Under Pressure: Exploring Choke and Clutch in Competitive Video Games

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Video games frequently invoke high-pressure circumstances in which player performance is crucial. These high-pressure circumstances are incubators for ‘choking’ and ‘clutching’—phenomena that broadly address critical failures and successes in performance, respectively. The eruption of esports into the mainstream has vitalized the need to understand performance in video games, and particularly in competitive games spaces. In this work, we explore the potential mechanisms behind choking and clutching and how they are related to player traits and tendencies. We report the results of multiple regression analyses, finding that the propensity to choke is positively correlated with Reinvestment, Obsessive Passion, and Public Self-Consciousness, as well as Approach and Avoidance coping styles. Likewise, we find that the propensity to clutch is negatively correlated with Social Anxiety, and positively with Private Self-Consciousness and player experience with competitive gaming. We propose that these findings can be utilized to scaffold and support performance in high-pressure gaming spaces, such as esports. This work represents an initial step in the empirical exploration of choking and clutching in competitive video game contexts.

CCS Concepts: • **Applied computing** → **Computer games**; • **Human-centered computing** → **Human computer interaction (HCI)**.

Additional Key Words and Phrases: gaming, video games, skills, performance, esports, competitive gaming, clutching, choking

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1 INTRODUCTION

In competitive multiplayer video games, players are frequently under pressure. Whether that pressure manifests as a boss fight, a final dash to the finish line, or as the need for pixel-perfect shooting accuracy versus a skilled opponent, competitive games consistently demand that a player performs in high-pressure circumstances. While players often relish the experience of this challenge [41], little is known about the mechanisms that govern successful—or thwarted—performance in these contexts.

The meteoric rise of esports has galvanized the need to investigate, assess, and understand what factors influence performance in competitive multiplayer video games [57, 64]. The term

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‘esports’ (electronic sports) refers to professional video game play, whereby expert players compete within various sporting contexts such as leagues, sponsored teams, or bracketed tournaments in the presence of spectators [21]. Each year, the esports industry achieves exponential growth—revenues from esports were estimated at \$24.9B USD in 2020 [5], and esports spectatorship is expected to grow to 646 million viewers by 2023 [58]. The relatively recent emergence of esports as a global phenomenon has changed the way we conceptualize skilled play, and has likewise paved the way for new avenues of research.

In esports, of particular relevance is the exploration of *performance under pressure*—an inescapable reality of competitive play. Colloquially understood in video game communities, and formalized in literature on physical sports [7, 54], are the concepts of ‘*choking*’ and ‘*clutching*’: respectively, failing and excelling in pressure conditions in which one’s success is imperative. Although fundamental in competitive video game play, the phenomena of both choke and clutch have yet to be examined within the context of esports—a domain that may lend itself to more opportunities for choke or clutch experiences. We cannot assume that knowledge generated in the context of physical sports automatically transfers to the context of esports as they differ in critical ways (e.g., risk of injury, body contact), thus warranting specific investigation of these constructs in competitive multiplayer video games.

Despite a rise in esports, knowledge is still being formed about the experience of high-level play, and how success is achieved and maintained in these contexts. Without knowledge of how success is achieved and maintained in esports, it is difficult for stakeholders and researchers to meaningfully support expertise development in competitive gaming contexts or guide best practice procedures. To address this, we turn to the application of self-focus models—i.e., models positing that choking is the result of attention focused inwards due to increases in anxiety [7]—that have been used in traditional sports to evaluate choke and clutch experiences. Self-focus models broadly suggest that poor performance is prompted by situational factors that induce pressure, such as the presence of an audience, reward contingency, and ego-relevance—all of which disrupt performance by increasing self-awareness [40]. In particular, we focus on self-focus models, such as reinvestment and self-consciousness that propose consciously attending to an automated response inhibits its occurrence [7, 45]. Additionally, we investigate the relationship between passion types and the propensity to choke or clutch, and whether performance is moderated by coping strategies. In traditional sports, athletes require attentional demands, such as decision making, attention, memory, fine motor coordination, and game knowledge [74]. Comparatively to traditional sports, we argue performance in esports requires these same attentional demands. Applying self-focus models to the context of esports may provide insight into whether performance is influenced in the same ways as traditional sport.

Esports has been identified as a critical area for further investigation within human-computer interaction (HCI) [21]. Identifying the factors that contribute to choke is essential for developing and implementing interventions that address the underlying mechanisms responsible for performance decrements in esports. Additionally, determining the factors that contribute to clutch may identify strategies for building resilience in high-pressure situations, which may enable professionals to prolong clutch experiences during important game moments [65]. Furthermore, investigating the psychological states of choke and clutch may contribute to a better understanding of human behavior and performance. This knowledge may be used to inform best practices in esports and establish a set of guidelines for maintaining optimal levels of professional play. In this paper, we apply self-focus models of reinvestment and self-consciousness, while also examining the role of passion and coping styles to question: *what are the underlying mechanisms that contribute to choke and clutch performance under pressure, and how do players cope in these scenarios?*

To this end, we undertook a quantitative approach to provide insights on the mechanisms and traits that contribute to choke and clutch within competitive multiplayer video games. Our results suggest that trait tendencies towards reinvestment, public self-consciousness, obsessive passion orientation, as well as both approach and avoidance coping styles are positively related to choking. Conversely, clutching was negatively related to social anxiety, and positively with private self-consciousness and player experience with competitive gaming. We contend that these findings provide support that trait tendencies susceptible to choke in physical sports also translate to the context of esports.

2 BACKGROUND

The popularity of esports is growing; however, alongside this growth is a changing landscape of esports. Once the sole domain of elite professional players on gaming computers, esports now also encompasses a vibrant collegiate scene [50, 59, 69] (including lucrative college scholarships), a growing mobile scene (with an increase in viewership of over 600% in 2019) [51], large-scale support for amateur tournaments [1–3], and even inclusion as a medal sport in the 2022 Asian Games [52].

Researchers are just beginning to explore high-level performance among esports athletes; recent work has investigated the mental skills of esports athletes [29], how sleep affects the performance of esports athletes [12, 13], how live streaming affects the performance of competitive gamers [46], and whether or not novel methods of doping in esports, such as through the use of transcranial direct current stimulation, can improve performance [22]. However, in the field of sports psychology, *performance under pressure* has been under investigation for decades. To this end, it is helpful to refer to the relevant concepts investigated in sports and psychology literature to inform transition to scholarly work in digital games. Within this section, we earmark concepts that we have identified as pertinent to performance under pressure in digital games.

2.1 Performance Under Pressure

‘Choking’ is a term used to describe a scenario in which a player fails to maintain their performance in a high-pressure situation where it is expected or highly important [7]. In contrast, ‘clutching’ refers to a scenario wherein a player performs well under pressure in an unfavorable situation, leading to a desirable outcome [54].

Within sports literature, attentional processing (mental and motoric tasks requiring cognitive processing) has received considerable support in conceptualizing the phenomenon of choke and, less extensively, clutch performance [7, 10, 45]. Performance in competitive video games may also be affected by the same changes in attentional processes that lead to choke and clutch in traditional sport (e.g. decision making, attention, memory, coordination, and game knowledge [74]). As such, we turn to sports literature to understand how we may translate this to esports contexts.

