survey gamers and non-gamers to investigate gender-based differences in access, interest, and experience that drive unequal outcomes in gaming and esports. Comparisons between gamers and non-gamers who are men and women drive home that external stereotypes interacting with internal social identity beliefs contribute to gender-gaming inequality.

While work on gender-gaming inequality has clear implications for other gender-unequal fields such as science, technology, engineering, and mathematics (STEM; Mayo, 2009), understanding gender inequality in gaming and esports is valuable in and of itself. As the gaming and esports markets grows explosively – the value of esports industry alone is expected to cross the one billion mark in 2021, a 14% increase from 2020 (Reyes, 2021) – dedicated women gamers deserve to benefit from its growth just as much as their male peers. Even beyond dedicated gamers, technological advances and the highly rewarding nature of games drive the increasing popularity of the hobby among children and adults alike. As gaming reaches a wider audience, a gender-equal gaming world is sure to support a gender-equal real world.

Chapter 2

Anxiety and Competitive Gaming Performance

"A group of friends and I entered a local Call of Duty tournament. Our semifinals opponent asked me loudly who I performed oral sex on to get on the roster before we started the first map. I wanted to be the 'cool girl' so I ignored him. I did end up playing like the 19th Amendment would get repealed if we lost … I acted like nothing happened when my friends asked me about it, but I cried when I got home. I really just wanted to be silly and play Call of Duty."

-A woman gamer subject reflecting on her negative experiences in gaming

Abstract

While practice and talent are widely discussed correlates of expertise, fewer analyses consider the role of emotion regulation. For example, in high-demand contexts, emotion regulation allows for skill execution despite performance anxiety and other acute stressors. This paper describes the role of emotion regulation in competitive video game players of a specific game with survey-based approaches. First, we describe individual differences in skilled performance across players of all skill levels (n = 253). In a multiple regression together, we find that past performance, recent practice, and domain-general emotion regulation predict tournament performance between individuals (n = 127). We also find that non-men underperform despite equal competitiveness, game engagement, and years in the community as men (n = 252). Next, we examine mood variance within individuals over the course of a competitive tournament ($n_{players} = 94$, $k_{matches} = 339$). While controlling for within-person variance and player rank, overarousal before a match is associated with sweeping loss or "choking." An iterative post-hoc analysis accounting for difference in tournament seed elucidates that some pre-match arousal is a result of justified

expectation of loss. Finally, an exploratory factor analysis of self-reported granular skills suggests that players believe traditional skill and emotion regulation to be distinct – yet the factor associated with emotion regulation does not correlate with domain-general emotion regulation measures, while the factor associated with skill does. Furthermore, men's self-ratings of traditional skill strongly correlate with their actual performance, while non-men's self-ratings do not. Together, these results suggest that esports competitors and coaches may benefit from emotion regulation skills training to define the interactions of emotion and performance and to practice down-regulation of arousal. Non-men may benefit especially from learning to acknowledge and address difficult emotions that may be associated with minority community status.

Literature Review

The psychological study of expertise has often focused on the roles of practice and talent. While practice and talent have clear effects on a person's range of skilled performance outcomes, another factor comes into play especially in high-demand and competitive performance contexts: emotion regulation. Competitive video gaming, or *esports*, is one such high-pressure context in which skill execution to outperform an opponent may depend on regulating anxiety in addition to cognitive and sensorimotor expertise.

Cognitive and Physiological Effects of Anxiety on Performance

Anxiety, defined in this paper as negatively valenced overarousal, is known to affect cognition during skilled performance in several ways.

The first route by which anxiety affects performance is through attention. Anxiety provokes "tunnel vision" or intense focus, which may benefit tasks when applied appropriately, but will harm performance when task-irrelevant stimuli ("distractions") interfere with cognitive processing (Eysenck et al., 2007; Kopell et al., 1970). Performance-related worries are one such spontaneously, internally generated distraction and addressing or suppressing those worries compromises verbal working memory resources (Baumeister et al., 2002; Maloney et al., 2014). Furthermore, when attention is directed inward, performers are likely to overanalyze otherwise automatic expert processes, causing further performance decrements (Broadbent & Broadbent, 1988; Maloney et al., 2014). Attention in visual space also narrows with anxiety (Wegbreit et al., 2015), a particularly relevant effect for esports.

Beyond attentional effects, cognition that depends on high-level, domain-specific information integration can be negatively affected by anxiety. The prefrontal cortex, heavily involved in executive control, has an abundance of cortisol receptors, resulting in a broad range of executive functions affected by stress (Blair, 2006; Maloney et al., 2014). For example, anxiety creates reactionary demands on the prefrontal cortex as it coordinates stress response across the body, resulting in competition for task-relevant executive processing (Maloney et al., 2014). Anxiety also harms performance through interference with long-term memory retrieval (for review, see Byron & Khazanchi, 2011).

Finally, physiological stress response also affects motor skill execution. In competitive contexts, fine motor skill performance worsens with increased physiological arousal (Landers & Arent, 2001). We expect that the hand shaking, sweating, and other physical results of sympathetic nervous system activation interfere with the hand movements and coordination of esports players just as they do other fine motor skills.

Because esports organizations actively recruit high-performing players from the general population, the line between player and fan is blurred in esports communities. Often, "choking" or underperformance due to anxiety is a common experience for players because they have so much to lose. One-on-one esports (such as the game described in this paper) especially emphasize player performance in competition with meaningful financial, social, and personal consequences (Rappaport, 2020). Competitors who do not fit the stereotypical definition of a gamer, such as cisgender and transgender women and non-binary participants ("non-men"), may have additional anxiety due to fear of confirming stereotypes about their underperformance, a phenomenon commonly known as *stereotype threat*.

Goal-Oriented Emotion Regulation

We define emotion regulation as the redirection of spontaneously generated emotion, a broad definition that encompasses regulation of affect, stress, and mood (Koole & Aldao, 2016). Emotion regulation is a process starting with the *evaluation* of emotional cues in the environment such as a challenging opponent, followed by the behavioral and physiological *experience* of the emotion such as increased arousal, and subsequent *modulation* of behaviors towards a goal, such as deep breathing to combat overarousal (Gross, 1998).

Emotion regulation can serve many purposes, but in the context of esports, we assume that players regulate their emotions to achieve the goal of peak performance in competition. In non-esports contexts, goal-oriented emotion regulation involves adjustment of arousal and stress to perceived optimal levels for the task (Tamir, 2016; DeCaro et al., 2011; Sanders, 1983; Del Guidice et al., 2011). In the long term, goal-oriented emotion regulation may allow a player to remain invested in skill development despite obstacles, plateaus, and other stressors within and outside of the game (Zimmerman, 2002).

One well-studied example of effective emotion regulation is *cognitive reappraisal* which involves explicit reconsideration of the threat as less emotionally impactful. Over time, reappraisal is associated with better mental health outcomes relative to other strategies such as suppression of emotion (Gross & John, 2003). However, reappraisal places heavy demands on verbal working memory and cognitive control (Ochsner et al., 2004) which creates a short-term spike in arousal (Denson et al., 2014) – and overarousal, ironically, interferes with the top-down control necessary for goal-oriented emotion regulation (Koole & Aldao, 2016). Some studies suggest that reappraisal is effective in some contexts to avoid choking, such as for expert golfers in a putting task (Balk et al., 2013) or during public speaking, math, and karaoke by reappraising the performance anxiety as excitement (Brooks, 2014). However, a recent systematic review of choking interventions in sports revealed no effect of reappraisal (Gröpel & Mesagno, 2017).

Other cognitive strategies for emotion regulation are associated with worse mental outcomes. The Cognitive Emotion Regulation Questionnaire (CERQ) is a measure of nine different emotion regulation strategies, including cognitive reappraisal (Garnefski et al., 2002; short form, Garnefski & Kraaij, 2006). Of the eight other strategies measured by the CERQ, three are associated with increased symptoms of depression and anxiety: self-blame, rumination, and catastrophizing. Other studies provide convergent evidence that these three maladaptive emotion regulation strategies harm both short-term and long-term outcomes like skill acquisition: for example, self-focused rumination is associated with short-term increased arousal cognition and anger (Pedersen et al., 2011).

In the context of esports, we expect that competitors will most often need emotion regulation to down-regulate arousal because video games and especially esports tend to increase arousal due to engagement, competition, and cognitive challenge (Yeh, 2015; Gellatly & Meyer, 1992). Furthermore, esports typically involve public broadcasting of games which creates performance pressure. Finally, for players who are not men, the extreme gender distribution of esports may create stereotype threat that needs to be regulated.

Hypotheses of Current Study

1) We expect that players who use reappraisal more frequently and maladaptive emotion regulation strategies less frequently will perform better in tournament, even after accounting for traditional markers of expertise such as long-term experience, past performance, and recent practice.

2) We predict that within individuals, higher arousal levels will predict underperformance in any given match due to the cognitive and physical interference of anxiety with skill execution.
3) To give effective, actionable advice to practitioners based on the findings of this study, we will define how players conceptualize emotion regulation in esports performance, especially compared to traditional skill. We predict that the factor structure of game-specific, granular skills will reflect players' lay theories of emotion regulation. Furthermore, individual differences such as rank or gender may predict existing attitudes towards emotion regulation such that different training may be more necessary or effective for certain groups.

Methods

Participants

Participants were recruited at 12 national-level *Super Smash Bros* ("Smash") competitive gaming tournaments across the United States between August 2016 and January 2020. The researcher set up a table that participants could approach. The research was advertised by online posts, paper flyers, and word of mouth. The researcher targeted high-skill and gender minority participants to increase their participation for this and other studies by reaching out to these individuals. Participants were paid $5 for completing pre-tournament surveys and $1 per each additional, optional survey. All methods and materials were approved by Northwestern University's Institutional Review Board.

The study used a non-experimental survey design. Before data collection, researchers estimated that 300 participants would be necessary to achieve at least 20 participants per group in terms of rank and the outcome measure of tournament performance. The minimum participant requirements were met at the final tournament in January 2020, thus we ended data collection.

Across the 12 tournaments, 285 participants completed the study. 32 participants were excluded from performance-based analyses because their online tournament records could not be located (29) or because they did not report rank (3), bringing the final participant count to 253. 10 participants gave incomplete data for measures of game experience but were included in analyses for which they had data.

Participant gender was 90.5% (228) cisgender men, 6.0% (15) cisgender women, 2.0% (5) transgender women, and 1.6% (4) non-binary people. 1 participant did not report. People other than cisgender men are overrepresented in this sample because they were specifically targeted, as noted. For gender-based analyses, we grouped participants into two categories: men (228 cisgender men) and gender minorities (24 women and non-binary people).

Mean age of the sample was 22.5 (range 18-34, *S.D.* = 3.5 years) with a skew towards younger participants. For the 219 participants who reported race, 60.0% (131) were White, 21.0% (46) were Asian, 10.5% (23) were Latino/a, 8.2% (18) were Black, and 1 was Native American.

Throughout the global Smash community, participants are ranked by local community members based on top performance at local tournaments. Additionally, an international committee of community members ranks a Top 100 worldwide each year. For this sample, 54.2% (137) participants were unranked, 19.8% (50) were ranked within their regions, and 26.1% (66) were ranked within the Top 100. Note that the Top 100 represents the best 0.5% of players, thus they are overrepresented in this sample.

All participants filled out pre-tournament surveys in Phase 1 (see *Measures)*. Of the 253 participants, 94 also opted into Phase 2 which involved match-by-match surveys. For the subsample of participants who opted into Phase 2, demographics including age, gender, and race were representative of Phase 1 except for player rank: only 16% (15) of Phase 2 participants were nationally ranked.

Measures

All participants completed pre-tournament surveys concerning their baseline arousal levels, game experience and practice habits, and self-ratings of game-specific skills. Participants could opt into other tasks for additional payment including the emotion regulation measure (CERQ) and Phase 2 surveys. After all study measures, participants completed a demographics sheet. Finally, the outcome measure of tournament performance was collected from publicly available online reports after the tournament ended.

Mood as Valence and Arousal. Players reported mood by marking on a 14 x 14 grid with axes of valence and arousal (Russell, 1980). A completed example with moods such as *frustrated* and *relaxed* was given. All participants completed this measure at the beginning of the study and participants in Phase 2 completed it again for each post-match survey.

Game Experience. Participants reported their game experience in years and months, the number of hours per week that they played and competed recently, and their rank, if any.

Cognitive Emotion Regulation Questionnaire (CERQ). 133 participants opted into a survey on emotion regulation for additional payment. The short form of the cognitive emotion regulation questionnaire or CERQ-short (Garnefski & Kraaij, 2006) asks participants to report how often they use 9 different cognitive emotion regulation strategies. Four strategies are known to correlate with depression and anxiety symptoms. Cognitive reappraisal is known to protect against symptoms of depression and anxiety. The three strategies in the CERQ that correlate positively with depression and anxiety symptoms (self-blame, rumination, and catastrophizing) were averaged to create a single measurement of maladaptive emotion regulation use.

Tournament Performance. The researcher collected the outcome variable of tournament performance from publicly available online tournament records after each tournament ended. For the sake of clarity and comparability across different tournament sizes, performance is presented as a percentile.

Match-by-Match Surveys. Participants in Phase 2 filled out a short survey on mood after every tournament match. The 94 participants reported 339 unique matches for an average of 3.6 matches per person.

To examine pre-match effects, we took mood values from the previous match's reported mood or from the pre-tournament survey in the case of the first tournament match.

Outcome of Each Match. Each match is decided by the best of three games. A "sweep" match represents two games played while a "contested" match represents three games played, with the losing player having won one of the three games. Thus, each match had four potential outcomes for the participant: sweeping win, contested win, contested loss, or sweeping loss.

Domain-Specific Self-Ratings of Granular Skills. Prior to data collection, the author consulted with members of the Smash community to create a comprehensive list of game-specific skills that determine performance. The final list after three rounds of consultations contained 17 specific skills that fell into four categories: knowledge of the game, sensorimotor skill, mindset and emotion regulation, and mastery-level dynamic cognition, such as predicting an opponent's decision and varying one's own gameplay accordingly. The complete list is available in Appendix A.

Results

Skill and Emotion Regulation Predict Performance

As expected, tournament performance for all 253 subjects correlated strongly with our measure of past performance, rank ($r = 0.56$), and our measure of accumulated experience, years of play ($r = 0.43$). Additionally, rank and years of play correlated strongly with each other ($r = 0.47$). Hours per week of recent practice correlated modestly with rank ($r = 0.28$) and tournament performance ($r = 0.27$), but not years of play ($r = 0.10$).

For the 133 subjects who completed the CERQ, CERQ scores of maladaptive emotion regulation predicted performance in the expected direction ($F(1,132) = 18.44$, $p < .0001$, $R^2 = 0.12$; see Figure 1). CERQ scores of positive reappraisal predicted tournament performance, but in the opposite direction hypothesized ($F(1,132) = 21.03$, $p < .0001$, $R^2 = 0.14$). These effects were driven by nationally-ranked players whose mean maladaptive emotion regulation scores and mean reappraisal score were the lowest (oneway ANOVA of maladaptive emotion regulation and rank: $F(2,132) = 9.05$, $p = .0002$, $R^2 = 0.1$, $mean_{unranked} = 3.1$, $mean_{regional} = 2.9$, $mean_{national} = 2.5$; oneway ANOVA of positive reappraisal and rank: $F(2,132) = 16.6$, $p <. 0001$, $R^2 = 0.20$, $mean_{unranked} = 3.7$; $mean_{regional} = 3.8$; $mean_{national} = 2.5$).

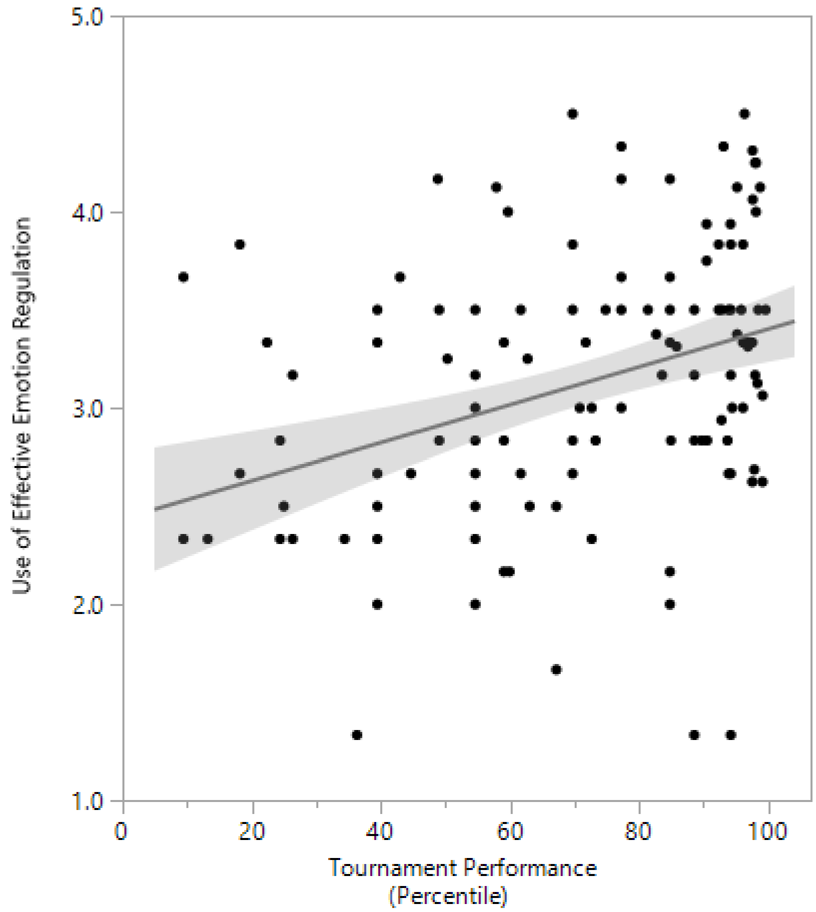

Figure 2.1. Higher-performing players report less frequent use of maladaptive emotion regulation strategies**.** Gray shaded area represents the confidence region for the fitted line. The *X* axis is the measure of player performance, that is, a player's final placing in tournament by percentile. The Y-axis is the average CERQ scores of three strategies known a priori to be positively correlated with clinical depression and anxiety.

Given the expected and overwhelming effect of skill, the most complete way to examine emotion regulation is in a combined model with skill. We conducted a stepwise regression with factors representing skill (years of experience, hours per week of recent practice, and the ordinal factor of rank) plus the two aspects of domain-general emotion regulation (CERQ reappraisal and CERQ maladapative emotion regulation use). In this model, hours playing per week, national compared to other ranks, and CERQ scores of maladaptive emotion regulation predicted tournament performance. The whole model was significant ($F(4,126) = 19.66$, $p <. 0001$, $R^2 = 0.39$; see Table 1).

	Estimate (95% C.I.)	**Standard Error**	**t Ratio**	**p-value**
Intercept	73.55 (55.6 – 91.5)	9.09	8.09	<.0001****
Hours of Recent Practice	0.51 (0.12 – 0.90)	0.20	2.61	.0103*
Rank: Unranked vs Regional	5.58 (-3.4 – 14.5)	4.54	1.23	.2223
Rank: Regional vs National	20.24 (10.3 – 30.2)	5.04	4.01	.0001***
CERQ Average of Maladaptive Emotion Regulation Scores	-6.22 (-11.6 – -0.8)	2.73	-2.28	.0243*

Table 2.2 Rank, recent hours per week of practice, and maladaptive emotion regulation use predict tournament performance. Final regression model predicting tournament performance (percentile) after a stepwise regression of years playing, hours per week playing, rank, and CERQ scores. * for p<.05, ** for p<.01, *** for p<.001, **** for p<.0001.

Notes on Modeling Mood and Match Outcome within Person

Typically, we expect that a player who is paired randomly against many others will have a limited range in match outcomes based on the difference between their and their opponents' skills, and we would use that variance to describe their skill objectively. However, tournaments are not run randomly: tournament structure is designed to account for most between-person variance in outcome. Double-elimination style tournaments are structured such that players are assigned a numerical value ("seed") corresponding to their predicted performance – like an Elo ranking in chess, but less strictly calculated and tournament-specific rather than universal. Tournaments are designed so that high-skilled players typically do not compete against each other until the end of the tournament, meaning the highest ranked players face the lowest ranked players in the opening round. Because tournament organizers determine seeding several days before the tournament, seed difference is both an objective prediction of match outcome as well as an easily accessible and accurate threat cue for a competitor. Thus, we expect little within-person variance in this dataset because it is absorbed by tournament seeding.

An additional consequence of double-elimination style tournaments is that the number of matches a person plays depends on their seed. Because seeding is typically based on player rank, we must include player rank in all within-person models to account for the unbalanced data set.

Finally, because 1) fewer than 10 players reported more than 7 matches and 2) tournament matches above 7 took place across several days of a tournament weekend, we excluded tournament matches numbered above seven (k = 17 excluded). Two further matches were excluded due to no reported outcome, leaving 339 total matches for 94 subjects.

Overarousal as a Predictor of Loss

To examine the effect of overarousal on the individual, we constructed a mixed model with matches as level 1 and players as level 2. Because match outcome had four possible ordinal values – sweeping loss, contested loss, contested win, sweeping win – we applied a cumulative link mixed model (Christensen, 2015) with level-1 pre-match arousal, level-2 rank, and the random effect of specific player ID as predictors.

The full model including pre-match arousal, rank, and player ID showed a significant effect for pre-match arousal levels (estimate = -0.088, *S.E.* = 0.030, *z-value* = -2.88, $p = 0.0040$) and rank (estimate = 0.627, *S.E.* = 0.188, *z-value* = 3.33, $p = 0.0009$). The p-value for the random effect was calculated by comparing the model with the random effect to an identical model without the random effect in a likelihood ratio test: the random effect of ID was not significant (likelihood ratio statistic = 0.2, p = 0.65).

Fixed Effect Coefficients				
	β (s.e.)	**95% C.I.**	**z-value**	**p-value**
Pre-Match Arousal	-0.09 (0.03)	-0.15 to -0.03	-2.880	0.0040**
Rank	0.63 (0.19)	0.25 to 0.99	3.332	0.0009**
Random Effects				
	Intercept (S.D.)			**p-value**
Player ID	0.07 (0.26)			0.6547

Table 2.3 Rank and pre-match arousal predict the outcome of an individual match. Parameter estimates for cumulative link mixed model predicting ordinal match outcome (sweeping loss, contested loss, contested win, sweeping win) with fixed effects of pre-match arousal and rank and random effect of ID. * for p<.05, ** for p<.01.

To better understand the main effect of arousal predicting performance, and due to the low impact of player ID in the multi-level model, we conducted a simple one-way ANOVA of match outcomes and pre-match arousal to test pairs of outcomes.

A oneway ANOVA revealed significant differences between game outcomes and pre-match arousal levels ($F(3, 338) = 4.22$, $p = .006$ $R^2 = 0.04$; see Figure 2). Comparisons for each pair using two-tailed Student's t-tests revealed significant differences between sweeping loss and both win conditions (sweeping loss and contested win: $t = -2.15$, $p = 0.03$; sweeping loss and sweeping win: $t = -3.38$, $p = 0.0008$) and no effect between all other pairs. These comparisons were confirmed by a Least Square Means Differences table after performing a multiple regression controlling for rank.

Distributions of pre-match arousal differed greatly by rank: regionally ranked players had the highest mean (2.28, *S.D.* = 3.56), followed by unranked players (1.96, *S.D.* = 3.41), then nationally ranked players, whose average mood was below zero on a negative seven to positive seven scale (-1.31, *S.D.* = 3.88). To compare matches of similar personal stakes, we also examined rank and pre-match arousal levels using only the last two matches collected per person. We found that nationally ranked players still reported lower pre-match arousal than unranked and regionally ranked players ($F(2,184) = 3.2$, $p = 0.04$, $R^2 = 0.03$).

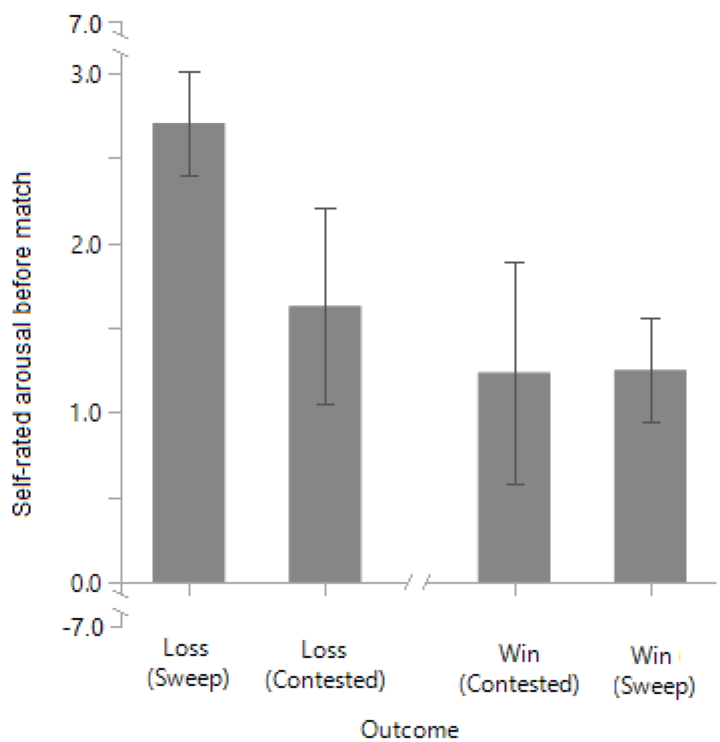

Figure 2.4. Self-reported arousal predicts a sweeping loss for the subsequent match. Error bars are ±1 standard error. Data drawn from 94 players who reported 336 matches. Each match is decided by the best of three games, such that a “sweep” match represents two games played, while a “contested” match represents three games played, with the losing player having taken a game. Pre-match arousal was self-rated on a scale from -7 to +7. Graph does not account for within-person variance or rank (see Table 2 instead). From Student’s t-test, * for p < 0.05 and ** for p < 0.001.

