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UNDERSTANDING MOTIVATIONAL FACTORS OF PROBLEMATIC VIDEO GAMING IN THE USMC AND USN

by

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Video games have become a staple in entertainment since the inception of digital gaming and can be used as a healthy way of escaping the stresses of modern society. With the increased usage of technology, military personnel have easier access to computer/internet gaming through various platforms. However, through excessive exposure, video games may become problematic and even addictive. With the potential issues that problematic video gaming may have on the Naval mission, this study assessed the prevalence, severity, and associated factors of video gaming on 87 Sailors from two U.S. Navy warships and compared these results with data from three U.S. Marine Corps commands from a similar study (954 Marines). Results showed that higher–severity gamers experienced statistically higher levels of depression, anxiety, loneliness, stress, and were 35% more likely to experience daytime sleepiness and 48% more likely to have an alcohol problem than lower–severity gamers. The strongest motivations to game for greater severity gamers were to escape from reality, cope with stress, and to compete with other gamers. We did not identify substantive differences between Sailors and Marines who played videogames. Further studies are needed to evaluate whether videogaming is the cause of a drop in the well-being of greater severity gamers and to reliability assess the criteria for both "problematic" and "disordered" video gaming that are more suited for an operational military environment.

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UNDERSTANDING MOTIVATIONAL FACTORS OF PROBLEMATIC VIDEO GAMING IN THE USMC AND USN

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ABSTRACT

Video games have become a staple in entertainment since the inception of digital gaming and can be used as a healthy way of escaping the stresses of modern society. With the increased usage of technology, military personnel have easier access to computer/internet gaming through various platforms. However, through excessive exposure, video games may become problematic and even addictive. With the potential issues that problematic video gaming may have on the Naval mission, this study assessed the prevalence, severity, and associated factors of video gaming on 87 Sailors from two U.S. Navy warships and compared these results with data from three U.S. Marine Corps commands from a similar study (954 Marines). Results showed that higher–severity gamers experienced statistically higher levels of depression, anxiety, loneliness, stress, and were 35% more likely to experience daytime sleepiness and 48% more likely to have an alcohol problem than lower–severity gamers. The strongest motivations to game for greater severity gamers were to escape from reality, cope with stress, and to compete with other gamers. We did not identify substantive differences between Sailors and Marines who played videogames. Further studies are needed to evaluate whether videogaming is the cause of a drop in the well-being of greater severity gamers and to reliability assess the criteria for both “problematic” and “disordered” video gaming that are more suited for an operational military environment.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADSM	active-duty service member
ADHD	attention deficit/hyperactivity disorder
ANOVA	analysis of variance
APA	American Psychiatric Association
AUDIT-C	Alcohol Use Disorders Identification Test for Consumption
BH-FDR	Benjamini-Hochberg False Discovery Rate
Br.COPE	Brief-Coping Orientation to Problems Experienced
CG	guided-missile cruiser
DDG	guided-missile destroyer
DSM-5	Diagnostic and Statistical Manual of Mental Health Disorders, fifth edition
ENS	Ensign
ESA	Entertainment Software Association
ESS	Epworth Sleepiness Scale
FPC	Force Protection Council
GD	gaming disorder
GAD-7	Generalized Anxiety Disorder - 7
GM	gray matter
GMT	general military training
ICD-11	International Classification of Diseases, Eleventh Revision
IGD	Internet Gaming Disorder
IGDS9-SF	Internet Gaming Disorder Scale–Short-Form
IQR	interquartile range
IRB	Institutional Review Board
JMP	John's Macintosh Project
M	mean
Mdn	median
MOCQ	Motives For Online Gaming Questionnaire
MRI	magnetic resonance imaging
NVGP	non-video game players

OCD	Obsessive Compulsive Disorder
PHQ-8	Patient Health Questionnaire
PSS-4	Perceived Stress Scale – 4
SD	standard deviation
SEAL	Sea Air and Land
SWLS	Satisfaction with Life Scale
UCLA	University California, Los Angeles
US	United States
USMC	United States Marine Corps
USN	United States Navy
USS	United States Ship
VGP	video game players
WHO	World Health Organization

EXECUTIVE SUMMARY

As members of the most powerful Navy, United States Sailors have a duty to uphold the prestige, quality, and dedication that comes with such a title. Over prolonged periods of time, the occupational stressors that characterize military life may lead to an inevitable deterioration of job performance, and ultimately, diminish health (Pfaff et al., 2010). With the constant advances in technology that have come with the rise of the digital age, one common activity to reduce stress is playing video games. Video games can have beneficial effects such as improving selective and peripheral attention and enhancing working memory (Palaus et al., 2017). However, excessive exposure to video games may become problematic and even addictive. Military personnel have easier access to computer/internet gaming through various platforms. With the potential issues that problematic video gaming may have on the Naval mission, this study had three goals.

The first goal of this study was to assess the prevalence and severity of problematic video gaming in the U.S. Navy. As assessed by the IGDS9-SF scale, the average severity of video gaming habits from our participants was low. Based on the ICD-11 "5 out of 9" and the IGDS9-SF score "greater than or equal to 36" criteria, none of the Sailors in the study sample were classified as "disordered" video gamers. However, it should be noted that even though a Sailor does not meet the ICD-11 criteria for disordered gaming, does not mean that problematic videogaming may still be present. Nineteen gamers falling in the 4th quartile (i.e., greater severity gamers) had statistically significantly higher scores on the PSS-4 scale ($p = 0.008$), PHQ-8 ($p = 0.004$), GAD-7 ($p < 0.001$), and on the UCLA loneliness scale ($p < 0.01$) as compared to the gamers in the 1st quartile (i.e., lower severity gamers). Also, gamers in the 4th quartile were more likely to report symptoms of major/severe depression (9.26 times more likely) and generalized anxiety (8.1 times more likely). The most frequently reported motivations for gaming by greater severity gamers stemmed from self–distraction, self–blame, escaping from reality, coping with stress, and recreation amongst others.

The second study goal was to identify factors associated with gaming severity in the U.S. Navy. Our findings show that, in comparison to lower severity gamers, higher severity

gamers reported higher levels of stress, depression, anxiety, and loneliness. Despite these differences, however, the two groups (i.e., lower and greater severity gamers) did not differ in terms of satisfaction with life, reported daily sleep duration, and time spent playing video games, regardless of the setting (i.e., whether on duty or deployed). These findings suggest that reported sleep duration and hours spent playing video games cannot be used to differentiate gamers in terms of video gaming severity. In examining motivational factors for playing video games, greater severity gamers scored higher in socializing with others, escaping from reality, coping with stress, finding competition, finding recreation among others, and developing skills. Further research is needed to determine if these motivational factors for gaming are the result of work-related or other issues.

The third goal of this study was to compare and contrast the results of gaming severity of Sailor gamers on ships, Sailor gamers in USMC commands, and Marine Corps gamers. All three groups were predominantly male, with both the "Sailors on ships" group ($p = 0.022$) and Marines ($p = 0.035$) having more males than the "Sailors in USMC commands" group. Additionally, Sailors in USMC commands were older than Sailors on ships ($p < 0.001$) and Marines ($p < 0.001$). In terms of daily sleep duration while on duty, Sailors on ships reported 2 more hours of sleep per day compared to Sailors in USMC commands ($p < 0.001$). As assessed by IGDS9-SF scores, the severity of video gaming habits was on average low and did not differ between the three occupational groups. Sailors assigned to USMC commands reported higher levels of depression and anxiety than their counterparts on ships, whereas Sailors on ships experienced greater levels of anxiety than Marines.

This study had several limitations. The data for the study were collected solely through a self–report survey tool. Our findings regarding service member state/well-being cannot be directly attributed to video gaming habits because other occupational stressors may have affected Sailor responses. Future research should assess and quantify the extent to which service member well-being is affected by video gaming compared to other occupational and personal stressors.

Lastly, we cannot reliably assess the prevalence of video gaming due to the small sample size. Follow-up studies should collect data from multiple ships to increase the

sample size and the generalizability of the results. Focus group interviews, similar to the focus group interviews that were conducted with the USMC, should be conducted on USN ships to further investigate specific issues and trends of concern with more reliable estimates of prevalence.

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To my parents, Limin Ma and Howie Xu: I love you. All my successes today are because of the love and sacrifices both of you have made throughout my almost three decades so far. As I mature throughout life and continue to gain in life experiences, I slowly start to realize more, and understand the value and meaning of every single action that was done for me from you. No matter how big or small, every action done by both of you was for my success. Although it may not have been apparent at the time, I see that now, now that I have a family myself. I love you, Mom and Dad. This degree and thesis are for you. Your son has made it!

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I. INTRODUCTION

A. BACKGROUND

The USN is an elite fighting force that surpasses many of the world's defense organizations. However, being a preeminent force requires strict discipline that results in constant pressure to maintain such a high status. Stress due to the characteristics of military life, reduced performance (a short-term effect which may become chronic), and health issues (if exposed to the stressors of military life for prolonged durations) may ultimately lead to diminished health (Pfaff et al., 2010). A common coping mechanism to reduce stress levels is to look for ways in which an individual can have an outlet to vent off tension from everyday life.

Globally, video games as entertainment have grown in popularity among adults (von der Heiden., 2018). As a recreational activity, video games are a healthy pastime activity (Billieux et al., 2015). Due to the wide popularity of video gaming in today's society, video games must satisfy a certain need. Reasons to play video games can simply be to entertain oneself (Ng et al., 2005), to socialize with others (multiplayer games) (Laconi et al., 2017), and to act as a healthy escapement from reality (Villani et al., 2018).

In moderation, video games can have beneficial effects such as contributing to higher spatial resolution in visual processing (Granic et al., 2014), improving selective and peripheral attention, boosting working memory (Palaus et al., 2017), and also serving as a healthy coping strategy (King, 2020). However, as with any activity, excessive exposure to video games may have negative consequences such as depression and sleep deprivation (Eickoff, 2015).

As described in the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Health Disorders* (DSM-5, 2013) under Internet Gaming, an individual may experience problematic video gaming if he or she has five or more of the defined symptoms within the last year. Symptoms experienced under the disorder include but are not limited to the inability to reduce gaming, withdrawal symptoms when gaming is taken

away or not possible, and the risk of having jeopardized or lost a job or relationship due to gaming.

Uncontrolled use of both computer and traditional video games has been associated with poor mental health and well-being, which can herald intense emotions of loneliness and low satisfaction with life (Lemmens et al., 2011). Problematic video gaming is included in both the DSM-5 (2013) and the 11th revision of the *International Classification of Diseases* (ICD-11) (WHO, 2019) as a medical disorder. With the increased use of technology, Active-Duty Service Members (ADSMs) have easier access to computer/internet gaming through various platforms and devices.

As a result of reduced sleep time, ADSMs may deal with negative affect states by using video gaming as a maladaptive coping mechanism (Metzoni et al., 2011; Snodgrass et al., 2018). Sleep deprivation, unbridled video gaming usage, and dereliction of duty were shown and reported in case studies of video gaming in the U.S. Navy, specifically in three U.S. Marines (Eickoff et al., 2015). Jocko Willink, a retired U.S. Navy SEAL (Sea, Air, and Land) Officer who had over 20 years of operational military experience states in his book *Discipline Equals Freedom* (Willink, 2017):

> Sleep is a necessity. Humans need sleep. Failure to get enough has serious side effects. Lack of sleep can cause negative hormonal changes, interfere with the metabolization of glucose, increase blood pressure, and suppress the immune system. Less sleep also means less human growth hormone in your body, which means less muscle mass and weaker bones. Mentally, the brain is impacted, as the ability to pay attention and to concentrate begins to diminish and problem-solving and basic reasoning becomes less acute. (p. 102)

Due to the operational tempo of the military environment, ADSMs must be able to adapt and learn efficiently. Excessive gaming, which may interfere with sleep, has the potential to disrupt the adaptation and learning, and cause an increased chance of errors and risk of accidents (Watson et al., 2015).

General Military Trainings (GMTs) are held annually to inform ADSMs regarding mental health. These GMTs always provide options for assistance if a Sailor is in need. Unfortunately, the social stigma if an ADSM seeks help for a disorder still exists, along

with the concern of being adversely affected in the workforce from seeking mental health care (Lieberman, 2018). This reality serves as a deterrent for seeking help for mental health concerns. Statements from post–deployment focus groups of service members regarding military mental health care claim, "Asking for help is seen as cowardice, so you don't like to bring up the fact that you might need help," and "They publicize mental health services…but people are better off not going unless you are told to because it will hurt your career" (Hosek et al., 2006). This fear of being shamed by peers, in addition to many Sailors being somewhat oblivious of their mental condition, may impede a Sailor from seeking mental health services. The extent of video gaming in the military is unknown although some survey data are currently being captured. Therefore, a study should be conducted on problematic video gaming to determine whether action must be taken.