2.1.1 Declarative and Procedural Processes in Choking. ‘Declarative’ and ‘procedural’ processes are psychological constructs that address task recall, knowledge, and automation. In cognitive psychology, declarative processes are described as slow and limited in nature, requiring attentional resources to consciously control the movement of a skill; conversely, procedural processes involved in performing a skill are automatic and do not demand attentional resources, thus enabling faster processing [77]. While developing a new skill (e.g., learning how to ride a bike), novices tend to utilize declarative processes to direct attention towards the step-by-step execution of a skill (e.g., pedalling, balancing, steering), which is honed into procedural execution with experience [25, 77]. However, in high-pressure situations—i.e., goalkeeping against a penalty shoot-out [7]—performance of a well-learned skill may be harmed when anxiety-induced declarative processes

interrupt the procedural mechanisms by redirecting attention towards the execution of the skill [25].

The translation of this to the context of video games is clear, wherein these high-pressure circumstances are facilitated as a matter of course; for example, in one-on-one combat against an opponent, in time pressure, and in boss fights. This is especially true for competitive esports contexts, wherein stakes are significantly increased and margin for error is significantly decreased.

2.1.2 Expertise and Performance. Expertise plays a notable role in performance. Interestingly, declarative processing was found to impair expert performance, but improve novice performance, in a batting task [25]; further, drawing attention away from explicit execution impaired novice performance. Ego investment also plays a role in expertise, with self-consciousness borne from audience pressure impairing expert, but not novice, performance [34]. It is possible that players of varying levels of expertise may also experience differences in attentional focus within competitive gaming contexts.

2.1.3 Age and Performance. The competitive gaming landscape is dominated by younger players, with many ‘retiring’ from competition in their mid-20s [31]. Few studies have investigated whether these trends are driven by age-related decline in cognitive and motor abilities or whether they are more related to sociological factors. Thompson et al. [66] showed age-related performance decline (due to slower self-initiated reaction times) within the video game *Starcraft 2*, starting at 24 years of age. Similarly, a cross-sectional investigation of video game preferences over age showed a shift away from performance as a motivation to play and also in importance of the experience of play [11]. The authors note, however, that these results may be attributed to a cohort effect, as large-scale longitudinal research on performance in video games is not yet available—an assertion shared by esports organizational staff [61]. Further research is needed to differentiate whether the underlying factors of age-based performance are social or physiological in nature.

2.1.4 Clutch Performance. Sports research on clutch performances has demonstrated that the experience of clutch is characterized by complete and deliberate focus, intense effort, heightened awareness, heightened arousal, absence of negative thoughts, and automaticity of skills [65].

Interestingly, clutch states have been reported to involve declarative processing, such as deliberate focus and conscious effort to raise performance rather than being fully automatic [26, 48]. While these findings appear to contradict conceptualizations of declarative processing in high-pressure contexts, research suggests that expert performers are capable of strategically allocating conscious attention toward regulating their psychological state (e.g., increasing effort and concentration) while maintaining the procedural execution of motor skills [24, 67]. In other words, skilled athletes may focus declarative processes on controlling psychological states, rather than consciously attending to the execution of procedural motor skills. Additionally, the performance outcome may be moderated by coping strategies that are employed by athletes during high-pressure situations [26, 48].

2.2 Trait Susceptibilities in Performance

In the following section, we address trait tendencies—i.e., reinvestment, self-consciousness, passion orientation, and coping styles—and their relevance to choking under pressure and esports in relation to self-focus models of attention formalized in traditional sport.

2.2.1 Reinvestment and Performance in Sport. As discussed in Section 2.1.1, the performance of well-learned skills may be impeded in high-pressure scenarios due to a reversal from procedural processes to declarative processes. In line with self-focus models of attention, this reversal may be due to a *predisposition* to focus attention inwards [45, 47]. To this end, Masters et al. proposes a model of ‘reinvestment’ of controlled processing, which refers to a tendency towards reversion

to declarative processes [45]. High ‘reinvestors’—athletes more susceptible to reinvestment—have been found to be more likely to fail under pressure on a complex task, and to rely on the use of more explicit rules and declarative knowledge while performing, than low reinvestors (athletes less susceptible to reinvestment) [45].

The concept of reinvestment has traditionally been studied in sport, in which explicit rules govern the physical or motoric components of the activity; however, Masters et al. [45] suggest that the exploration of reinvestment in “... *skills such as chess, which involve no motoric component but provide a rich source of failure under pressure*” presents a noteworthy avenue of investigation. Reinvestment may be useful for understanding performance decrements in esports; for example, reinvesting players performing in first-person shooters may use explicit rules such as, “*I must keep my crosshairs still and centered while I aim for the head of an opponent and left click the mouse to pull the trigger,*” which may elicit a disruption in their performance.

2.2.2 Self-Consciousness and Performance in Sports. Within esports and competitive play, players are exposed to various factors that may induce self-consciousness such as performance anxiety, ego-relevance, and the presence of an audience, which may lead an individual to experience an episode of choke [8]. Research suggests that this self-consciousness may induce declarative processing [19, 77]. For example, the presence of a camera [17], audience [7, 16], mirror [16], an individual’s own voice [30], or even a preview window in a video chat application [49] have been shown to direct attention inwards. Interestingly, Baumeister [7] finds that individuals low in self-consciousness are more susceptible to choking under pressure compared to those high in self-consciousness. While these findings may seem contradictory to the notion that self-focus inhibits automated skills, Baumeister suggests that those low in self-consciousness are not accustomed to performing a task while aware of its execution under pressure, resulting in poorer performance outcomes compared to those high in self-consciousness. These findings may be applicable to the context of esports and competitive play as players are exposed to a variety of factors that may induce self-evaluation and self-consciousness.

2.2.3 Passion and Performance in Sports. The dualistic model of passion is of interest in the context of competitive play within esports as, similar to traditional sports, players often engage in play out of desire rather than obligation. While the dualistic model of passion has been the focus of much research inquiry in the domain of games user research [23, 38, 42, 56], it is currently unknown how passion orientation influences performance under pressure in competitive multiplayer video games.

When an activity becomes an integral part of an individual’s life, it develops into a central component of their self-identity that may manifest itself in the form of either ‘harmonious’ or ‘obsessive’ passion [72]. Obsessive passion may elicit a variety of negative emotions that may direct attention inwards, resulting in an increased susceptibility to choke; in contrast, an activity is considered harmonious if it does not impede or overpower other aspects of an individual’s life.

The investigation of passion in performance under pressure has been limited; however, research by Hill and Shaw [28] found that passion may be a moderator of choking among athletes within a team sport, suggesting that obsessive passion may be associated with choking in sport due to the internalized controlled nature of obsessive passion on attention.

2.2.4 Coping Mechanisms in Sports. Within sport research, coping styles are commonly categorized into approach and avoidance styles. In this dichotomy, approach coping styles encompass task-oriented behaviors that attempt to control, manage, or change the stressful situation, while avoidance coping styles refer to emotion-focused behaviors that attempt to withdraw, either physically or psychologically, from the source of the stress [6, 60].