Post-Hoc Iterative Analysis: Anxiety Emerges from Expectation of Loss

Beyond general anxiety, pre-match arousal may emerge from accurate expectation of loss: a player may become especially nervous before facing a high-skill opponent to whom, by tournament design, they are likely to lose. Although controlling for rank could account for this "intimidation factor" in the previous analysis, the size and international scope of the community means that many high-skill players are not recognizable on sight. To examine the role of accurate loss expectation, we added to the model a variable for difference in tournament seeding, which is a publicly available, third-party prediction of expected match outcome. We coded all matches for seed difference between the player and their opponent and included it in the mixed model as a level-1 (match) predictor. Due to delay in coding these data, four players' (13 matches) worth of data had been deleted from public record by the time of collection, so the following results describe 90 participants and 326 matches.

In this post-hoc model, seed difference accounts for most of the variance in outcome (estimate = -2.161, *S.E.* = 0.435, z-value = -2.497, $p < .0001$) while rank remains a significant predictor (estimate = 0.497, *S.E.* = 0.233, z-value = 2.138, $p = 0.0325$). Compared to the originally hypothesized model including rank, pre-match arousal, and player ID, the role of pre-match arousal is reduced (estimate = -0.063, *S.E.* = 0.036, z-value = -1.756, $p = 0.0791$) and the role of player ID is increased (random effect value increased from 0.07 to 0.43; p-value calculated by performing a likelihood ratio test on the post-hoc model with and without the random effect, likelihood ratio statistic = 3.54, $p = 0.0597$).

The model including seed difference is a better fit for the data: AIC is reduced from 760.76 to 723.21. The likelihood ratio test comparing the models with and without seed difference is significant (likelihood statistic = 37.6, $p < .0001$).

Fixed Effect Coefficients				
	β (s.e.)	**95% C.I.**	**z-value**	**p-value**
Pre-Match Arousal	-0.06 (0.04)	-0.133 to 0.007	-1.756	0.079
Rank	0.50 (0.23)	0.04 to 0.95	-4.967	0.033*
Seed Difference	-2.16 (0.44)	-3.01 to -1.31	2.138	<.0001****
Random Effects				
	Intercept (S.D.)			**p-value**
Player ID	0.43 (0.66)			0.060

Table 2.5. Rank and pre-match arousal predict the outcome of an individual match. Parameter estimates for cumulative link mixed model predicting ordinal match outcome (sweeping loss, contested loss, contested win, sweeping win) with fixed effects of pre-match arousal, seed difference, and rank, and random effect of ID. * for p<.05, ** for p<.01, *** for p<.001, **** for p<.0001.

Player Self-Ratings of Skill: A Mixed-Methods Exploration

Prior to data collection, the first author consulted with members of the Smash community to create a comprehensive list of game-specific skills that determine performance (see Appendix A). The final list after three rounds of consultations contained 17 specific skills that fell into four categories: knowledge of the game, sensorimotor skill, mindset and emotion regulation, and mastery-level dynamic cognition, such as predicting an opponent's decision and varying one's own gameplay accordingly. This list was randomized and presented to participants for self-reported ratings of each granular skill so that we could use quantitative statistics to explore latent player beliefs about the structure of skill and the relationship of latent factors to their performance.

Factor analysis of the 17 self-ratings of skills revealed a 2-factor structure which corresponded to skill-based and emotion-regulation-based items, despite the originally hypothesized 4-factor structure. The 13 questions related to sensorimotor execution, knowledge, and mastery clustered together onto the first factor while the 4 questions about in-game emotion regulation (*overcoming performance anxiety, managing emotional reactions to in-game events, managing emotional reactions to out-of-game events, overall control of emotions and reactions)* clustered onto a second factor. For the skill factor, loadings were all above 0.7, a conservative cutoff point for factor grouping. The skill factor had no loadings of greater than 0.4 on any item in the emotion regulation factor. For the emotion regulation factor, loadings were above or rounded to 0.7, and none had loadings with the skill factor greater than 0.4. The factors did not correlate meaningfully with each other (r = 0.06). The complete list of factor loadings is available in Appendix B.

To test the validity of these factors, we compared them to existing measures of skill and emotion regulation. The skill factor correlated positively with tournament performance (r = 0.54), years of experience (r = 0.50), and hours of recent practice (r = 0.30). The skill factor and rank had a strong relationship in a one-way ANOVA ($F(2,252) = 74.4$, $p < .0001$, $R^2 = 0.37$). Gender did not predict self-rated scores on the skill factor after accounting for actual performance. Surprisingly, the skill factor correlated with CERQ positive reappraisal scores such that more skill meant less reappraisal use (r = -0.30). The skill factor correlated moderately with CERQ maladaptive emotion regulation scores such that more skill meant less frequent use (r = -0.20).

On the other hand, the self-rated emotion regulation factor did not strongly correlate with CERQ maladaptive emotion regulation scores (r = -0.13) or CERQ positive reappraisal scores (r = -0.06), nor with tournament performance (r = 0.11). However, rank predicted the emotion regulation factor such that nationally ranked players rated themselves significantly higher than unranked or regionally ranked players ($F(2,252) = 7.96$, $R^2 = 0.06$, $p = 0.0004$; two-tailed

Student's t-test: national versus regional difference, $t = 3.34$, $S.E. = 0.17$, $p = 0.001$; national versus unranked difference, $t = 3.64$, $S.E. = 0.14$, $p = 0.0003$).

Gender identity predicted the emotion regulation factor in a pooled t-test such that gender minorities rated themselves as worse at emotion regulation ($t = -2.88$, $S.E. = 0.20$, $p = 0.004$), a relationship that remained after controlling for actual performance. Furthermore, while men competitors self-ratings of traditional skill strongly predicted their performance ($r = 0.57$), non-men's self-ratings of skill did not predict their performance at all ($r = 0.006$).

Discussion

Higher-Ranked Players Use Maladaptive Emotion Regulation Less Often

Like other classically studied domains of expertise such as chess or sports, esports tournament performance is predicted by past performance, accumulated experience, and recent learning or skill maintenance. This paper's novel finding is that even accounting for such proxies of skill in a quantitative analysis, maladaptive emotion regulation use is associated with worse tournament performance.

The three emotion regulation strategies defined as maladaptive (rumination, self-blame, and catastrophizing) all involve heightened physiological arousal. As our within-person analyses and other research suggests, overarousal is harmful to performance, which creates a feedback loop: losses are followed by poor coping, which creates overarousal, leading to further losses. Additionally, maladaptive emotion regulation may deter the long-term skill acquisition process because players with poor emotion regulation are less likely to maintain goal-directed motivation over the years of practice required to achieve the highest level of skill. For example, strings of consecutive losses and extended skill plateaus are common during mid-level training. If a person engages in harsh self-criticism, tends to ruminate on their lack of success, or catastrophizes particularly meaningful or widely broadcast losses, consecutive losses and plateaus may become challenging enough that a person disengages from the hobby. Thus, people who regularly use maladaptive emotion regulation may be self-selecting out of the highest ranks of the game through both poor tournament performance and long-term self-sabotage.

Although maladaptive emotion regulation may exert a selection effect, an additional explanation to consider is that higher-skilled players need to regulate emotion less often. Indeed, nationally ranked players in this study reported using both positive reappraisal and maladaptive emotion regulation significantly less often than regionally ranked and unranked players. Confidence stemming from past success may lead to low threat appraisal and anxiety generation in the tournament context (Laborde et al., 2014), so high-ranking players may have less stress to regulate in individual matches. Even for matches that are high stakes for a nationally ranked player, their arousal levels seem to remain manageable; post-hoc analysis limited to only the final two tournament matches collected per person found that nationally ranked players still had lower pre-match arousal ratings than unranked and regionally ranked players. Thus, the confidence of top players may play a protective role in overall anxiety levels across an entire tournament.

Other than domain-specific confidence, individual differences in domain-general emotional factors such as stress reactivity or quality of life may have supported nationally ranked players throughout their skill acquisition process. Future work measuring these variables in high-ranking players could explain how much of the effect of maladaptive emotion regulation is due to short-term arousal mismanagement, long-term self-selection out of the game, or differences in physiological processing of both in-game and non-game stressors.

In terms of design-based alternative explanations, the finding that better performance is correlated with rank and emotion regulation could be an interaction between a practice effect and the self-report nature of the surveys: higher-ranked players may be more experienced in managing anxiety due to competing frequently in high-pressure circumstances, thus underrate their own use of emotion regulation.

Theoretically, the emotion regulation strategy of positive reappraisal could counteract or replace the use of maladaptive strategies, as has worked in some experimental and health contexts (such as Garland, Gaylord, & Fredrickson, 2011 or Finkelstein-Fox, Park, & Kalichman, 2020). However, in this esports context, use of positive reappraisal is not associated with performance in a stepwise regression with other factors. Because positive reappraisal is cognitively costly, high-performing players may not adopt it because they cannot afford to devote cognitive resources to it when they need emotion regulation the most: during high-stress competition. Still, positive reappraisal could have a protective effect in long-term training efforts for the same reason that maladaptive emotion regulation use harms long-term performance: it gives players an option for regulating out-of-competition stressors like consecutive losses, skill plateaus, or unexpected life events. Teaching high-skill players about positive reappraisal, including appropriate times to use it, may promote skill growth.

Overall, the person-level relationship between performance and emotion regulation identified in this study can be better understood by studying nationally ranked or otherwise experienced players who are furthest along in the skill acquisition process. Future research on experienced players that measures stress physiology, self-efficacy beliefs, life stress, and skill growth over time will allow us to parse the roles of self-selection, measurement effects, and individual differences in anxiety generation in our person-level findings.

Pre-Match Arousal Predicts Match Outcome

As originally hypothesized, we found that higher pre-match arousal levels are associated with sweeping losses after accounting for within-person variance and player rank in a cumulative logistic mixed model. An iterative post-hoc analysis suggests that seed difference accounts for most variance in match outcome. Although we included tournament seeding in our iterative analysis because it is the best available marker of objective skill difference, seeding is not just a third-party judgment of skill: players are aware of their seed before competing, so seed difference also represents an accurate threat cue or "justified" anxiety. Thus, we interpret the strong effect of seeding – which absorbs variance previously attributed to both pre-match arousal and rank in the originally hypothesized model – to be a result of both objective skill difference and anxiety harming performance. Even so, the effect of pre-match arousal is reduced to marginal significance rather than removed entirely, thus warrants further investigation.

Future work discerning the roles of threat cues, general pre-match anxiety, and individual stress reactivity on match-level performance will need to happen in a lab setting. Because the study game does not have universal Elo rankings or seed-blind tournaments, researchers will need lab-based manipulations of player skill and the availability of threat cues to compare these effects.

Player Beliefs about Emotion Regulation

The two-factor structure of granular skill ratings implies that players think about traditional skill and emotion regulation as different constructs. However, it is the skill factor, not the emotion regulation factor, that correlates with domain-general scores of emotion regulation. What players are thinking of as emotion regulation – their self-ratings of overcoming performance anxiety, managing emotional reactions to in-game and out-of-game events, and overall control of emotions and reactions – may instead be a self-rating of how much anxiety they generate.

For example, nationally ranked players have the highest self-rated scores on the emotion regulation factor but the lowest scores on the domain-general emotion regulation measures. If nationally ranked players have high confidence in their game skill, they will appraise fewer threats in the game environment which they may take as evidence of successful emotion regulation in that context. On the other hand, gender minority participants, who have additional burdens of managing their safety and self-esteem in a male-dominated hobby, have lower average ratings on the emotion regulation factor. If gender minorities are experiencing more anxiety from non-competitive sources, they may see themselves as less effective regulators, even though they are simply dealing with more stressors. Indeed, their self-ratings of skill compared to their actual performance suggests that gender minorities have low gaming self-efficacy.

Whatever the emotion regulation factor is capturing, the two-factor structure of the data likely reflects dual sources of information. Players typically receive broad feedback on their skill from wins and losses rather than fine-grained feedback on sub-skills, which explains why knowledge, sensorimotor, and expert-level skill are a single factor instead of the expected three factors. Additionally, players are aware of their internal moods and the instances in which internal moods interfere with performance; common gaming slang terms like *tilted* or *salty* or even *choke* specifically denote that a player became too worked up for the circumstance, thus suggest an awareness of an appropriate level of physiological arousal.

Educating players that emotion regulation is a *process* involving both an environmentally elicited reaction as well as cognitive regulation of that reaction (see Gross, 1998) could protect against effects of overarousal like choking under pressure. For example, gender minority players may report higher threat or pressure in the esports environment compared to male peers. Acknowledging that different life experiences lead to different threat appraisal could validate gender minority players and prevent the maladaptive regulation strategy of self-blame: rather than a personal failing, their anxiety reflects a threat appraisal process that is normal and furthermore, cognitive regulation of that threat is within their control. As another example, some competitors endorse the belief that anger is a desirable emotional state for achieving competitive goals thus they will actively regulate their emotions towards anger in competitive contexts (Tamir, 2016). Awareness that overarousal drives choking may change these players' attitudes towards the utility of anger in esports performance and open the possibility of training to down-regulate anxiety to improve performance.

Implications for Dissertation

This study suggests that anxiety harms esports performance. Although there were too few gender minority participants to test within-person anxiety effects, gender minorities or non-men underperform, have lower self-efficacy beliefs, and report using emotion regulation more often in gaming contexts, which suggests that they may be experiencing stereotype threat above and beyond the performance anxiety found in men. Due to the low number of non-men – 15 cisgender women, 5 transgender women, and 4 non-binary participants out of 253 total participants – even in this sample that targeted them, high-quality analysis of their in-tournament anxiety is difficult. Instead, the researcher decided to see if stereotype threat is a factor in a more readily available sample: novice or non-gaming women.

Chapter 3

Stereotype Threat in New Women Competitors

"I was a part of a predominantly male game club my first two years of college … I became VP of the club for a year and helped run tournaments… It was hard for us to maintain female membership because the moment a girl entered the club room they would be swarmed by thirsty dudes."

-A woman gamer subject reflecting on her negative experiences in gaming

Abstract

Competitive video gaming or esports relies on cognitive and fine motor skill rather than sex-dependent physical skill, thus the field has potential for gender-equal competition. However, at present, esports is male-dominated at both the casual and professional levels. When a domain is heavily male-dominated, women are at risk of experiencing stereotype threat which interferes with their performance and motivation, thereby maintaining the status quo of women's underrepresentation. To parse the effects of stereotype threat on novice women players, we ran in-lab esports tournaments under two conditions: in women-only cohorts or in mixed-gender cohorts with novice men. We found that women in women-only cohorts had lower anxiety, higher internal motivation, and more accurate self-assessment of their skill than women in mixed-gender cohorts. On the match level, we found that women underperformed against men regardless of whether her opponent had played the study game more often, less often, or equal to her in the past year. In short, women-only tournaments may aid recruitment and retention of women in esports by mitigating stereotype threat effects, establishing positive game experiences,

and building networks of support for new women players prior to or in addition to gameplay in mixed-gender competitive spaces.

Literature Review

Competitive video gaming or esports depends on cognitive skill that is expressed through fine sensorimotor action. As a result, practice and cognitive talent (rather than sex-related physicality) determine the range of a person's skilled gaming outcomes. Despite this inherent potential for gender equality in esports competition, social and historical forces have shaped video games generally and esports especially into male-dominated fields from the casual to professional levels (Prescott, 2014).

Mechanisms of Women's Underrepresentation in Esports

Because competitiveness is stereotyped as a masculine trait, population-level differences in interest may contribute to the gender participation gap in esports (for example see Greenberg et al., 2010). But even beyond baseline interest, women face several barriers to entering masculine-stereotyped domains: they have fewer incidental opportunities for entry, less social support for interest, and avoid entering the community because they anticipate having less relative power and a lower sense of belonging (Wood & Eagly, 2012; Chen & Moons, 2015). Gaming is stereotyped as a masculine domain among men and women, gamers and non-gamers, and children through adults (Cruea & Park, 2012; Dill & Thill, 2007), and video game content itself maintains a male audience through targeted marketing and game content that excludes and objectifies women characters (Burgess et al., 2007; Dill & Thill, 2007; Downs & Smith, 2010). Objectification of women game characters not only signals to women that they do not belong and are not valued, but also lowers self-efficacy beliefs in women game players (Behm-Morawitz & Mastro, 2009). Existing work on women in science, technology, engineering, and mathematics (STEM) suggests that lower domain-specific self-efficacy predicts both short-term engagement and lifelong outcomes (Bussey & Bandura, 1999; Dweck, 2013). In sum, both domain-general and domain-specific forces discourage women from entering gaming and esports.

Even when a woman is interested and invested in gaming, she faces active pushback from gaming communities. Public-facing women gamers such as Twitch streamers and live-streamed women esports players face more identity-based harassment compared to their male peers (gaming generally: Ruberg et al., 2019; Nakandala et al., 2017; Fox & Tang, 2014; esports specifically: Ruvalcaba et al., 2018; Zolides, 2015; Kuznekoff & Rose, 2013). Furthermore, when it comes to moving from casual to professional spaces, women gamers have fewer opportunities: for example, collegiate varsity teams and college clubs tend to target existing high-skill players rather than facilitating skill development (Taylor & Stout, 2020) – which means women players, who are less likely to be encouraged to play esports throughout their development (Wood & Eagly, 2012), are already at a disadvantage for making the varsity cut. All in all, negative experiences and non-inclusive systems create cognitive and structural conditions that discourage interest and impair skill acquisition for women players.

Negative stereotypes about women in gaming also put women's immediate performance at risk. Stereotype threat, or performance decrements resulting from anxiety of confirming negative stereotypes about one's social group, is a well-studied phenomenon shown to affect diverse social groups based on race, gender, nationality, and more (see Spencer et al., 2016 for review). Stereotype threat and anxiety generally are especially harmful to performance in challenging or high-pressure tasks (Spencer et al., 2016), including esports (Nolla et al., under review). Anxiety is known to impact performance by reducing available working memory capacity for recall and execution; anxiety also shifts attention to internal, performance-related distractions rather than external, task-relevant stimuli (Schmader et al., 2008; Maloney, Sattizahn, & Beilock, 2014). Beyond the short term, stereotype threat impacts learning processes, feedback-seeking behaviors, and intrinsic motivation (Rydell & Boucher, 2017; Thoman et al., 2013; Inzlicht & Kang, 2010). Thus, women are at high risk of underperformance whether they are beginners or veterans: negative gender-gaming stereotype content and its resulting anxiety interfere with performance, learning, and motivation.

The Present Study: Stereotype Threat in New Women Players

Previous empirical work conducted at esports tournaments confirms the severe underrepresentation of women in esports (with recruitment procedures specifically targeting women competitors, the sample had only 6% cisgender and 2% transgender women; Nolla et al, under review). Because women in gaming are difficult to recruit and furthermore, they have already overcome gender stereotyping by virtue of their participation, we chose to manipulate the effects of stereotype threat on novice gamers.

We employed an in-person or ensemble stereotype threat manipulation to mimic the real-world experience of entering a tournament and varied whether the tournament cohort was mixed-gender (high threat) or women-only (low threat). One advantage of a competitive tournament study design is that a single person plays games against multiple other people in a short time, allowing for person-level analyses of emotional and motivational outcomes as well as match-level analyses of performance outcomes. Another benefit is that our study results can be easily extended to real-life interventions for recruitment of novice women.

Several studies on women in non-esports gaming have found stereotype threat effects on performance in single-player games (Kaye & Pennington, 2016; Vermeulen et al., 2016). We expect that our ensemble threat manipulation, or the physical presence of and equal representation of men, will have an immediate and strong effect on women (Murphy, Steele, &

Gross, 2007; Alt et al., 2019), allowing us to reliably produce stereotype threat within the novel context of esports. Additionally, we expect that inexperienced players will rely more heavily on stereotypes than personal experience in anticipating their first tournament experience. Due to the manipulation type and within-person repeated tests in the form of multiple tournament matches, we expected larger effect sizes in our study compared to prior single-player studies.

Hypotheses

Our specific predictions are that women in mixed gender tournament cohorts will report more anxiety and self-consciousness and lower engagement and self-efficacy than women in women-only tournaments. On the match-by-match basis within mixed-gender tournaments, we expect that women will perform worse against men than they do against other women, even when controlling for previous game experience.

Methods

Recruitment

Participants were selected from a pool of introductory psychology students based on three criteria from a pre-screening questionnaire. First, they had never competed in an organized tournament for the study game, *Super Smash Bros* ("Smash"). Second, they had played the game more than once in the past year but not more often than weekly. And last, they were recruited based on gender to create equal numbers of mixed-gender cohorts and women-only cohorts. Study participants were randomly selected among students who met all criteria. Two women-only tournament groups consisted of paid university community members who met the same criteria.

Participants. 183 participants completed the study in 18 tournament groups. Participants included 122 cisgender women and 61 cisgender men between the ages of 18 to 22 with a skew towards younger ages. 11 tournaments had mixed-gender cohorts and 7 had women-only cohorts. The participants completed a total of 780 matches across all tournaments (see Appendix A for match-by-match classification counts).

Study Design. Participants completed two one-hour sessions. The first session involved training in groups of 1 to 4 participants. In the first session, the female first author told participants that all participants were selected to be approximately equally skilled. Then, she presented a 10-minute slideshow about Smash, including basic explanations of the history of the game series, a video of a professional tournament grand finals match with two male competitors, the researcher's hypotheses about expert-level skill, and framing of the study as a comparison between expert- and novice-level skill. For an additional 10 minutes, the researcher taught the game controls and basic game strategies. The participants spent the remaining forty minutes of the first session playing against one another except in the case of single-person training groups in which the researcher played against the participant at an appropriate skill level.

The second session involved a competitive tournament against other study members in groups of 7 to 14 participants. At the start of the second session, participants were given instructions on how to track their match outcomes, then they played against as many other participants as possible in the allotted time. In the case of small tournament groups, participants also played a match against a computer used by competitive-level players for training. Participants completed a set of surveys on their tournament experiences (see Appendix B) and their endorsement of gender-gaming stereotypes at the end of participation.

Measures

Previous Smash Experience. In screening questions, participants reported how frequently they had played Smash in the past year: *never, almost never, every few months, monthly, weekly,* or *dail*y. Subjects were randomly selected among people who met all eligibility criteria (see Section 2.1). Only participants who responded *almost never* (61)*, every few months* (67)*, monthly* (44), or *weekly* (11) participated in the study. In a 2 (gender) by 4 (frequency) contingency table Chi-square test, the randomly selected eligible men reported more experience with Smash than the randomly selected eligible women (χ^2 (3, N = 183) = 11.77, p = 0.008).

Other Gaming Experience and Gaming Knowledge. To assess familiarity with video gaming more generally, some participants were asked in screening to estimate their weekly hours of gameplay outside of the study game (including computer games, console games, and phone games). Of the 110 participants who answered this screening question, zero hours per week of gameplay was the smallest possible answer (17 participants), followed by 1-2 hours (58), 2-5 hours (18), more than 5 hours (17). We performed a Chi-Square test on a 2 (gender) x 4 (frequency) contingency table and found that the randomly selected eligible men reported more frequent gameplay than the randomly selected eligible women (χ^2(3, N = 110) = 11.41, p = 0.001).

Because time estimates may differ from objective experience based on participants' self-efficacy beliefs, 107 participants also completed a 45-point quiz before the training session to assess objective video game knowledge. Scores on the knowledge quiz correlated modestly with reported hours of video gaming per week ($F(3,105) = 15.16$, $R^2 = 0.31$, $p < .0001$). All participants in this study scored significantly lower on the quiz compared to a sample of 88 self-identified competitive gamers; additionally, despite pre-screening, men in the study scored significantly higher than women. Being a competitive gamer equaled three times the score difference than being a novice man versus novice woman (multiple regression: $F(3,212) = 108.7$, $R^2 = 0.61$, $p <.0001$; non-gamers versus competitive gamers estimate = -7.4, S.E. = 0.53, $p < .0001$; women versus men estimate = -2.4, S.E. = 0.55, $p < .0001$), a further confirmation of the novice status of all participants in this sample.

Results of these descriptive measures indicate that even by random selection among players of a novice or non-competitive skill level, men in this sample reported greater frequency of Smash and general video game play and demonstrated greater knowledge of video games than women. However, these differences can be statistically controlled for in performance-based analyses.

State-Trait Anxiety Inventory. Before the training session and before the tournament session, participants completed the 20-item state section of the Spielberger State-Trait Anxiety Inventory (STAI; Spielberger et al, 1983). Immediately after the tournament, participants completed the 6-item short form of the STAI (Marteau & Bekker, 1992). Both the long-form and short-form of the STAI involve rating agreement with statements such as "*I am worried*" or "*I feel content"* (reverse coded) on a scale of 1 to 4 (*not at all, somewhat, moderately so, very much so*). A person's final score on the STAI was calculated by averaging the item scores.

Tournament Performance. Participants played one match against each other person in their tournament group. Each player began with three "lives" and the match ended when one player reached zero lives. Thus, for each match, participants could score either negative (loss) or positive (win), with no possibility of a draw.