B. STUDY SCOPE AND OBJECTIVES

This study will assess the extent to which video gaming is present in the USN, compare the results with USMC commands, and evaluate its impact on the everyday life of ADSMs. The study includes the assessment of attributes, features, and outcomes of video gaming in the USN. Following the approval of the Institutional Review Board (IRB), a survey was conducted to document participant demographics, background, the prevalence of video gaming, and the motivation factors of problematic video gaming. An extensive review of the literature regarding video gaming and the effects of problematic video gaming on well-being was conducted. The objectives of the study are the following:

- Assess the prevalence and severity of problematic video gaming in the U.S. Navy.
- Identify the associations and factors of gaming severity in the USN.
- Compare and contrast the results of gaming severity of Sailor gamers on ships, Sailor gamers in USMC commands, and Marine gamers.

C. THESIS OUTLINE

Chapter I provides an introduction and purpose. Chapter II is a comprehensive review of background knowledge, literature, studies, and provides a fundamental understanding of problematic video gaming and its related topics. Chapter III contains the methodology and structure of the study. Chapter IV discusses the analysis and results of the data from Chapter III. Chapter V elaborates on the discussion and results, makes recommendations, and provides suggestions for future work.

II. LITERATURE REVIEW

Video games are enjoyed throughout the world and continue to be a prominent form of entertainment. However, depending on certain external factors and the mental state of the user, chronic video gaming can become addictive and problematic. Problematic video gaming is the uncontrollable desire for video gaming that results in notable deterioration of an individual's ability to participate and perform in daily life activities despite understanding the negative repercussions (Metzoni et al., 2011; Di Blassi et al., 2019). The disorder may lead to a deterioration in multiple areas of everyday life (Andreason & Palleson, 2014). Current military services to support the mental health of service members have minimal effect and are even avoided (Hosek et al., 2006).

This chapter begins by providing a definition of video games, describing the demographics of video gamers, and the popularity and factors that motivate players to engage in video gaming, including internal and external inducements. This chapter details the physiological changes that occur in the brains of individuals classified as disordered gamers and describes the symptoms and conditions of problematic video gaming. Lastly, this chapter discusses current military treatments available to treat service members and their limitations.

A. VIDEO GAMES

The term "video gaming," as defined by Merriam-Webster Dictionary, is "an electronic game in which players control images on a video screen." Esposito (2005) described video games as "a game which we play thanks to an audiovisual apparatus and which can be based on a story" (Esposito, 2005, para. 4). Interactivity is what distinguishes video games from other media such as movies, television, and books (Granic et al., 2014). Granic et al. further explain that "players cannot passively surrender to a game's storyline…video games are designed for players to actively engage with their systems and for those systems to, in turn, react to players' agentive behaviors," (Granic et al., 2014, p. 66).

The video game industry has grown to a 100-billion-dollar industry globally (History.com Editors, 2017), with America contributing 90 billion dollars of sales up to the year 2020 (Bezrutczyk, 2021). According to Stanley Pierre-Louis, President and Chief Executive Officer of Entertainment Software Association (ESA), "There are more than 214 million video game players across the United States, three quarters of all United States households have at least one person who plays video games…70 percent of those under 18 regularly play video games" (Entertainment Software Association [ESA], 2020, p. 3).

A 2017 survey from Pew Research Center shows twice as many adults under 50 years of age in the United States play video games when compared to adults that are 50 years of age and greater (Pew Research Center, 2017). Figure 1 shows men under the age of 50 play significantly more video games than women of the same age group.

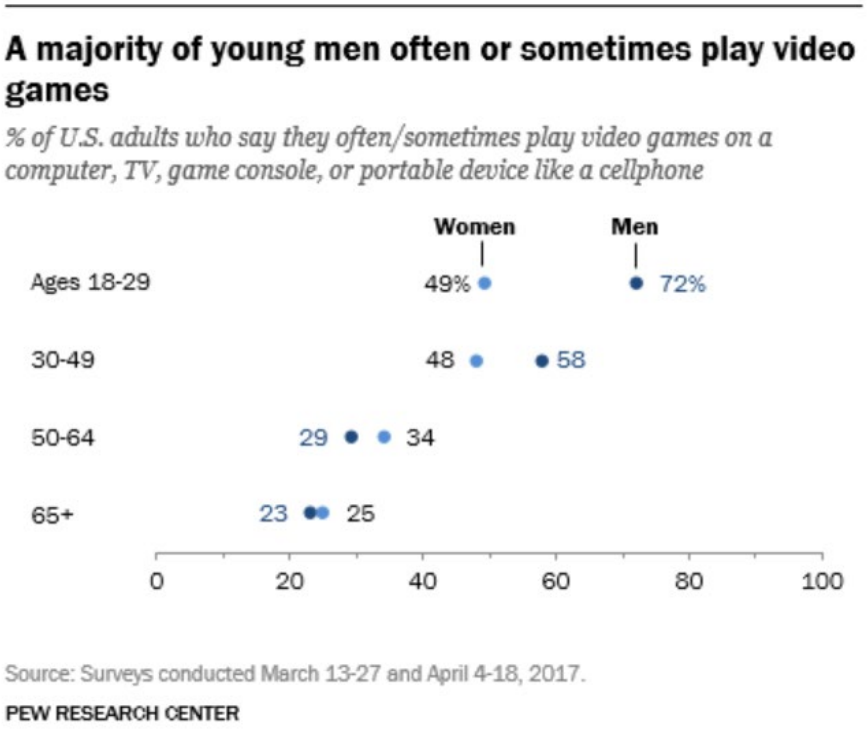


Figure 1. Percentage of U.S. adults who play video games. Source: Pew Research Center (2017).

Video gaming can be enjoyed through various platforms, including, but not limited to traditional video gaming consoles, hand-held devices such as portable gaming consoles and smartphones, and computer gaming. The platform used by the player is situational, and the most convenient mode of playing is often utilized. According to a survey conducted by the ESA in 2020, the most common devices used to play video games among adult players were smartphones (61%), gaming consoles (52%), and personal computers (49%) (ESA, 2020).

B. THE MOTIVATION FOR PLAYING VIDEO GAMES

Much research has been done to uncover the root motivators that cause users to initiate, engage, and continue playing video games (Yee et al., 2006). As a recreational activity, video games are a healthy activity (Billieux et al., 2015). Reasons to play video games can include entertaining oneself (Ng et al., 2005), socializing with others (multiplayer games) (Laconi et al., 2017), video gaming as a pastime (von der Heiden et al., 2019), and/or as healthy escapism from reality (Villani et al., 2018). The results of a 123-participant survey conducted by Nordby and colleagues in 2019 are shown in Figure 2 and display the various reasons video gamers play games. The Pure Procrastination Scale (PPS) consists of 12 items from previously established procrastination scales based on the Likert scale ranging from 1 to 5. It was developed by Steel (2010) (Svartdal et al., 2016), and used by Norby and colleagues who found that players playing video games to "escape" reality had the highest PPS score (higher scores indicate more procrastination) (Nordby et al., 2019). This information is shown in Figure 3. After an analysis of variance (ANOVA) test was completed, the Tukey-Kramer post-hoc test revealed that the motivation, "escape," differed statistically from the rest of the reasons to play except for "stress" and "reward."

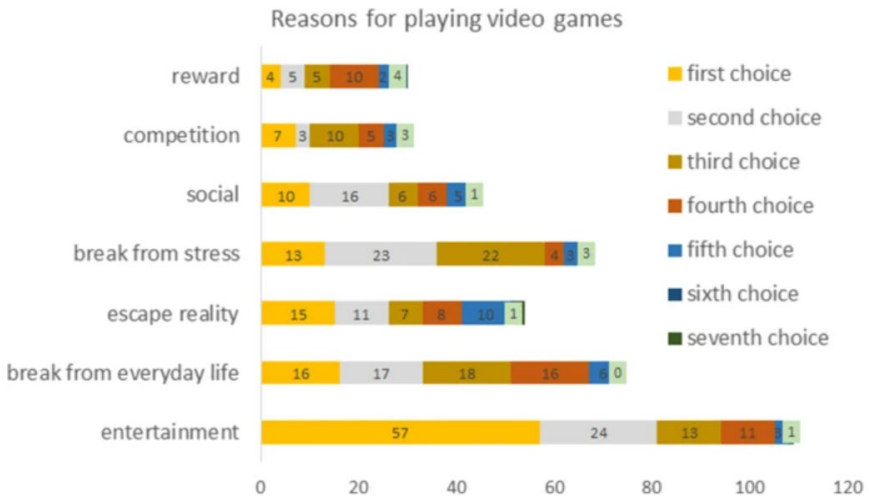


Figure 2. Reasons for playing video games. Source: Nordby et al. (2019).

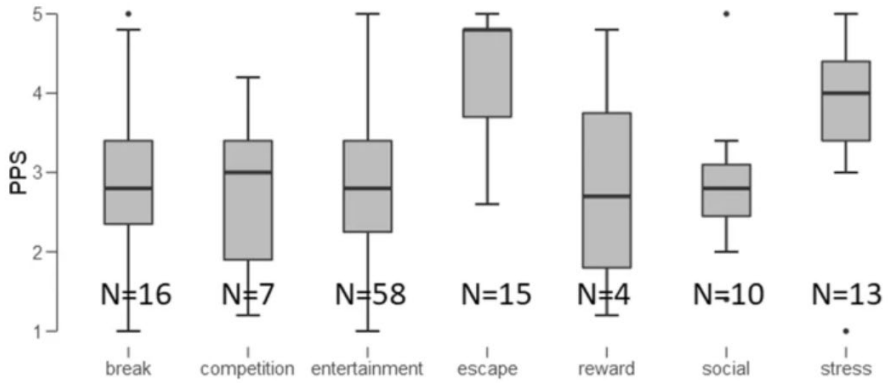


Figure 3. Escapism as the main reason for video gaming in relation to procrastination. Source: Nordby et al. (2019).

Conversely, a population of video gamers view the virtual world as more pleasing than the real world and engage in virtual life more often than others (Demitrovics et al., 2011). Several studies aim to discover the various motivations to play video games other than individuals seeking to acquire the positive aspects that come along with video games. Yee (2006) attempted to test Bartle's (2003) model regarding gaming motivations (Demitrovics et al., 2011). Yee's (2006) results showed three main motivational categories of gamers: achievement (advancement, mechanics, competition), socialization (acculturation, comradery, connection), and immersion (discovery, role–playing, modulation, escapism).

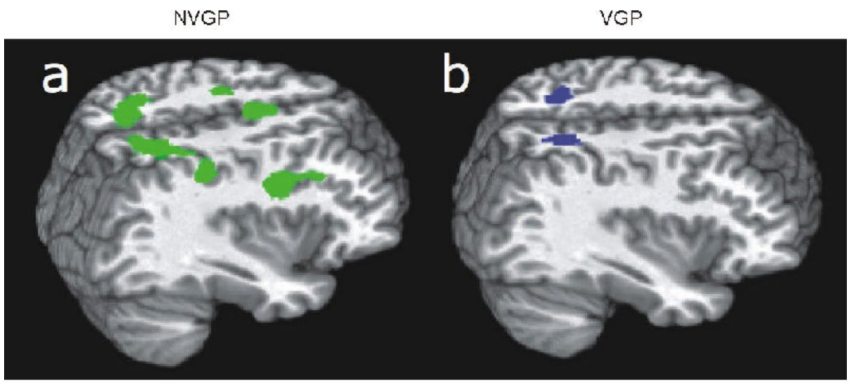
In addition, to Yee's findings, three key basic needs are imperative in being able to maintain intrinsic motivation for a particular activity: competence (the aspiration to experience oneself as proficient and successful), relatedness (the yearning of being connected to a certain group or organization), and autonomy (the desire to be responsible for one's own actions; Ryan et al. 2017). In order to supplement deep learning, creativity, and enhancement of performance at tasks requiring high-quality engagements (such as military occupations), intrinsic motivation must be present (Shahram, 2019). Intrinsic motives, such as self-entertainment, curiosity, and experiencing the state of flow was found to keep video game players consistently engaging in video gaming in a study by Hsu and Lu (2007). Characteristics of the flow state include but are not limited to intense concentration on the present task, distortion of temporal experiences, and continuously adjusting actions based on feedback (Nakamura et al., 2002). Similar results were found and supported the work of Hsu and Lu from studies conducted by Wan and Chiou in 2007, adding that "players' intrinsic motivation would be higher when extrinsic rewards were low expectancy, low relevance, intangible, and contingent" (Wan et al. 2007, para. 1).