The current understanding of coping styles in sport is inconsistent. Wang et al. [75] find that athletes who used approach styles of coping were more susceptible to choking under pressure than those who used avoidant coping styles; cogent with theory on self-focus models of attention, Wang et al. suggest that approaching the stressor may inhibit performance through focus on the execution of the task. In contrast, recent research suggests that approach coping styles are actually effective in preventing episodes of choke in sport—finding that elite golf players who perform well under pressure, in fact, report the use of approach-style coping strategies [26, 27], and that choking-resistant netball players improved task performance by utilizing coping strategies that actively address the stressor [48].

These concepts have yet to be examined in the context of esports and competitive multiplayer video games. Investigating the coping strategies that are applied in high-pressure circumstances during competitive play may help identify adaptive coping styles that are useful for maintaining optimal performance, and preventing episodes of choke, in esports.

2.3 Summary

In sum, these studies highlight that the phenomenon of choking and clutching under pressure may be explained by circumstances that induce controlled processing of a task and direct attention inwards, such as self-consciousness [19], reinvestment [45], and obsessive passion [28, 71] which may be moderated by coping strategies [26, 48]. Although the concepts of choking and clutching under pressure have been studied within physical sports literature, to our knowledge, no study has explored these in the context of competitive multiplayer video games and esports. These self-focus models of attention may provide a useful framework for understanding choke and clutch experiences in games.

3 METHODS

A comprehensive, informed, and nuanced understanding of human performance within multiplayer video games is critical for the academic scaffolding and support of esports. We propose that a vital component of this experience is that of performance under pressure—in particular, its maintenance. The present study seeks to modify and apply existing concepts within traditional sport literature to identify the mechanisms that contribute to performance under pressure—specifically, propensity to choke and propensity to clutch—in competitive multiplayer video games. To investigate these concepts, we conducted an online study to answer our three primary research questions:

- RQ1. Are there traits that relate to performance under pressure?
 - RQ1a. How does trait reinvestment relate to propensity to choke and clutch?
 - RQ1b. How does trait self-consciousness relate to propensity to choke and clutch?
- RQ2. Does passion orientation relate to performance under pressure?
- RQ3. Does coping style relate to performance under pressure?

We investigated our research questions by conducting a quantitative analysis on data gathered in an online survey. To examine participant traits, we included inventories that assess individual tendencies towards self-consciousness, reinvestment, and passion. Participants were then prompted to recall experiences in which they have choked and clutched, while completing items concerning the coping styles that were used in each scenario.

3.1 Participants and Procedure

Participants (N=274) were recruited from Amazon's Mechanical Turk (MTurk), which is an online marketplace that allows researchers to deploy studies through Human Intelligence Tasks (HIT) to

diverse populations [14]. MTurk has also been shown to be useful in behavioral research for its wide range of uses, diverse participant pool, speed, cost, and accessibility [15, 44].

Participants were pre-screened on MTurk for those with experience playing competitive multiplayer video games and who identified as gamers. The pre-screening process involved asking participants to specify, along with a few distractor questions, the degree to which they identify as a gamer and to indicate their preferences (using sliders from 0 to 100) for narration in games, single player games, multiplayer games, and competition in games. Participants qualified to participate in the online survey if they indicated a high preference for the following categories (qualifying scores provided in parentheses): gamer identification (>45), multiplayer video games (>51), and competitive multiplayer video games (>51). We chose these cutoffs as our intention was to recruit only players who enjoyed multiplayer and competitive multiplayer games; gamer identification was assigned a lower threshold as it was less central to our intended population sampling. We invited participants who met these thresholds to complete the survey; 274 responded. Our sample size was influenced by our decision to use individual traits as predictors in a regression, treating them as continuous data; we aimed for a sample size greater than 200 following removal of spurious data.

The online survey was deployed on MTurk through the Human Intelligence Task (HIT) interface to the qualifying participants. The survey was created using an open-source browser-based experiment tool [33]. Upon accessing the HIT, participants were provided a consent form which outlined the purpose of the study, its potential risks and benefits, anonymity procedures, and participants' right to withdraw. After providing informed consent, participants answered questionnaires about their demographics (e.g., age, gender, nationality, and racial/ethnic identity), gaming preferences and history, experience with esports or competitive gaming, as well as trait inventories regarding reinvestment, self-consciousness, and passion types. Next, participants were asked to provide their own definitions of 'choking' and 'clutching' and indicate whether they had choked or clutched in a competitive multiplayer video game, as well as how often these episodes occurred. Finally, participants were provided the following definitions of choke [7] and clutch [54] to ensure comprehension of the terms: "*Choking* is a term used to describe a scenario in which a player fails to maintain their performance in a situation where it is expected or highly important"; and "*The term 'clutching' refers to a scenario wherein a player performs well under pressure in an unfavorable situation, leading to a desirable outcome*". Afterwards, participants were prompted to recall a scenario in which they choked or clutched, then completed an inventory concerning the coping styles that were used in each scenario. The presentation of the series of questions related to clutching and choking were counterbalanced across participants to control for order effects. Following completion of the survey, participants were debriefed, thanked, and compensated for their participation. Ethics approval was obtained from our University, and participants were compensated \$6USD; the study took approximately 30 minutes to complete.

The final sample consisted of data from 210 participants from Canada and the United States (men=141, women=68, non-binary=1) aged 18 to 59 ($M=33.9$, $Mdn=32.5$, $SD=8.3$). The participants were very experienced with competitive video game play: they reported an average of 13.1 hours per week ($SD=9.8$) playing competitive multiplayer games, had been playing competitive multiplayer gamer for an average of 11.9 years ($SD=7.3$), and rated their expertise with their most-played competitive multiplayer game title as an average of 3.8 ($SD=0.8$) on a scale from 1 to 5. Participants also reported whether they had professional experience in esports, defined as, "... experiences where you have competed as a player, either as a professional or semi-professional, in esports related events (e.g., leagues, sponsored teams, and bracketed tournaments) in a competitive multiplayer video game." The majority of participants indicated they did not have professional experience (no=149); however, some did report prior professional experience (yes=50), while the remaining did not know (unsure=11).

3.2 Measures

Choking and Clutching Propensity: As there is no validated scale of the propensity to clutch or choke, we constructed a four-item scale for each construct, shown in Table 1; internal consistency of the items was considered good [20]: Choking: $\alpha = .80$; Clutching: $\alpha = .80$.

Choking Items	Clutching Items
I often choke in competitive multiplayer video games	I often clutch in competitive multiplayer video games
I rarely choke in competitive multiplayer video games (R)	I rarely clutch in competitive multiplayer video games (R)
When under pressure in multiplayer video games, I tend to perform badly	When under pressure in multiplayer video games, I tend to perform well
I fall flat in video game situations that demand I perform well	I thrive in video game situations that demand I perform well

Table 1. Items used in the assessment of propensity to choke and propensity to clutch.