At the participant level, we scored tournament performance as a kill-to-death ratio (KTD) across matches they played. Because a person's KTD was dependent upon the skill of other participants in the same tournament group, players' KTDs are not a measure of objective skill and are not comparable across tournaments. However, the KTD accurately reflects the within-tournament performance of an individual. Because KTD is a ratio that results in a log-normal distribution, we log-transformed KTD for linear analyses. Two participants were excluded at this stage for having KTD greater than 2 standard deviations above the mean.

To compare across tournaments, we classified each unique match as *expected outcome, predicted tie,* or *upset* based on the previous Smash experience reported by each player during recruitment. Additionally, we classified matches as between two men (MM), between a woman and a man (WM), or between two women (WW).

Post-Tournament Survey. Participants answered several questions about their tournament experience on a Likert scale of 1 to 7. Questions included: 1) how much performance pressure they felt; 2) how important it was for them to do well in the tournament; 3) focus on self versus opponent during gameplay; and 4) a comparison of their skill to other competitors. Additionally, participants wrote free responses that were coded as a binary yes or no: 5) whether they used a strategy in gameplay and 6) whether they used a strategy for emotion regulation.

At the very end of the study, participants were administered the Video Game Sexism Scale (VGSS) which measures stereotypical attitudes about women in gaming (Fox & Tang, 2014). Participants rated agreement with 16 statements such as "*If a woman plays with a team or guild, she is almost always the weakest link*" and "*Women don't play games to kill or achieve"* on a Likert scale of 1 to 7.

Correction for Multiple Comparisons

For the STAI, four independent post-tournament Likert-type questions, two independent post-tournament short answers on emotion regulation and strategy use, and post-tournament VGSS scores, a Bonferroni correction results in a required alpha level of 0.00625 for statistical significance ($\alpha/n = 0.05/8$).

Results

We have two primary categories of hypotheses. First, we examine person-level outcomes on emotion and motivation. We expect to find that women in mixed-gender cohorts have higher anxiety, greater self-consciousness or focus on self versus opponent, lower engagement, and lower self-efficacy or confidence relative to performance. Second, we examine match-level performance. After correcting for previous game experience, we expect women in mixed-gender cohorts to underperform against men, where baseline performance is defined by success against same-gender opponents.

Person-Level Outcomes

Anxiety. Women in women-only cohorts reported lower STAI scores after the tournament ($M = 2.05$, $SD = 0.45$) than participants in mixed-gender cohorts ($M_{men} = 2.38$, $SD = 0.45$; $M_{women} = 2.37$, $SD = 0.45$; oneway ANOVA, $F(2,176) = 10.59$, $p < .0001$, $R^2 = 0.11$; see Figure 1) despite equal STAI scores between groups at baseline and before the tournament. Paired comparisons using Student's t-tests confirm group differences between women in women-only cohorts and other groups (t-test versus women in mixed-gender cohorts: $t(174) = 3.76$, $p = 0.0002$; t-test versus men in mixed-gender cohorts: $t(174) = 4.06$, $p < .0001$), with no difference between men and women in mixed-gender cohorts. The finding that women in women-only cohorts experience less anxiety remained even after controlling for actual tournament performance – that is, whether women lost a lot or won a lot they had lower anxiety following women-only tournaments than following mixed-gender cohorts.

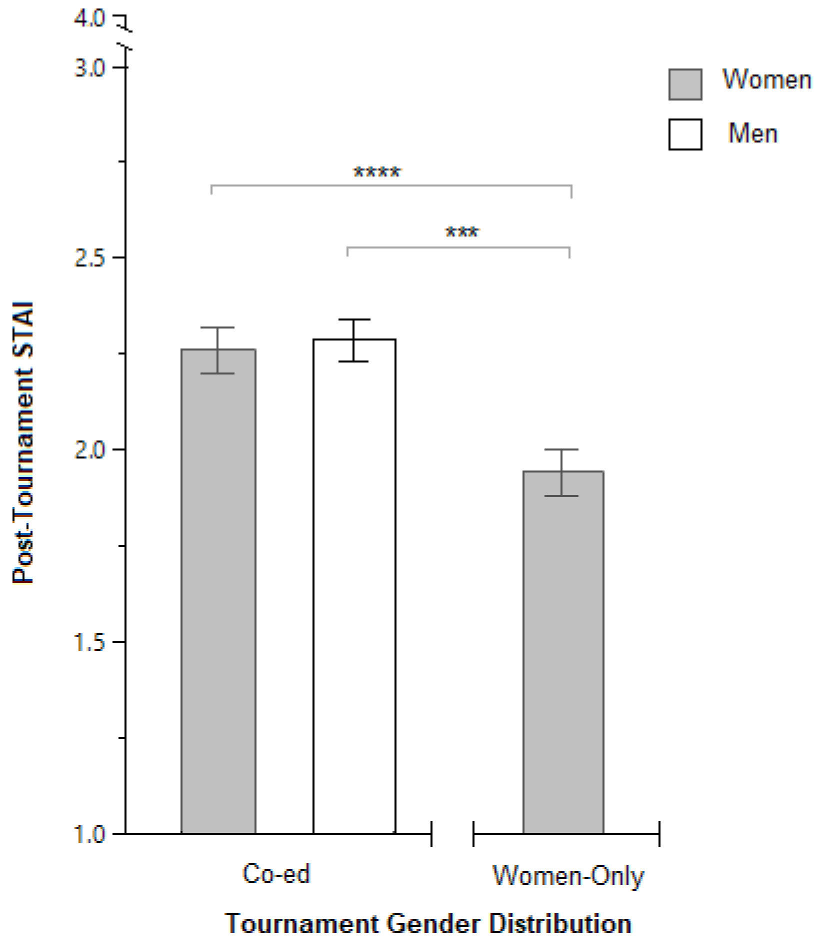

Figure 3.1. *Women in women-only cohorts report lower anxiety after the tournament.* Women in women-only cohorts have lower STAI scores post-tournament than participants in mixed-gender cohorts despite equal STAI scores between groups at baseline and before the tournament ($F(2,178) = 11.18$, $p < .0001$, $R^2 = 0.11$; t-test versus women in mixed-gender cohorts: $t(174) = 3.76$, $p = 0.0002$; t-test versus men in mixed-gender cohorts: $t(174) = 4.06$, $p < .0001$). * for p < .05, ** for p < .01, *** for p < .001, **** for p < .0001.

Motivation. Responses to the question "How important was it for you to do well in the tournament?" showed significant differences between gender and cohort groups ($F(2,177) = 6.03$, $p = 0.003$, $R^2 = 0.06$). Women in the mixed-gender cohort are reported significantly lower importance ($M = 2.09$, $SD = 1.31$) than both men in mixed-gender cohorts ($M = 2.95$, $SD = 1.31$;

t(175) = 3.31, p = 0.001) and women in women-only cohorts (M = 2.78, SD = 1.31; t(175) = 2.70, p = 0.008).

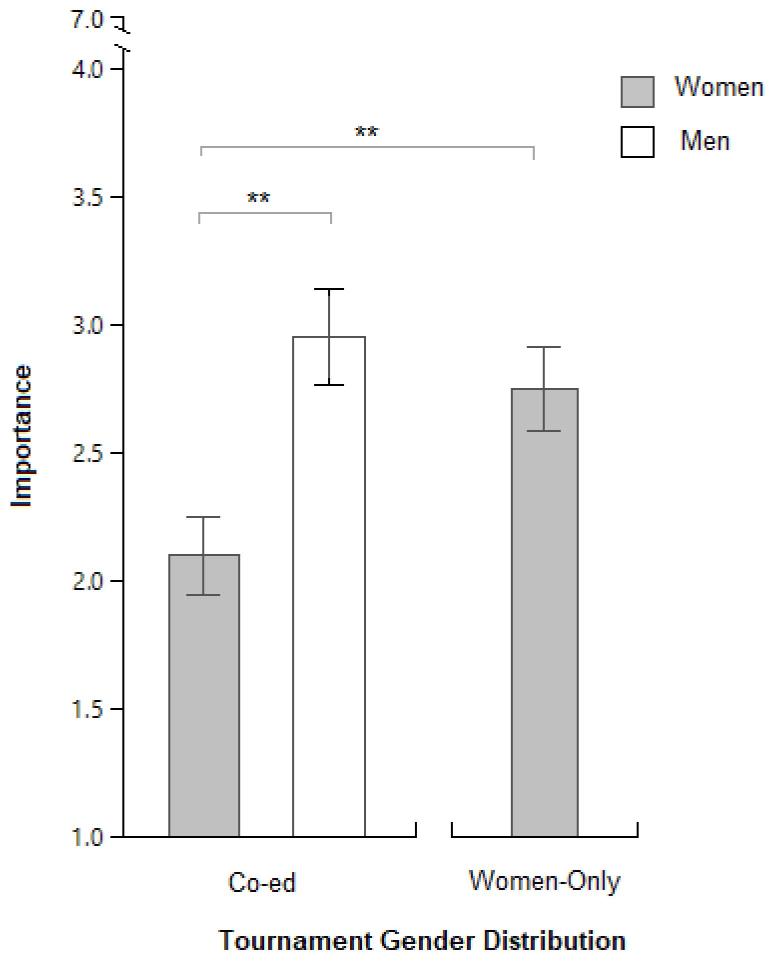

Figure 3.2. Women in mixed-gender cohorts reported lower importance of doing well in the tournament. (F(2,177) = 6.03, p = 0.003, R^2 = 0.06). Group differences were significantly different between women in mixed-gender cohorts and men in mixed-gender cohorts (t(175) = 3.31, p = 0.001) and women in women-only cohorts (t(175) = 2.70, p = 0.008). Bars represent one standard error. * for p < .05, ** for p < .01, *** for p < .001, **** for p < .0001.

Self-Efficacy or Confidence Relative to Performance. Participant ratings on the question "How would you compare your skill to the other players in the tournament?" accurately reflected objective tournament performance measured as KTD, where KTD is z-scored as described in Section 2.4.4 ($F(1,173) = 208.7$, $p < .0001$, $R^2 = 0.55$). Furthermore, in a multiple regression, gender and tournament cohort predicted self-assessed skill above and beyond KTD with a significant interaction term (see Table 1; whole model: $F(5,172) = 59.7$, $R^2 = 0.63$, $p < .0001$). The significant interaction terms suggest that women in women-only cohorts and men in mixed-gender cohorts accurately estimate their skill while women in mixed-gender cohorts consistently underrate themselves relative to their performance.

Variable	Estimate	S.E.	95% CI	p-value
Intercept	2.78	0.18	2.42 to 3.14	<.0001****
KTD	1.11	0.25	0.62 to 1.60	<.0001****
Gender/Tourney: W vs WW	0.94	0.22	0.51 to 1.38	<.0001****
Gender/Tourney: W vs M	1.03	0.24	0.56 to 1.50	<.0001****
Interaction: KTD by W vs WW	1.04	0.36	0.33 to 1.76	0.0046**
Interaction: KTD by W vs M	1.19	0.36	0.48 to 1.91	0.0012**

Table 3.3 & Figure 3.4. *Women in Mixed-gender Cohorts Underrate Their Skill.* The relationship between actual performance and perceived performance differs based on gender and tournament cohort. In a multiple regression together ($F(5,172) = 59.7$, $R^2 = 0.63$, $p < .0001$), actual performance predicts skill self-rating, gender predicts skill self-rating, and the interactions comparing women in mixed-gender cohorts to the two other groups are significant. CI = confidence interval, KTD = kill to death ratio, W = women in mixed-gender cohort, WW = women in women-only cohort, M = men. * for p<.05, ** for p<.01, *** for p<.001, **** for p<.0001.

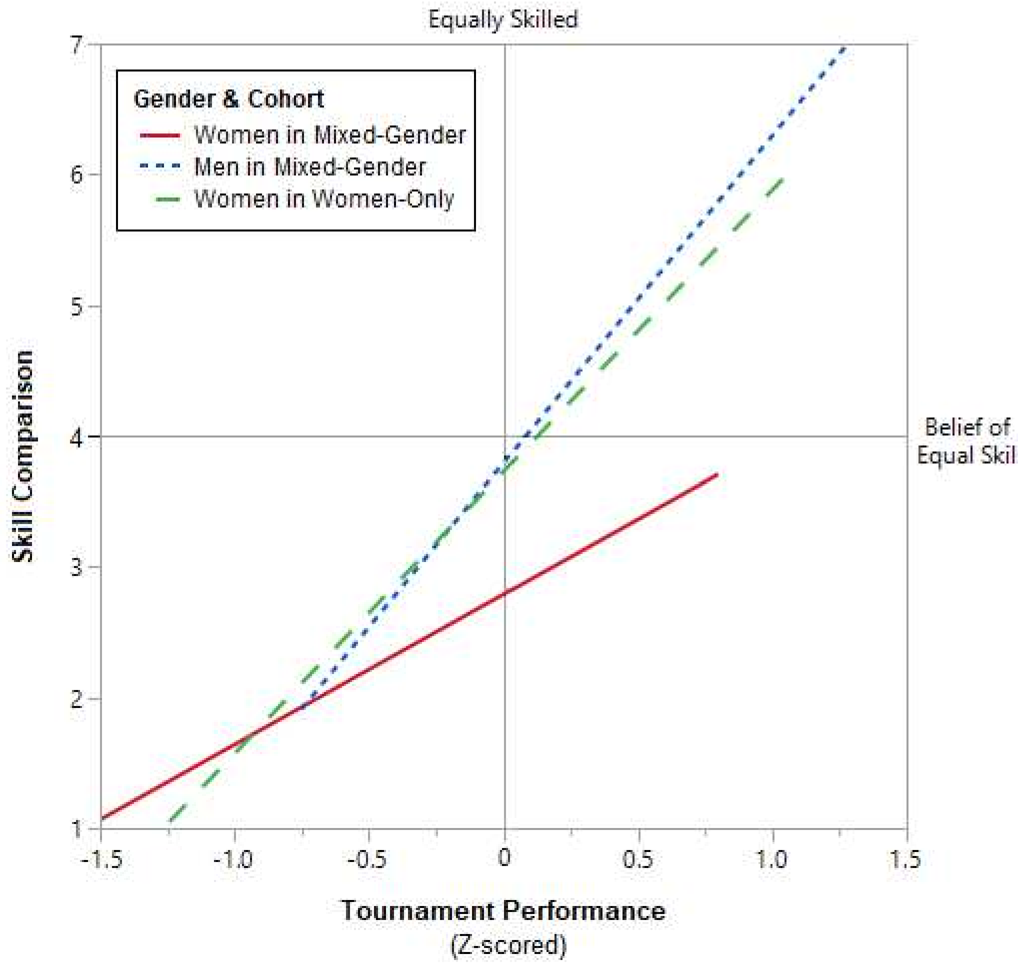

Table 3.3 & Figure 3.4. *Women in Mixed-gender Cohorts Underrate Their Skill.* The relationship between actual performance and perceived performance differs based on gender and tournament cohort. In a multiple regression together ($F(5,172) = 59.7$, $R^2 = 0.63$, $p < .0001$), actual performance predicts skill self-rating, gender predicts skill self-rating, and the interactions comparing women in mixed-gender cohorts to the two other groups are significant. CI = confidence interval, KTD = kill to death ratio, W = women in mixed-gender cohort, WW = women in women-only cohort, M = men. * for p<.05, ** for p<.01, *** for p<.001, **** for p<.0001.

The other Likert-type post-tournament questions on performance pressure and on self-other focus did not differ by group.

For the two short-answer questions on gameplay strategy and emotion regulation strategy, only emotion regulation strategy showed a gender difference such that women used it more often than did men ($\chi^2(1, N = 145) = 5.55, p = 0.02$); however, this exploratory effect did not survive Bonferroni correction for multiple comparisons (see *Methods)*.

Finally, gender-gaming stereotype endorsement (VGSS) produced a floor effect in this population. We applied a sinh-arcsinh ("SHASH") transformation to reshape scores to a normal distribution (Jones & Pewsey, 2009). The transformed data showed a gender effect that men endorsed more gender-gaming stereotypes than did women ($t(163) = 2.11, p = 0.04$); again, this exploratory effect did not survive Bonferroni correction for multiple comparisons.

Match-by-Match Performance Outcomes

Our methodology for this analysis was inspired by a paper on stereotype threat in women chess players by Stafford (2018) which compared women chess players' performance in individual matches against men and against other women. Although we did not have elo scores or equivalent performance history for our novice players, we used the difference in Smash and gaming experience between players to calculate expected match outcomes. Smash and gaming experience were quantified as values of 1 through 4 based on their reported experience in the past year (see Section 2.4.1*)*. Our calculations always put the higher number first, thus difference scores fell between 0 and 3.

We compared the expected outcome to the actual, binary outcome of the match and described each match as *expected* outcome (higher skill player won; n = 363)*,* predicted *tie* (equally skilled; n = 271)*,* or *upset* (lower skill player won; n = 146). For a complete breakdown of match classifications and counts, see Appendix A.

Difference scores based on Smash experience predicted the actual outcome of the match in a Chi-square test of the 2x4 contingency table ($\chi^2(3, N = 780) = 61.9, p < .0001$), although these difference scores accounted for only 8% of overall variance in actual outcome in a nonparametric regression (n = 780, R^2 = 0.08, residual SE = 0.47, bandwidth = 0.32). Differences scores for other gaming experience did not predict actual outcome in a Chi-square test of the 2x4 contingency table ($\chi^2(3, N = 425) = 0.9$, p = 0.83).

To examine the data for stereotype threat effects on expected versus observed outcome of individual matches, we classified matches based on gender differences: matches could be women versus women (WW; n = 383), men versus men (MM; n = 140), or women versus men (WM; n = 257). WW matches could be further classified as within mixed-gender tournaments (n = 91) or women-only tournaments (n = 292), but none of the following analyses were significantly impacted by difference in tournament gender, thus WW matches were treated as one type. The proportions of predicted outcomes (*expected, tie,* or *upset*) did not differ based on gender differences of the competitors ($\chi^2(4, N = 780) = 1.5$, p = 0.83; see Appendix A).

For the case of WM predicted ties, that is in cases where men and women were equally experienced in the game, women lost 72 of 86 matches (83.7%), which is significantly different from the expected proportion of 50% (exact binomial test, 95% CI: 0.742 to 0.908, $p < .0001$).

For the remaining 171 WM matches with predicted outcomes, men also outperformed women (see Appendix C for a complete summary of WM matches in table form.) In the 129 matches between higher-skilled men and lower-skilled women, men won 116 matches (89.9%), a much higher rate than higher-skill men won against lower-skilled men (66.7% or 62 out of 93 MM matches; *Fisher's exact test:* OR = 4.71, $p < .0001$). Another way to look at this same result is to consider lower-skilled women's upset rate against higher-skilled men as described above (13 out of 129 matches or 10.1%) compared to 34% upset rate against higher-skilled women (84 upsets out of 245 WW matches; *Fisher's exact test*: OR = 0.22, $p < .0001$).

For the 42 matches between lower-skilled men and higher-skilled women, women won 4 matches (9.5%). In matches against other women, the higher-skilled woman won 65.7% of the time (161 out of 245 WW matches; *Fisher's exact test*: OR = .06, $p < .0001$). From the men's performance perspective, lower-skilled men overperformed against higher-skilled women compared to their performance against higher-skilled men (MM matches were 33.3% or 31 upsets out of 93; *Fisher's exact test*: OR = 18.56, $p < .0001$).

A logistic regression with ordinal skill difference and the binary predictor of the man being lower-skilled predicted an upset such that being a man and not the skill gap between players predicted upsets (whole model: $F(3,167) = 75.14$, $p < .0001$, $R^2 = 0.57$; Intercept estimate = 0.07, SE = 0.07, p = 0.27; Skill Difference estimate = 0.02, SE = 0.04, p = 0.65; Man Rated Lower estimate = 0.81, SE = 0.06, $p<.0001$).

Discussion

In our sample of first-time esports tournament-goers, women who competed in women-only cohorts had better emotional and motivational outcomes than women who competed in mixed-gender cohorts. Women in women-only cohorts had lower anxiety; they reported that their tournament performance was more important to them, that is, they were more invested; and they gave more accurate skill comparisons to other players, that is, they had higher self-efficacy. Furthermore, the investment and self-efficacy ratings of women in women-only cohorts did not differ from ratings by men in mixed-gender cohorts, suggesting that women in mixed-gender cohorts may experience a decrease in investment and self-efficacy rather than women in women-only cohorts experiencing a boost. Based on these results, three of our person-level hypotheses were supported: women in women-only cohorts were spared the experience of stereotype threat because men were not present during training and tournament, while women in mixed-gender cohorts experienced stereotype threat with accompanying anxiety, detachment, and lowered self-efficacy beliefs.

Comparing anxiety levels across groups, women in women-only cohorts reported significantly less anxiety than any participants in mixed-gender cohorts. Given that women-only cohorts had similar rates of expected results, upsets, and predicted ties, and that women in women-only cohorts reported high investment, we suggest that women in women-only cohorts had a tournament experience that was both competitive and fun rather than frustrating or meaningless. Notes from the researcher's tournament logs support this suggestion: women-only tournaments were described as "loud" and "like a party" compared to "quiet" and "business-like" descriptors of mixed-gender tournaments.

Our hypothesis that women in mixed-gender cohorts would experience greater self-consciousness was not supported. In fact, anxiety did not relate to focus on the self versus the opponent across all participants. We suspect that the high attentional demands of competing in the study game as novices outweighed any anxiety-related attentional effects.

Regarding match-by-match performance outcomes, analyses of match-by-match data revealed that women underperformed against men at every level. When women were the lower skilled competitor, they rarely upset higher-skilled men, doing so less often than they upset higher-skilled women. Even in the case of predicted ties, women lost to equally skilled men at a rate significantly greater than chance. Even when women were the higher-skilled competitor, they underperformed against lower-skilled men, winning only 9% of games they were projected to win. The across-the-board underperformance of women in our study suggests a strong stereotype threat effect that may be linked to the inexperience of our players. That is, stereotype threat may exert the greatest influence on players whose inexperience means they do not have any examples of personal success to draw upon in the face of an opponent who is stereotyped to be better based on difficult-to-change traits like gender and sex.

Our study implies that esports needs women-only spaces. In the specific example of women-only tournaments, we found that providing a positive and non-threatening environment improved performance, anxiety levels, and self-efficacy beliefs for first-time women competitors. Based on work in other male-dominated fields such as engineering, technology, and trade work, we also suspect that women-only spaces can create feelings of belonging, reduce self-stereotyping, improve learning, and provide positive experiences that motivate and engage (Freitag et al, 2012; Rommes et al, 2005; Kirton & Healy, 2004; Kim, 2002). Alternatively, the negative experience of a threatening tournament may impact women's willingness to return: one study of girls in youth chess competitions suggests that girls who suffer performance decrements due to stereotype threat are less likely to compete in the future (Rothgerber & Wolsiefer, 2014). In terms of performance outcomes, positive social gaming experiences tend to increase hours of game play (Johnson et al, 2016), and accumulated hours of practice drive the skill acquisition process in most domains including esports (Nolla et al, under review). Additionally, discussion of strategy with other women has been shown to elevate gaming performance in strategy games (Prislin et al, 1996). In short, women's comfort in esports settings underlies their skill acquisition process through both motivational and material pathways. Anecdotally, many women would agree that social comfort begets skill, but the authors hope that the empirical evidence provided in this paper encourages esports organizations to prioritize creation of women-only spaces to create a more equal gaming world.

We want to stress that because gaming skill is linked to cognitive rather than sex-dependent physical characteristics, the goal of women-only esports spaces is to recruit and grow skill, not to segregate permanently. Women-only training and tournament spaces may engage women, grant them opportunities to accumulate hours of experience that they may not have had as children and adolescents, and create esports-related networks of social support and community (Romine, 2019), all of which supports their play in mixed-gender competition.

Implications for Dissertation

Based on the results of this study, non-gamer women experience stereotype threat against novice men who are more, less, and equally skilled. As expected, higher anxiety and lower self-efficacy accompany the experience of stereotype threat in novice women, mirroring the first study on non-men tournament competitors. For these novices, the strong effect of tournament cohort suggests that gender-gaming stereotypes are known prior to any actual competitive gaming experience. Thus, in the next study, we set out to establish that novice and gaming women are exposed to and affected by gender-gaming stereotypes throughout development.

Although women-only tournaments buffered the effects of stereotype threat in this case, segregation is not a compelling permanent answer to real-world gender-gaming stereotype threat given that men and women are physically capable of the same skill. While women-only tournaments may serve as a valuable resource for growth and support for women in gaming, we wanted to use the next study to understand how women have enter male-dominated gaming spaces even when they did not have access to women-only resources. Identifying the experiences, strategies, or personality traits that allow women to enter and survive in gaming spaces may give us clues on how to improve the gaming world to accommodate women who have not entered or survived it.

Chapter 4

Access, Identification, and Experiences of Existing Women Gamers

"After 8 years and over 1000 hours of playing, I got a message from a guy saying 'Welcome to [this game],' which I didn't understand. We played a round, I literally doubled his score … He then proceeded to tell me that I played decently for it being my first time and went on to explain the game's difficulty settings to me … I literally just exist in the game and have a gamertag that people can tell is feminine. That's apparently all the prompting they need to do this stuff."

-A woman gamer subject reflecting on her negative experiences in gaming

Introduction

As technological advancements make gaming widely accessible, gender differences in gaming behaviors become increasingly important to understand. While men and women play casual smartphone games at equal rates, men are much more likely than women to describe themselves as expert-level or aspiring professional gamers (27.7% of men vs 14.2% of women; SOOG 2019). Previous research estimates 16 to 29% of gamers in "hardcore" action and competitive games are women (Paaßen et al, 2017), placing women as minorities in dedicated gaming spaces.