The lifeline of extrinsic goals, goals that are pursued for external reasons and not for its own satisfaction, rely on the continuous flux of external rewards or punishment (wealth, fame, image, and/or adverse consequences) (Oudeyer & Kaplan, 2009; Di Domenico & Ryan, 2017). Once the supply of external motivators is removed, the motivation for the extrinsic goals follows (Heshmat, 2019). Intrinsic motivation is involved in all areas of human activity that ultimately require mastery, which explains the strong desire for addicted video game players to play video games (Rich, 2020; Heshmat, 2019). In 2009, Frostling-Hennignsson and colleagues showed that the flow state, along with team collaborations (communications and teamwork) and escapism (a place to refuge) were all main motives of video gamers (Frostling-Henningsson, 2009). Frostling-Henningsson further states, "Gaming provided gamers a world in which ordinary, mundane trivialities could be forgotten or put aside, a world where they could forget about everyday problems" (2009, p. 562).

Various video games utilize compulsion loops, a habitual series of activities that instills the desire in the user to continue in the activity by reaching achievements, thereby releasing neurochemicals such as dopamine. These reward structures create the desire for the player to play for longer, keeping them involved in the game (Wang et al., 2019). Video gaming disorder is similar to gambling disorder. With the increased dopamine in the brain from rewards at specific intervals, players may experience difficulty disconnecting themselves from the game (Fauth-Bühler et al., 2017). Furthermore, depending on the psychological state of the player, video gamers may gain of feelings of confidence and pleasure that are only attainable in the virtual world (Long et al., 2018). The ease of accessibility of video games (such as daily utilization) and the combination of fulfillment that video games may provide (release of dopamine and increased psychological state) has the potential to become addictive, especially in internet video games that do not have a defined ending (Griffiths, 2010).

C. BENEFITS OF VIDEO GAMING

In addition to the entertainment that video games provide, such as instant gratification, feedback, and achievement (Norby et al., 2019), video games offer various health benefits such as enhancements in socialization (quality social engagements), cognition (increased attention span), motivation (the will to improve when dealing with failure), and emotions (spiritual regulation) (Granic et al., 2014; Russoniello et al., 2009; Anderson & Bushman, 2001). In fact, brain imaging scans (see Figure 4) of video game players (VGPs) showed greater selective attention than non-video game players (NVGPs), which suggests greater filtering of non-relevant information (Bavelier et al., 2012).



NVGPs brain imaging scan as attentional burden is raised (a). Fronto-parietal network areas showed less recruitment in VGPs (b), allowing for more efficient filtering of non-relevant information.

Figure 4. Comparing attentional network generation and distraction processing between NVGPs and VGPs. Source: Bavelier et al. (2012).

In moderation, video games can improve selective and peripheral attention, boost working memory (Palaus et al., 2017), and become a healthy coping strategy by serving as an outlet to deal with stressors (King, 2020; Schneider et al., 2018). In relation to a healthy coping strategy, recreational video gaming can be a healthy way of escaping the pressure and stress of modern society. According to Evans (2001), escapism through video gaming allows players to depart an unwanted state and transition to a preferred realm. However, excessive exposure to video games may have negative consequences, and become problematic (Chang et al., 2018).

D. PROBLEMATIC VIDEO GAMING

> Gaming Disorder…as a pattern of gaming behavior…characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over the other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences.
>
> —World Health Organization
> Addictive Behaviors: Gaming Disorder, September 2018

Because of the benefits that a video gamer may experience, excessive video gaming may become problematic and even addictive (Kuss et al., 2012). Problematic video gaming

is the inability to resist video gaming that results in notable deterioration of an individual's ability to participate and perform daily life activities despite understanding the negative repercussions (Metzoni et al., 2011; Di Blassi et al., 2019). Video gaming addiction is included by both the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Health Disorders (DSM-5, 2013) and in the 11th revision of the International Classification of Diseases (ICD-11, 2019). According to Section III of the DSM-5, an individual is said to have an Internet Gaming Disorder (IGD) as a result of problematic video gaming if five of the nine defined symptoms are experienced: (1) fixation with video gaming; (2) withdrawal symptoms when video gaming is not present at any moment (including but not limited to depression, irritability, and uneasiness); (3) tolerance and the need to satisfy the urge to play video games; (4) failed attempts in ceasing to play video games; (5) the loss of interest and motivation to continue with other activities as a result of video gaming; (6) the continued utilization of video gaming despite the knowledge of problems; (7) deceiving family members or others regarding the time spent video gaming; (8) the use of video gaming as a scapegoat to alleviate other negative moods such as guilt or misery; (9) the risk of having jeopardized or lost a job, relationship, or career opportunity due to video gaming.

Like the DSM-5, the ICD-11 defines problematic video gaming under Gaming Disorder (GD). An individual is considered to have GD, if the following behavior patterns are severe enough that it results in a notable deterioration in personal, family, social, educational, occupational, or other important areas of daily life for at least 12 months: (1) lack of resistance and control over video gaming; (2) prioritizing video gaming over other activities; (3) resumption of video gaming regardless of negative consequences (ICD-11, 2019). Currently, studies have not yet classified problematic videogaming as a well-defined disorder. Problematic video gaming may be seen as more of an impulse-control disorder rather than a compulsive behavioral disorder since problematic video gaming features many symptoms of impulsivity (extreme sensitivity to rewards, impaired self-control, and risky decision-making) (Starcevic et al., 2017). Conversely, game–addicted patients have been shown to prepare and organize their gaming periods before

playing, which suggests that problematic video gaming may be a behavioral disorder rather than an impulse disorder (Kuss et al., 2012).

The American Psychological Association conducted a large-scale cross-sectional study of 23,533 adults (mean age 35.8 years, ranging from the age of 16 to 88 years) to examine demographic variables of addiction to technological behaviors (Andreassen et al., 2016). Correlations between addictive video gaming use and mental disorder symptoms were both positive and significant. The results indicated that being male and single was significantly associated with problematic video gaming usage. Age was inversely proportional to the probability of problematic video gaming usage.

E. SYMPTOMS AND HEALTH RISKS OF PROBLEMATIC VIDEO GAMING

> The booming popularity of online games has led to an increase in addiction, which can result in players ignoring family and job responsibilities. Severe cases can lead players to crime, health problems or even death.
>
> —Lawrence Sanders, Professor of Management Science and Systems
> University at Buffalo School of Management

Addictive video game usage is associated with characteristics of personality such as low self-esteem (Ko et al., 2005), stunted self-accomplishment (Jeong & Kim, 2011), belligerence (Mehroof & Griffiths, 2010), and even to severe symptoms of clinical depression and anxiety (Wang et al., 2018). Repercussions of video game use include an absence of organic friends (Kowert et al., 2014), stress and pathological coping (Milani et al., 2018), diminished social health and social abandonment (Lemmens et al., 2011), psychosomatic complications (Muller et al., 2015), and dwindling academic success (Chiu et al., 2004).

Furthermore, uncontrolled use of both computer and traditional video games have been found to have associations between poor mental health, which can usher deep feelings of loneliness and low satisfaction with life (Lemmens et al., 2011). With the increased use of digital technology, individuals have easier and quicker ways to access various platforms of video games. Both the convenience of video gaming and the high occupational stress

that many individuals may experience may cause structural and functional changes in an addicted individual's reward system (Palaus et al., 2017). These structural and functional changes in the brain of problematic video gamers may cause Attention Deficit Hyperactive Disorder (ADHD), depression, and obsessive-compulsive disorder (OCD) (Gonzales-Bueso et al., 2018). Due to poor psychological well-being in addicted gamers, problematic video gaming has a higher chance of being an issue since addicted gamers are allowed to immerse themselves in an alternate reality (Taquet et al., 2017).

To maintain optimal health, it is recommended that adults sleep 7 or more hours a night on a regular basis (Paruthi et al., 2016). Excessive video gaming can interfere with healthy sleep patterns (Watson et al., 2015). Specifically, excessive video gaming may reduce sleep time (Metzoni et al., 2011), impair daytime alertness and increase daytime tiredness (Weaver et al., 2010), but also increase errors/accidents and greatly disrupt users' adaptation and learning abilities (Watson et al., 2015). Hartmann and colleagues (2019) compared the use of video gaming and board gaming before sleep. Study findings suggested that playing a video game before sleep led to a reduced sleep efficiency of 3.5% (15 more minutes spent awake during periods of allotted sleep) after prolonged playing when compared to the same duration played for the board game (Hartmann et al., 2019).

F. PHYSICAL AND MENTAL EFFECTS AND ADAPTATIONS THAT OCCUR FROM PROBLEMATIC VIDEO GAMING

Since the medical community largely views problematic video gaming as an impulse-control disorder (Young et al., 1998), research tends to focus on the brain's abnormal reward processing patterns. Constant rewards and reinforcements are essential to all addictions, whether the addiction is chemical or behavioral (Griffiths, 2010). Neurobiological evidence suggests that an imbalance between the brain's reflective and reactive reward system causes video-gaming addictions (Sussman et al., 2017). If physical changes can be observed in the brains of problematic video gamer players, research can be done to better understand the root causes of video game addiction and how to address the disorder (Buhler et al., 2015).

The duration and frequency of playing video games cannot be the sole measure in determining whether or not problematic video gaming or non-problematic video gaming exists (Kiraly et al., 2017). Problematic video gamers are not the only group that spends a copious amount of time playing video games. Professional video gamers frequently engage and immerse themselves in video gaming for their careers. One way to distinguish between healthy and unhealthy video game usage is the amount of self–control in continued video game usage despite negative consequences (Feng et al., 2017).

Magnetic resonance imaging (MRI) scans of gaming addicted individuals showed neurological activities in the prefrontal cortex, nucleus accumbens septi, anterior cingulate area, and caudal nucleus that were indistinguishable from other behavioral addictions such as pathological gambling and substance abuse disorders (Long et al., 2019). Regions of the brain activated to the same magnitude when game–addicted patients are presented with a gaming picture, akin to the presentation of drug pictures to drug-addicted patients (Weinstein, 2015). Structural studies have shown a remodeling of volume to the ventral striatum (responsible for decision-making and reward-related behavior (Higosaka et al., 1989) in game-addicted patients as a resulting from changes in frequency, quantity, and effort exerted for a certain reward (Weinstein, 2015). This brain remodeling that occurs in addicted individuals is solidified by cycling through a three-stage loop consisting of binge/intoxication (experiencing/engaging in the addictive activity), withdrawal/negative effect (cravings due to absence of addicted activity), and preoccupation/anticipation (when engaging in other activities, the forward expectation of the addicted action) (Koob & Volkow, 2018). Figure 5 shows a model of the compulsive addiction cycles (binge/intoxication, withdrawal/negative affect, and preoccupation/anticipation) that occur in the brain and its subsequent processes.

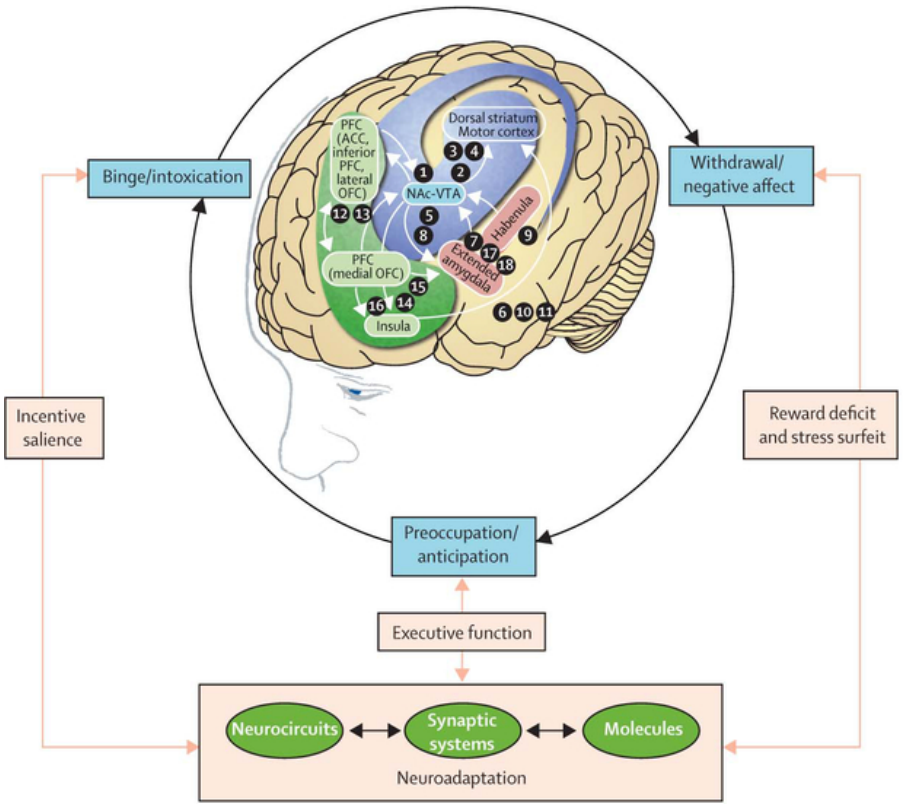


Figure 5. The cycle of the neurological domains that correspond to the solidification of the addiction process. Source: Koob and Volkow (2018).