Revised Self-Consciousness Scale (RS-CS): The 22-item RS-CS includes three subscales: Public Self-Consciousness (7 items; “*I’m self-conscious about the way I look*”), Private Self-Consciousness (9 items; “*I generally pay attention to my inner feelings*”) and Social Anxiety (6 items; “*Large groups make me nervous*”). Participants were asked to indicate the extent to which each statement reflects how they feel about themselves using the following response format: 1 = not at all like me, 2 = a little like me, 3 = somewhat like me, and 4 = a lot like me, after which scores are averaged across questions. In our sample, Cronbach’s α was in line with previous-reported values: Private Self-Consciousness ($\alpha = .74$; $\alpha = .75$ [63]), Public Self-Consciousness ($\alpha = .83$; $\alpha = .84$ [63]), and Social Anxiety ($\alpha = .88$; $\alpha = .79$ [63]).

Reinvestment Scale (RS): The 20-item Reinvestment Scale measures an individual’s tendency to focus attention inwards [45]. In line with previous studies [32, 35, 36], the original yes/no response format was replaced in this study by a 5-point Likert type scale ranging from 1 (extremely uncharacteristic) to 5 (extremely characteristic). The use of this scale is reported to be a more reliable and valid measure [73] and enables respondents to better indicate the extent in which they identify with each item [53]. Items were averaged to produce an overall reinvestment score, with higher scores reflecting a greater tendency for reinvestment. In our sample, Cronbach’s $\alpha = .87$, which is in line with previous-reported values ($\alpha = .80$: [45]).

The Dualistic Passion Scale: The 12-item passion scale [70] assesses Harmonious Passion (HP; 6 items) and Obsessive Passion (OP; 6 items). Sample items include “*playing video games is in harmony with the other activities in my life*” for HP and “*I have almost an obsessive feeling for video games*” for OP. Items within the scale were modified to include the phrasing “*playing video games*” at the beginning or end of each item, and employed a 7-point Likert scale (1 = not true at all, 7 = very true). Items from both the HP and OP subscales were averaged to produce overall passion scores for each subscale. In our sample, Cronbach’s α was in line with previous-reported values from Marsh et al. [43] for both HP ($\alpha = .82$; $\alpha = .83$ [43]) and OP ($\alpha = .91$; $\alpha = .86$ [43]).

Coping Style in Sport Inventory (CSSI): The 16-item CSSI [6] assesses Approach Coping Styles (8 items; “*I thought about the unpleasant experience for quite some time*”) and Avoidance Coping Styles (8 items; “*I concentrated on what I had to do next*”) on a 5-point Likert scale (1 = not at all used, 5 = used all the time). Participants were asked to indicate the reactions they used while during a recalled ‘choke’ scenario. In our sample, Cronbach’s α was lower (Approach Coping: $\alpha = .64$; Avoidance Coping: $\alpha = .52$) than previous-reported values gathered in the context of sport (Approach Coping: $\alpha = .84$; Avoidance Coping: $\alpha = .80$; [4]). As reliability in our sample was low, we report our findings, but take caution in the interpretation of the results. For symmetry, we also collected approach and avoidance coping style with clutching (CSSI:Clutching), but found this

scale to be difficult for participants to interpret as ‘coping’ with a positive outcome (like a clutch performance) is not a common use of the term. We do not present any analysis of CSSI: Clutching; however, it was used in our data cleaning process (see Section 3.3).

3.3 Data Analyses

Before analyzing the data, we first reverse-coded items and calculated the means and standard deviations for each scale’s subconstructs for all 274 participants. Responses that did not meet the threshold quality criteria were filtered from the sample. First, we filtered out 42 participants who completed the study too quickly, defined as less than 1.2 seconds per item within the Reinvestment, RSCS, Passion, CSSI: Choking, and CSSI: Clutching scales, which indicated a lack of attention in completing responses. Second, we removed 13 participants who violated the zero variance filter on any of the 5 scales, indicating there was zero diversity in their responses (they simply repeated the same response). Third, we ran a variance filter to detect responses from participants that were more than three standard deviations above the mean variance on two or more of the following questionnaires: Reinvestment, RSCS, Passion, CSSI: Choking, and CSSI: Clutching. Zero participants were removed in this step, indicating that the pattern of responses were consistent as evidenced by small variances in responses. Lastly, we removed 9 participants whose free form responses indicated bot-like behavior (copied from a source on the internet) or nonsensical responses that could not be interpreted as meaningful. Overall, the filtering process removed 64 participants, totalling 210 valid responses that were processed and used for further analyses.

We conducted multiple regression analyses using traits to investigate their relationship with the propensity to clutch or choke, with a significance threshold of $\alpha=.05$. Using hierarchical regressions, we controlled for age (see section 2.1.3) and self-rated experience in the competitive video game they play most (see section 2.1.2) by entering them in the first block and adding predictors of interest in the second block. We calculated separate regression models for the influence of each trait on the propensity to choke and clutch, but included sub-constructs for each trait within a single multiple regression model to account for shared variance within a scale. This choice means that the predictions are made by the non-shared rather than the shared variance within the set of predictors. As we conducted multiple tests on the same dependent measures (four regressions for propensity to choke and four for propensity to clutch), we correct for familywise error rates of each model using a Bonferroni correction, which set α for a significant model at 0.0125. We report standardized regression coefficients (β) and p-values for individual predictors and R^2 values, F, and p-values for the regression models. SPSS 26 was used for all statistical tests on the quantitative data.

4 RESULTS

Table 2 shows the means (and standard deviations) of our measures, and correlations between the measures presented in our results. We further explore the relationships between the propensity to choke and clutch and the various traits through multiple regression analysis. We present our results by research question.

4.1 RQ1. Are there Traits that Relate to Performance under Pressure?

4.1.1 RQ1a. How does Trait Reinvestment Relate to Propensity to Choke and Clutch? As shown in Table 3, the models were significant for both choking and clutching. Experience negatively correlates with choking, whereas, it positively correlates with clutching. Age did not significantly correlate with either choking or clutching. Trait reinvestment—i.e., a tendency to consciously control the step-by-step components of executing a skill through use of explicit rules—correlated with propensity to choke, but not propensity to clutch.

	Mean (SD)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Age	33.9 (8.4)					*	*		*				
(2) Expertise	3.8 (0.8)	-.115		**	**					**	**		
(3) Propensity to Choke	2.5 (0.9)	.073	-.285		**	**		*	*		*	**	**
(4) Propensity to Clutch	3.6 (0.8)	.022	.453	-.504					*	*			
(5) Reinvestment	3.2 (0.7)	-.164	.070	.248	-.045		**	**	**		**	**	*
(6) Private Self-Consciousness	2.8 (0.5)	-.161	.000	.054	.120	.588		**	**	**	**	**	*
(7) Public Self-Consciousness	2.8 (0.7)	-.120	.067	.172	-.028	.651	.461		**	*	**	**	
(8) Social Anxiety	2.5 (0.9)	-.170	-.019	.176	-.173	.446	.209	.436			**	**	
(9) Passion: Harmonious	5.3 (1.0)	.027	.300	-.095	.173	.090	.244	.157	.003		**	**	
(10) Passion: Obsessive	3.2 (1.5)	-.036	.222	.151	.063	.513	.248	.304	.169	.199		**	**
(11) Choking: Approach Coping Style	3.1 (0.7)	.097	.122	.190	.116	.381	.213	.272	.181	.218	.387		**
(12) Choking: Avoidance Coping Style	3.1 (0.6)	.085	-.026	.220	-.045	.175	.137	.065	.021	.012	.213	.271	

Table 2. Means and standard deviations for all measures. Correlations (Pearson r) between demographic factors, propensity to choke and clutch, traits, and passion. * $p < .05$, ** $p < .01$.