Nevertheless, women who game regularly (greater than five hours per week) have similar behaviors to men: a survey of 900 women from the US, China, and Germany found that 88% of women who play games regularly play competitive games, including action and survival-based games (75%) and shooter games (65%; Reach3, 2021). Although these dedicated women gamers are playing the same games as men, they are vastly underrepresented both in positions of celebrity and in everyday spaces.

Because gaming is physically arbitrary and known sex differences in cognitive skill cannot explain the magnitude of gender differences in gaming participation and performance (see

Background), research on social forces that impact women's gaming access, interest, and experiences are valuable in explaining gender-based differences in gaming outcomes.

Access to Gaming

Regardless of a person's gender identity ("woman," "man," "non-binary"), sex assigned at birth ("male" or "female") determines how children are treated by parents, teachers, and peers. Parents encourage normative behaviors and interests through multiple means including direct teaching, differential expectations and encouragement, and modeling (Maloney et al, 2015; Park et al, 2017; Acosta et al, 2021); peers tease to uphold gender-based norms (see Keltner et al, 2001 for review; Jewell & Brown, 2014); and teacher behaviors communicate their own confidence in specific domains which affects children's gendered confidence and competence (Gunderson, Ramirez, Levine, & Beilock, 2011). In short, sex shapes how the world at large treats a child and expects them to behave, and because children have limited control over their environments themselves, their sex often determines what opportunities they are afforded or denied.

Computers, technology, and gaming have been stereotyped as masculine in recent decades (Shashaani, 1994), thus we would expect parents to support their male children playing video games and discourage their female children from gaming. The opinions of adults are important because adults control material access: if parents will not buy their daughter a game console, she is less likely to try gaming and less able to play even if she is interested.

Even if some parents are ambivalent to gaming, gender-based attitudes affect transfer of hobbies through same-sex friendships (Martin et al, 2013; Fabes et al, 2003). In other words, if most girls are discouraged from gaming by parents or have parents who are ambivalent, all girls are less likely to encounter the hobby in same-sex friendships. Alternatively, boys with ambivalent or even disapproving parents may still discover and regularly access gaming through same-sex friendships. Peer norms and friendships allow hobbies to spread, and if a hobby is highly gendered, its transfer will be dependent on the sex of childhood friendships.

Hypotheses: Fewer adults who were assigned female at birth will report a console in their homes during childhood and adolescence, although this effect may be mediated by having a brother. Also, female adults have lower rates of gaming entry through friend groups and instead enter the hobby through siblings or their own initiative.

Interest in Gaming

Video games that are considered "hardcore" or favored by dedicated players often have elements of strategy, skill building, and fast-paced decision-making (Ip & Jacobs, 2005; Poels et al, 2012). Like women who choose to pursue STEM majors, women with high systemizing interests may enter and remain in gaming because they enjoy the problem solving and strategy aspects of gaming despite gender norms (Jungert et al, 2019; Wright et al, 2015). Similarly, women who are competitive may play esports for the instant-access, fast-paced, and high-stakes competition offered by the genre.

Besides topic interest, gender norms during adolescence impact willingness to pursue gendered hobbies and eventually careers. Around age 12, gender stereotypes start to majorly differentiate hobbies or interests into distinct male-female categories as teenagers navigate gender identity and peer relationships (Miller et al, 2018; Jewell & Brown, 2014). Adolescent girls who value their feminine gender identity may avoid gaming as a hobby or distance themselves from it if they played games as children because gaming is stereotyped as masculine. Functionally, this means that even if they have access to a gaming console at home, they may choose not to play it. On the flipside, low gender identification may allow women to persist in gaming: women employed in the games industry tend to have lower gender-based collective self-esteem (Prescott & Bogg, 2013).

Similarly, women who express interest in games may be put off by sexist game content that is present in the highest-impact games. The major gaming media itself reflects objectification of women (Burgess, Stermer, & Burgess, 2007; Downs & Smith, 2010), which signals a lack of belonging to women, reducing their interest and likelihood of playing (Cheryen et al, 2015; Behm-Morawitz & Bastro, 2009; Terlecki, et al, 2011). Additionally, gamers with celebrity status are largely men, which may signal a lack of belonging to interested women (Morgenroth et al, 2015; Maloney et al, 2018). For example, only one of the top 10 Twitch streamers by follower count and earnings is a woman (Loadout, 2021) and the first woman to appear on the esports professional earnings list is at spot number 344 (Esports Earnings, 2020). Furthermore, only 8.2% of collegiate esports competitors are women (National Association of Collegiate Esports, 2021).

Hypotheses: Women in gaming will have higher systemizing interest and/or competitiveness than non-gaming women. Women who value or conform to their gender identity will have decreased their gaming from childhood to adolescence and adolescence to adulthood due to gender norms and sexist gaming content.

Experiences in Gaming

Women regularly experience gender-based harassment in gaming (Ruberg et al., 2019; Nakandala et al., 2017; Fox & Tang, 2014; Ruvalcaba et al., 2018; Zolides, 2015). In one study, use of a female voice versus a male voice elicited three times the negative comments during multiplayer action games (Kuznekoff & Rose, 2013). Identity-based harassment discourages women especially because by adulthood, gender is unlikely to change, thus criticisms based on gender are inherently essentialist.

Women also face structural barriers while gaming: collegiate varsity esports club recruitment tends to target existing high-skilled individuals rather than helping players build skill, resulting in low rates of recruitment for women (Taylor & Stout, 2020).

Protective factors against harassment could include: 1) successful emotion regulation or reappraisal of negative experiences (Johns, Inzlicht, & Schmader, 2008); 2) reducing gameplay hours or leaving gaming altogether (Gross, 1998); 3) limiting gameplay to solo and/or non-competitive play (Cote, 2015); or 4) limiting gameplay to women-only environments (Nolla et al*, under review). In fact, 51% of dedicated women gamers conceal their gender identity in multiplayer settings to avoid harassment (Reach3, 2021).

Hypotheses: Women who play games will report experiences of harassment and othering. Women who are currently gamers may have more effective emotion regulation, lower gender identification, or report avoidance-based strategies to cope with gender-based harassment.

Resulting Adulthood Outcomes

As a result of these multiple social forces that impact women's access, interest, and experiences in gaming, we are likely to replicate differences in gaming outcomes between women who do and do not game, as well as men and women who do not game. We expect to see differences between non-gamer men and women: stereotyping will lead non-gamer women to have much lower gameplay frequency, self-efficacy, enjoyment, and identification compared to non-gamer men (Ogletree & Drake, 2007; Terlecki et al, 2011; Shaw, 2012). We expect differences between gamer and non-gamer women to be similar, such that gamer women have equal self-efficacy, enjoyment, and identification to gamer men but lower endorsement of gender-gaming stereotypes.

Hypotheses: Gameplay frequency, gaming self-efficacy, gaming enjoyment, identification with the term “gamer,” and endorsement of gender-gaming beliefs will differ between women gamers and non-gamers and between men and women non-gamers. These differences will correlate with differences in access, interest, and experiences as described above.

Exploratory Issue: Gender Non-Conformity and Gaming

Throughout childhood and adolescence, non-cisgender kids may be drawn to gaming as an alternative exploration of identity. The customization of gaming avatars allows players to explore gendered self-expression, with measurable effects on their behaviors and attitudes (the “Proteus effect”, Yee & Bailenson, 2007).

A recent survey of transgender people seeking gender-affirming surgery found that about three-fourths of participants experienced gender dysphoria by age 7 but live with untreated gender dysphoria until adulthood (23 years old for trans men, 27 years old for trans women; Zaliznyak, Bresee, & Garcia, 2020). For people who were assigned female at birth (“female”) who transition to non-binary or transmasculine gender identities, gaming may be maintained as a hobby since it does not conflict with their gender identity. People who were assigned male at birth (“male”) may leave gaming to reflect their feminine identity, although since many make the transition after adolescence they may experience less direct peer pressure to leave gaming for gender reasons.

Generally speaking, this dissertation will not analyze non-cisgender participants based on their specific gender identity (i.e. transgender women, non-binary people, etc) due to low numbers of each group. However, some analyses will use sex assigned at birth while others use gender identity. Gender identity analyses will either include non-cisgender participants as a single group together or will exclude them from analysis.

Methods

Participant Recruitment and Demographics

Participants were sampled from two populations. The first sample included 190 randomly selected Northwestern University introductory psychology students. 56% (105) were cisgender women, 41% (78) were cisgender men, 2% (5) were non-binary assigned female at birth, and 1% (2) were non-binary assigned male at birth. Participants mean age was 21 years old (*S.D.* = 4.3 years) with a range from 18 to 33. While 47% (90) of the students reported playing games at least once per week, the majority of students played infrequently or less than five hours per week (see Table 4.1).

The second group was recruited through the first author's Twitter account which had been previously established within a network of gender-diverse gamers. The 196 participants all played games at least once per week as a condition for accessing the survey. 64% (125) were cisgender men, 16% (32) were cisgender women, 15 (9%) were non-binary assigned male at birth, 15 (9%) were trans women, and 9 (5%) were nonbinary assigned female at birth. Mean age of this population was 23 years old (*S.D.* = 3.9 years) with a range from 18 to 34.

Subject Gender	Student Sample		Gamer Sample	
Cisgender Women	*Infrequent*	95 (90.5%)	*Infrequent*	9 (28.1%)
	Regular	7 (6.7%)	*Regular*	9 (28.1%)
	Dedicated	3 (2.9%)	*Dedicated*	14 (43.8%)
	Total	105	Total	32
Cisgender Men	*Infrequent*	46 (59%)	*Infrequent*	18 (14.4%)
	Regular	20 (25.6%)	*Regular*	35 (28.0%)
	Dedicated	12 (15.4%)	*Dedicated*	72 (57.6%)
	Total	78	Total	125
Non-Binary People	*Infrequent*	4	*Infrequent*	4
	Regular	1	*Regular*	9
	Dedicated	2	*Dedicated*	11
	Total	7	Total	24
Transgender Women			*Regular*	5
			Dedicated	9
			Total	14

Table 4.1. The student sample reported gaming much less often than the gaming sample, where *infrequent* is less than 5 hours per week of play, *regular* is 5-15 hour per week of play, and *dedicated* is greater than 15 hours per week of play.

Other demographic information for the 387 participants such as race, ethnicity, or socioeconomic status were not collected to preserve anonymity.

Study Design

First, participants completed a consent form. If they were recruited from the Twitter sample, they were asked to confirm that they played games at least once per week. Participants from Twitter were also able to give their email if they wished to enter a lottery for a $20 gift card for participation. After they consented, all participants were automatically directed to a new, anonymized survey with all measures. Surveys were presented in the following order: gaming experiences, personality measures, and demographics. Participants could opt out of any measure or individual question; thus most analyses do not include the full 387 participants.

Measures

Gaming Experience

All participants answered questions about their current gaming experience. First, they were asked about the average number of hours they played per week in the past year on any device. Based on previous work (Royse et al, 2007) as well as model comparisons, gameplay frequency was divided into three ordinal categories: *infrequent* gamers who play less than 5 hours per week, *regular* gamers who play 5 to 15 hours per week, and *dedicated* gamers who play over 15 hours per week.

Participants were also asked about the devices they most frequently used to play, including phones, computers, handheld consoles, or at-home consoles. They were also asked about the style of games they played, including solo play, in-person social play, digital social play, competitive play, cooperative play, and competitive multiplayer esports.

Next, participants reported their past gaming experience. On a four-point Likert-type scale, they reported how many days per week they played games during childhood (ages 5-12) and adolescence (ages 12-18). Participants who reported gaming once per week also reported whether they had access to a game console during childhood and adolescence and about siblings in the home.

Finally, all participants reported current attitudes about gaming, including 1) their gaming enjoyment (Kazakova et al, 2014); 2) their identification with the social groups *gamers* and *esports competitors* (Tropp & Wright, 2000); 3) their video game self-efficacy (Vorderer, Hartmann, & Kilmmt, 2003); and 4) their endorsement of gender-gaming stereotypes, the video game sexism scale (VGSS; Fox & Tang, 2014).

Participants who indicated that they played competitive multiplayer games also filled a survey on negative experiences like bullying and harassment within gaming (adapted from the Negative Acts Questionnaire for the workplace; Einersan et al, 2009). This included rating how often they experienced 20 kinds of negative acts on a scale from "Never" to "Always" with an option for Not Applicable. Most items remained the same, such as, "Being shouted at or being the target of spontaneous anger" or "Spreading of gossip or rumors about you." For an example of one adjustment made to fit gaming contexts, the original item "Having key areas of responsibility removed or replaced with more trivial or unpleasant tasks" was changed to "Being given trivial or unpleasant tasks to do by others on your team."

Personality Measures

All participants filled out surveys on domain-general individual differences.

First, they filled out the Competitiveness Orientation Measure (COM; Smither & Houston, 1992). The COM has four subscales of competitiveness, including domain-general competitiveness; dominance, or needing to compete at any cost to secure one's own self-worth; competitive affectivity, or the desire for competition based on the emotional state of intensity that it brings; and personal enhancement, or desire to improve oneself through competition independent of social effects.

Next, they filled out the Systemizing and Empathizing Quotients (SQ-EQ; Baron-Cohen et al, 2003). Although the SQ and EQ are famous tools for identifying people on the autism spectrum disorder, the SQ specifically measures the drive to analyze or construct systems. The EQ measures the preference to identify others' thoughts and feelings and respond appropriately. In the original study (Baron-Cohen et al, 2003), men tended to have higher SQ scores than women and women tended to have higher EQ score than men.

Then, participants filled out the cognitive emotion regulation questionnaire (CERQ, Garnefski & Kraaij, 2006); The CERQ has items that correlate with symptoms of depression and anxiety: items representing positive reappraisal are associated with fewer symptoms and items describing rumination, catastrophizing, and self-blame correlate with more symptoms.

Finally, they completed the Collective Self-Esteem Scale which measured gender group membership (CSE; Luhtanen & Crocker, 1992). The CSE has four subscales. Membership involves feeling like a worthy member of the social group. The private subscale measures how a someone personally feels about their social group. The public subscale measures how others think of the social group. Finally, the identity subscale measures how important the social group is to a person’s self-concept. Gender non-conforming participants were instructed to fill out the CSE according to their chosen gender, not their sex assigned at birth.

Mixed Methods Measures

Participants who reported playing games at least once per week answered three open-ended questions on gaming. The first question asked about how they started gaming and who they game with presently. The second question asked what motivates them to game. The third question asked about negative experiences in gaming contexts.

Short answer questions were analyzed with a mixed methods approach. First, the researcher used a qualitative approach to identify themes emerging from the data. In other words, rather than reviewing literature and testing hypotheses about subject answers, themes were identified only after collecting and reviewing all qualitative data in aggregate. Each answer was analyzed independently of subject data, including other answers by the subject and subject demographics. Then, answers were coded for presence or absence of themes. We used logistic regression to test whether subject-level differences predicted the presence of each theme.

Demographics

Participants reported their age, gender identity, and sex assigned at birth at the end of all surveys.

Results

Model Comparisons Approach to Sex and Gender

Transgender and non-binary participants were unequally distributed between gamer and student samples. Thus, they will only be included in analyses that control for gameplay frequency. For all other cases, we used a data-driven or model comparison approach to see whether a model with sex assigned at birth or gender identity (limited to cisgender men and women) had the best fit by highest R-squared.

Access to Gaming

Probability of Console in the Home

Only participants who reported gaming once a week answered questions about console access and use of a console. Thus, the following statistics are inflated compared to the general population average of one third of households owning a game console (Nielson, 2017).

In childhood, access differs weakly based on sex: 93% (158/170) of male participants had access to a console in the home while 83% (65/78) of female participants had access (Fisher's test: OR = 2.62, 95% CI = 1.04 to 6.65, $p = .0242$).

In adolescence, access differs significantly based on gender: 95.7% (133/139) of cisgender men had access and 80.3% (53/66) of cisgender women had access (Fisher's test: OR = 5.34, CI = 1.80 to 18.23, $p = 0.001$).

Short Answer Question: How Did You Start?

For the question of entry among participants who game at least once a week, 226 answers directly described the social context in which they began gaming ("entry"). In final coding, the researcher identified 5 categories of entry: friends; parents, uncles, and aunts; siblings and cousins; whole family, including both parents and siblings; or self-discovery. Sex assigned at birth was a better predictor of entry than gender identity or the hybrid gender-sex model. Responses came from 170 male and 56 female participants.

Female and male participants had equal proportions of play with siblings (41% and 31% respectively), play with parents (21% and 11%), self-discovery (14% and 13%), and play with family (9% and 8%). However, female participants were much less likely to enter gaming through their friend groups (female rate 14.3% versus male rate 36.5%; Fisher's Exact Test: OR = 0.29, CI = 0.11 to 0.67, $p = 0.0015$).

Mode of entry did not differ by gameplay frequency.

Interest in Gaming

Systemizing Quotient (SQ)

Cisgender women who rated themselves higher on SQ had higher gaming frequencies in adulthood. Dedicated gamer women are the only group of women that reach equivalent SQ to the average man. Each main effect and the interaction were significant, with small to medium effect sizes (Whole model ANOVA: $F(5,225) = 14.43$, $p < .0001$, $R^2 = 0.18$; main effect of gender: $F = 39.78$, Partial $\eta^2 = .1205$, $p < .0001$; main effect of gaming: $F = 4.60$, Partial $\eta^2 = .0279$, $p = 0.0107$; interaction effect: $F = 5.29$, Partial $\eta^2 = .0321$, $p = 0.0055$). The EQ, or empathizing quotient, did not differ based on participant sex assigned at birth, gender identity, or gameplay frequency, despite past evidence that women score higher on the EQ.

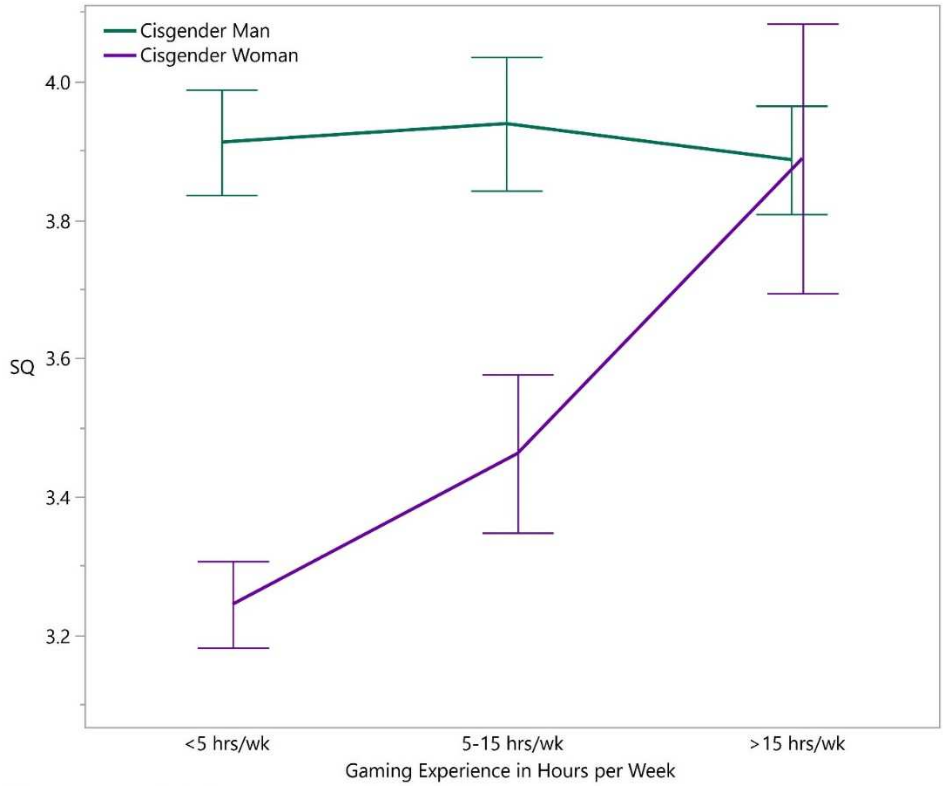

Figure 4.2 Women gamers have equivalent systemizing quotient to the average man Interaction effect of gender and gameplay frequency with systemizing quotient (SQ) or interest in analytic fields. SQ is on a scale from 1 to 6. Main effect of gender is a medium effect size while gaming frequency and interaction effects are small effect sizes.

Competitiveness

Competitiveness did not differ based on gameplay frequency or the interaction between gender and gameplay frequency. Instead, a model with just cisgender men and women was the best fit for competitiveness, rather than sex assigned at birth.

For the four subscales of the Competitiveness Orientation Measure (COM), three had meaningful differences between cisgender men and women. Men scored higher on the general competitiveness subscale ($Mean_{women}$ = 3.20, S.E. = 0.08; $Mean_{men}$ = 3.75, S.E. = 0.06; t(340) = -

5.55, $p < .0001$), the personal enhancement subscale ($Mean_{women} = 3.48$, S.E. = 0.08; $Mean_{men}$ = 3.83, S.E. = 0.06; t(340) = -3.53, p = 0.0005), and the dominance subscale ($Mean_{women} = 2.74$, S.E. = 0.08; $Mean_{men} = 2.96$, S.E. = 0.06; t(340) = -2.24, p = 0.03). We found no differences for the competitive affect subscale (overall mean = 3.2).

Probability of Using an Available Console

For children with a console in the home, console use differs significantly by sex: 99.4% (157/158) of male and 87.7% (57/65) of female participants played a console that was in their home (Fisher's Exact Test: OR = 21.7, CI = 2.81 to 978.65, p = 0.0003).

For adolescence with a console in the home, use of that console differs significantly by gender: 98.5% (131/133) of cisgender men played while 83% (44/53) of cisgender women played (Fisher's Exact Test: OR = 13.18, CI = 2.59 to 130.10, p = 0.0002).

Change in Reported Gaming Frequency from Childhood to Adolescence

Cisgender women were much more likely to reduce their gaming frequency from childhood to adolescence than cisgender men (t(335) = -3.90, S.E = 0.14, $p < .0001$). Cisgender men increased their gameplay by about half of a day on average, while cisgender women decreased their gameplay by about half a day on average.

Looking at the full spectrum of gender identity and sex assigned at birth for qualitative impressions, cisgender women are the only gender group who lower the number of days per week that they game from childhood to adolescence. Note that female participants who end up identifying as nonbinary in adulthood (n = 13) *increase* their gaming from childhood to adolescence.

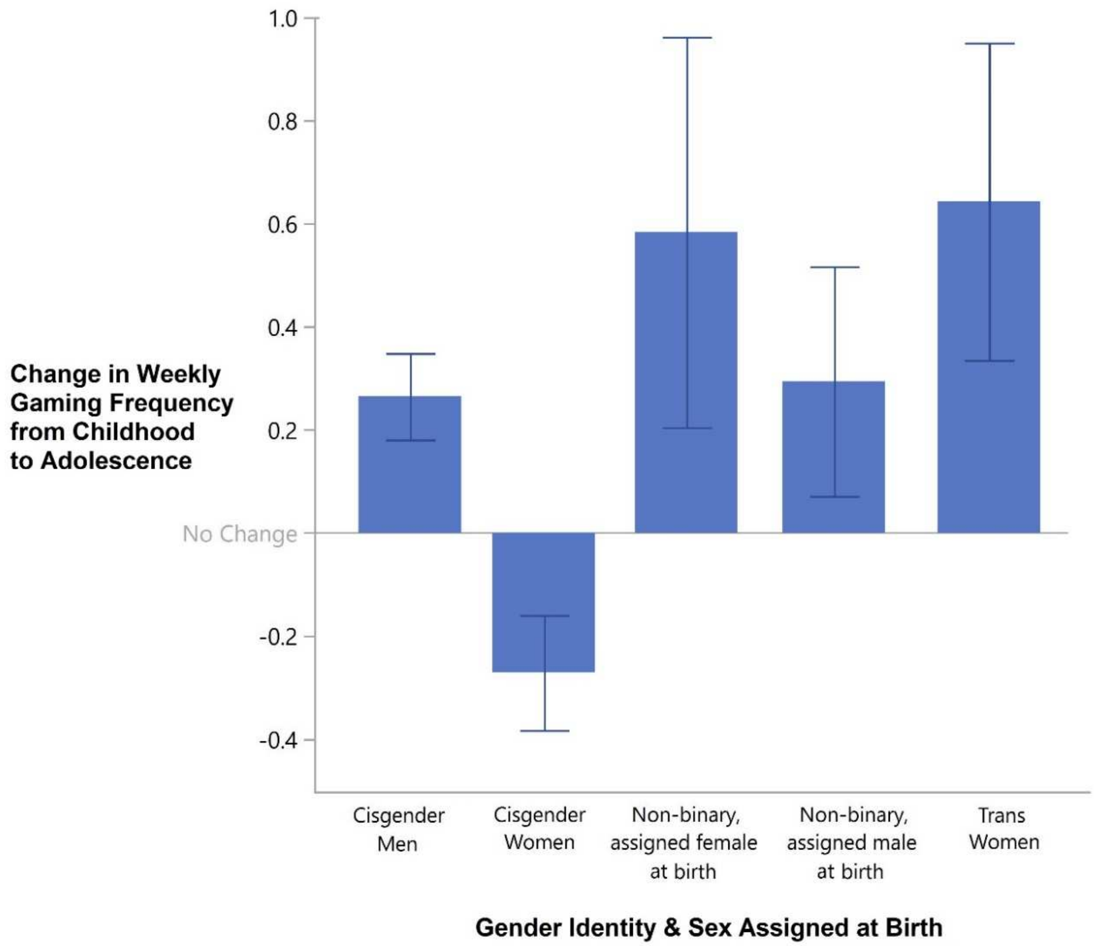

Figure 4.3 Cisgender women reduce their gaming frequency from childhood to adolescence while all other gender groups increase their gaming frequency. A change value of 0.5 indicates one day of play per week. Comparison of cisgender men and cisgender women: t(335) = -3.90, S.E = 0.14, $p < .0001$.