G. CURRENT MILITARY TREATMENTS FOR PROBLEMATIC VIDEO GAMING

In addition to providing traditional health care, the Department of the Navy realizes the need for aiding their service members in terms of their mental and psychological health by providing directly accessible supplementary services. In the Department of the Navy mental health care systems, such as the Marine Corps Force Preservation Council (FPC), providers can "evaluate, assess, counsel, and treat military members who have failed to meet standards set by their chain of command" (Eickhoff et al., 2015, pp. e839–e840). Eickoff states in a 2015 article that, ADSMs utilize mental health services for "underlying mental disorders when they exhibit or endorse symptoms of depression, anxiety, anger, fatigue, as well as other symptoms" (Eickoff et al., 2015, p. e840). Aside from the services provided, Sailors are constantly assessed and counseled by senior members of the military

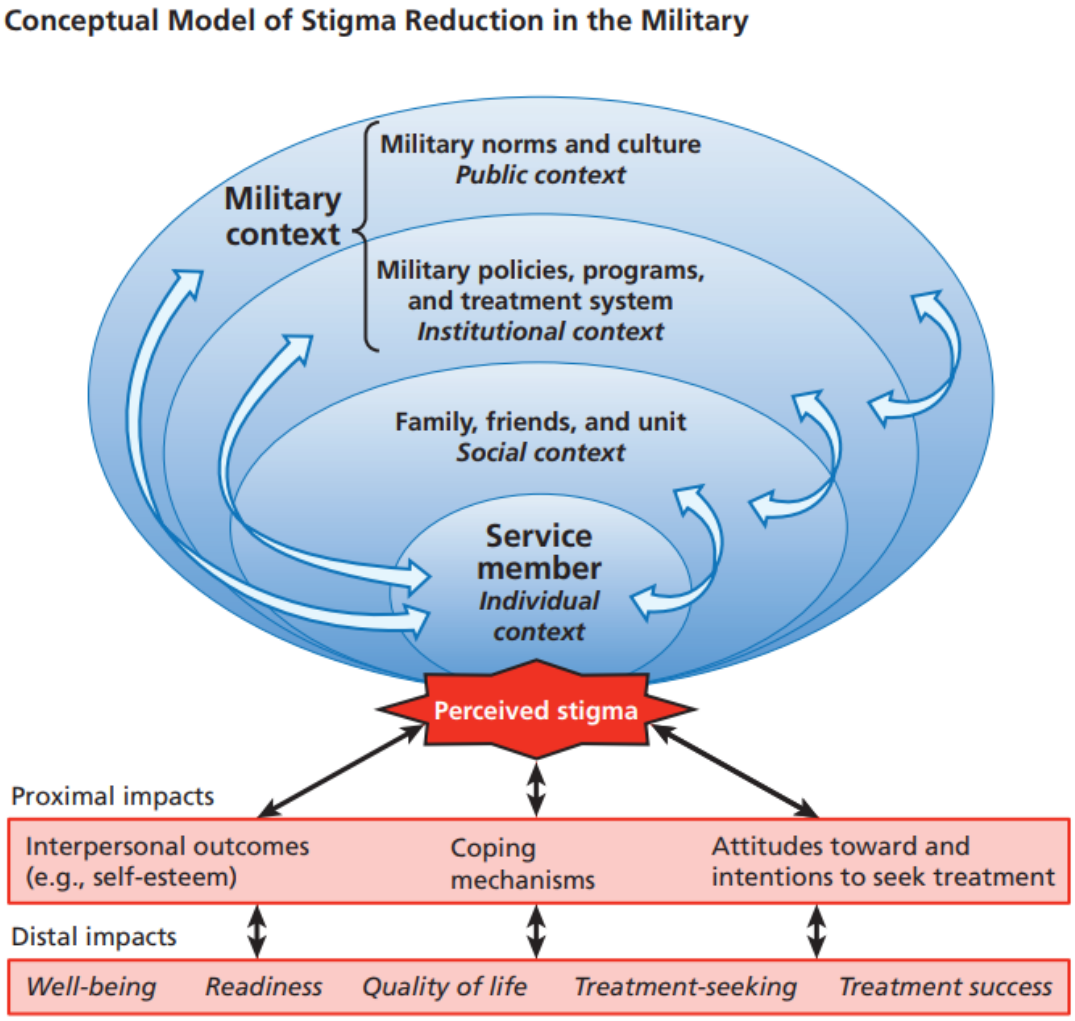
(Evaluation Reports for enlisted personnel and Fitness Reports for Officers) to evaluate one's work performance, and if needed, mental and psychological well–being.

Chaplains providing religious services also serve as mental health counselors. Part of a chaplain's duties is to provide confidential mental health services to Sailors. ADSMs who have the courage and motivation to improve may also seek help using these services. However, mental health care may be avoided mainly due to the perceived stigma of appearing "weak" (Corrigan & Penn, 1999), as well as concerns about promotion potential, despite service statements promising confidentiality (Liberman, 2018). Figure 6 shows a conceptual model of factors that influence stigma along with immediate and long–term outcome effects.

A 2006 RAND Corporation study found that although some ADSMs find formal mental health counseling to be helpful, many view the military's mental health services as a "trap," and feel that the military can do a better job in aiding their employees:

- If I needed help, I would be more likely to turn to other unit members. We can talk it out among ourselves.
- Asking for help is seen as cowardice, so you don't like to bring up the fact that you might need help.
- The combat stress team is not helpful at all. They weren't there in the situation with you. Your buddy is more helpful.
- They publicize mental health services…but people are better off not going unless you are told to because it will hurt your career… (Hosek et al., 2006, pp. 55–56)

As indicated by the statements above, ADSMs lack of trust in the military's mental health care system. In a 2012 study, officer and enlisted personnel within the Department of the Navy reported that by seeking help for mental health disorders such as video game addiction have the following impacts: fear of their respective commands losing faith in them (49.8 percent), fear of being treated poorly (45 percent), fear of hurting their careers (35.6 percent), and fear of non-confidentiality (37 percent) were all present (Adler & Castro, 2012; Acosta et al., 2014).



Blue regions represent factors that reduce social stigma on the service member, two of which the military directly can contribute. Red regions represent immediate and distal negative impacts of stigma on the service member.

Figure 6. Service members and the mental health care stigma. Source: Acosta et al. (2014).

Even if an ADSM benefited from the services, they will be perceived as "weak," and it could ultimately hurt their careers when it comes to occupational advancement and promotions. Figure 7 summarizes the flow of what service members experience when receiving mental health services from the military.

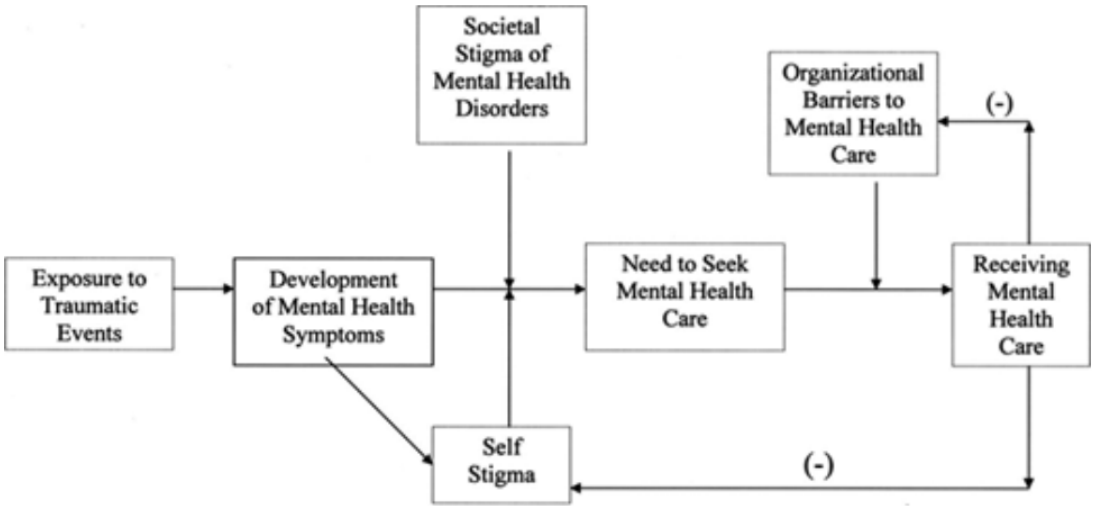


Figure 7. Flow diagram of the origin of the social stigma and hurdles service members experience. Source: Greene-Shortridge and Britt (2007).

A study done by Hosek and colleagues using focus groups consisting of 51 officers and 273 enlisted personnel post-deployment concluded that the most helpful mechanism for coping with general stress was to talk to other service members that have gone through similar experiences as opposed to having formal, documented counseling (Hosek et al., 2006).

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III. METHODS

Chapter III describes the methods used in the preparation, setup, execution, and data analysis of the video gaming study. The study was conducted in tandem with Ensign (ENS) Edrie Orpilla's thesis which focused on video gaming in the U.S. Marine Corps.

A. PARTICIPANTS

Initially, three warships of the USN were recruited to participate in the study. The USS *Thomas Hudner* (DDG 116) participated while underway whereas USS *Cape St. George* (DDG 71) and USS *San Jacinto* (CG 56) participated while in-port. At the time this thesis was written, however, data from only the two in-port ships had been received. Hence, our analysis is based on data from DDG 71 and CG 56. The study originally included 87 active-duty service members (ADSMs) who volunteered to participate. Eight participants reported that they did not play video games and were subsequently removed from further analysis.

Each ship had a maximum crew capacity of 330 personnel (40 Officers and 310 Enlisted). All Sailors assigned to the three ships were allowed to participate in the study. Table 1 displays the actual response rate for each ship.

Table 1. Number of participants for each USN ship.

Ship	**Received Responses**	**Response Rate, %**
USS *Cape St. George* (DDG 71)	29	8.3%
USS *San Jacinto* (CG 56)	58	16.6%

Comparisons of Sailors on ships were made with participants from a similar video-gaming study with USMC commands, which consisted of 52 Sailors and 954 Marines. The USMC commands consisted of the 2nd Combat Engineer Battalion (2d CEB) of Camp Lejeune, NC, 3rd Marine Logistics Group (3d MLG) of Okinawa, and the 2nd Marine Air

Wing (2d MAW) of Cherry Point, NC. The Sailors from these commands were grouped as "Sailors in USMC commands" and Marines were grouped as "USMC." The study protocol was approved by the Naval Postgraduate School's Institutional Review Board (IRB) (NPS IRB# NPS.2021.0040-IR-EP7-A).

B. EQUIPMENT/APPARATUS

1. Questionnaires

The data collected on the Sailors of USN ships was based on a survey. First, we conducted an extensive review of the literature on video gaming, motivational factors to play video games, problematic video gaming, the symptoms, and effects of video game addiction on behavior, mood, and personal well-being, the physical and mental adaptations resulting from problematic video gaming, and currently military approaches for dealing with mental health issues. Information from the literature review was combined with sponsor requirements and led to the development of the study questionnaire.

The study began with a consent form, which consisted of a privacy act statement, introduction to the study, study procedures and costs, confidentiality of information, and points of contact. After consenting to participate in the study, participants filled out the questionnaire which included four sections. The first section of the questionnaire included items related to the respondents' demographics and occupational characteristics (age, sex, rank, years on active duty, deployment history, and combat experience). The second section included behavioral habits (i.e., sleep duration, consumption of nicotine and/or caffeinated beverages, and physical exercise routines), video gaming habits (number of years of video game experience, genre of video games played, video game habits at home, video game habits when deployed/underway, assessment of severity of video game activity from the Internet Gaming Disorder Short Form (IGDS9-SF)), reasons for playing video games (Motives For Online Gaming Questionnaire (MOCQ)), stress level (Perceived Stress Scale (PSS-4), Satisfaction with Life Scale (SWLS), Brief-Coping Orientation to Problems Experienced (Br.COPE), Patient Health Questionnaire (PHQ-8), Generalized Anxiety Disorder (GAD-7) scale, UCLA (University of California, Los Angeles) Loneliness Scale, Epworth Sleepiness Scale (ESS), and the Alcohol Use Disorders

Identification Test for Consumption (AUDIT-C)). The scoring strategies used for these ten standardized scales are listed in the following sections.