4.1.2 RQ1b. How does Trait Self-consciousness Relate to Propensity to Choke and Clutch? As shown in Table 4, the models were significant for both choking and clutching. As with the models for reinvestment, experience was negatively related to choking, but positively related to clutching, whereas, age did not significantly correlate with either propensity to choke or clutch. Public self-consciousness—i.e., awareness of the self as an object in social contexts—correlated with choking, but not clutching. However, clutching was correlated positively with private self-consciousness—i.e., attention directed inwards to one’s thought processes—and negatively with social anxiety—i.e., apprehension of being evaluated in a social context; neither private self-consciousness nor social anxiety was associated with choking.

	Choking				Clutching			
	B	[LLCI, ULCI]	β	p	B	[LLCI, ULCI]	β	p
Age	.009	[-.004, .022]	.086	.188	.006	[-.006, .018]	.065	.306
Experience	-.307	[-.440, -.175]	-.295	<.001	.440	[.324, .556]	.465	<.001
Reinvestment	.363	[.199, .527]	.283	<.001	-.078	[-.222, .066]	-.067	.286
Model	$R^2=.160$, $F_{3,206}=13.1$, $p<.001$				$R^2=.215$, $F_{3,206}=18.8$, $p<.001$			

Table 3. **Reinvestment:** Multiple regression results with explained variance at the second level, unstandardized regression coefficients (B), 95% confidence intervals on coefficients ([LLCI, ULCI]), standardized regression coefficients (β), and p -values for regressions predicting the propensity to choke and clutch, using age, experience, and trait reinvestment as predictors. Goodness of fit indices (R^2 , F , p) provided.

4.2 RQ2. Does Passion Orientation Relate to Performance under Pressure?

As shown in Table 5, the models were significant for both choking and clutching. As with the previous models, experience was negatively correlated with propensity to choke, but positively correlated with propensity to clutch, whereas, age did not significantly correlate with either choking or clutching. Harmonious passion—i.e., a balanced and authentic passion for a beloved activity—did not correlate with clutching or choking. However, obsessive passion—i.e., a preoccupation and inflexible persistence toward a loved activity—positively correlated with propensity to choke, but did not correlate with propensity to clutch.

	Choking				Clutching			
	B	[LLCI, ULCI]	β	p	B	[LLCI, ULCI]	β	p
Age	.008	[-.006, .021]	.075	.265	.007	[-.005, .018]	.071	.252
Experience	-.297	[-.433, -.161]	-.285	<.001	.438	[-.325, .551]	.463	<.001
Private	-.057	[-.304, .190]	-.034	.648	.305	[-.099, .511]	.199	.004
Public	.210	[.006, .414]	.163	.043	-.083	[-.253, .087]	-.071	.335
Social Anxiety	.121	[-.025, .266]	.120	.103	-.148	[-.270, -.027]	-.163	.017
Model	$R^2=.134$, $F_{5,204}=6.31$, $p<.001$				$R^2=.265$, $F_{5,204}=14.7$, $p<.001$			

Table 4. **Self-Consciousness:** Multiple regression results with explained variance at the second level, unstandardized regression coefficients (B), 95% confidence intervals on coefficients ([LLCI, ULCI]), standardized regression coefficients (β), and p -values for regressions predicting the propensity to choke and clutch, using age, experience, and trait self-consciousness (private self-consciousness, public self-consciousness, social anxiety) as simultaneous predictors. Goodness of fit indices (R^2 , F , p) provided.

	Choking				Clutching			
	B	[LLCI, ULCI]	β	p	B	[LLCI, ULCI]	β	p
Age	.005	[-.009, .018]	.047	.479	.007	[-.005, .018]	.072	.250
Experience	-.331	[-.474, -.187]	-.317	<.001	.434	[-.310, .558]	.459	<.001
Harmonious	-.043	[-.164, .079]	-.048	.491	.034	[-.071, .139]	.042	.522
Obsessive	.130	[.056, .204]	.233	.001	-.022	[-.086, .042]	-.044	.489
Model	$R^2=.133$, $F_{4,205}=7.88$, $p<.001$				$R^2=.214$, $F_{4,205}=13.9$, $p<.001$			

Table 5. **Passion Orientation:** Multiple regression results with explained variance at the second level, unstandardized regression coefficients (B), 95% confidence intervals on coefficients ([LLCI, ULCI]), standardized regression coefficients (β), and p -values for regressions predicting the propensity to choke and clutch, using age, experience, and passion orientation (harmonious passion, obsessive passion) as predictors. Goodness of fit indices (R^2 , F , p) provided.

	Choking				Clutching			
	B	[LLCI, ULCI]	β	p	B	[LLCI, ULCI]	β	p
Age	.001	[-.013, .014]	.007	.911	.007	[-.005, .018]	.072	.250
Experience	-.315	[-.449, -.181]	-.302	<.001	.427	[-.310, .545]	.451	<.001
Approach	.236	[.064, .409]	.182	.008	.082	[-.069, .233]	.069	.287
Avoidance	.235	[.043, .426]	.162	.016	-.077	[-.244, .090]	-.058	.366
Model	$R^2=.157$, $F_{4,205}=9.52$, $p<.001$				$R^2=.217$, $F_{4,205}=14.2$, $p<.001$			

Table 6. **Choking Coping Style:** Multiple regression results with explained variance at the second level, unstandardized regression coefficients (B), 95% confidence intervals on coefficients ([LLCI, ULCI]), standardized regression coefficients (β), and p -values for regressions predicting the propensity to choke and clutch, using age, experience, and choking coping style (approach and avoidance) as predictors. Goodness of fit indices (R^2 , F , p) provided.

4.3 RQ3. Does Coping Style Relate to Performance under Pressure?

As shown in Table 6, the models were significant for both choking and clutching. As with the previous models, experience negatively correlated with propensity to choke, but positively with propensity to clutch, whereas, age did not significantly correlate with either choking or clutching. Both an avoidance and approach style of coping with choking correlated with propensity to choke. As would be expected, neither approach nor avoidance styles of coping with choking correlated with propensity to clutch.

5 DISCUSSION

5.1 Summary of Results

Overall, our results suggest that experience has a consistent positive correlation with clutching and negative correlation with choking. Trait tendencies towards reinvestment and public self-consciousness, as well as obsessive passion orientation, approach coping styles, and avoidance coping styles, positively correlated with propensity to choke. Separately, social anxiety negatively correlated with propensity to clutch, whereas private self-consciousness positively correlated with propensity to clutch. Specifically, we found that:

- Across all models, experience with a game was associated with a reduction in propensity to choke and an increase in propensity to clutch.
- Across all models, age was not associated with either propensity to choke or clutch.
- Choking was associated with increased reinvestment, public self-consciousness, obsessive passion, and both approach and avoidance styles of coping with choking.
- Clutching was associated with higher private self-consciousness and lower social anxiety.