Furthermore, in a multiple regression together, change in gameplay frequency is moderated by gender membership esteem, or belief that one is a worthy member of their gender, for cisgender women only (Whole model ANOVA: F(3,332) = 8.95, $p < .0001$, $R^2 = 0.075$; Intercept estimate = 0.86, S.E. = 0.40, t = 2.16, p = 0.03; Gender estimate = 0.24, S.E. = 0.7, t = 3.56, p = 0.0004; CSE Membership estimate = -0.18, S.E. = 0.08, t = -2.13, p = 0.03; Interaction estimate = 0.25, S.E. = 0.08, t = 2.94, p = 0.004). Collective membership esteem is on a scale from 1 to 7 and a change value of 0.5 indicates one additional day of gaming from childhood to adolescence.

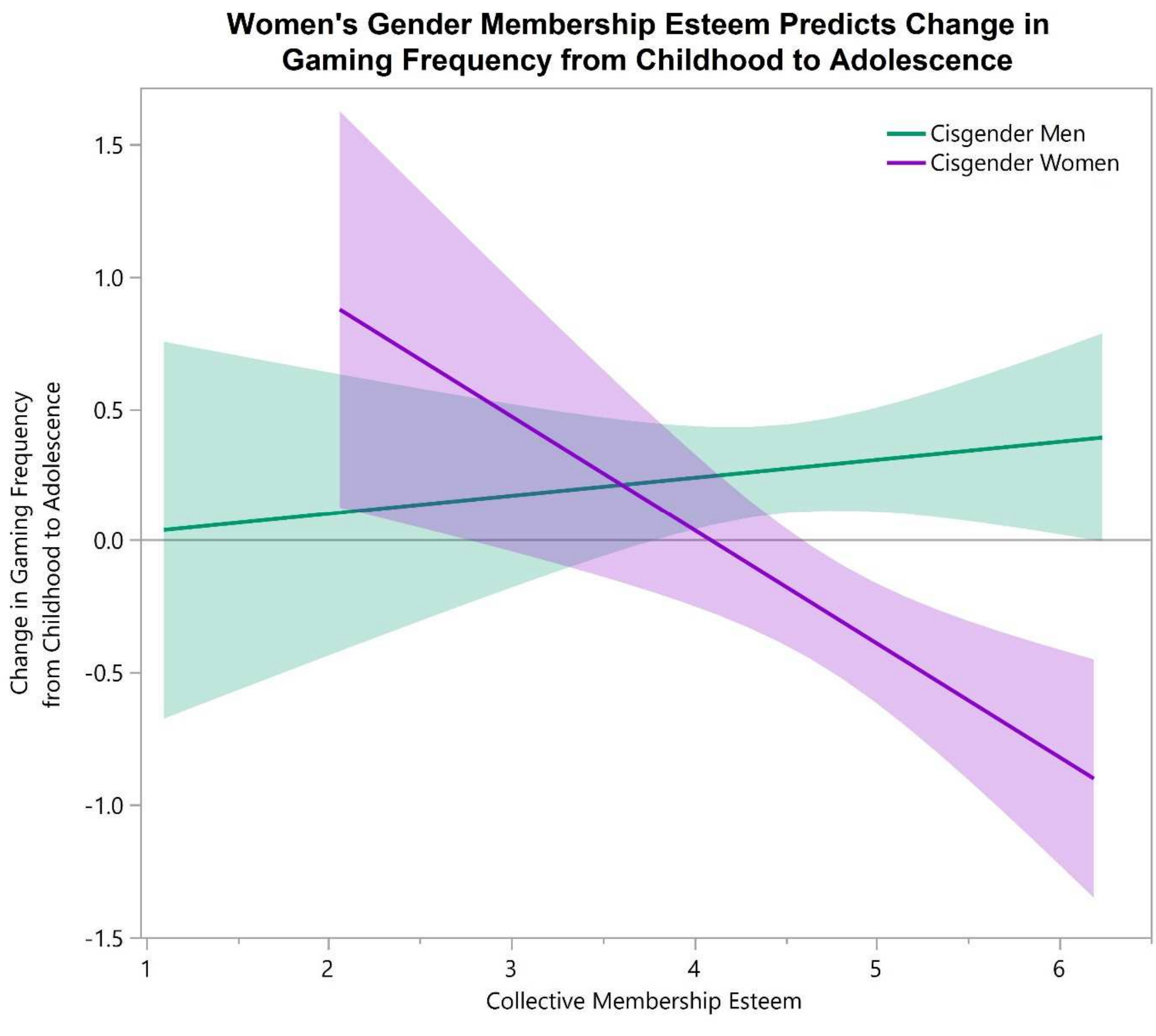

Figure 4.4 Collective membership esteem predict women's change in gaming from childhood to adolescence, but not men's change. Collective membership esteem is on a scale from 1 to 7 and a change value of 0.5 represents one additional day per week of gaming.

Experience in Gaming

Women Report More Frequent Negative Acts

Using a negative experiences scale adapted from established scales of toxic workplace environment, women who are regular or dedicated gamers report more kinds and frequency of negativity (harassment, bullying, game throwing, etc) than men who game as much. In fact, men's frequency of negative experiences in gaming does not differ based on their gameplay frequency. Both main effects of gender and gameplay frequency, as well as the interaction effect, are small effect sizes (Whole model ANOVA: $F(5, 167) = 2.3$, $p = 0.0477$, $R^2 = 0.066$; gender effect: $F = 3.48$, Partial $\eta^2 = .0210$, $p = 0.0640$; gaming effect: $F = 2.76$, Partial $\eta^2 = .0329$, $p = 0.0665$; interaction effect: $F = 6.92$, Partial $\eta^2 = .0546$, $p = 0.0106$).

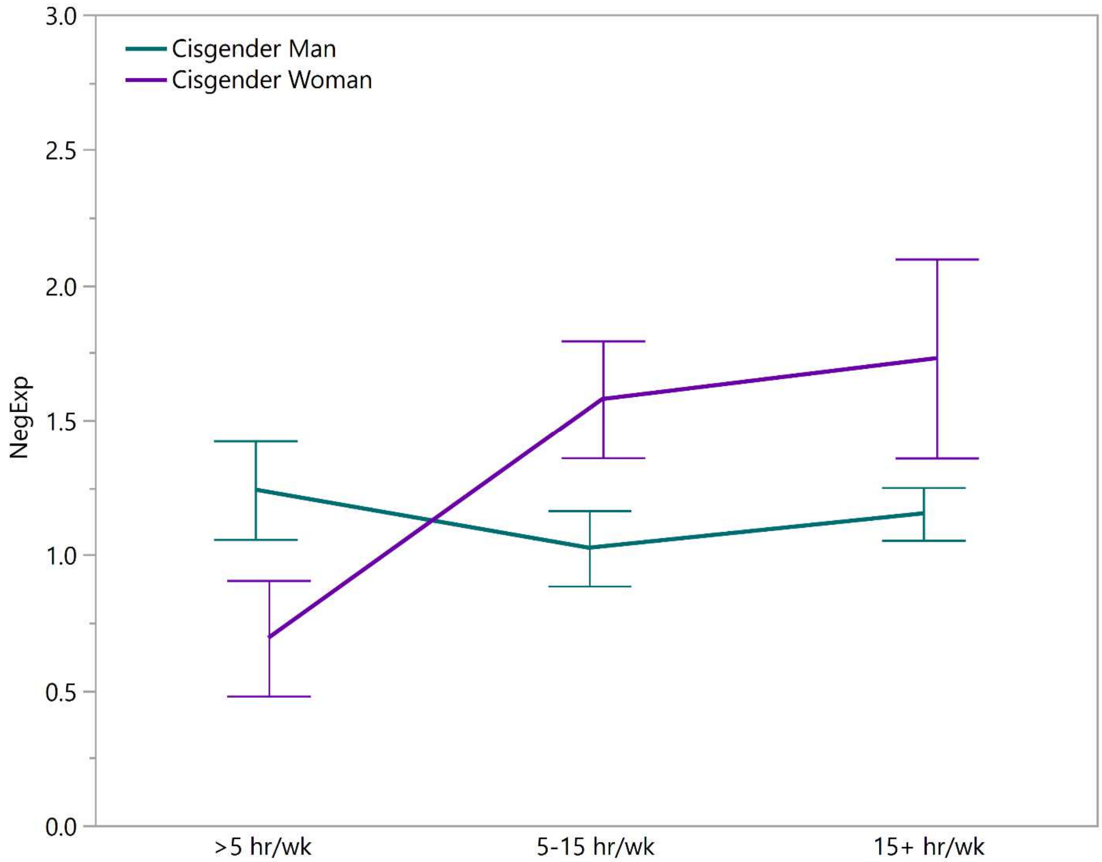

Figure 4.5 Women who game more frequently report greater number and kinds of negative experiences in gaming, while men's negative experiences do not differ based on gameplay frequency. Negative experiences are on a scale from 0 to 4.

Short Answer: Who Do You Play With?

For the question of who they gamed with, we identified five groups: friends known prior to gaming ("friends"), people met in gaming including strangers and online-only friends ("other players"), family, romantic partners, and solo gaming.

Gaming with friends was the most frequently reported mode of gaming (85%). This proportion did not differ by sex, gender identity, or gaming frequency.

Gaming with family was the next most common experience (53%). Sex assigned at birth was a significant predictor of whether a person gamed with family: Female participants mentioned family (68.7%) more often than male participants (47.3%; $\chi^2(1) = 9.43$, $p = 0.002$, $R^2 = 0.025$). Gaming with family did not differ based on gender identity or gaming frequency.

Gaming with other players was the next most common experience (38.2%). The hybrid gender-sex model predicted whether a participant mentioned other players: non-cisgender participants had the highest proportion (53.7% or 22/41) followed by cisgender men (37.9% or 66/174) and cisgender women (29.3% or 17/58; $\chi^2(2) = 6.02$, $p = 0.05$, $R^2 = 0.017$). Online friends were also more common amongst gamers who played more: infrequent gamers, 12/69 or 17.4%; regular gamers, 35/ or 43.2%; and dedicated gamers, 58/122 or 47.5% ($\chi^2(2) = 19.4$, $p < .0001$, $R^2 = 0.054$).

About one third of gamers mentioned playing alone (89/272 or 32.7%), and this did not differ by gender, sex, or gaming frequency.

Finally, few gamers mentioned playing with a romantic partner or significant other (10.7%). Female participants reported gaming with a partner (15/67 or 22.4%) more often than male participants (14/205 or 6.8%; $\chi^2(1) = 11.20$, $p = 0.0008$, $R^2 = 0.061$). Gaming with a partner did not differ by gender or gaming frequency.

Short Answer: Have You Had Negative Social Experiences in Gaming?

Participants who gamed once per week were also given the option to describe negative social experiences in gaming, including the range of negativity "from minor rudeness to criminal wrong." Participants responded both from personal experience and from what they witnessed happening to others. Of the 196 responses, 124 responses were from cisgender men, 34 were from cisgender women, and 38 were from non-cisgender participants (30 male and 8 female). For gameplay frequency, answers were given by 28 infrequent gamers (<5 hours per week), 58 regular gamers (5-15 hours per week), and 110 dedicated gamers (>15 hours per week).

The researcher identified five categories of negative experiences. Two categories were particularly distinct: first, *criminal wrong*, or any experience that could result in legal action; and second, *relationship strain* or interpersonal conflict because of the game with people they knew prior to the game. The remaining three categories were interrelated: *toxicity*, *salt,* and identity-based *othering* tended to co-occur and overlap. *Toxicity* is a common catch-all term for rudeness encountered in gaming such as sarcasm, insults, abuse of chat, or purposeful underperformance or interference to anger teammates. Depending on an individual's definition, *toxicity* could be inclusive of *salt* and *othering*. *Salt* is the specific experience of frustration, rage, or anger associated with losses or underperformance. *Othering* is inclusive of sexist, racist, and ableist slurs, jokes, and comments. While all three could be grouped into the same category of non-criminal and anonymous offensive behavior, the researcher categorized *salt* and *othering* as distinct categories because they were often listed separately from or in addition to general *toxicity*.

The most common negative experience was *toxicity* with 55% of participants having witnessed it. This is likely the most common category because of its broadness: answers including "rudeness," "verbal harassment," and "trash talk," or described the behaviors of others as "offensive," "toxic," or "inappropriate" without more specifics fell into this category. Experiences of toxicity did not differ by gender identity or sex assigned at birth, but the proportion of players experiencing toxicity increased with their gameplay frequency: gamers who played less than 5 hours per week experienced toxicity the least (8 or 28.6%), followed by gamers who played 5-15 hours per week (31 or 53.5%) and gamers who played 15+ hours per week (61.8%; $\chi^2(2) = 10.14$, $p = 0.006$, $R^2 = 0.038$).

Identity-based *othering* was the next most common experience, with 42.9% of participants having experienced sexism, racism, homophobia, or ableism. More than half of cisgender women (67.7% or 23/34) and non-cisgender participants (54.9% or 21/39) reported experiencing *othering* compared to a third of cisgender men (32.3% or 40/124; contingency table analysis: $\chi^2(2) = 16.2$, $p = 0.0003$, $R^2 = 0.06$). As with toxicity, more hours of gameplay resulted in more experiences of *othering* (less than 5 hours was 14%, between 5 and 15 was 40%, and over 15 was 52%; $\chi^2(2) = 14.5$, $p = 0.0007$, $R^2 = 0.05$).

For sexist-based *othering* specifically, over half of cisgender women mentioned sexism (64.8% or 22/34) compared to non-cisgender participants (38.5% or 15/39) or cisgender men (16% or 20/124; $\chi^2(2) = 31.33$, $p < .0001$, $R^2 = 0.132$). Note that the hybrid model is still a better fit than sex assigned at birth for the experience of sexism specifically.

For the theme of *relationship strain,* 28.6% of participants reported in similar proportions across sex, gender, and gameplay frequency.

About a quarter of participants described *salt* in themselves or other players as a negative experience in gaming (23.5%). Experiences of *salt* did not differ by number of hours played, but they were especially high in cisgender men versus cisgender women or non-cisgender participants (cisgender men, 29.8% or 37/124; non-cisgender, 12.8% or 5/39; cisgender women 11.8% or 4/34; $\chi^2(2) = 8.5$, $p = 0.015$, $R^2 = 0.040$).

For the final theme, *crime* was the least frequent experience by 16.8% of participants. The most common crime experienced was theft of personal property (13.3%), but other answers included cyberstalking, sexual assault, doxing, attempted swatting, illegal drug use at tournaments, and physical assault after a match. Experiences of crime did not vary based on gender, sex, or gameplay frequency.

Some participants (16.8% or 33) reported no negative experiences at all. About half of these participants (14) reported that they actively avoided social gaming so that they would not experience negativity. Sex assigned at birth best predicted the use of an avoidance strategy: 20.9% (9) of female participants reported actively avoiding social gaming due to anticipation of negative experiences versus 3.3% (5) of male participants (Fisher's Exact Test: OR = 6.33, CI = 1.8 to 25.4, $p = 0.001$).

Adult Gaming Outcomes

Enjoyment of Gaming

Women who game more than 5 hours per week enjoy gaming more than men, while women who game less than 5 hours per week enjoy it less than men. The main effect of gaming frequency is a medium effect size while gender and interaction effects are small effect sizes (Whole model ANOVA: $F(5,337) = 6.53$, $p<.0001$, $R^2 = 0.09$; gender effect: $F = 4.06$, Partial $\eta^2 = .0121$, $p = 0.0447$; gaming effect: $F = 11.24$, Partial $\eta^2 = .0634$, $p < .0001$; interaction effect: $F = 4.15$, Partial $\eta^2 = .0244$, $p = 0.0166$).

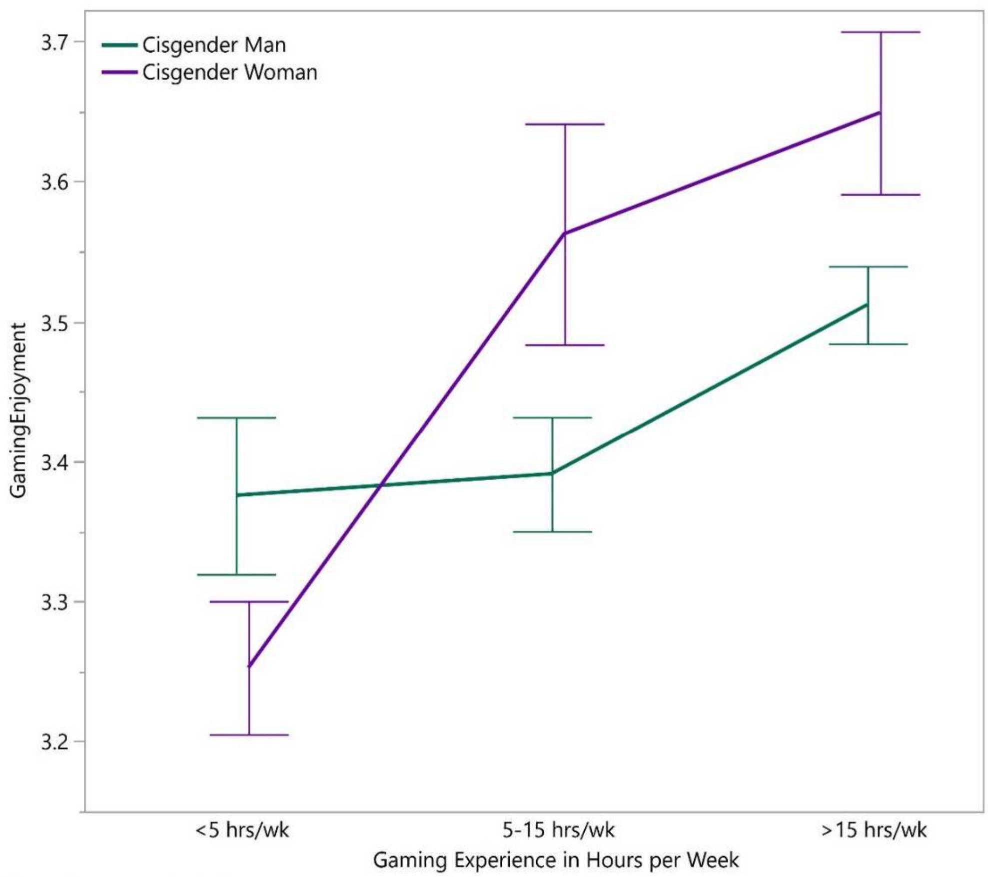

Figure 4.6 Among non-gamers, men enjoy gaming more, while among gamers, women enjoy gaming more. Enjoyment is on a scale from 1 to 5.

Gaming Self-Efficacy

Women who play games more than 5 hours per week have the same gaming self-efficacy as men, but women who game less have much lower self-efficacy than men. The main effects of gender and gaming are large effect sizes while the interaction effect is a medium effect size (Whole model ANOVA: $F(5,337) = 53.42$, $p < .0001$, $R^2 = 0.45$; gender effect: $F = 69.31$, Partial $\eta^2 = .1727$, $p < .0001$; gaming effect: $F = 54.74$, Partial $\eta^2 = .2480$, $p<.0001$; interaction effect: $F = 10.93$, Partial $\eta^2 = .0618$, $p<.0001$).

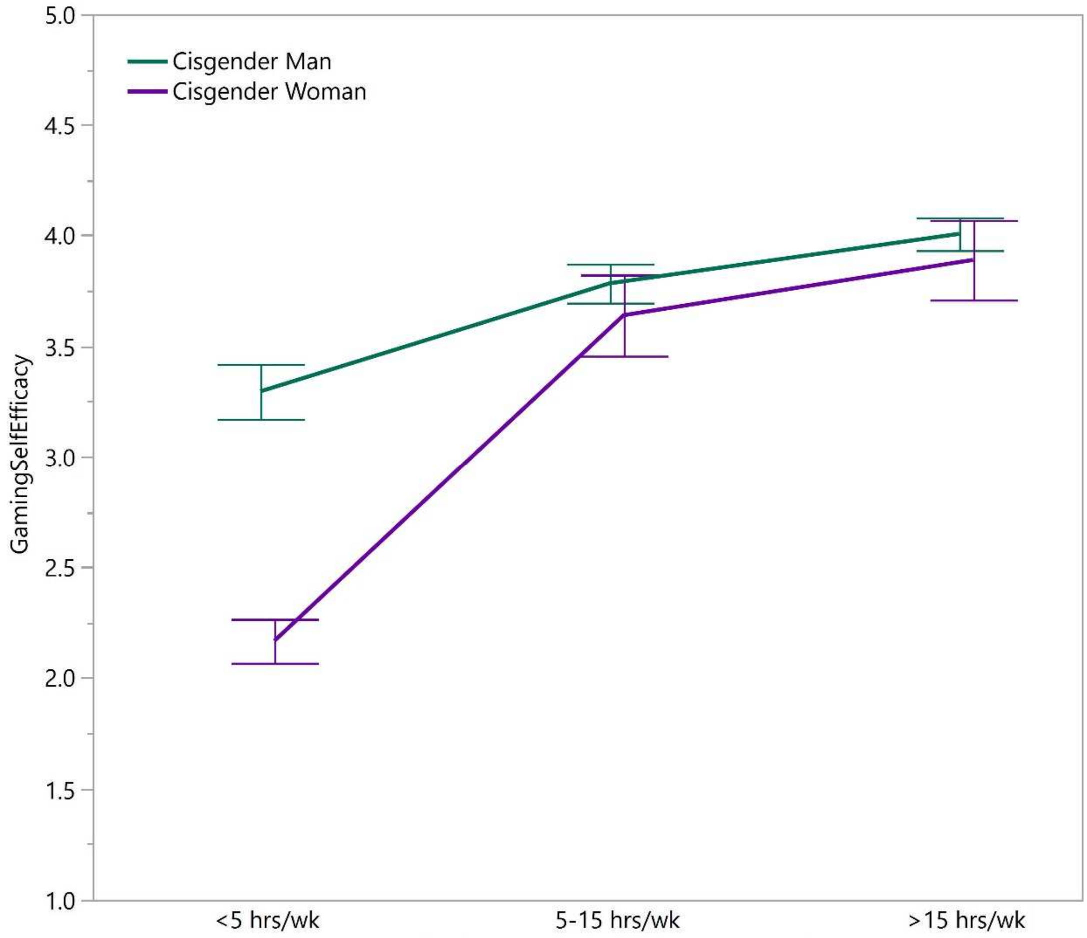

Figure 4.7 Women who game more than five hours per week have equal self-efficacy to men who game as much. Self-efficacy is on a scale from 1 to 5.

Gamer Identity

Women who play more than five hours per week identify with "gamers" as a group equally to men. The effect of gameplay frequency is large, gender is medium, and the interaction is small (Whole model ANOVA: $F(5,339) = 70.34$, $p < .0001$, $R^2 = 0.51$; gender effect: $F = 34.43$, Partial $\eta^2 = .0935$, $p < .0001$; gaming effect: $F = 100.98$, Partial $\eta^2 = .3768$, $p < .0001$; interaction effect: $F = 6.98$, Partial $\eta^2 = .0401$*, $p = 0.0011$).

However, even among high-frequency women gamers, women still don't identify with label of "esports competitor." The effect of gameplay frequency is large, the interaction effect is small, and the gender effect is non-significant (Whole model ANOVA: $F(5,336) = 29.86$, $p < .0001$, $R^2 = 0.31$; gender effect: n.s.; gaming effect: $F = 29.74$, Partial $\eta^2 = .1523$, $p < .0001$; interaction effect: $F = 3.83$, Partial $\eta^2 = .0226$, $p = 0.0227$).

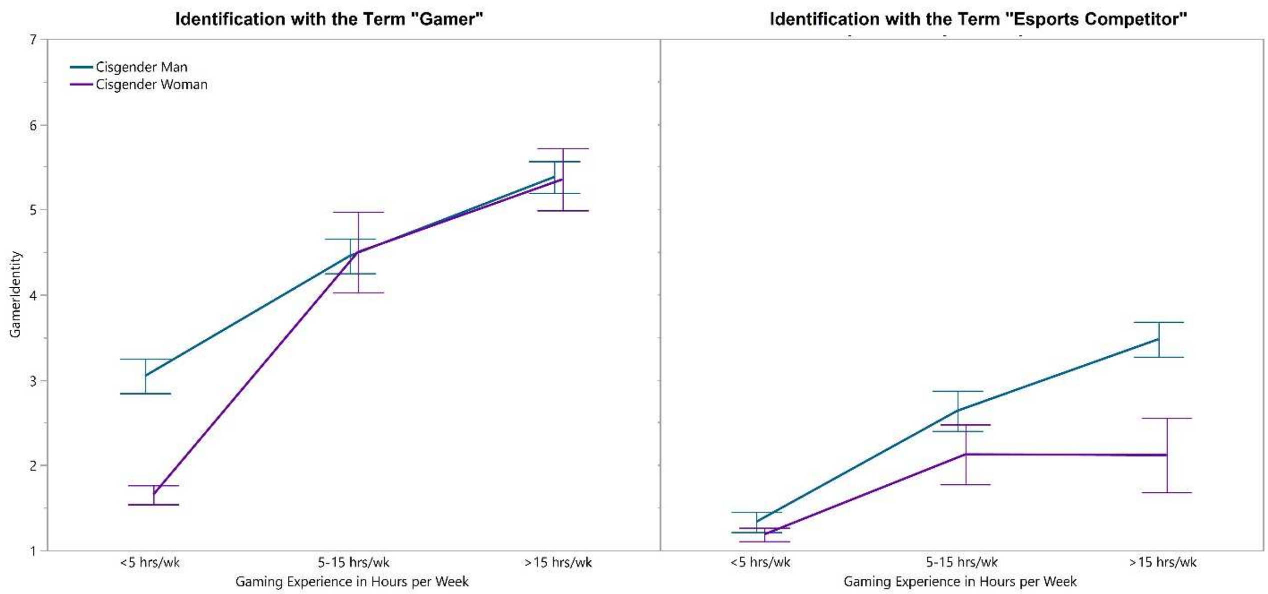

Figure 4.8 Gamer men and women identify equally with the term "gamer" but not the term "esports competitor." Each identity factor is on a scale from 1 to 7.