1. Internet Gaming Disorder 9, Short-Form (IGDS9-SF): The IGDS9-SF is a psychometric instrument derived from the nine essential touchstones that comprise IGD as defined in the DSM-5 (APA, 2013). The intent of the IGDS9-SF was not to diagnose IGD but to evaluate the severity and destructive consequences of IGD over a 12-month period (Pontes and Griffith, 2015). This tool utilized nine questions that evaluate gaming habits and rate the user's behavior using a 5-point Likert scale on any gaming platform (online and offline gaming from computer/laptop, and/or any other gaming console such as mobile phones and tablets). A response of "Never" was given a score of 1, "Rarely" was given a score of 2, "Sometimes" was given a score of 3, "Often" was given a score of 4, and "Very Often" was given a score of 5. Final scores can be obtained by summing the responses to the nine questions of the IGDS9-SF, ranging from a minimum score of 9 points to a maximum score of 45 points. Higher scores are suggestive of a greater magnitude of IGD severity (APA, 2013). To distinguish between disordered gamers and non-disordered gamers, at least five out of the nine criteria must have a score of 5 ("Very Often") or a total composite score resulting ranging from 36 to 45 (Pontes & Griffith, 2015).

2. Motives For Online Gaming Questionnaire (MOCQ): The MOCQ was developed by Demetrovics et al., (2011), which measured seven dimensions of gaming motivation. The dimensional aspects included "Social" (interaction among individuals), "Escape" (escape from reality), "Competition" (competition between players), "Coping" (dealing with stress), "Skill Development" (practice and train to achieve greater results), "Fantasy" (game character identity), and "Recreation" (leisure). The MOCQ tool measured the motives of online video gaming via 27 questions by having the user rate their gaming motivations from a five-

point scale: “1” representing “Almost never/never,” “2” representing “Some of the time,” “3” representing “Half of the time,” “4” representing “Most of the time,” and “5” representing “Almost always/always.”

3. Perceived Stress Scale – 4 (PSS-4): The PSS-4 tool is a four-item questionnaire developed by Cohen and colleagues that was designed to quantify the respondent’s level of stress for the past month (Cohen et al., 1983). Originally, the PSS was designed to be a 14-item questionnaire (known as the Perceived Stress Scale-14 [PSS-14]) to measure how over–whelmed and unforeseeable a respondent’s life was due to stress for the past month (Warttig et al., 2013). The PSS-14 was later modified to 10 items, known as the Perceived Stress Scale-10 (PSS-10), and further to the PSS-4 (Cohen & Williamson, 1988). The PSS-4 tool has an advantage over its predecessors due to the shorter time required to complete the questionnaire without having to sacrifice reliability (Vallejo et al., 2018). Participant’s responses are based on a scale ranging from 0 to 4: “0” representing “Never,” “1” representing “Almost Never,” “2” representing “Sometimes,” “3” representing “Fairly Often,” and “4” representing “Very Often.” Respondent’s scores may range from 0 to 16, with higher scores correlating to more stress (Cohen et al., 1983).

4. Satisfaction with Life Scale (SWLS): The SWLS tool was developed by Diener and colleagues to measure subjective global life satisfaction of a participant’s well–being (Diener et al., 1985). The scores of the SWLS have been predictive of future behaviors such as suicide attempts and have been shown to have high temporal reliability (Pavot et al., 1991; Diener et al., 1985). The scale allows participants to evaluate, integrate, and interpret different life domains into consideration, such as health and wealth, but does not assess those domains specifically (Arrindell et al., 1991). The SWLS had participants complete a 5-item questionnaire that was answered using a 7-point Likert scale, which resulted in scores that ranged from 5 to 35. Cumulative scores between 5 and 9 indicated the

participant was extremely dissatisfied with life. Cumulative scores between 10 and 14 indicated the participant was dissatisfied with life. Cumulative scores between 15 - 19 indicated the participant was slightly dissatisfied with life. A cumulative score of 20 indicated a participant was neutral in satisfaction in life. A cumulative score of 21–24 represented slight satisfaction in the participant's life. Cumulative scores between 26 and 29 indicated the participant was satisfied with life. Cumulative scores greater than 31 indicated the participant was extremely satisfied with life. For individual questions of the SWLS, a score of "1" represented "Strongly Agree," "2" represented "Disagree," "3" represented "Slightly Disagree," "4" represented "Neither agree nor disagree," "5" represented "Slightly Agree," "6" represented "Agree," and "7" represented "Strongly Agree."

5. Brief-Coping Orientation to Problems Experienced (Br.COPE): The Br.COPE tool is an abridged version of the COPE inventory which assessed a broad range of coping responses developed by Carver and colleagues (Carver et al., 1989). Specifically, the Br. COPE used a shortened multidimensional 28-item inventory (from the original 60-item questionnaire of the COPE) which consisted of commonly used strategies used for coping and regulation of the mental state in response to stressors (Carver, 1997). The Br.COPE presented fourteen aspects of different coping dimensions to the respondent: 1) Planning, 2) active coping, 3) using instrumental support, 4) acceptance, 5) using emotional support, 6) positive reframing, 7) humor, 8) turning to religion, 9) self–distraction, 10) self–blame, 11) venting, 12) denial, 13) behavioral disengagement, and 14) substance use. Items 1 – 3 are considered "Problem–focused" coping styles, items 4 – 8 are considered "Emotion-focused" coping styles, and items 9 – 14 are considered "Dysfunctional" coping styles (Carver, 1997). The 28-items of the Br.COPE were rated using a 4-point Likert scale: "1" represented "I haven't been doing this at all," "2" represented "A little

bit," "3" represented "A medium amount," and "4" represented "I've been doing this a lot." The Br.COPE can be used to gauge both trait coping (the technique individuals personally deal with common daily stressors) and state coping (the technique in which individuals deal with specific personal stressors) (Muller & Spitz, 2003).

6. Patient Health Questionnaire – 8 (PHQ-8): The 8-item PHQ-8 measured the relative level of depression of a respondent for the past 2-weeks and is widely accepted as a valid diagnostic tool for depressive disorders in extensive clinical studies (Kroenke et al., 2009). Respondents answered each item of the PHQ-8 by choosing values ranging from 0 to 3: "0" representing "Not at all," "1" representing "Several days," "2" representing "More than half the days," and "3" representing "Nearly every day." The final score of the PHQ-8 is the sum of the 8 items. Scores that had a value of 10 and greater were classified as major depression and scores that had a value of 20 or greater were classified as severe major depression (Kroenke et al., 2009). In a U.S. military millennium cohort study conducted by Wells and colleagues, the PHQ-8 performed on par with its more extensive counterpart, the PHQ-9, in the validity and reliability in detecting depression (Wells et al., 2013).

7. Generalized Anxiety Disorder – 7 (GAD-7): The GAD-7 uses a 7-item diagnostic method to determine the degree to which a patient is suffering from Generalized Anxiety Disorder (GAD) for the past 2-weeks in primary care settings (Spitzer et al., 2006). Based on the 13-items of the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV), GAD-7's shortened 7-items analyzed (1) feelings of anxiety and nervousness; (2) uncontrollable worrying; (3) over-worrying about various aspects; (4) issues relaxing; (5) experiencing restlessness; (6) short-tempered irritable behavior; and (7) frequent fearing an unpleasant event may occur (Johnson et al. 2019). Respondents rated their response to the 7-items by selecting "Not at all," "Several Days," "More than Half the

Days," or "Nearly Every Day" with scores of 0, 1, 2, or 3, respectively. GAD-7 scores were obtained by summing the scores of all 7-items. Interpretations of scores depended on the range of score values: scores from 0 to 4: Minimal Anxiety, scores from 5 to 9: Mild Anxiety, scores from 10 to 14: Moderate Anxiety, scores that are 15 or greater: Severe Anxiety (Spitzer et al., 2006). For scores of 8 and greater, it is considered reasonable for further assessments to be conducted to determine the existence of anxiety disorder (Sapra et al., 2020).

8. The University of California, Los Angeles Loneliness Scale (UCLA Loneliness Scale): The UCLA Loneliness Scale is a 20-item tool used to quantify the respondent's subjective feelings of loneliness and feelings of social seclusion (Russel et al., 1978). The 20 items detect loneliness within the subject by probing for both negative appraisals and emotions in social relationships (Goossens et al., 2014). Respondents rate their response to each item by selecting "Never," "Rarely," "Sometimes," or "Always." Possible score values range from a minimum loneliness score of 20 and a maximum loneliness score of 80.

9. Epworth Sleepiness Scale (ESS): The ESS is an 8-item questionnaire designed by Australian Doctor Murray Johns in 1991 to measure a subject's general level of daytime sleepiness (Johns, 1990). Respondents were asked to rate how likely they were to fall asleep in everyday scenarios by using a scoring system that ranged between 0 to 3; A Score of 0 represented "None," a score of "1" represented "Slight," a score of "2" represented "Moderate," and a score of "3" represented "High." ESS scores can range between 0 and 24. The existence of general daytime sleepiness is apparent in respondents with cumulative scores of 11 and greater (Omobomi & Quan, 2018). Higher ESS scores indicate a higher tendency to fall asleep during daily activities than other people (Johns, 2009).

10. Alcohol Use Disorders Identification Test for Consumption (AUDIT-C): The AUDIT-C is an abbreviated version of the AUDIT and is often used in situations where the AUDIT is not appropriate (e.g., insufficient time) (Khadjesari et al., 2017). The AUDIT-C offers guidance to indicate the severity of a person's drinking habits at home/off duty/after the duty day (Higgins–Biddle et al. 2018). Respondents answered three questions that the AUDIT-C, which indicated the frequency in which reflects closest to their personal drinking habits. Males with scores of 4 and greater and females with scores greater than 3 or greater are suggestive of an alcohol disorder (Higgins-Biddle et al., 2018).

Participants who were not video game players (determined in the second section of the questionnaire, "Behavioral Habits" stage) were re-routed to the fourth section of the survey, "ADSM State," bypassing the third section, "Video Game Habits" stage. The questionnaires were anonymous, with none of the respective chain of commands nor the survey team able to determine the identity of any individual participant. The survey took approximately 20 to 30 minutes to complete. Figure 8 illustrates the logic of the video gaming questionnaire. The study questionnaire is shown in Appendix A.

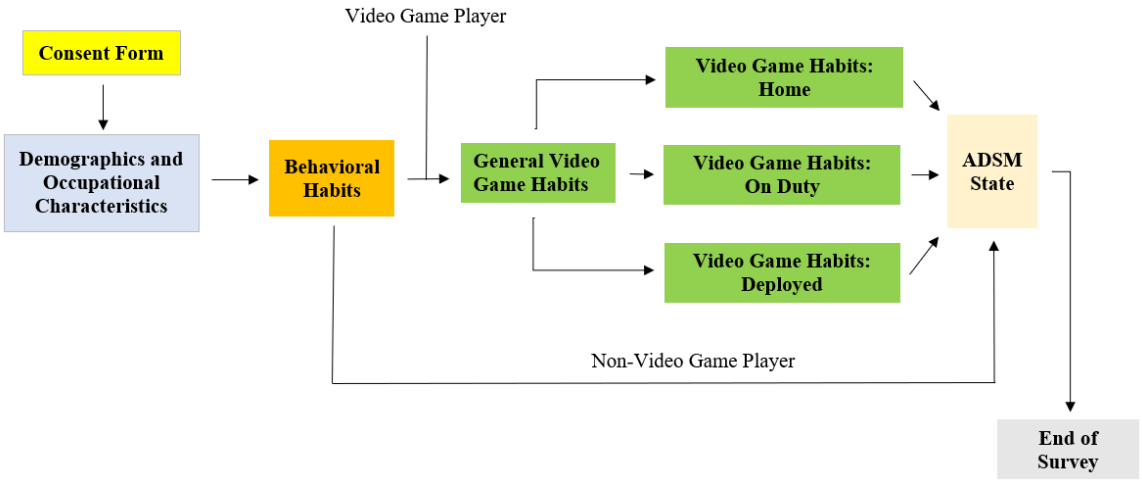


Figure 8. Video gaming survey flow logic

2. TimeUse Web Application

Developed by Pulsar Informatics Inc., the Time Use 2.0 (version 20210317100) web application was used by the participants to log their daily activities (i.e., work/watch/on duty, play or watch video games, personal time that excluded video games, exercise, sleep, and meals) during the 24-hour day, split into 15-minute intervals. This application was only used for participants who were crew members of the ships in-port (USS *San Jacinto* and USS *Cape St. George*). Participants were asked to log their daily activities for 10 consecutive days by logging onto the website with their given username and password via computer or mobile device. The daily TimeUse application log took approximately two minutes a day to complete. Figure 9 shows the interface of the TimeUse application for various menus.