In this section, we discuss our exploratory results, and offer speculative interpretation rooted in the extant literature. This discussion may be helpful for guiding future confirmatory research that offers causal experiment design and accompanying interpretation.

5.2 Contextualization of Results

5.2.1 Reinvestment. To investigate RQ1a (“*How does trait reinvestment relate to propensity to choke and clutch?*”), we explored relationships between reinvestment and the propensity to choke and clutch. That reinvestment emerged as a positive correlate for choking, but not for clutching, confirms—in the context of video games—extant sports literature contending that ‘high reinvestors’ are more likely to under perform in high-pressure scenarios [45]. As in physical sports, a predisposition in video games towards the re-adoption of declarative processing (disrupting faster, and more intuitive, procedural processes) may thwart performance in high-pressure events. Players predisposed to reinvestment may find themselves suddenly reliant on explicit rules in pressure scenarios; e.g., the earlier example of a reinvesting first-person shooter player who, in a critical moment, focuses on crosshair placement, knowledge about their weapon (e.g., spray patterns), and rehearses required inputs (formerly an automated task). As declarative processing requires additional attentional resources, switching to these explicit rules may slow, limit, and otherwise thwart performance. In a qualitative study by Fanfarelli [18], professional *Overwatch* athletes identified two overarching themes as important elements to professional play: game sense (e.g., survival, prediction, communication, and thoughtfulness); and mechanics (aim, ability usage, movement, positioning, and team-based synergies). As competitive multiplayer video games often require fast reaction and response time, and strategic decisiveness, any disruption to the execution of an in-game response may constitute a failure in performance.

Further, the identification of reinvestment as a related variable to choking in video games may support its presence in less motoric tasks. While previous literature has largely examined

reinvestment in the context of physical activity (e.g., ball sports), there has been a dearth of literature exploring its application in predominantly mental or cognitively-driven activities. As such, this research suggests that reinvestment is not solely an artefact of the physical domain, and that explicit mental rules may also be automated—and likewise susceptible to deautomization. Alternatively, it may be that the motoric requirements of video game play (e.g., reaction time vs. response time, wherein reaction time includes a motor component; or, fine motor skills associated with aim) are the components being automated and deautomized.

5.2.2 Self-Consciousness. To investigate RQ1b (*"Does trait self-consciousness relate to propensity to choke and clutch?"*), we explored relationships between public self-consciousness, private self-consciousness, social anxiety, and the propensity to choke and clutch. We found that public self-consciousness positively correlated with choking, private self-consciousness positively correlated with clutching, and social anxiety negatively correlated with clutching.

As public self-consciousness denotes a tendency to consider one's public qualities or impressions (e.g., behaviors, stylistic expression, and so on), as opposed to private qualities (e.g., values, beliefs, and feelings), it may be that a focus on perception translates to online gaming environments. Following this, a player who rates higher for public self-consciousness may likewise focus on their public online qualities—for example, their presentation as a competent player, or as a useful teammate. Nervousness about behaviors or actions that may negatively impact their public perception (such as poor performance—e.g., inaccuracy or imperfect decision-making) may induce hesitation or otherwise disrupt performance, trigger declarative processing, and lead to choke. Further, public self-consciousness may introduce a critical distraction: in lieu of focusing on their performance or the game state, players may instead ruminate on others' current and future perceptions of themselves—thus impairing performance. For a player who is already concerned about prior performance (for example, a player experiencing a loss streak), this may have a snowballing effect. These findings further expand on research by Baumeister [7], who found audience pressure detrimental to performance; this may have foundations in concerns about the audience's perception of the player.

Additionally, research by Matsui et al. [46] found that streaming game play on Twitch has a negative impact on performance in League of Legends. It is suggested that carrying out two cognitively intensive tasks simultaneously—interacting with Twitch chat and focusing on performance—may result in a deterioration in performance due to cognitive overload. However, the performance of streamers may also be affected by factors unrelated to their own capabilities such as through the following stream-sniping tactics: 'queue sniping' (i.e., tuning into a stream to simultaneously queue up with the streamer with the intention of entering their game to hinder the streamer's chances of winning); and 'ghosting' (i.e., an enemy player tuning into a stream to gain an unfair advantage of where the streamer's team is positioned). Streamers may also be susceptible to general scrutinization and harassment from viewers in Twitch chat which may result in increased self-consciousness about one's performance. To address these performance concerns, streamers often resort to creating stream specific accounts for streaming content, and reserve alternative accounts for climbing and ranked play off stream.

Interestingly, greater tendency towards private self-consciousness positively correlated with propensity to clutch. As private self-consciousness is internalized, and concerns one's innermost thoughts, one explanation may be that self-scrutiny prompts self-improvement: players who are concerned about their performance's impact on their own feelings, and their own self-perception, may actively seek to rectify weaknesses they have identified in their performance. Rectifying self-identified limitations in performance may lead to improved overall performance (or a perceived improvement) and associated increased self-confidence, which may promote clutching. Additionally,

failing may also be perceived less harshly by the player: failures in performance may instead represent an opportunity for growth and reflection, rather than as an aspersion or condemnation of one's ability. As such, fear of failure may be reduced—which, in turn, may promote improved performance and opportunity to clutch.

Finally, greater social anxiety was found to negatively correlate with clutch. Social anxiety differs from public self-consciousness in that it explicitly addresses apprehensiveness over being judged by others, and nervousness in the company of groups. Following this, our results suggest that players who are more concerned with being negatively evaluated or judged by a group—or who experience nervousness in groups, or amongst strangers—may be less likely to clutch. Notably, competitive multiplayer titles, especially those popular in esports, regularly feature team-based environments; e.g., *League of Legends*, *Rainbow Six Siege*, *Counter-Strike*, *Fortnite*, and *DotA 2*. Furthermore, many team-based games possess a spectating system that allows players to spectate teammates after death. As such, those who are troubled by interaction with groups or strangers, and who are concerned by being negatively evaluated by others, may be less resilient to these types of environments. Consequently, anxiety may reduce the potential for maintained or high performance in an unfavorable situation.

5.2.3 Passion Orientation. To investigate RQ2 ("*Does passion orientation relate to performance under pressure?*"), we explored relationships between obsessive passion, harmonious passion, and the propensity to clutch and choke. Increased obsessive passion (a preoccupation and inflexible persistence towards gaming) was found to positively correlate with choking. For those preoccupied with playing video games, and for whom gaming forms an inextricable and potentially uncontrollable aspect of their lives (and one of few avenues for enjoyment), it may be that the outcome of a game holds greater weight and consequence than for those who engage more harmoniously. In obsessive passion, individuals associated the activity with self-worth or social acceptance [71]; as such, failure to succeed in the activity may threaten these constructs. Following this, as a potential loss could be perceived to be more harmful, the associated higher stakes may induce greater anxiety and pressure—which may contribute to an increased chance for reinvestment, errors in judgement, and failures in performance. Additionally, players who trend towards obsessive passion for gaming may be more likely to ruminate on and recall moments of choke, thus potentially increasing self-reported propensity to choke.