Gender-Gaming Stereotypes.

Gamers, women, and non-cisgender participant**s** tend to endorse fewer gender-gaming stereotypes, with no interactions. The video game sexism scale (VGSS) is on a scale from 1 to 5. The effect of gameplay frequency is medium while the effect of gender is small (Whole model ANOVA: $F(4,379) = 11.56$, $p < .0001$, $R^2 = 0.110$; gender effect: $F = 9.71$, Partial $\eta^2 = .0492$, $p < .0001$; gaming effect: $F = 13.93$, Partial $\eta^2 = .0691$. $p < .0001$).

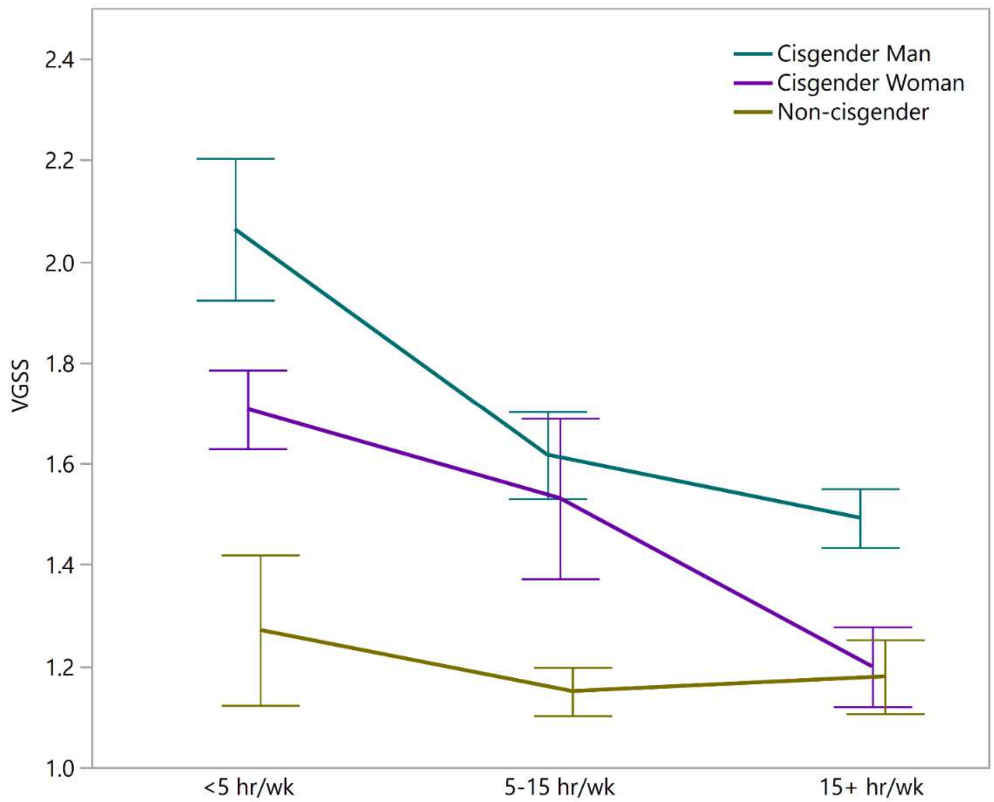

Figure 4.9 Gamers, women, and non-cisgender people endorse fewer gender-gaming stereotypes. The Video Game Sexism Scale (VGSS) is on a scale from 1 to 5.

Discussion

At every stage of gaming participation – access, interest, experience, and outcomes – we found differences based on sex ("male", "female"), gender ("women", "men", "non-binary"), and gameplay frequency. In short, our results indicate that gaming is a masculine domain thanks to multiple social forces that discourage women's participation over time.

Female Gamers Had Less Access

For access, female gamer participants reported less access than male gamer participants, both by the likelihood of encountering gaming in same-sex friendships and the presence of consoles in the home.

Women gamers were less likely to enter gaming through friends, which supports the hypothesis that gaming is a gender-appropriate peer experience for boys but not girls. Women did not have a particular alternative entry point, but rather had marginally increased probabilities of entering gaming through siblings and direct parental support.

For childhood console access, or access between the ages of five to twelve, overall console ownership was higher than the general population in the sample of gamers, but female gamers still did not have equal probability of having a console in the home. For adolescent console access, or access between the ages of thirteen and eighteen, gender identity was a better indicator of access than sex had been in childhood, which may reflect the increasing influence of an adolescent on their home environment or an additive probability of a family acquiring a console over time.

Presently, we can only speculate that parent influence drives the childhood gender difference in access and that adolescent independence reduces parental power over hobbies. Future research may benefit from direct measurements of parental attitudes and more exact surveying of the circumstances surrounding console access, rather than this study's yes or no question format about the broad developmental periods of childhood and adolescence.

Systemizing Quotient and Gender Identity Predict Women's Gameplay Frequency

Our hypothesis that women gamers would have higher SQ scores than women non-gamers was supported. In fact, dedicated women gamers were the only group who reached the average SQ scores of men. Although we cannot establish causality using surveys – after all, playing games may inspire interest in systems, or a third variable like low sociability may drive both effects – this difference supports the idea that dedicated women gamers specifically enjoy the analytic or strategic content offered by "hardcore" games.

On the other hand, our hypothesis that competitive women would game more frequently was not supported. Instead, we replicated the typical finding that men are more competitive than women regardless of gameplay frequency for either group. As will be discussed, competitive gaming and esports are inherently social games, so the costs of playing competitive games may be too high even for women who are particularly competitive.

As another measure of interest, we examined the likelihood of participants using a console that was available to them. In both childhood and adolescence, women were significantly less likely to play an available console than men. Furthermore, as gender stereotypes became more salient in adolescence, cisgender women were the only group of participants who played *less* in adolescence than childhood. This effect was moderated by gender membership: women who were on the upper half of the collective self-esteem scale, or generally agreed that they were a worthy member of their gender group, were the most likely to reduce their gaming. Whether they sacrificed a gamer identity for a feminine identity, were driven out of gaming, or simply lost interest in favor of other activities is unclear. Research on adolescent women who do and do not regularly play games may elucidate the specific causes for adolescent women's reduced gameplay.

Gender Minorities Experience Gender-Based Harassment and Limit Their Gameplay

In both quantitative analyses and mixed-methods assessment, women reported greater frequency of negative gaming experiences like harassment. Women gamers' average higher scores on the adjusted Negative Acts Questionnaire suggest that they at least "now and then" experience harassment and bullying in gaming contexts, from questioning of their competence to outright aggression. Qualitative responses about negative experiences in gaming also showed important differences: women and non-cisgender participants were much more likely to report any kind of social “othering” and especially sexism in their responses. Although it could be argued that women and non-cisgender people are more sensitive to othering based on being social minorities in gaming, appearing as a woman in gaming may objectively result in more harassment: at least one experimental study found that a woman’s voice garnered more negative comments than a man’s voice in an online multiplayer game (Kuznekoff & Rose, 2013).

Women were more likely to report gaming with family members and significant others, and less likely to game with strangers online. Women were also more likely to report active avoidance of social gaming altogether to prevent harassment. These social curation strategies, as well as the strategy of concealing gender identity, replicate previous qualitative and survey-based work (Cote, 2015; Reach3, 2021).

One unexpected finding from the question about negative gaming experiences was that men were significantly more likely to mention salt, or underperformance-based rage, in their answers. These answers included stories about both themselves and others losing their cool after a loss, shifting blame to teammates and friends, or otherwise behaving in ways that they do not outside of gaming. The experience of salt not only may reflect men’s increased competitiveness but also may be an important component of understanding gaming as a space of masculine exploration and feminine exclusion. Anger is one of the few “acceptable” forms of emotion expression under hegemonic masculinity. Even though dedicated gamer men scored significantly lower on their collective self-esteem subscale of identity, or they are less likely to say that being a man is central to who they are than a non-gamer man, they may still be limited by the social tools given to them for emotion expression and regulation. Future studies on the experience of salt could elucidate why men experience it more and may explain some of the negativity that women face in social gaming.

Adult Outcomes for Gamer Women

For the outcomes of gaming self-efficacy and gamer identification, our results were as expected: regular and dedicated women gamers had equivalent self-efficacy and identification to regular and dedicated men gamers. In other words, women who have survived the "filtering" effects of stereotypes on access, interest, and experience are likely the most confident and comfortable in gaming spaces. To our surprise, women gamers had increased enjoyment of games compared to men gamers. If women must make a cost-benefit analysis of gaming participation, this finding makes sense: women who remain in gaming do so because they particularly enjoy it, enough to put up with gender-based harassment or other social friction from defying gender norms. Alternatively, gaming is such an integral activity to male socializing that men may play frequently for the social benefits despite moderate enjoyment of the activity itself.

However, the results for self-efficacy, identification, and enjoyment for non-gamer participants drive home the reality of gender-gaming stereotyping. Although non-gamer men had significantly lower self-efficacy than gamer men, they still scored significantly higher than non-gamer women. That is, non-gamer men have more gaming confidence and more easily relate to the label of gamer than non-gamer women, even though they do not play much. In terms of the identification of non-gamer men, their masculinity may allow them to partially relate to other gamers – or, perhaps, women's femininity prevents them from identification with the label of gamer or having confidence in their gaming abilities at all.

Finally, for the issue of gender-gaming stereotype endorsement, we found a main effect of gender as predicted: women were less likely to endorse sexist gaming stereotypes than men across the board. However, we were surprised to find a main effect of gameplay frequency. While it makes sense for regular and dedicated women gamers to endorse fewer gender-gaming stereotypes – they are the proof of the opposite, after all – men who played more frequently were also less likely to endorse gender-gaming stereotypes. One explanation may be that the more a man plays, the more likely he is to encounter women gamers and re-evaluate negative stereotypes about them. Another explanation could be that gamers are less likely to endorse negative stereotypes about other gamers, even women gamers. Or perhaps the most dedicated gamers are also the youngest, who have grown up in an increasingly diversified gaming world.

Esports as a Niche, Hyper-Masculine Domain Among Gamers?

The finding that even dedicated women gamers do not relate to the label of "esports competitor" suggests that esports is qualitatively different from other forms of dedicated gaming. Due to population-level differences in competitiveness that were replicated in this study, esports may be a particularly masculinized field within the already male-dominated hobby of gaming. Alternatively, esports are social games by necessity because they are competitions, and women gamers in this study were significantly more likely to avoid social gaming than men in this sample due to anticipated harassment. Due to the low numbers of women in esports (Nolla et al, under review), qualitative rather than quantitative work on women esports competitors compared to dedicated women gamers of other genres could explain why dedicated women gamers are less likely to identify as esports players.

Results for Transgender and Non-binary Subjects

Due to our sampling procedures, most non-cisgender subjects were recruited online (39 subjects) rather than through student class participation (6 subjects). Online participants were required to play games at least once a week to access the study, so naturally, our transgender and non-binary subjects have very high average gameplay frequency. In several findings for which gender identity was a significant predictor, interaction effects for non-cisgender participants were obscured by their high rates of gaming – for example, 42 of 42 non-cisgender participants with access to a console played it in adolescence. However, qualitative work with transgender and non-binary gamers could identify whether gaming is attractive in part due to the possibility of gender exploration.

The only finding about non-cisgender participants that controlled for gameplay frequency and found an effect was their low endorsement of gender-gaming stereotypes. Non-cisgender participants were the least likely to endorse gender-gaming stereotypes regardless of their own gameplay frequency, which may reflect their own experience with and interrogation of gender stereotypes.

Conclusion

This study replicates known unequal outcomes in gaming based on gender such as women's lower gaming self-efficacy and lower frequency of gameplay. Our novel contribution is that access, interest, and experience differences in men and women each explain existing gender-gaming inequalities. Our work suggests that women are kept out of gaming or limited in their participation at every turn by specific, changeable social forces. Future work may explain some unclear effects, such as the role of identity exploration in transgender and non-binary participants' gameplay or the unique deidentification of dedicated gamer women with esports. Likewise, future empirical work may answer important remaining questions, such as identifying the source of men's low gender-gaming stereotype endorsement, explaining gamer men's frequent experiences with underperformance-induced rage, or determining whether parents' gender attitudes affect the likelihood that they will buy their children a game console. In the following chapter, we will address potential interventions to reduce the gender-gaming participation and performance gaps.

Chapter 5

Conclusions

"I went over to my friend's house to play Call of Duty and Halo and I remember not being told how to do ANYTHING in the game. I felt really humiliated too because I was the only non-male member of the group and I could feel the differences between us."

-A woman subject reflecting on negative experiences in gaming

Across these studies, results have demonstrated that women have different experiences with games at every stage of involvement. This conclusion will not only summarize findings but discuss implications for the future of the games industry.

This dissertation began with a field study of competitive gamers at national tournaments. Previous work and player anecdotes suggest that emotion regulation could influence expertise expression such as when a player "chokes" under pressure. Indeed, higher anxiety was associated with lower performance at the match level while on the person level, anxiety-producing emotion regulation strategies were associated with worse performance.

Due to interest in statistical comparisons of the competitive experience of gender minorities, the first author actively recruiting gender minorities into the study to explore how gender-based anxiety may affect competition as well – even though by author estimates, feminine-presenting people make up less than 5% of competitors. Although the study did not have sufficient data for match-level or within-person analyses, gender minorities differed from cisgender men in the relationship between domain-general and domain-specific emotion regulation: gender minorities rated themselves very poorly on emotion regulation during Smash competition despite average ratings of their domain-general regulation.

Because gender minorities in esports have already had a variety of experiences that could contribute to beliefs of poor emotion regulation, the next study focused on one of the earliest formal points in a player's involvement in esports: their first competitive tournament. In the second study, women college students who had played *Smash* but never formally competed underwent training sessions and tournaments in either women-only or mixed-gender cohorts. Compared to the women in women-only conditions, the women in mixed-gender conditions seemed to be experiencing stereotype threat: they had higher anxiety levels at the end of the tournament, reported less investment in their play after the tournament, estimated their skill to be weaker than their actual performance, and most importantly, they underperformed against men and not against other women. These women were competing against men that they had been told were equally unskilled, yet gender still affected their experience and expectations of competitive gaming. Clearly, gender-gaming stereotypes are salient and define expectations much earlier than a woman's first competitive experience in esports.

The next study surveyed a sample of students and a sample of self-identified gamers to identify when gender-gaming differences begin and how they impact adult gaming outcomes. Surveys measured childhood, adolescent, and adult experiences with gaming; current attitudes toward and experiences in gaming; and domain-general personality variables with known gender differences such as competitiveness and systemizing interests. We compared these variables to adult gaming frequency, predicting that gender minorities would differ from cisgender men not only in their adult gaming frequency, but also in their access, interest, and experience in gaming throughout their lives.

Through both quantitative survey analyses as well as mixed methods analyses of open-ended short answer questions, we confirmed the hypotheses that gaming access, interest, and experience differ by sex assigned at birth as well as gender identity. In terms of access, female participants were less likely to have a console in their homes growing up and they also were less likely to discover gaming through their same-age peers compared to male participants. In terms of interest, cisgender women were the only group to lose interest in gaming from childhood to adolescence, and the higher their gender membership, the more interest they lost; in comparison, cisgender men and each group of non-cisgender participants became more interested over the same period. Cisgender women's interest in systems also predicted their gameplay frequency with dedicated women gamers having equivalent systemizing quotients to cisgender men of all gameplay frequencies. For experience, women gamers reported greater frequency of in-game bullying and harassment in quantitative measures as well as more frequent experiences of othering, especially sexism, in qualitative answers. Women were more likely to report gaming with family and significant others than men, and less likely than men to report gaming with strangers; similarly, women gamers were more likely to avoid multiplayer games due to anticipation of harassment. Finally, for adult outcomes, cisgender women who game at least five hours per week have equivalent self-efficacy and gamer identification to cisgender men, yet they have higher enjoyment. Non-gamer men and women especially differ in self-efficacy beliefs, gamer identification, and enjoyment. Non-cisgender participants, women, and gamers all tend to endorse the fewest gender-gaming stereotypes. For the question of esports, even dedicated women gamers do not relate to the identity of "esports competitor" despite identifying as a "gamer."

The underrepresentation of women in esports observed in the first study of the dissertation is clearly caused by multiple social factors: stereotyping affects women's gaming experiences from childhood, where they may never even encounter the hobby, to adulthood, where they experience more negative acts even after hundreds of hours of play. Likewise, solutions to gender-gaming inequality will need to happen at multiple developmental time points and at multiple structural levels.

At the systems level, game companies can begin by changing their advertising: by increasing women's representation and relatability on games covers and in game content, both players and parents may begin to see gaming as accessible to women and girls (Cheryan et al, 2015). With more girls playing games, gaming will more easily spread within girls' peer groups as it does within boys' peer groups. As evidenced in adult men players, social motives beyond basic enjoyment can be a powerful reason to remain in gaming, so if women are gaming with their friends, they are likely gaming more and for longer (Johnson et al, 2015). In terms of increasing women's performance, social discussions around gaming can also result in strategy shifts that improve performance compared to solo training (Moon et al, 2013; Prislin et al, 1996).

At the same time, increased representation of women characters as well as women players will allow girls to find role models in games and envision themselves as belonging in gaming spaces (Morgenroth et al, 2015; Uszkoreit, 2018). Increased representation of women players will also influence the stereotypes held by all because an equal gender ratio demonstrates that women can succeed in the social role of "gamer" (Bosak et al, 2012) – which, on the physical and brain-based levels of expertise, is entirely possible.

Leadership in gaming spaces, whether in game companies or local gaming communities, can take responsibility for moderating sexist and negative behaviors in multiplayer games to increase retention of women. Effective moderation will also increase the visibility of existing women gamers, as they may not feel like they need to hide their identities to play. Additionally, community organizers can create women-only tournaments or other women-only spaces so that women players have places where they can build networks of support, catch up on total gaming hours if they began gaming later in life than the average man, and play without threat (for similar findings in other domains, see Frietag et al, 2012; Kirton & Healy, 2004; Rommes et al, 2005).

Small-scale educational initiatives among or by individual women could also alleviate the effects of stereotype threat. If women are aware that their increased anxiety during competition is a natural result of being a numeric minority and has nothing to do with their essential ability, they are less likely to internalize that being a girl makes them an inherently worse competitor. Additionally, women may benefit from reassurance that they may have had different life experiences with gaming, so it's okay if they're not the best gamer in the room, they are still fully capable of being a skilled gamer if they want to be.

Since the global pandemic of COVID-19 altered in-person access to socializing, many people have begun to see video games differently: as a social activity rather than a loner's fixation and as an opportunity for relaxation instead of a trigger of aggression. Presently, we have the unique historical opportunity to rethink the definition of a "gamer" and perhaps expand it to include and uplift women and other gender minorities who have not previously fit the masculine stereotype. With awareness of the many and multiplicative causes of gender-gaming disparities, we can move forward towards change.

References

Acosta, D. I., Polinsky, N. J., Haden, C. A., & Uttal, D. H. (2021). Whether and How Knowledge Moderates Linkages between Parent–Child Conversations and Children's Reflections about Tinkering in a Children's Museum, Journal of Cognition and Development, 22:2, 226-245, DOI: 10.1080/15248372.2020.1871350

Almog, R., & Kaplan, D. (2017). The nerd and his discontent: The seduction community and the logic of the game as a geeky solution to the challenges of young masculinity. *Men and Masculinities*, *20*(1), 27-48.

Alt, N. P., Goodale, B., Lick, D. J., & Johnson, K. L. (2019). Threat in the company of men: ensemble perception and threat evaluations of groups varying in sex ratio. *Social Psychological and Personality Science*, *10*(2), 152-159.

Ammons, R. B. (1956). Effects of knowledge of performance: A survey and tentative theoretical formulation. *The Journal of general psychology*, *54*(2), 279-299.

Anderson, M. (2004). Sex differences in general intelligence. In R. L. Gregory (Ed.), The Oxford companion to the mind. Oxford, UK: Oxford University Press.

Balliet, D., Li, N. P., Macfarlan, S. J., & Van Vugt, M. (2011). Sex differences in cooperation: A meta-analytic review of social dilemmas. *Psychological Bulletin, 137*(6), 881-909.

Balk, Y. A., Adriaanse, M. A., de Ridder, D. T. D., & Evers, C. (2013). Coping under Pressure: Employing Emotion Regulation Strategies to Enhance Performance under Pressure. *Journal of Sport and Exercise Psychology, 35*(4), 408-418. doi.org/10.1123/jsep.35.4.408

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, 28: 117–148.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Macmillan.

Baron-Cohen, S., Richler, J., Bisarya, D., Gurunathan, N., & Wheelwright, S. (2003). The systemizing quotient: an investigation of adults with Asperger syndrome of high-functioning autism, and normal sex differences. *Philosophical Transactions of the Royal Society London. 358*, 361-374. **https://doi.org/10.1098/rstb.2002.1206**

Baumeister, R. F., Twenge, J. M., & Nuss, C. K. (2002). Effects of social exclusion on cognitive processes: anticipated aloneness reduces intelligent thought. *Journal of personality and social psychology*, *83*(4), 817.

Bedyńska, S., Krejtz, I., & Sedek, G. (2018). Chronic Stereotype Threat Is Associated With Mathematical Achievement on Representative Sample of Secondary Schoolgirls: The Role of Gender Identification, Working Memory, and Intellectual Helplessness. *Frontiers in psychology*, *9*, 428. https://doi.org/10.3389/fpsyg.2018.00428

Behm-Morawitz, E., & Mastro, D. (2009). The effects of the sexualization of female video game characters on gender stereotyping and female self-concept. *Sex roles*, *61*(11-12), 808-823.

Beilock, S. L., & Carr, T. H. (2005). When high-powered people fail: Working memory and "choking under pressure" in math. *Psychological science*, *16*(2), 101-105.

Beilock, S. L., Jellison, W. A., Rydell, R. J., McConnell, A. R., & Carr, T. H. (2006). On the causal mechanisms of stereotype threat: Can skills that don't rely heavily on working memory still be threatened?. *Personality and Social Psychology Bulletin*, *32*(8), 1059-1071. https://doi.org/10.1177/0146167206288489

Beilock, S. L., & McConnell, A. R. (2004). Stereotype threat and sport: Can athletic performance be threatened?. *Journal of Sport and Exercise Psychology*, *26*(4), 597-609. https://doi.org/10.1123/jsep.26.4.597

Bem, S. L. (1981). Gender schema theory: A cognitive account of sex typing. *Psychological review*, *88*(4), 354.

Blair, C. (2006). Toward a revised theory of general intelligence: Further examination of fluid cognitive abilities as unique aspects of human cognition. *Behavioral and Brain Sciences*, *29*(2), 145-153.

Boot, W. R., Kramer, A. F., Simons, D. J., Fabiani, M., & Gratton, G. (2008). The effects of video game playing on attention, memory, and executive control. *Acta psychologica*, *129*(3), 387-398. https://doi.org/10.1016/j.actpsy.2008.09.005

Boot, W. R., Sumner, A., Towne, T. J., Rodriguez, P., & Anders Ericsson, K. (2017). Applying aspects of the expert performance approach to better understand the structure of skill and mechanisms of skill acquisition in video games. *Topics in cognitive science*, *9*(2), 413-436. **https://doi.org/10.1111/tops.12230**

Born, J., Kern, W., Fehm□Wolfsdorf, G., & Fehm, H. L. (1987). Cortisol effects on attentional processes in man as indicated by event□related potentials. *Psychophysiology*, *24*(3), 286-292.

Bosak, J., Sczesny, S., & Eagly, A. H. (2012). The impact of social roles on trait judgments: A critical reexamination. *Personality and Social Psychology Bulletin*, *38*(4), 429-440.

Broadbent, D., & Broadbent, M. (1988). Anxiety and attentional bias: State and trait. *Cognition & Emotion*, *2*(3), 165-183.

Brooks, A. W. (2013). Worry at work: How state anxiety influences negotiations, advice, reappraisal, and performance.

Burgess, M. C., Stermer, S. P., & Burgess, S. R. (2007). Sex, lies, and video games: The portrayal of male and female characters on video game covers. *Sex roles*, *57*(5-6), 419-433.

Bussey, K., & Bandura, A. (1999). Social cognitive theory of gender development and differentiation. *Psychological review*, *106*(4), 676.

Byron, K., & Khazanchi, S. (2011). A meta-analytic investigation of the relationship of state and trait anxiety to performance on figural and verbal creative tasks. *Personality and Social Psychology Bulletin*, *37*(2), 269-283.

Chase, W. G., & Simon, H. A. (1973). Perception in chess. *Cognitive psychology*, *4*(1), 55-81.