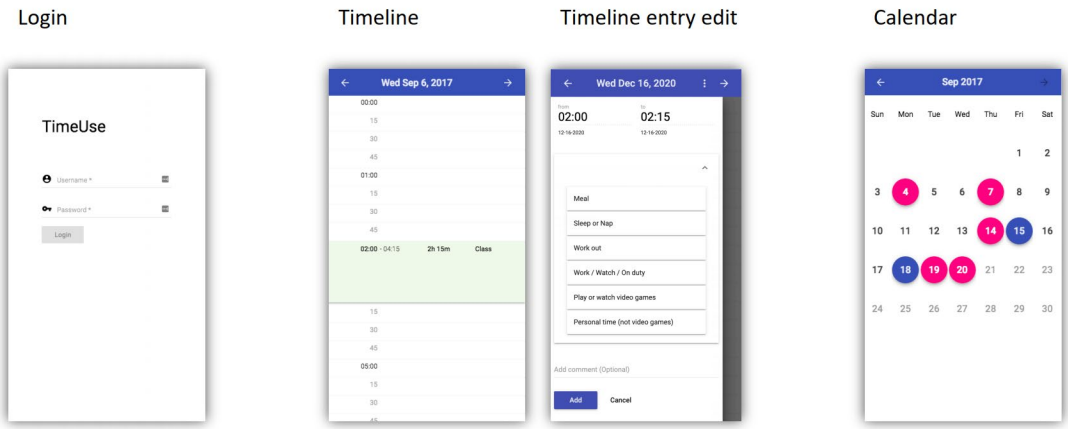
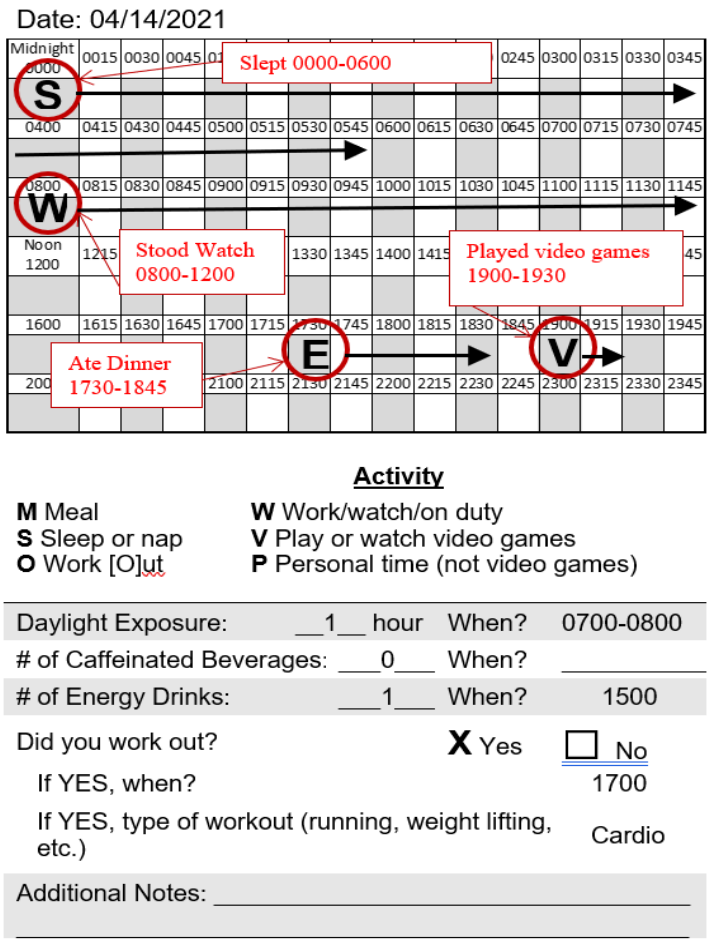


Figure 9. TimeUse application screen interface for "Login," "Timeline," "Timeline Entry Edit," and "Calendar" screens

3. Activity Log

While underway, cellular internet connection is lost. Therefore, the participants of the crew of the USS *Thomas Hudner* used printed activity logs to log their daily activities. Participants were asked to document in the printed logs the same activity information about activities their peers using the TimeUse application on the in-port ships. The daily paper-based activity log tracks users' activities in 15-minute increments and took approximately two minutes to complete per day. Figure 10 provides an example of one completed day. Appendix B contains this activity log.



Example descriptions of daily activities are shown in red circles.

Figure 10. Sample of paper-based activity log

C. PROCEDURE

We conducted a background literature review on video gaming, motivational factors to play video games, problematic video gaming, the symptoms and effects of video game addiction on behavior, mood, and personal well-being, the physical and mental adaptations as a result of problematic video gaming, and current military solutions to mental health disorders. Taking into consideration both the requirements of the sponsor and our literature review, an in-depth questionnaire was developed to assess for ADSM demographic characteristics, personal background and self-evaluated life information, video gaming habits, and related behaviors. The platform of questionnaires included surveys with logs to track daily activities, physical paper surveys, and smartphone-based

applications for digital data collection. We created interview questions through various platforms to understand the motivational factors of problematic video gaming of Sailors. Appendix B contains these interview questions. The questions were then submitted to the Naval Postgraduate School's IRB (NPS IRB# NPS.2021.0040-IR-EP7-A) and were subsequently approved.

The three phases of the study were "Phase I: Preparation," "Phase II: Data Collection and Analysis," and "Phase III: Reporting."

The crew of USS *Thomas Hudner* completed paper-based surveys and activity logs to track daily activities. The crew members of the two ships that were in-port, the USS *San Jacinto* and the USS *Cape St. George* participated using paper-based questionnaires and a smartphone-based application to track daily activities. Table 2 shows the differences in administration between the three ships.

Table 2. Tools used to evaluate USN ships during their process in video gaming study

Ship	**TimeUse Application**	**Activity Log**
USS *Thomas Hudner* (DDG 116)	✗	✓
USS *Cape St. George* (DDG 71)	✓	✗
USS *San Jacinto* (CG 56)	✓	✗

1. Sailors In-port: USS *San Jacinto* and USS *Cape St. George*

The research team recruited Sailors from the USS *San Jacinto* and USS *Cape. St. George* in person. Active–duty recruiters wore non-military clothing while recruiting. Sailors who chose to participate in the study were given an envelope that contained the information needed to participate in the study. The envelope contained:

- Two identical consent forms (one copy to be retained by the research team and one copy for the participant).

- A 20–30-minute video gaming questionnaire.
- Instructions on how to access the two-minute a day Time Use application to record daily activities (e.g., work, leisure, exercise, sleep, meals).
- A return envelope.

Consent forms had to be signed before Sailors were allowed to participate in the survey. Sailors were asked to use the smartphone application to record their activities for 10 consecutive days. The information from the application was directly sent to a secure NPS server. Once Sailors signed the consent form, completed the survey, and placed the contents into the return envelope, the completed envelopes were placed into the return box for submission. The research team then retrieved the surveys and returned the surveys to the Human Systems Integration (HSI) laboratory for analysis.

2. Sailors At-sea: USS *Thomas Hudner*

The ombudsperson forwarded emails of potential participants and made shipboard announcements to the Sailors of USS *Thomas Hudner* regarding the video gaming study. Two boxes were placed in the mess decks. One box contained envelopes with the following contents:

- Two identical consent forms (one copy to the research team and one copy for the participant).
- A 20–30-minute video gaming survey.
- A two-minute a day paper activity log to record daily activities (e.g., work, leisure, exercise, sleep, meals.
- Two return envelopes.

Consent forms had to be signed for Sailors to participate in the survey. Sailors were asked to use the paper activity logs to record their activities for 10-consecutive days. Signed consent forms, completed surveys, and completed paper activity logs were placed in the second envelope were placed in the second box after the participants have completed their

submissions. The contents of the submission box were mailed back to the research team at NPS by the OMBUDSPERSON.

D. DATA PREPARATION

The questionnaire data were manually entered into Microsoft Excel by the NPS research team. Blank items in the "Demographic Information and Occupational Characteristics," "Behavior Habits," and "Video Gaming Habits" section that required a "Yes"/"No" response, while other items were completed, were assumed to have a response of "No." If a numerical range was given as a response in the above sections, the average of the numerical range was calculated. For AUDIT-C, if participants left a question blank, a value of "0" was substituted for that question when calculating the final AUDIT-C score. For caffeine usage, the participants' daily caffeine quantity was calculated using the equation below. The caffeine content of each beverage was approximated given by the Mayo Clinic Staff (2020).

$$Caffeine\ Consumption = (47mg * Tea) + (96mg * Coffee) + (22mg * Soda) + (215mg * Energy\ Drink)$$

After cleaning the dataset, there were 78 remaining participants whose data could be used for further analysis.

E. ANALYTICAL ASSESSMENT

All analyses were done in Microsoft Excel and JMP Pro 16.0.1. All variables underwent descriptive statistical analysis to identify aberrant entries. We then described our participants by displaying their various demographic information, which included their career characteristics and video gaming habits. The demographics of interest were age and sex. The video gaming habits section delved into the Sailors' video gaming habits in three main settings: 1) At home/off duty, 2) on duty/in port, and 3) deployed or underway. The results of the study were presented as a mean and standard deviation (M, SD) for parametric distributions and median and interquartile range (Mdn, IQR) for non-parametric distributions. The statistical significance level was chosen as $\alpha = 0.05$. Normality was inspected within the data by visual inspection of the histograms and normal quantile plots

for distribution patterns, and analytically by using the Shapiro-Wilk W test. If the magnitude of skewness exceeded 0.5 and the magnitude of kurtosis was greater than 3, the assumption of normality was not met.

To address the first component of this thesis, "Assess the prevalence and severity of problematic video gaming in the USN," participants who had scores that fell within the 1st quartile (lower IGD severity) and 4th quartile (higher IGD severity) of IGDS9-SF scores were compared against variables of interest. Pairwise comparisons were made with the pairwise Wilcoxon Rank Sum test or Fisher's Exact Test, depending on the type of data of the variable of interest. In addition, the effect size was calculated to measure practical significance using non-parametric r or relative risk, using 95% confidence intervals. Effect sizes of 0.2, 0.5, and 0.8 were assumed to be low, medium, and high risk, respectively (Sullivan & Feinn, 2012). Having an AUDIT score suggestive of an alcohol problem, experiencing elevated daytime sleepiness, symptoms of GAD, falling within a depression group, and being classified as a 4th quartile gamer (greater gaming severity) were considered risk categories.

To address the second component of this thesis, "Identify the factors associated with problematic video gaming in the USN," we assessed gaming severity using IGDS9-SF scores with the demographics and validated assessments of interest. Spearman's rho was used to identify correlations. Post-hoc statistical significance was assessed with the Benjamini-Hochberg False Discovery Rate (BH-FDR) controlling procedure with $q = 0.20$ to adjust for p-value inflation.

Finally, to address the third component of this thesis, "Compare and contrast the results of gaming severity of Sailor gamers on ships, Sailor gamers in USMC commands, and Marine gamers," three groups were created: Sailors currently assigned to a USN warship were classified as "Sailors on ships"; Sailors assigned to USMC commands were classified as "Sailors in USMC commands"; and "Marines." The three groups were assessed with each other against other variables of interest using the Dunn method for joint ranking post–hoc test for multiple comparisons.

IV. RESULTS

This chapter presents the analysis of the data collected from the USS *San Jacinto* and USS *Cape St. George*. In addition, comparisons were made between the data of the USN ships and data collected from three USMC commands that participated in the same study. Detailed results regarding the data from the USMC commands are presented in the thesis conducted by ENS Edrie Orpilla. Given that only four participants used the TimeUse application, activity data were not used for analysis. Also, data from the USS *Thomas Hudner* were not available for analysis at the time this thesis was written.

A. DEMOGRAPHICS AND OCCUPATIONAL CHARACTERISTICS

All Sailors in the study sample were serving on active duty. Of the 78 Sailors who were gamers, 54 were from the USS *San Jacinto* and 24 Sailors were from the USS *Cape St. George*. The study sample included 75 (97%) males and 74 (93%) enlisted personnel. Table 3 shows the demographic and occupational characteristics of the study participants. Of the participants who had deployment experience, the total time deployed ranged from one month to 48 months, with only 6 (12%) Sailors having experienced combat.