The dualistic model of passion has been the focus of much research inquiry in the domain of games user research [38, 42, 56], including specifically within the context of esports [23]. While research on passion is limited in the context of performance in competitive multiplayer video games, our results suggest that choking is associated with obsessive passion, which presents an interesting avenue for further investigation concerning passion orientation and the propensity to choke.

5.2.4 Coping Style. To investigate RQ3 ("*Does coping style relate to performance under pressure?*"), we explored relationships between approach coping style, avoidance coping style, and the propensity to choke and clutch. Both approach (i.e., strategies that actively address the stressor) and avoidance (i.e., strategies that avoid the stressor) coping styles were found to positively correlate with choke. Within sports literature, there is relative incohesion in understanding what coping styles are used among athletes in stressful situations. However, the commonality among such studies is that athletes use either approach or avoidance mechanisms in sport. In the context of multiplayer video games, we found that both styles of coping positively correlated with choking—indicating both strategies may be harmful in online game play. In line with reinvestment, those who used approach coping mechanisms may have directed attention towards the execution of the task, resulting in performance decrements due to shifts in procedural processing to more declarative processing.

For those who used avoidance coping strategies, players may have been focused on impressing others, potentially contributing to an episode of choke. Additionally, the coping mechanisms used in physical sports may not translate to online multiplayer video game contexts as indicated by the relatively low reliability obtained for both subscales. While players report engaging in either approach or avoidance coping strategies in online play, these strategies both appear to be unsuccessful in reducing the likelihood of choking. One possible explanation for this finding may be that the fast pacing in video games does not afford players an adequate amount of time to effectively cope with stressors compared to physical sports. As a result, cognitive processes may be impaired while using either approach, contributing to the lack of effectiveness in both approaches.

Further, rather than utilizing coping mechanisms during video game play, research by [55] suggests that players may benefit from offline interventions designed to increase emotional control—potentially improving performance by reducing perceived stress intensity. The authors identified that players reported the use of more problem-focused (i.e., approach) coping strategies and suggest that coaches, team managers, and sport psychologists use strategies that help players actively address the stressors they experience. Applying coping strategies offline may better equip players with the tools they need to succeed under stress in online environments. Additionally, Behnke et al. [9] found that pleasant emotions (e.g., enthusiasm) along with high-approach tendencies (i.e., actions that address a stressor) enhance performance. As such, emotional control interventions should implement strategies that enhance a player's ability to focus on pleasant emotions while utilizing an approach-focused coping strategy to actively address stressors.

5.2.5 Experience & Age. Consistent across all results, less experience was connected with a greater propensity to choke. Conversely, more experience was connected with a greater propensity to clutch. These relationships are fairly intuitive: those with less experience may be more likely to make mistakes, and especially so under pressure, due to reduced familiarity with their preferred competitive video game (e.g., map layouts, tactics, combos, character skills, and so on). Furthermore, as novices tend to utilize slower declarative processes [25, 77], choking may be more prevalent for less experienced players. In contrast, those with increased experience may be more equipped to succeed in pressure conditions due both increased game knowledge, and automated response through the procedural processing.

Age did not play a role in choke and clutch, indicating that players' propensity to clutch and choke may be associated with trait susceptibilities, experience, and ability in the game, rather than by factors related to age (such as physical condition). As such, these findings do not suggest that *performance* in competitive multiplayer games is not related to age—but rather that *propensity to choke* (or performance under pressure) may not be. Although previous studies exploring age and competitive gaming suggest that performance itself [66], and the importance of performance [11], may change as we age, our results suggest that there may be little association between aging and *ability to perform under pressure*. However, further longitudinal studies are required to identify whether any age-related findings in competitive gaming are attributed to age or to a cohort.

5.3 Implications

This study, representing an initial step in investigating choking and clutching in the context of online video games, offers wide-ranging implications. In this section, we discuss the implications and applications of our findings in both research and industry contexts. In particular, we focus on the context of our work in the domain of esports and professional video game play.

Our work reveals implications for esports training and management. We suggest that collecting trait inventories from rostered players may allow an esports organization to determine, ahead of time, if a player may benefit from training, coaching, or familiarization with pressure scenarios.

We suggest that training may be specialized to trait susceptibility. For example, a player with trait susceptibility to reinvestment may benefit from a training regimen that encourages procedural processing in play; alternatively, a player with self-consciousness trait susceptibility may benefit from a training regimen that prioritizes desensitization to audience or social pressures (e.g., familiarization with stage performance). Further, organizational staff may implement general pressure training programs that familiarize players with performance in high-pressure circumstances—thus equipping players with the ability to maintain, or excel, in contexts where their performance is critical. Additionally, our work may contribute to game design in terms of facilitating clutch performance in competitive play. Game companies may support players in maintaining optimal performance under pressure by limiting in-game features that draw attention to one's performance, such as removing the spectator function that informs players they are being watched. In competitive video games, score boards are also a source of pressure as they inform players how well they are performing relative to others. While this may be beneficial for gauging how well one is performing, it may likewise be a distraction that lures players into a suboptimal state of mind—resulting in performance decrements due to increased self-awareness or self-consciousness related to ego-relevance. Game designers may address this issue by designing an alternative method of measuring performance that does not directly reflect a player's hierarchical value to their team. For instance, Blizzard Entertainment implemented a medal system in *Overwatch*—whereby each player's stats are only visible to the individual—in an attempt to provide personalized insights on performance relative to teammates. However, this approach lacks meaningful insights on individualized performance and contributes to performance comparisons among teammates. Game developers may address these predicaments by implementing a medal system that gauges individual performance relative to the average stats that are achieved for each hero to promote personal improvement rather than competition and comparisons among teammates. Alternatively, game developers could implement a system that informs players how well the team is doing in terms of eliminations, objectives, damage outputs, etc., rather than personal performance stats, to promote better team cohesion and cooperation.

We also suggest that experience performing for an audience—that is, with spectator pressure—may help to reduce social anxiety associated with being observed. One natural avenue for this may constitute live streaming game play to an audience. We also posit that future work on performance under pressure may benefit from exploring streamers' experience of choking and clutching in video games, and in particular, examining the role that public self-consciousness and social anxiety may play in their performance.

We suggest that, alongside reinvestment and a lack of experience, anxiety represents a key factor in thwarting performance under pressure. Individuals who trend towards public self-consciousness, social anxiety, harmful adoption of avoidance and approach coping styles, and obsessive passion may experience a fear of loss—risking social judgement, self-worth, and perception that ultimately impedes performance—thus eliciting choking in high pressure contexts. This could lead to play behaviors known colloquially in gaming and sporting contexts as 'playing scared' (as opposed to 'playing to win'): an overly cautious, passive, or ineffective play style motivated by fear of loss; and, separately, 'ladder anxiety': anxiety borne specifically out of fear of loss in the high stakes context of a ranked match, often stemming from concerns about disappointing others or oneself [68]. Such a phenomenon may have roots in negativity bias—a cognitive bias in which negative events, such as game losses, are more impactful and weighted more heavily than positive events, such as game wins [62]. However, there are approaches that may alleviate symptoms of ladder anxiety and help overcome 'playing scared'. It is suggested that being aware of how one experiences ladder anxiety (e.g., sweaty palms, cold hands, negative thoughts), and recognizing what prompts these experiences, is important for understanding how to cope with such symptoms

[68]. For instance, ensuring one is in a comfortable environment and in a positive state of mind prior to performing may maximize one's ability to maintain their performance and avoid prompting negative experiences. Optimal player state may be further facilitated by ensuring that players are well-rested, as research has shown that esports performance—as with other cognitive performance—is vulnerable to the negative effects of sleep deprivation [12]. Game companies may also assist in reducing ladder anxiety by removing promotional games—*League of Legends* has done so for ranking up within divisions, instead determining a player's rank based on their elo (i.e., a rating system that calculates the relative skill levels of players). Removing promotion series may reduce anxiety associated with rankings and allow players to focus on improving rather than on playing not to lose (i.e., playing scared).