Chen, J. M., & Moons, W. G. (2015). They won't listen to me: Anticipated power and women's disinterest in male-dominated domains. *Group Processes & Intergroup Relations*, *18*(1), 116-128.

Cheryan, S., Plaut, V. C., Davies, P. G., & Steele, C. M. (2009). Ambient belonging: how stereotypical cues impact gender participation in computer science. *Journal of personality and social psychology*, *97*(6), 1045.

Cheryan, S., Master, A., & Meltzoff, A. N. (2015). Cultural stereotypes as gatekeepers: Increasing girls' interest in computer science and engineering by diversifying stereotypes. *Frontiers in Psychology, 6*(49). doi:10.3389/fpsyg.2015.00049.

Christensen, R. H. B. (2015). A Tutorial on fitting Cumulative Link Mixed Models with clmm2 from the ordinal Package. *The comprehensive R archive network. R Foundation for Statistical Computing, Vienna. Available online at https://cran. r-project. org/web/packages/ordinal/vignettes/clmm2_tutorial. Pdf*

Cote, A. C. (2015). "I can defend myself": Women's strategies for coping with harassment while gaming online. *Games and Culture*. doi:10.1177/1555412015587603.

Coutrot, A., Silva, R., Manley, E., de Cothi, W., Sami, S., Bohbot, V. D., Wiener, J.M., Hölscher, C., Dalton, R. C., Hornberger, M., and Spiers, H. J. (2018). Global Determinants of Navigation Ability. *Current Biology, 28*(17), 2861-2866. doi: 10.1016/j.cub.2018.06.009.

Darvin, Lindsey. (March 2021). "At colleges nationwide, esports teams dominated by men." *The Conversation. https://theconversation.com/at-colleges-nationwide-esports-teams-dominated-by-men-154793*

DeCaro, M. S., Thomas, R. D., Albert, N.B., & Beilock, S. L. (2011). Choking Under Pressure: Multiple Routes to Skill Failure. *Journal of Experimental Psychology: General, 140*(3), 390-406.

Del Cuidice, M., Ellis, B. J., & Shirtcliff, E. A. (2011). The Adaptive Calibration Model of stress responsivity. *Neuroscience and Biobehavioral Reviews, 35*, 1562-1592.

Denson, T. F., Creswell, J. D., Terides, M. D., & Blundell, K. (2014). Cognitive reappraisal increases neuroendocrine reactivity to acute social stress and physical pain. *Psychoneuroendocrinology*, *49*, 69-78. https://doi.org/10.1016/j.psyneuen.2014.07.003

Dill, K. E., & Thill, K. P. (2007). Video game characters and the socialization of gender roles: Young people's perceptions mirrorsexist media depictions. *Sex Roles, 57*(11–12), 851–864. doi:10.1007/s11199-007-9278-1.

Downs, E., & Smith, S. L. (2010). Keeping abreast of hypersexuality: A video game character content analysis. *Sex roles*, *62*(11-12), 721-733.

Duda, J. L. (1989). Relationship between task and ego orientation and the perceived purpose of sport among high school athletes. *Journal of sport and exercise psychology*, *11*(3), 318-335.

Duda, J. L. (2005). Motivation in sport. *A handbook of competence and motivation*, *318*, 335.

Duda, J. L., & Hall, H. (2001). Achievement goal theory in sport: Recent extensions and future directions. *Handbook of sport psychology*, *2*, 417-443.

Duda, J. L., & Nicholls, J. G. (1992). Dimensions of achievement motivation in schoolwork and sport. *Journal of educational psychology*, *84*(3), 290.

Dweck, C. S. (2013). *Self-theories: Their role in motivation, personality, and development*. Psychology press.

Einarsen, S., Hoel, H., & Notelaers, G. (2009). Measuring exposure to bullying and harassment at work: Validity, factor structure and psychometric properties of the Negative Acts Questionnaire-Revised. *Work & stress*, *23*(1), 24-44.

Entertainment Software Association. (2019). 2019 Sales, Demographic, and Usage Data. *Essential facts abotu the computer and video game industry.* Retrieved from: https://www.theesa.com/esa-research/2019-essential-facts-about-the-computer-and-video-game-industry/

Entertainment Software Association. (2020). *2020 Essential Facts about the Video Game Industry. https://www.theesa.com/resource/2020-essential-facts/*

Entertainment Software Association. (2021). *2021 Essential Facts about the Video Game Industry. https://www.theesa.com/resource/2021-essential-facts-about-the-video-game-industry/*

Esports Earnings. *Top 100 Highest Overall Earnings.* Retrieved July 2021. https://www.esportsearnings.com/players/highest-overall

Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: attentional control theory. *Emotion*, *7*(2), 336. http://dx.doi.org/10.1037/1528-3542.7.2.336

Fabes, R. A., Martin, C. L., & Hanish, L. D. (2003). Young children's play qualities in same□, other□, and mixed□sex peer groups. *Child Development, 74, 921 – 932. doi: 10.1111/1467□8624.00576*

Fox, J., & Tang, W. Y. (2014). Sexism in online video games: The role of conformity to masculine norms and social dominance orientation. *Computers in Human Behavior*, *33*, 314-320. https://doi.org/10.1016/j.chb.2013.07.014

Freitag D., Hofstätter B., Thaler A. (2012) Women-only Engineering Education – a Promising Austrian Model Initiative. In: Béraud A., Godfroy AS., Michel J. (eds) GIEE 2011: Gender and Interdisciplinary Education for Engineers. SensePublishers, Rotterdam. https://doi.org/10.1007/978-94-6091-982-4_22

Gaillard, A., Fehring, D. J., & Rossell, S. L. (2021). A systematic review and meta□analysis of behavioural sex differences in executive control. The European Journal of Neuroscience, 53(2), 519–542. https://doi.org/10.1111/ejn.14946

Garnefski, N., & Kraaij, V. (2006). Cognitive emotion regulation questionnaire – development of a short 18-item version (CERQ-short). *Personality and Individual Differences,* 41, 1045-1053.

Garnefski, N., Kraaij, V., & Spinhoven, P. (2002). Manual for the use of the Cognitive Emotion Regulation Questionnaire. *Leiderdorp, The Netherlands: DATEC*.

Gellatly, I. R., & Meyer, J. P. (1992). The effects of goal difficulty on physiological arousal, cognition, and task performance. *Journal of Applied Psychology*, *77*(5), 694. http://dx.doi.org.turing.library.northwestern.edu/10.1037/0021-9010.77.5.694

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of psychopathology and behavioral assessment*, *26*(1), 41-54. https://doi.org/10.1023/B:JOBA.0000007455.08539.94

Greenberg, B. S., Sherry, J., Lachlan, K., Lucas, K., & Holmstrom, A. (2010). Orientations to Video Games Among Gender and Age Groups. *Simulation & Gaming*, *41*(2), 238–259. https://doi.org/10.1177/1046878108319930

Gröpel, P., & Mesagno, C. (2017). Choking interventions in sports: A systematic review. *International Review of Sport and Exercise Psychology*, 1-26. https://doi.org/10.1080/1750984X.2017.1408134

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology*, *39*(3), 281-291.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of personality and social psychology*, *85*(2), 348. http://dx.doi.org/10.1037/0022-3514.85.2.348

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2012). The role of parents and teachers in the development of gender-related math attitudes. *Sex roles*, *66*(3-4), 153-166.

Inzlicht, M., & Kang, S. K. (2010). Stereotype threat spillover: how coping with threats to social identity affects aggression, eating, decision making, and attention. *Journal of personality and social psychology*, *99*(3), 467.

Ip, B., & Jacobs, G. (2005). Segmentation of the games market using multivariate analysis. *Journal of Targeting, Measurement and Analysis for Marketing, 13*, 275–287. doi:10.1057/palgrave.jt.5740154.

Ireland, M. J., Clough, B. A., & Day, J. J. (2017). The cognitive emotion regulation questionnaire: factorial, convergent, and criterion validity analyses of the full and short versions. *Personality and Individual Differences*, *110*, 90-95. https://doi.org/10.1016/j.paid.2017.01.035

Jewell, J. A., & Brown, C. S. (2014). Relations among gender typicality, peer relations, and mental health during early adolescence. *Social Development*, *23*(1), 137-156.

Johns, M., Inzlicht, M., & Schmader, T. (2008). Stereotype threat and executive resource depletion: Examining the influence of emotion regulation. *Journal of Experimental Psychology: General*, *137*(4), 691. http://dx.doi.org.turing.library.northwestern.edu/10.1037/a0013834

Johnson, D., Gardner, J., & Sweetset, P. (2016). Motivations for videogame play: Predictors of time spent playing. *Computers in Human Behavior 63*, 805-812.

Jones, M. C. & Pewsey, A. (2009). Sinh-arcsinh distributions. *Biometrics*, 96(4), 761-780. Retrieved from http://www.jstor.org/stable/27798865

Jungert, T., Hubbard, K., Dedic, H., & Rosenfield, S. (2019). Systemizing and the gender gap: examining academic achievement and perseverance in STEM. *European Journal of Psychology of Education*, *34*(2), 479-500.

Kaye, L. K., & Pennington, C. R. (2016). "Girls can't play": The effects of stereotype threat on females' gaming performance. *Computers in Human Behavior*, *59*, 202-209. https://doi.org/10.1016/j.chb.2016.02.020

Kaye, L. K., Pennington, C. R., & McCann, J. J. (2018). Do casual gaming environments evoke stereotype threat? Examining the effects of explicit priming and avatar gender. *Computers in Human Behavior*, *78*, 142-150. https://doi.org/10.1016/j.chb.2017.09.031

Kahn, A., Ratan, R., & Williams, D. (2014). Why we distort in self-report: Predictors of self-report errors in video game play. *Journal of Computer-Mediated Communication, 19*(4), 1010–1023. doi:10.1111/jcc4.12056.

Kazakova, S., Cauberghe, V., Pandelaere, M., & De Pelsmacker, P. (2014). Players' expertise and competition with others shape the satisfaction of competence needs, gaming gratifications, and contingent self-esteem in a gaming context. *Cyberpsychology, Behavior, and Social Networking*, *17*(1), 26-32.

Keltner, D., Capps, L., Kring, A. M., Young, R. C., & Heerey, E. A. (2001). Just teasing: a conceptual analysis and empirical review. *Psychological bulletin*, *127*(2), 229.

Kim, M. M. (2002). Cultivating intellectual development: Comparing women-only colleges and coeducational colleges for educational effectiveness. *Research in Higher Education*, *43*(4), 447-481.

Kirton, G., & Healy, G. (2004). Shaping union and gender identities: a case study of women only trade union courses. *British Journal of Industrial Relations*, *42*(2), 303-323.

Koenig, A. M., & Eagly, A. H. (2014). Evidence for the social role theory of stereotype content: Observations of groups' roles shape stereotypes. *Journal of personality and social psychology*, *107*(3), 371.

Koole, S. L., & Aldao, A. (2016). The Self-Regulation of Emotion. In Vohs, K. D. & Baumeister, R. F. (Ed.) *Handbook of Self-Regulation, Second Edition: Research, Theory, and Applications* (pp 24-41). Guilford Publications.

Kopell, B. S., Wittner, W. K., Lunde, D., Warrick, G., & Edwards, D. (1970). Cortisol effects on averaged evoked potential, alpha-rhythm, time estimation, and two-flash fusion threshold. *Psychosomatic Medicine*, *32*(1), 39-50.

Kuznekoff, J. H., & Rose, L. M. (2013). Communicating in multiplayer gaming: Examining player responses to gender cues. *New Media & Society, 15*(4), 541–556. doi:10.1177/1461444812458271.

Laborde, S., Lautenbach, F., Allen, M. S., Herbert, C., & Achtzehn, S. (2014). The role of trait emotional intelligence in emotion regulation and performance under pressure. *Personality and Individual Differences*, *57*, 43-47. https://doi.org/10.1016/j.paid.2013.09.013

Landers, D., & Arent, S. (2001). Arousal-performance relationships. *Applied sport psychology: Personal growth to peak performance.* 4th ed. Mountain View: Mayfield; pp. 206–228.

Lauer, J. E., Yhang, E., & Lourenco, S. F. (2019). The development of gender differences in spatial reasoning: A meta-analytic review. *Psychological Bulletin*, *145*(6), 537.

Limelight Networks. (2019). *The State of Online Gaming – 2019.* *https://www.limelight.com/resources/white-paper/state-of-online-gaming-2019/* Retrieved July 2021.

Limelight Networks. (2020). *The State of Online Gaming – 2020.* *https://www.limelight.com/resources/white-paper/state-of-online-gaming-2020/* Retrieved July 2021.

Loadout (2021.) Who are the biggest Twitch streamers? Retrieved July 2021. https://www.theloadout.com/streamers/biggest-streamers

Lupien, S. J., & McEwen, B. S. (1997). The acute effects of corticosteroids on cognition: integration of animal and human model studies. *Brain research reviews*, *24*(1), 1-27. https://doi.org/10.1016/S0165-0173(97)00004-0

Luhtanen, R., & Crocker, J. (1992). A collective self-esteem scale: Self-evaluation of one's social identity. *Personality and social psychology bulletin*, *18*(3), 302-318.

Maloney, E. A., Sattizahn, J. R., & Beilock, S. L. (2014). Anxiety and cognition. *Wiley Interdisciplinary Reviews: Cognitive Science*, *5*(4), 403-411. **https://doi.org/10.1002/wcs.1299**

Maloney, E. A., Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2015). Intergenerational effects of parents' math anxiety on children's math achievement and anxiety. *Psychological Science*, *26*(9), 1480-1488.

Maloney, M., Roberts, S., & Caruso, A. (2018). 'Mmm… I love it, bro!': Performances of masculinity in YouTube gaming. *New Media & Society*, *20*(5), 1697-1714.

Mayo, 2009. Video Games: A Route to Large-Scale STEM Education? *Science,* 323(5910), p 79-82. DOI: 10.1126/science.1166900

Miller, D. I., Nolla, K. M., Eagly, A. H., & Uttal, D. H. (2018). The development of children's gender□science stereotypes: a meta□analysis of 5 decades of US draw□a□scientist studies. *Child development*, *89*(6), 1943-1955.

Moon, J., Betts, S., & Anderson, J. R. (2013). Individual differences and workload effects on strategy adoption in a dynamic task. *Acta psychologica*, *144*(1), 154-165

Morgenroth, T., Ryan, M. K., & Peters, K. (2015). The Motivational Theory of Role Modeling: How Role Models Influence Role Aspirants' Goals. *Review of General Psychology*, *19*(4), 465–483. https://doi.org/10.1037/gpr0000059

Murphy, M. C., Steele, C. M., & Gross, J. J. (2007). Signaling threat: How situation cues affect women in match, science, and engineering settings. *Psychological Science, 18,* 879-885.

Nakandala, S., Ciampaglia, G., Su, N., & Ahn, Y. Y. (2017, May). Gendered conversation in a social game-streaming platform. In *Proceedings of the International AAAI Conference on Web and Social Media* (Vol. 11, No. 1).

Nazareth, A., Huang, X., Voyer, D., & Newcombe, N. (2019). A meta-analysis of sex differences in human navigation skills. *Psychonomic bulletin & review*, *26*(5), 1503-1528.

Newby, J. L., & Klein, R. G. (2014). Competitiveness reconceptualized: Psychometric development of the competitiveness orientation measure as a unified measure of trait competitiveness. *The Psychological Record*, *64*(4), 879-895.

Nielson. (2017). The Nielsen Total Audience Report: Q2 2017. https://www.nielsen.com/us/en/insights/report/2017/the-nielsen-total-audience-q2-2017/

Nolla, K., Beeman, M., & Reber, P. (Under review). Emotion regulation supports expert performance in esports players. *International Journal of Sport and Exercise Psychology.*

*Nolla, K., Beeman, M., & Reber, P. (Under review). Women-Only Cohorts Reduce Stereotype Threat and Improve Performance Outcomes for First-Time Women Gamers in the Male-Dominated Hobby of Esports. *Computers in Human Behavior Reports.*

Nosek, B. A., & Smyth, F. L. (2011). Implicit social cognitions predict sex differences in math engagement and achievement. *American Educational Research Journal*, *48*(5), 1125-1156.

Ochsner, K. N., Bunge, S. A., Gross, J. J., & Gabrieli, J. D. (2002). Rethinking feelings: an FMRI study of the cognitive regulation of emotion. *Journal of cognitive neuroscience*, *14*(8), 1215-1229. https://doi.org/10.1162/089892902760807212

Ochsner, K. N., Ray, R. D., Cooper, J. C., Robertson, E. R., Chopra, S., Gabrieli, J. D., & Gross, J. J. (2004). For better or for worse: neural systems supporting the cognitive down-and up-regulation of negative emotion. *Neuroimage*, *23*(2), 483-499. https://doi.org/10.1016/j.neuroimage.2004.06.030

Ogletree, S.M., and Drake, R. (2007). College Students' Video Game Participation and Perceptions: Gender Differences and Implications. *Sex Roles* **56,** 537–542. https://doi.org/10.1007/s11199-007-9193-5

Paaßen, B., Morgenroth, T. & Stratemeyer, M. What is a True Gamer? The Male Gamer Stereotype and the Marginalization of Women in Video Game Culture. *Sex Roles* **76,** 421–435 (2017). https://doi.org/10.1007/s11199-016-0678-y

Park, D., Schaeffer, M. W., Nolla, K. M., Levine, S. C., & Beilock, S. L. (2017). How do generic statements impact performance? Evidence for entity beliefs. *Developmental science*, *20*(2), e12396.

Pedersen, W. C., Denson, T. F., Goss, R. J., Vasquez, E. A., Kelley, N. J., & Miller, N. (2011). The impact of rumination on aggressive thoughts, feelings, arousal, and behaviour. *British Journal of Social Psychology*, *50*(2), 281-301.

Prescott, J., & Bogg, J. (2013). The Gendered Identity of Women in the Games Industry. *Eludamos: Journal for Computer Game Culture, 7(*1), p 55-67.

Prislin, R., Jordan, J. A., Worchel, S., Semmer, F. T., & Shebilske, W. L. (1996). Effects of group discussion on acquisition of complex skills. *Human Factors*, *38*(3), 404-416.

Poels, Yorick, Annema, Jan Henk, Verstraete, Mathijs, Zaman, Bieke, & De Grooff, Dirk. (2012). Are you a gamer? A qualititive study on the parameters for categorizing casual and hardcore gamers. *Iadis International Journal on Www/internet*, *1*, 1–16.

Rappaport, A. (2020*). Melee is Broken: Super Smash Bros. Melee: An Interdisciplinary Esports Ethnography.* [Unpublished master's thesis]. Concordia University.

Reach3 Insights. (2021). Reach3 Insights' New Research Reveals 59% of Women Surveyed Use a Non-Gendered/Male Identity to Avoid Harassment While Gaming. Retrieved July 2021. https://www.reach3insights.com/women-gaming-study. Sampling procedures supplemented with private email communication to Reach3 Insights in May 2021.

Reyes, M. S. (2021 Jan 5). Esports Ecosystem Report 2021: The key industry companies and trends growing the esports market which is on track to surpass $1.5B by 2023. *Business Insider*. https://www.businessinsider.com/esports-ecosystem-market-report

Roivainen, E. (2011). Gender differences in processing speed: A review of recent research. *Learning and Individual differences*, *21*(2), 145-149.

Romine, M. R. (2019, Jun 24). Women's Esports Competitions: One Path to Equity. https://medium.com/@rhoulette/womens-esports-competitions-a-path-to-equity-65edbc7c6b29

Rommes, E., Faulkner, W., & Van Slooten, I. (2005). Changing lives: The case for women-only vocational technology training revisited. *Journal of Vocational Education and Training*, *57*(3), 293-317.

Rothgerber, H., & Wolsiefer, K. (2014). A naturalistic study of stereotype threat in young female chess players. *Group Processes & Intergroup Relations*, *17*(1), 79-90. https://doi.org/10.1177/1368430213490212

Royse, P., Lee, J., Undrahbuyan, B., Hopson, M., & Consalvo, M. (2007). Women and games: technologies of the gendered self. *New Media & Society*, *9*(4), 555–576. https://doi.org/10.1177/1461444807080322

Ruberg, B., Cullen, A. L., & Brewster, K. (2019). Nothing but a "titty streamer": legitimacy, labor, and the debate over women's breasts in video game live streaming. *Critical Studies in Media Communication*, 1-16.

Russell, J. A. (1980). A Circumplex Model of Affect. *Journal of Personality and Social Psychology,* 39(6), 1161-1178.

Ruvalcaba, O., Shulze, J., Kim, A., Berzenski, S. R., & Otten, M. P. (2018). Women's Experiences in eSports: Gendered Differences in Peer and Spectator Feedback During Competitive Video Game Play. *Journal of Sport and Social Issues, 42*(4), 295–311. https://doi.org/10.1177/0193723518773287

Rydell, R. J., & Boucher, K. L. (2017). Stereotype threat and learning. In *Advances in experimental social psychology* (Vol. 56, pp. 81-129). Academic Press.

Sanders, A. F. (1983). Towards a model of stress and human performance. *Acta psychologica*, *53*(1), 61-97.

Schmader, T. (2010). Stereotype threat deconstructed. *Current Directions in Psychological Science*, *19*(1), 14-18.

Schmader, T., Johns, M., & Forbes, C. (2008). An integrated process model of stereotype threat effects on performance. *Psychological review*, *115*(2), 336. http://dx.doi.org.turing.library.northwestern.edu/10.1037/0033-295X.115.2.336

Shashaani, L. (1994). Gender-differences in computer experience and its influence on computer attitudes. *Journal of Educational Computing Research*, *11*(4), 347-367.

Shaw, A. (2012). Do you identify as a gamer? Gender, race, sexuality, and gamer identity. *New Media & Society*, *14*(1), 28–44. https://doi.org/10.1177/1461444811410394

Silverman, I. W. (2006). Sex Differences in Simple Visual Reaction Time: A Historical Meta-Analysis. *Sex Roles, 54*(1), 57–68. https://doi.org/10.1007/s11199-006-8869-6

Smither, R. D., & Houston, J. M. (1992). The nature of competitiveness: The development and validation of the competitiveness index. *Educational and Psychological Measurement*, *52*(2), 407-418.

Spencer, S. J., Logel, C., & Davies, P. G. (2016). Stereotype threat. *Annual review of psychology*, *67*, 415-437.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1968). *State-trait anxiety inventory (self-evaluation questionnaire)*. Consulting Psychololgists Press.

Stafford, T. (2018). Female Chess Players Outperform Expectations When Playing Men. *Psychological Science, 29*(3), 429-436. https://doi.org/10.1177/0956797617736887

Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of personality and social psychology*, *69*(5), 797.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive science*, *12*(2), 257-285. **https://doi.org/10.1207/s15516709cog1202_4**

Tamir, M. (2016). Why do people regulate their emotions? A taxonomy of motives in emotion regulation. *Personality and Social Psychology Review*, *20*(3), 199-222.

Terlecki, M., Brown, J., Harner-Steciw, L., Irvin-Hannum, J., Marchetto-Ryan, N., Ruhl, L., & Wiggins, J. (2011). Sex differences and similarities in video game experience, preferences, and self-efficacy: Implications for the gaming industry. *Current Psychology*, *30*(1), 22-33.

Thoman, D. B., Smith, J. L., Brown, E. R., Chase, J., & Lee, J. Y. K. (2013). Beyond performance: A motivational experiences model of stereotype threat. *Educational psychology review*, *25*(2), 211-243.

Tropp, Linda & Wright, Stephen. (2000). Ingroup Identification as the Inclusion of Ingroup in the Self. *Personality and Social Psychology Bulletin,* 585-600.

Uszkoreit, L. (2018). With Great Power Comes Great Responsibility: Video Game Live Streaming and Its Potential Risks and Benefits for Female Gamers. In *Feminism in Play*(pp. 163-181). Palgrave Macmillan, Cham.

Vermeulen, L., Castellar, E. N., Janssen, D., Calvi, L., & Van Looy, J. (2016). Playing under threat. Examining stereotype threat in female game players. *Computers in Human Behavior*, *57*, 377-387. https://doi.org/10.1016/j.chb.2015.12.042

Vermeulen, L., & Van Looy, J. (2016). "I play so I am?" A gender study into stereotype perception and genre choice of digital game players. *Journal of Broadcasting & Electronic Media*, *60*(2), 286-304.

Vorderer, P., Hartmann, T., & Klimmt, C. (2003, May). Explaining the enjoyment of playing video games: the role of competition. In *Proceedings of the second international conference on Entertainment computing* (pp. 1-9).

Vossen, E. (2018). On the Cultural Inaccessibility of Gaming: Invading, Creating, and Reclaiming the Cultural Clubhouse.

Voyer, D., Postma, A., Brake, B., & Imperato-McGinley, J. (2007). Gender differences in object location memory: A meta-analysis. *Psychonomic bulletin & review*, *14*(1), 23-38.

Wegbreit, E., Franconeri, S., & Beeman, M. (2015). Anxious mood narrows attention in feature space. *Cognition and emotion*, *29*(4), 668-677.

Weisgram, E. S., Bigler, R. S., & Liben, L. S. (2010). Gender, values, and occupational interests among children, adolescents, and adults. *Child Development*, *81*(3), 778-796.