Table 3. Demographic and occupational characteristics of the study sample

Males, # (%)	75 (97%)
Age in Years, Mdn (IQR)	24.5 (11)
Rank, # (%)	
Officers (O-1 to O-3)	4 (5%)
Warrant Officers (W-2)	1 (1%)
Staff NCOs (E-7 to E-8)	5 (6%)
Junior NCOs (E-1 to E-6)	68 (87%)
Years of service, Mdn (IQR)	3 (8)
Sailors with deployment experience, # (%)	46 (59%)
Sailors with combative experience during deployment, # (%)	6 (12%)

B. BEHAVIORAL HABITS

Sailors were asked how many hours they slept per day in three settings (at home/off duty, on duty/in port, when deployed/underway). Reported daily sleep duration was 6 hours (IQR = 2) when on duty/in port and deployed/underway. Participants reported slightly greater amounts of sleep while at home/off duty, with median hours of sleep of 6.5 (IQR = 2). Figures 11 to 13 show the distributions of reported daily sleep duration in the three settings.

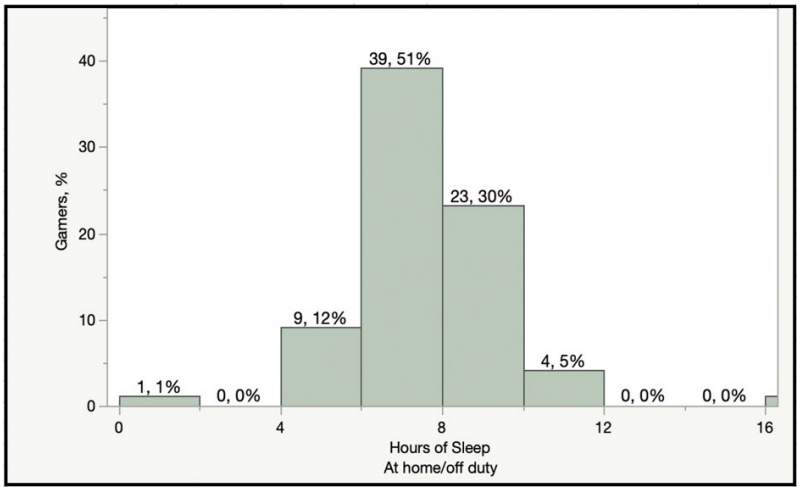


Figure 11. Sailors' reported daily sleep duration while at home/off duty

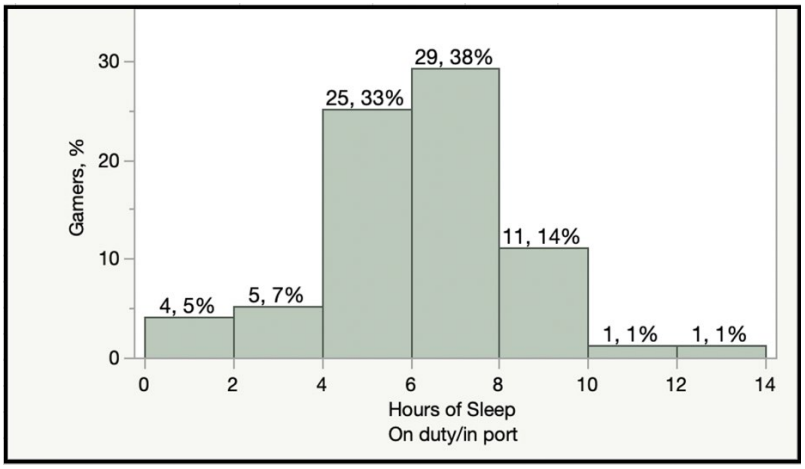


Figure 12. Sailors' reported daily sleep duration on duty/in port

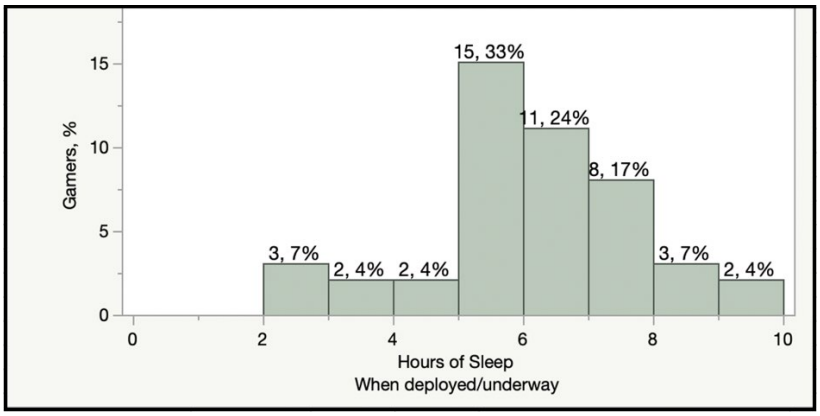


Figure 13. Sailors' reported daily sleep duration when deployed/underway

Thirty-one (40%) Sailors reported using nicotine products (cigarettes, chewing tobacco/snuff, nicotine gum or patches, electronic smoke, etc.), 66 (85%) Sailors reported drinking caffeinated beverages with an estimated median consumption of caffeine of 141 (IQR = 385) milligrams per day. In terms of physical exercise, 11 (14%) Sailors reported that they did not have an exercise routine.

Sailors were classified as "Gamers" (78, 91%) if they reported playing video games in at least one of the three settings, i.e., at home/off duty, on duty/in port, when deployed/underway. Specifically, 73 (94%) Sailors reported playing video games at home/off duty, 52 (67%) Sailors reported playing video games on duty/in port, and 61 (78%) Sailors reported playing video games while deployed/underway.

C. VIDEO GAMING HABITS

Sailors reported playing video games for 18 (IQR = 9) years, ranging from 3 to 35 years. Figure 14 shows the distribution of years of video gaming experience. Of the 77 participant responses, Table 4 shows the genres of video games that Sailors reported playing.

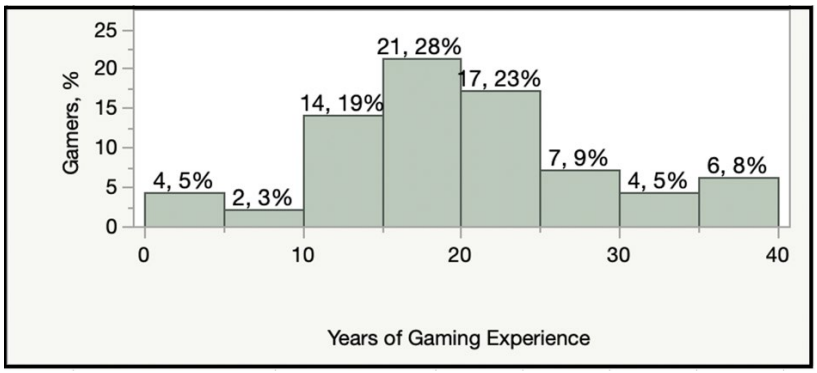


Figure 14. Gaming experience distribution

Table 4. Genres of Video Gaming Played

Genre	Count (%)
Action/Adventure	68 (88%)
Shooter	62 (80%)
Platformer	58 (75%)
Role-Playing	53 (69%)
Fighting	51 (66%)
Racing	44 (57%)
Battle Royal	38 (49%)
Sports	37 (48%)
Multi-Player Online Battle Arenas	36 (47%)
Strategy	36 (47%)
Card-Based Games	27 (35%)
Puzzle	27 (35%)
Simulation	25 (32%)
Music and Dance	20 (26%)
Other	11 (14%)

1. Video Gaming Habits when At Home/Off Duty

Sailors reported playing video games three hours per day when at home/off duty (median value: IQR = 2.5). Figure 15 shows the reported daily duration of video gaming in hours at home/off duty. When at home/off duty, most Sailors reported playing video games on a gaming console (60, 82%), a smartphone, with (57, 78%) participants, or a desktop/laptop computer (40, 55%). Figure 16 shows the device usage distribution by Sailors when at home/off duty.

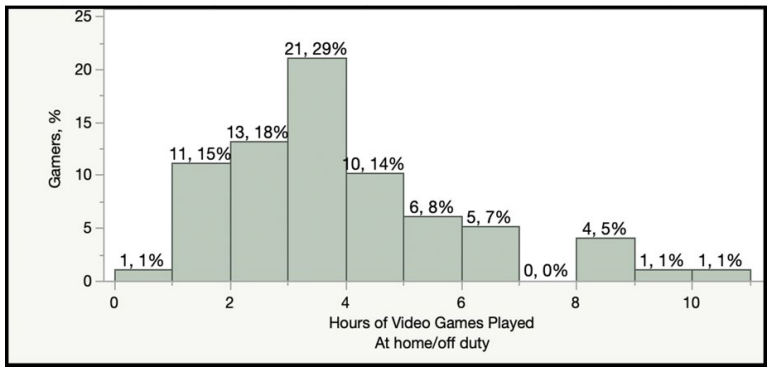
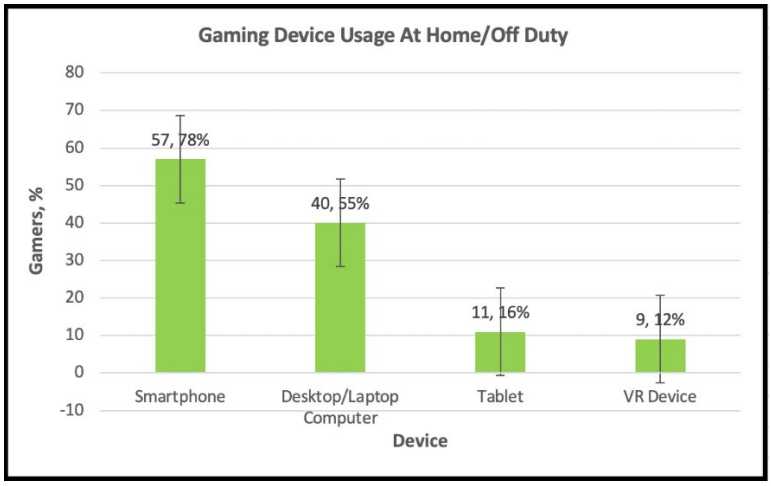


Figure 15. Reported hours of video games played per day while home/off duty



Vertical lines denote the standard error of proportion.

Figure 16. Gaming device usage at home/off duty

2. Video Gaming Habits On Duty/In Port

The reported median hours of video gaming were 2 hours (IQR = 2), one hour less than when participants were home/off duty. Figure 17 shows the reported daily hours of video gaming participants were engaging in per day while on duty/in port. Out of the 56 responses, most gamers reported playing video games while on duty/in port on smartphones (46, 82%), followed by gaming consoles (36, 64%). Figure 18 shows this distribution. No participants reported using a VR device.

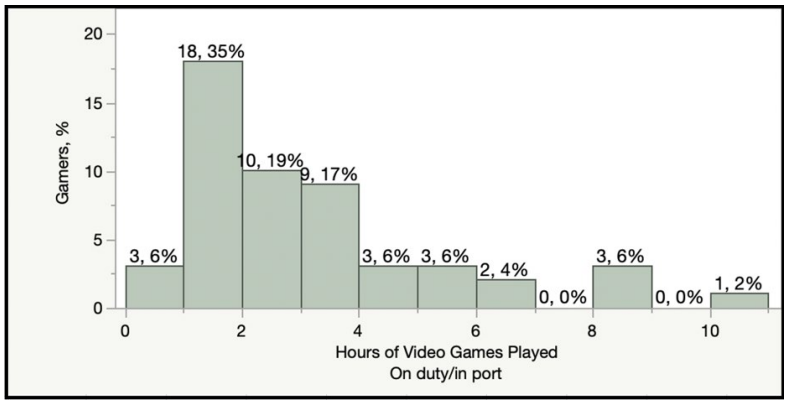
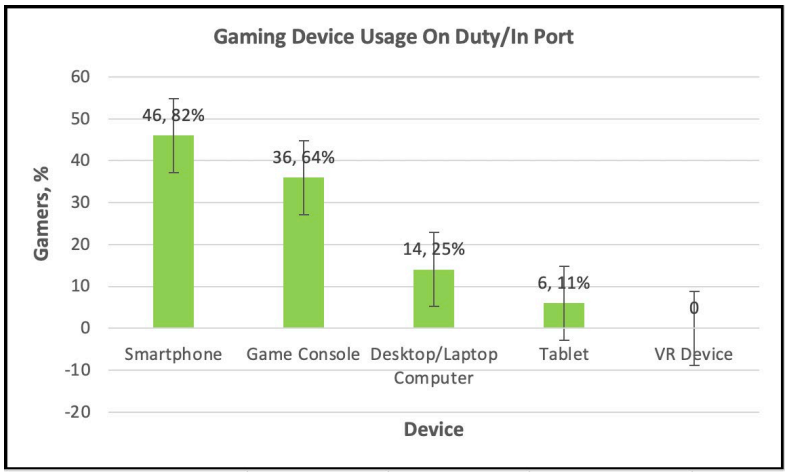


Figure 17. Reported hours of video games played per day while on duty/in port



Vertical lines denote the standard error of proportion.