Another phenomenon of interest related to performance under pressure is that of emotion regulation. Developing effective coping strategies is essential for maintaining an optimal psychological state during high pressure moments. Those who fail to regulate their emotions in competitive play may be more susceptible to an episode of choke. Of particular relevance in the domain of esports in regard to emotion regulation is the phenomena of 'going on tilt'—a prolonged suboptimal state of mind occurring from a series of failures [76]. Once the point of tilt has been reached, performance is often not reconcilable due to the mentality that one has already 'given up'. Research by LeNorgant [39] examined the role of self-talk in relation to performance in both traditional and online sporting contexts. It was found that esports competitors engage in less self-talk and have more negative thought patterns compared to traditional athletes. LeNorgant [39] suggests that these negative patterns of self-talk contribute to the increased likelihood of experiencing tilt. As such, esports professionals would benefit from receiving early interventions targeted towards regulating emotions and maintaining an optimal state of mind during performance.

Additionally, research by Kou and Gui [37] examined how *League of Legends* players regulate their emotions in competitive play. Many players acknowledged tilt played a role in their performance decrements and suggested strategies for coping with this state such as taking a break to mentally reset, setting a goal for each match, releasing oneself from the fear of losing, or seeking emotional support from friends. Recent work by Wu et al. [78] also examined player experiences of tilt in *League of Legends*, and found that players who perceived tilt as malleable (i.e., the belief that one can change how easily they get tilted) were more likely to respond with positive strategies when the game was the trigger of their tilt than those who perceived tilt as 'fixed' or unchangeable. However, perceptions of malleability made no difference in coping response when players perceived their own performance as the catalyst for their tilt. As such, Wu et al. [78] suggest that coaches and managers may reframe player's approach to tilt by implementing emotion regulation strategies that combat self-judgment, negative self-talk, and stress. Further investigating the role of tilt in relation to choke and clutch would provide insight into what psychological states facilitate or thwart performance.

Future research would also benefit from a more in-depth investigation of the subjective experiences of both choke and clutch performance within competitive multiplayer video games. The mechanisms underlying choke and clutch performance are complex, involving nuances in how the phenomenon is experienced across individuals with differing traits and experiences. While our study highlights that player traits and tendencies contribute to episodes of choke and clutch performance, it does not identify the broader pressures at play—nor does it evaluate the player experience of choke and clutch. As such, a subjective investigation of the experience of choke and clutch performance would provide a valuable contribution within the literature concerning performance in esports contexts.

5.4 Limitations

We investigated self-reported instances of choking and clutching in competitive multiplayer video games, which may be subject to participant bias. As with most research utilizing methods of self-report, participants may have sought to provide socially desirable responses by either overestimating or underestimating their performance. Although responses were anonymized, participants may not have wanted to identify themselves as ‘chokers’ as there are often negative connotations associated with poor performance (e.g., noob). Additionally, while we provided definitions of both choke and clutch performance to ensure comprehension of the terms, some participants may not have fully understood the explanations provided. As such, participants may not have provided accurate reports of how often they choke and clutch due to misinterpretation of the terms. Another potential limitation is that our findings may not generalize to esports professionals as the majority of our participants (149) indicated they did not have professional experience in esports related events. Professionals may have more experience performing under pressure as well as different coping strategies in competition compared to the average gamer. As this is exploratory research, it is helpful to first understand the experience for a more generalizable population. From there, research can be further refined for investigation among more specialized groups. A natural next step for research on this space, building off these findings, would be to investigate the experience of performance under pressure specifically in professional esports contexts. Future research identifying performance differences under pressure among esports professionals and the general population of gamers would be an interesting avenue for further investigation. While these factors should not influence the interpretation of the results, future research should remain cognizant of these potential limitations.

As expected, we did not find any significant results for coping style and propensity to clutch. The questionnaires are designed to measure coping styles during stressful events, which included items not applicable to clutch performance (e.g., “I thought about the unpleasant experience for quite some time,” “I tried to learn from the unpleasant experience”). Future research would benefit from developing coping style inventories that measure coping styles in stressful situations leading up to a clutch performance or pleasant experience. We also acknowledge the potential limitation of using self-report methods of coping styles from events experienced in the past, as participant recall may be degraded based on temporal distance from the event. Conducting an experiment in which coping styles are measured immediately after a clutch or choke performance may provide more accurate results. We also recognize that the CSSI may not translate to the context of online multiplayer video games, which warrants further investigation of the coping styles used within online gaming. However, our results indicate that concepts used within physical sports also provide valuable insights regarding performance in esports. As such, future research should continue to investigate how concepts within traditional sports translate into online gaming contexts to identify patterns of commonality. We also advise researchers to interpret such findings with caution and to make gaming specific amendments to concepts borrowed from traditional sports where applicable.

Finally, participants in our study were recruited from a variety of gaming backgrounds and genres such as first-person shooters (FPSs) and multiplayer online battle arenas (MOBAs). On this account, there may be specific gaming genres and mechanics that facilitate more episodes of choke and clutch compared to others. Further examining choke and clutch performance within specific gaming titles may provide insight into what genres and mechanics are most facilitative of choking and clutching. However, our results provide generalizability among a variety of gaming titles concerning choke and clutch performance—indicating there are shared mechanics across gaming contexts that contribute to both choke and clutch performance.

6 CONCLUSION

In this paper, we investigated the role that player traits and tendencies play in both choke and clutch performance. Our work extends findings from traditional sports literature into the virtual realm of esports. We found that trait tendencies towards reinvestment, public self-consciousness, obsessive passion orientation, as well as approach coping styles and avoidance coping styles, positively correlate with propensity to choke. Propensity to clutch was negatively correlated with social anxiety, and positively correlated with private self-consciousness and player experience with competitive gaming. Furthermore, our results support that mechanics susceptible to deautomization in physical sports also translate to more cognitive domains such as online multiplayer video games. In accordance with our findings, we propose recommendations for improving and maintaining performance in esports, and suggest potential avenues of further investigation within research concerning expertise and performance development. Research that continues to build upon player trait susceptibilities and concepts traditionally used in physical sports will equip researchers and esports performance personnel (e.g., coaches, managers, and players) with the tools required to address performance concerns. By unpacking the relationships between individual traits and propensity to choke and clutch, our work takes a step toward helping esports enthusiasts—from amateur competitors through professional athletes—perform their best when under pressure.

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