Williams, D., Consalvo, M., Caplan, C., & Yee, N. (2009). Looking for Gender: Gender Roles and Behaviors among Online Gamers, *Journal of Communication*, 59(4), p 700-725, https://doi.org/10.1111/j.1460-2466.2009.01453.x

Wood, W., & Eagly, A. H. (2012). Biosocial construction of sex differences and similarities in behavior. In *Advances in experimental social psychology* (Vol. 46, pp. 55-123). Academic Press

Wright, D. B., Eaton, A. A., & Skagerberg, E. (2015). Occupational segregation and psychological gender differences: How empathizing and systemizing help explain the distribution of men and women into (some) occupations. *Journal of Research in Personality*, *54*, 30-39.

Yee, N., & Bailenson, J. (2007). The Proteus effect: The effect of transformed self-representation on behavior. *Human communication research*, *33*(3), 271-290.

Zimmerman, B. J. (2006). Development and Adaptation of Expertise: The Role of Self-Regulatory Processes and Beliefs. *The Cambridge handbook of expertise and expert performance,* 705-722. http://dx.doi.org/10.1017/CBO9780511816796.039

Zolides, A. (2015). Lipstick bullets: Labour and gender in professional gamer self-branding. *Persona Studies*, *1*(2), 42-53.

Appendices

Appendix A: Anxiety and Competitive Gaming Performance

Appendix A, 1. Specifics of Smash Skills

Please answer these questions regarding the game you will be filling out surveys for in tournament today.

On a **scale of 1 to 10**, with 1 being a complete novice and 10 being a nationally-ranked player, how would you rate yourself on each of the following Smash skills?

1._____knowledge of your character (including feasible combos, frame data, hitboxes, etc)
2._____knowledge of matchups
3._____knowledge of stages
4._____overall knowledge of Smash
5._____consistently implementing tech the way you intend
6._____implementing complex tech
7._____overall control and understanding of your inputs
8._____overcoming performance anxiety
9._____managing emotional reactions to in-game events (e.g., an unexpected upset)
10.____managing emotional reactions to out-of-game events (e.g., a loud crowd)
11.____overall control of your emotions and reactions
12.____reading your opponent in-game
13.____strategically varying your gameplay
14.____reacting appropriately to unexpected actions from your opponent
15.____flexibility to compensate for your own mistakes
16.____creativity (your ability to come up with novel and useful responses to in-game problems)
17.____overall ability to adapt in-game

Appendix A, 2. Factor Loadings of Skill Self-Ratings

Domain-specific Skill	**Factor 1 Loading**	**Factor 2 Loading**
Knowledge of character	**0.80****	0.11
Knowledge of matchups	**0.75****	0.27
Knowledge of stages	**0.72****	0.16
Overall knowledge of game	**0.72****	0.28
Consistent physical inputs	**0.79****	0.14
Complex physical inputs	**0.80****	0.22
Overall control of inputs	**0.75****	0.21
Predicting opponent's decisions	**0.78****	0.30
Strategically varying own gameplay	**0.79****	0.11
Reacting to unexpected opponent decisions	**0.77****	0.27
Recovering from mistakes	**0.73****	0.40*
Creativity in gameplay	**0.79****	0.28
Overall adaptability in-game	**0.81****	0.34
Managing emotional reactions to in-game events	0.21	**0.82****
Managing emotional reactions to out-of-game events	0.19	**0.72****
Overcoming performance anxiety	0.35	**0.67***
Overall control of emotional reactions	0.18	**0.88****

Factor loadings for factor analysis of player self-rating of game-specific skills. Bolded values indicate the final grouping of the individual question into factor 1 or 2. * represents loadings between 0.4-0.7 and ** represents loadings above 0.7.

Appendix B: Stereotype Threat in First-Time Women Gamers

Appendix B, 1. Training Session Script

Materials: Participant checklist on a clipboard; up to 4 consent forms; up to 4 STAI forms; Wii/controllers set up on kitchen TV

Before participants arrive: Review who you are expecting in the study. Have the consent forms and the STAI forms ready to go with their ID numbers on them. Set up the Wii to the Smash character select screen with 3 stocks and 5 minutes, then mute it until they play. Set up the Powerpoint presentation on any computer, making sure that there is sound and a Youtube link to a Finals match of your choice.

Introduction & Powerpoint: Welcome them to the study. Make sure everyone is here, checking them off of the printed participant list. Give them the consent form and say they're welcome to ask any questions. If they request a copy of the consent form, we can email it. Give them the STAI with their ID number and collect it when finished.

Before you start the powerpoint, give a verbal basic overview of study: "Today, I'll teach you about a game called Super Smash Bros and you'll get to practice. Next week, you'll participate in a tournament with other members of the study. You've all been preselected to be at about the same skill level."

[Do Powerpoint presentation, ~10 minutes.]

Game Training

"Okay, now I'll show you the basic controls of the game and how to play."

If there are 3 or fewer players, pick up a controller yourself for the first round so that you can demonstrate as you teach them.

They can pick whatever characters they want, but you should encourage them to try more than one character. At first, you'll probably do most of the talking – if they can't decide on a character, you can offer suggestions and chat about the game. ("Link uses a lot of ranged moves." "Jigglypuff has a bunch of jumps so can get back on stage easier." Etc)

If you are doing one-on-one training, you should sandbag so they have a chance to try out their character. You don't have to lose on purpose, but you should be very relaxed and let them play.

How-To Script:

"The object of the game is to knock your opponent off of the stage to take their lives."

"You can kill someone by knocking them off and not letting them back on again (edgeguarding) or by getting them to a high percent and hitting them with a powerful attack, knocking them offscreen."

BUTTON	DESCRIPTION
A attacks	"Quick, weak attacks. They can interrupt slower attacks."
B attacks	"Special attacks that are different for each character. Some of them are ranged, some are not."
Smash attacks (C-stick)	"Strong but slow attacks. Use them when you want to finish off your opponent."
Jump (X, Y, tap)	"You can use the control stick or the X and Y buttons. If you press it quickly, you do a short jump. If you press it twice, you do a double jump."
Shield (L or R)	"If your opponent hits your shield, you won't take damage. If you keep up your shield too long, it pops."
Grab (Z)	"After you grab someone, you can throw them in any direction with the control stick. Different characters have different grab ranges. For instance, Pikachu has tiny short arms so a small range, while Link has a grappling hook."

Finishing up: Once you've taught them the basics, they can play against each other. In large groups, do a free-for-all for a few matches, but make sure everyone gets at least one match one-on-one against each other person in the group. The small-group practice and play should be at least 20 minutes but doesn't need to take the full hour.

Appendix B, 2. Original Measures in Post-Tournament Exit Survey

1. **How much performance pressure did you feel during the tournament?**

1	2	3	4	5	6	7
No pressure	A little pressure	Some pressure	Average pressure	A lot of pressure	Great pressure	Extreme pressure

2. **How important was it for you to do well in the tournament?**

1	2	3	4	5	6	7
Not at all important	A little important	Somewhat important	Important	Very important	Greatly important	Extremely important

3. **Throughout the tournament, how much did you focus on yourself versus your opponents?**

1	2	3	4	5	6	7
Completely on myself	More on myself	A little more on myself	Equally on myself/my opponent	A little more on my opponent	More on my opponent	Completely on my opponent

4. **How would you compare your skill to the other players in the tournament?**

1	2	3	4	5	6	7
I'm far worse	I'm worse	I'm a little worse	Equal skill	I'm a little better	I'm better	I'm far better

---

Did you use any strategy in your gameplay? If so, what?

Did you use any strategy to deal with performance pressure or nervousness? If so, what?

Appendix B, 3. Classification of matches for match-by-match analyses

	Tournament Type	Match Type	Predicted versus Actual Outcome	
Total Matches *n* = *780*	Mixed-Gender Tournaments *n = 488*	W vs W *n = 91*	Expected	37.3% *(34)*
			Upset	25.3% *(23)*
			Tie	37.3% *(34)*
		W vs M *n = 257*	Expected	46.6% *(120)*
			Upset	19.8% *(51)*
			Tie	33.4% *(86)*
		M vs M *n = 140*	Expected	44.3% *(62)*
			Upset	22.1% *(31)*
			Tie	33.6% *(47)*
	Women-Only Tournaments *n = 292*		Expected	43.5% *(127)*
			Upset	21.0% *(61)*
			Tie	35.5% *(104)*

Predicted outcomes were predicted by subtracting a player's skill from their opponent's, both on a scale of 1 to 4. *Expected* matches are matches in which the more experienced player won, *upsets* are matches in which the less experienced player won, and *ties* are matches in which players had equal experience thus no specific predicted outcome. The ratio of expected results, upsets, and ties was not significantly different based on tournament type and match type but see Table 2 for details on how matches between a woman and a man differed from expectation.

Appendix B, 4. Matches between women and men, compared to same-gender matches, demonstrate women's underperformance

		Estimated Win Rate	Actual Win Rate	Statistical Test
W vs M Matches *n = 257*	*Man More Skilled* *n = 129*	Women's Upset Rate Against Other Women: 84 out of 245 (34%)	Women's Upset Rate Against Men: 13 out of 129 (9.3%)	*Fisher's exact test* OR = 0.22 CI = 0.11 – 0.41 p < .0001****
		Men's Expected Rate Against Other Men: 62 out of 93 (66.7%)	Men's Expected Rate Against Women: 116 out of 129 (90.7%)	*Fisher's exact test* OR = 4.71 CI = 2.22 – 10.52 p < .0001****
	Woman More Skilled *n = 42*	Women's Expected Rate Against Other Women: 161 out of 245 (65.7%)	Women's Expected Rate Against Men: 4 out of 42 (9.5%)	*Fisher's exact test* OR = 0.055 CI = 0.01 – 0.16 p < .0001***
		Men's Upset Rate Against Other Men: 31 out of 93 (33.3%)	Men's Upset Rate Against Women: 38 out of 42 (90.5%)	*Fisher's exact test* OR = 18.56 CI = 5.93 – 78.01 p < .0001****
	Man & Woman Equally Skilled *n = 86*	Chance: 43 out of 86 (50%)	Women won 14 out of 86 (16.3%)	*Binomial Test* CI = 0.72 – 0.91 p < .0001****

By comparing women's performance against other women to their performance against men, and men's performance against other men compared to their performance against women, we see that women underperform whether they are higher skilled, lower skilled, or equally skilled. OR = Odds Ratio, CI = Confidence Interval, **** for p < .0001.

Appendix C: Access, Interest, and Experience in Existing Women Gamers

Appendix C, 1. Describe your social experiences with gaming. How did you start? Who do you play with? Do you game with friends?

Coding Process. After reading all 273 answers, the researcher identified and coded for five relevant social groups: family, friends, self-motivated play, other players online who were or are strangers, and significant others.

After coding each answer for these five groups, the researcher re-coded 226 answers for groups identified as entry points or introducers of gaming. These included family, friends, and self-discovery; no one identified significant others as an entry point, and it is impossible to discover games through people met exclusively through games. The entry codes for the "family" category were more specific, including subcodes of parents, siblings, cousins, and uncles/aunts/adult friends of the family. In the end, the researcher grouped family adults into one entry category of "parents," other children into one entry category of "siblings," and created a "family" category for both adult and child family members.

Below, we describe the counts for entry into gaming. Then, each code is given in a contingency table with the most relevant subject grouping and the presence or absence of the code in answers. Additionally, a few answers including the code are given as examples.

Entry to Gaming

	Friends*	**Sibling**	**Parent**	**Family**	**Alone**	**Total**
Female	8	34	12	5	8	56
Male	62	53	18	14	23	170
Total	70 (31.0%)	76 (33.6%)	30 (13.3%)	19 (8.4%)	31 (13.7%)	226

Frequency table for answers that mentioned a specific introducer to gaming. * for "Friends" represents a significant difference in the proportion of answers based on sex assigned at birth.

Code 1: Friends

Present	**Absent**	**Total**
230 (84.2%)	43 (15.8%)	273

The “Friends” code frequency did not differ based on gender, sex assigned at birth, or gaming frequency.

Friends Example 1

I started playing Minecraft with school friends and from there found other online Minecraft communities. Currently I play with an Overwatch team that I'm close to but not on.

Entry Code: Friends

Social Codes: Friends, Other Players

Friends Example 2

My first social experiences were playing Pokemon Blue/Red/Yellow in elementary school around friends and then moved into playing World of Warcraft with strangers. When I can I try to game with friends or my wife, though most of the time I play with strangers.

Entry Code: Friends

Social Codes: Friends, Other Players, Significant Other

Code 2: Family

	Present	**Absent**	**Total**
Assigned female at birth	46	21	67
Assigned male at birth	97	108	205
Total	143 (52.4%)	129 (47.6%)	272

Presence of the "Family" code is best predicted by sex assigned at birth. One subject did not report sex assigned at birth.

$\chi^2(1) = 9.43$, $p = 0.002$, $R^2 = 0.025$.

Family Example 1

I started playing mario bros 3 with my dad when I was a few years old. My dad would play a lot of games with me like mario kart until I was old enough to find friends who played games through school or the neighborhood. Gaming was always more of a social thing to me, and even when playing single player games it was generally with friends in the room playing something else, or even talking with friends about the game to bond over the shared experience. In that sense, I consider all of my gaming from age 3-18 as probably being entirely social experiences as it all either occurred with others directly or indirectly. There was really never any recluse/shut in gaming that some stereotypes reinforce.

Entry Code: Parents

Social Codes: Family, Friends

Family Example 2

As a child I played Nintendo 64 and the Playstation with my cousins, or shared experiences of my single-player games with friends at school. But it was family that I gamed with as a child.

As a teenager it expanded out to play Eyetoy/Singstar type games with school friends, or sitting side by side playing Runescape in the school computer room.

By the time I was 20, my social experiences included chats with online-only friends and playing [Player vs Player] or raiding together on Destiny mostly.

Entry Code: Siblings

Social Codes: Family, Friends, Other Players

Family Example 3

I started playing Wii with my family on rainy days when we couldn't spend time outside around the age of 12. My parents never endorsed gaming, so it wasn't until more recently (two years ago) that I began to play with friends. My old neighbors wanted to see what Fortnite was about because it used to be the game that everyone was talking about. The Fortnite trend was where I really was introduced to gaming.

Entry Code: Family (General)

Social Codes: Family, Friends

Code 3: Self-Motivated Play

Present	Absent	Total
89 (32.6%)	184 (67.4%)	273

Whether a person games alone or not does not differ by gender, sex assigned at birth, or frequency of gameplay.

Self-Discovery Example 1

I used to play the Mario games you could buy at the mall kiosks and then the Gameboy. I gamed alone until I got a ps2 [Playstation 2] and played with cousins. I started playing online with friends around CoD mw3 [Call of Duty: Modern Warfare 3] on the Xbox 360. I also played at my neighbor's house when mw2 [Modern Warfare 2] was first out.

Entry Code: Self

Social Codes: Self, Cousins, Friends

Self-Discovery Example 2

Got into gaming just out of sheer interest as a kid. I had a few handheld Nintendo and got a GameCube. I used to play alone since I am an only child until online games became a thing and my mom let me play first person shooters starting in high school. Today I solely game with friends online.

Entry Code: Self

Social Codes: Self, Other Players, Friends

Code 4: Other Players

	Present	**Absent**	**Total**
Infrequent (<5 hr/wk)	12	57	69
Regular (5-15 hr/wk)	35	46	81
Dedicated (>15 hr/wk)	58	64	122
Total	105 (38.6%)	167 (61.4%)	273

Other Players Example 1

I first started with mmorpgs [massive multiplayer online roleplaying games]. I would make guilds and people would join so we would end up voice chatting and eventually expand our libraries of games. Recently ive picked up vrchat and met very cool friends many of which have similar tastes in gaming so we end up playing stuff together. Im not great with people; severe social anxiety, so i tend to play games more solo, but i also really enjoy playing with friends that i am close enough to and feel comfortable with

Entry Code: Self

Social Codes: Self, Other Players, Friends

Other Players Example 2

I was always the best kid at smash bros on the block, to the point where no one wanted to play with me after a certain point. Later I got into CoD [Call of Duty] but quit after a couple years because of the intense emotional toll that playing online took. I got back into smash a year or so later and learned about its competitive scene, and started playing with a bunch of strangers who quickly became my friends. Besides a semi-active competitive presence, gaming was mostly social and to push my limits as a player. I've always played mario kart and racing games with friends and family, and pokemon with others. Even competing with my sisters for high scores in pokemon snap, turning a single player game into a competitive one.

Entry Code: Friends

Social Codes: Friends, Other Players, Family

Code 5: Significant Other

	Present	**Absent**	**Total**
Assigned female at birth	15	52	67
Assigned male at birth	14	191	205
Total	29 (10.6%)	243 (89.4%)	272

Presence of the "Significant Other" code is best predicted by sex assigned at birth. One subject did not give sex assigned at birth.

$\chi^2(1) = 11.20$, $p = 0.0008$, $R^2 = 0.061$.

Significant Other Example 1

I play with my husband but we play different games.. just in the same room together. I do not play with friends

Entry Code: None

Social Codes: Significant Other

Significant Other Example 2

I started playing games because my dad and brother played games, so it was just part of our family. However, I was not allowed to play the games they played. I could only play Mario games or other more acceptably "girl enough" games (Barbie, Goosebumps, cartoonlike, etc.). I was sometimes allowed to watch them play their games, not always.

I played Mario games with family, like the Mario Tennis, Mario Kart, Mario Party, etc.

In middle school, I took The Sims over to friends' houses, and we'd play that "together". (One person would control the game, and the rest of us would watch and talk about it.)

In high school, I started playing games online such as Halo 1 for PC, Halo 2 on Xbox live, etc.

In college, I had a couple different groups of friends that I'd play Mass Effect 3 multiplayer with.

Currently, I play games with my partner (two consoles in the same room), and when I play Mass Effect 3 multiplayer now, I mostly just play with random folks.

Entry Code: Family

Social Codes: Family, Friends, Significant Other, Other Players

Appendix C, 2. Have you had any negative social experiences in gaming contexts, whether at someone's house, online, or at a public event? What is the range of those experiences - minor rudeness to criminal wrong? Do you have any specific negative experiences you are willing to share?

Coding Process. After reading all 196 answers, the researcher identified six themes: criminal wrong, relationship strain, "salt" or underperformance-induced anger, sexism, and other "-isms" such as racism, homophobia, and ableism, and general rudeness or toxicity. Sexism and other "-isms" were grouped together under the theme of othering but answers specifically mentioning sexism were identified as well. Furthermore, some participants reported no negative experiences, for a total of 6 themes.

Theme 1: Toxicity or Rudeness

	Present	**Absent**	**Total**
Infrequent (<5 hr/wk)	8	20	28
Regular (5-15 hr/wk)	31	27	58
Dedicated (>15 hr/wk)	68	42	110
Total	107 (54.6%)	89 (45.4%)	196

Gaming frequency predicted reports of "toxicity" or "general rudeness."

$\chi^2(2) = 10.14$, $p = 0.006$, $R^2 = 0.038$.

Toxicity Example 1

On the rare occasions that I would play alone and be teamed with an immature guy, there would be sexual comments as well as a lot of trash talking. I consider it moderate rudeness since I never paid much attention/care to it.

Themes: Sexism, Toxicity

Toxicity Example 2

I have had some negative experiences both online as well as at in person competitive events. Online is more typical, I have definitely been flamed, called every name under the sun, threatened, etc. None of that ever really got to me other than making me angry when I still had some anger issues as a teen gamer.

Themes: Toxicity

Theme 2: Othering

	Present	**Absent**	**Total**
Infrequent (<5 hr/wk)	4	24	28
Regular (5-15 hr/wk)	23	35	58
Dedicated (>15 hr/wk)	57	53	110
Total	84	112	196

Gaming frequency predicted reports of othering, inclusive of sexism, racism, homophobia, ableism, and so on.

$\chi^2(2) = 14.48$, $p = 0.0007$, $R^2 = 0.054$.

	Present	**Absent**	**Total**
Cisgender Woman	23	11	34
Cisgender Man	40	84	124
Non-Cisgender Participant	21	18	39
Total	84 (42.6%)	113 (57.4%)	197

Gender identity also predicts the presence of othering in short-answer responses.

$\chi^2(2) = 16.23$, $p = 0.0003$, $R^2 = 0.060$.

Othering Example 1

Nazism and alt-right individuals co-opted various circles I used to hang with for Grand Strategy Games. so-called Wehraboos. Thankfully I was one of the admins of a close group of people and stopped it a single user. Unfortunately, I was promptly taken out of that admin role. I don't know what that group is doing now. - Various times while playing Overwatch I have seen players call out female player's performance and blaming them for losses. I called out such behavior when I saw it, which then made me a target as well. Eventually, I stopped playing Overwatch (for various reason, but including this one).

Themes: Othering (racism), Sexism

Othering Example 2

I have had people insult or harass me because they disliked me, and publicly mock my speech impediment when I do commentary at events. I stopped playing smash in my local scene because someone would harass me regularly and it was not addressed for over a year.

Themes: Toxicity, Relationship Strain, Othering (ableism)

Othering Subtheme: Sexism

	Present	**Absent**	**Total**
Cisgender Woman	22	12	34
Cisgender Man	20	104	124
Non-Cisgender Participant	15	24	39
Total	57 (28.9%)	140 (71.1%)	197

Gender identity also predicts the presence of othering in short-answer responses.

$\chi^2(2) = 31.33$, $p < .0001$, $R^2 = 0.132$.

Sexism Example 1

I can't use voice chat online because I get harassed too much. I sometimes get made fun of for picking the "girly" characters in games. At gaming events I am sometimes called a "clout-chaser" if I try to make friends. At gaming parties (the official convention after-parties that happen at clubs) I get groped or non-stop hit on.

Themes: Sexism

Theme 3: Relationship Strain

Present	**Absent**	**Total**
56 (28.4%)	141 (71.6%)	197

Whether a person mentioned relationship strain does not differ by gender, sex assigned at birth, or frequency of gameplay.

Relationship Strain Example 1

During my sophomore year, I made my first ever "gamer" friend. He invited me to play with his group, a charming collection of dorks and outcasts, exactly my people. However, during the weeks I was getting to know them I realized that they wanted me to play with them for several hours, every night. I was devoted to my studies, and I didn't have the time to do something like that. The friend who invited me was kind, but he eventually started harassing me a little for not coming to hang out with them. It made me feel like I had to sacrifice my studies to be friends with them. Combine this with the fact that they played League, and usually got really angry at each-other during the games, made the environment seem really toxic and sad. One day while the guy who invited me was pestering me I kinda blew up at him in a way I've never really known myself to do. I awkwardly apologized later, but I really haven't spoken with them since.

Themes: Relationship Strain, Salt, Toxicity

Relationship Strain Example 2

Yes. Sometimes my brothers can be super competitive and when they were kids they didn't know how to deal with anger. So there was a lot of yelling at the TV, which wasn't really a good time.

Themes: Relationship Strain

Theme 4: Salt

	Present	**Absent**	**Total**
Cisgender Woman	4	30	34
Cisgender Man	37	87	124
Non-Cisgender Participant	5	34	39
Total	46 (23.3%)	151 (76.7%)	197

Gender identity predicts the presence of salt in short-answer responses.

$\chi^2(2) = 8.47$, $p = 0.015$, $R^2 = 0.040$.

Salt Example 1

Sometimes it's very awkward when I beat a player at an in person tournament who can't handle negative emotions, and will curse you out, insult you, or throw objects. Luckily this rarely happens but after 9 years in the FGC [Fighting Game Community], it has happened a lot

Themes: Salt

Salt Example 2

My most common negative experience was my own frustration at constantly losing against my (much more skilled) friends. I'm not proud of how I dealt with those feelings, and how I sometimes could bring the mood way down over a game we were trying to enjoy together

Theme: Salt, Relationship Strain

Theme 5: Crime

Present - Theft	**Present – Other Crime**	**Present – Both Theft and Other Crime**	**Absent**	**Total**
23 (11.7%)	7 (3.6%)	3 (1.5%)	164 (83.2%)	197

Whether a person mentioned crime does not differ by gender, sex assigned at birth, or frequency of gameplay. Theft of personal property or money was the most common experience.

Crime Example 1 (Theft)

I have had people steal my games. That doesn't seem to be uncommon when you are younger. Negativity seems to be prolific online so I mostly game only with people I know. In that way I have only seen anger from losing a match of some kind. But it would be resolved shortly thereafter.

Themes: Crime (Theft), Toxicity, Relationship Strain

Crime Example 2 (Other Crime)

I have had countless negative experiences while gaming, or in gaming contexts. The most common negative experiences are dealing with toxicity/verbal abuse online, however, these are more benign and easier to look past now. The more emotionally painful negative experiences come from in-person events at people's houses and at events. Typically they involved rude comments about someone's skill, casual racism/sexism/transphobia, etc. The worst experience that is unfortunately tied to a gaming context involves myself being sexually assaulted/exploited and borderline groomed by a former friend I met through gaming at my school at age 10. I was often touched/groped by this person in both public and private, under the guise of "just joking" or using his longer-tenure friendship of our friend group as a power structure.

Themes: Toxicity, othering (racism/transphobia/sexism), Crime (Sexual Assault)

Theme 6: No Negative Experiences

	No Negative Experiences Due to Active Avoidance*	**No Negative Experiences for Any Reason (Including Avoidance)**	**Neg. Exp. Reported**	**Total**
Female	9	12	31	43
Male	6	21	132	153
Total	15	33	163	196

Short answers that reported no negative experiences due to active avoidance of social gaming differed by sex assigned at birth.

Fisher's Exact Test comparing Count of Active Avoidance between Male and Female:

OR = 6.33, CI = 1.78 to 25.37, p = 0.001.

No Negative Example 1

i personally have not had any negative social experiences in gaming contexts, although i know some people who have.

Themes: None

No Negative Example 2

I avoid the social aspect as much as possible when not with people I trust.

Themes: None (avoidance)