Figure 18. Gaming device usage while on duty/in port

3. Video Gaming Habits when Deployed or Underway

Sailors reported playing video games for 2 hours (median value; IQR = 2) in a typical day when deployed/underway. Figure 19 shows the reported hours of video gaming participants were engaging in per day while on duty/in port. Sailors reported playing video games mostly in gaming consoles (52, 83%) and smartphones (41, 66%) – results based on 62 responses.

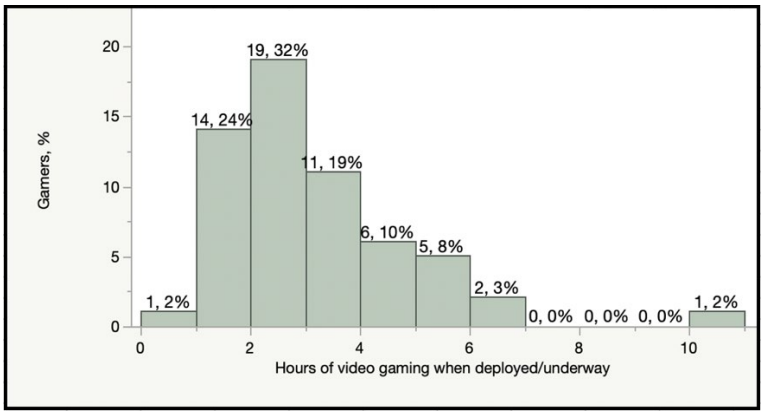
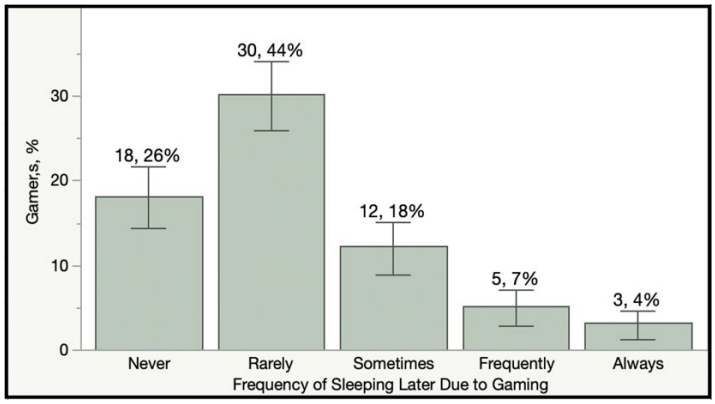


Figure 19. Reported hours of video games per day played while deployed/underway

4. Sleeping Later due to Video Gaming

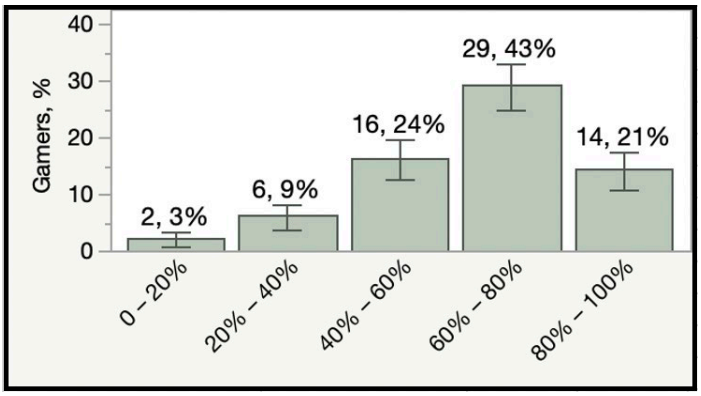
Sailors who reported playing video games before bedtime were asked whether they have slept later because of playing video games. Responses showed that 20 (29%) gamers reported sleeping later sometimes, frequently, or always. These results are shown in Figure 20 below.



Vertical lines denote the standard error of proportion.

Figure 20. Frequency of sleeping later due to video gaming

When asked about video gaming habits while underway/deployed of other shipmates, 29 (43%) Sailors estimated that 60% to 80% of their shipmates played video games when underway/deployed. The distribution of Sailor estimations of the video gaming habits of the crew is shown in Figure 21.



Vertical lines denote the standard error of proportion.

Figure 21. Sailor video gaming perceptions of fellow shipmates

5. Severity of Video Gaming

The severity of video gaming habits was assessed by the IGDS9-SF score. Higher scores are indicative of a greater magnitude of video gaming severity (APA, 2013). Analysis showed that the median IGDS9-SF score was 14 (IQR = 7.5) ranging between 9 and 31. The distribution of IGDS9-SF scores is shown in Figure 22. Based on the IGDS9-SF scores, we used two criteria to assess the prevalence of disordered gamers. If a participant reported at least five of the nine IGDS9-SF criteria at the "5: Very Often" level or if the IGDS9-SF total score was greater than or equal to 36, then the participant was classified as having a gaming disorder (Pontes et al., 2015). Based on these two criteria, none of the Sailors were classified as disordered gamers.

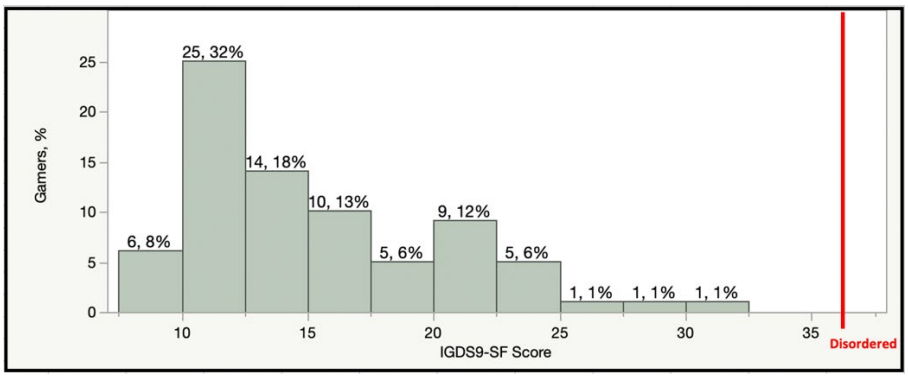
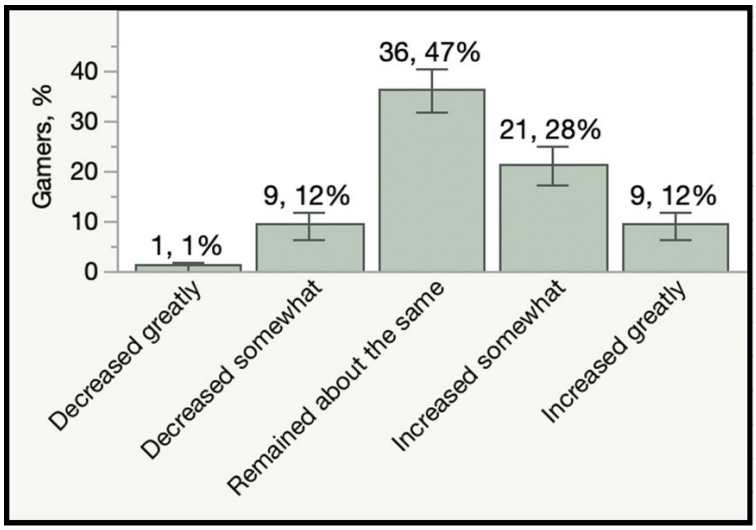


Figure 22. IGDS9-SF score distribution

6. Video Gaming Activities before and during the COVID-19 Pandemic

Many Sailors (36, 47%) reported that their gaming activities did not change after the COVID-19 pandemic compared to their video gaming activities before COVID-19. However, 30 (40%) Sailors reported that their video gaming habits increased during COVID-19 compared to 10 (13%) Sailors who reported that their video gaming decreased (Figure 23).

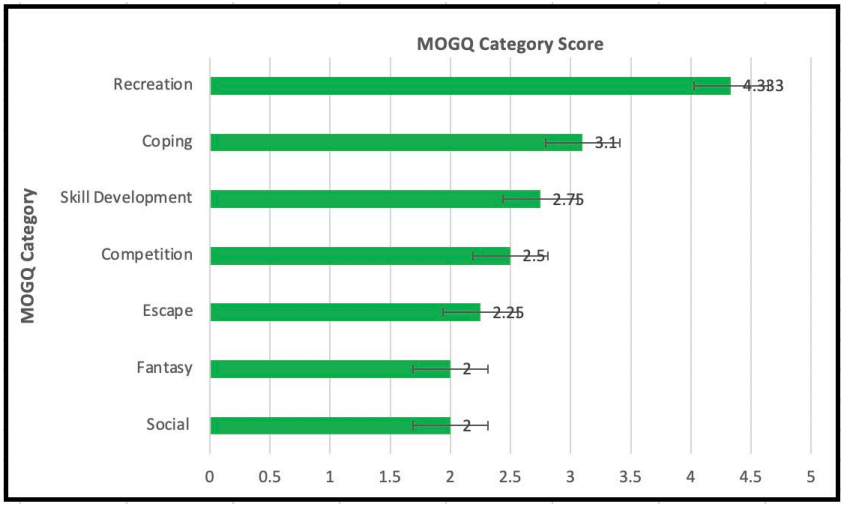


Vertical lines denote the standard error of proportion.

Figure 23. Changes in video gaming activities due to COVID-19

D. WHY SAILORS PLAY VIDEO GAMES

The Motives for Online Gaming Questionnaire (MOGQ) was used to assess motivational factors for playing video games in terms of seven dimensions. The dimensions with the highest median score were "recreation" (Mdn = 4.333, IQR = 1.333), followed by "coping with stress," with a mean of 3.100 $\pm$ 0.96. The social (building and maintaining social relationships) and fantasy factors were last in terms of their median score (2). Detailed results are shown in Figure 24.



Horizontal lines denote the standard error of the means.

Figure 24. MOGQ Scores for motivation to play video games

E. SAILOR STATE

The median perceived stress score from the Perceived Stress Scale (Perceived Stress Scale PSS-4) (Figure 25) was 8 (IQR = 2) ranging from 0 to 16, with higher scores denoting higher levels of perceived stress (Cohen et al., 1983).

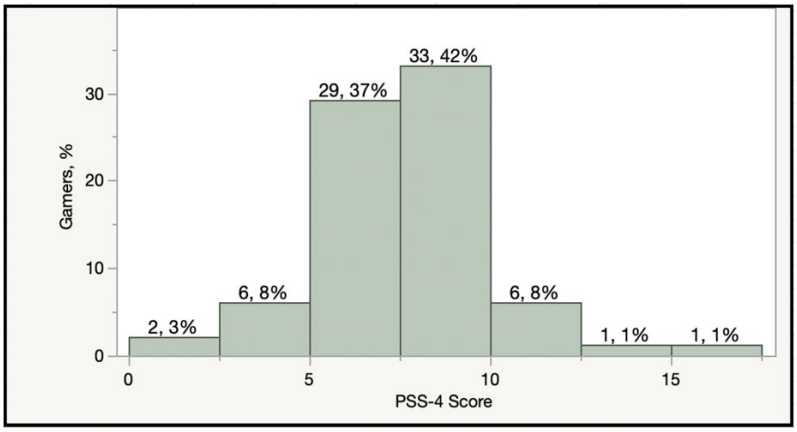


Figure 25. Distribution of PSS-4 scores

F. SATISFACTION WITH LIFE SCALE

The mean SWLS score of the participants was 22.9 $\pm$ 6.32, ranging from 5 to 35 with higher scores indicating greater life satisfaction. Figure 26 shows the distribution of the SWLS scores for the two ships and Figure 27 displays Sailors groups based on the level of satisfaction with life. Although 28 (36%) Sailors reported being satisfied with their life, 26 (32%) have an SWLS score denoting dissatisfaction with life.

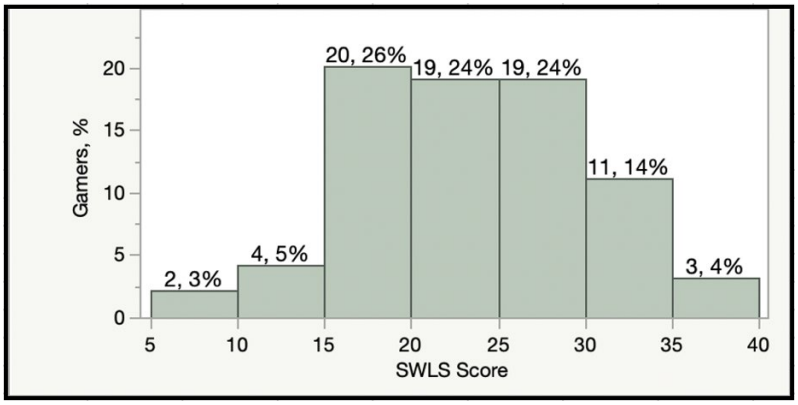
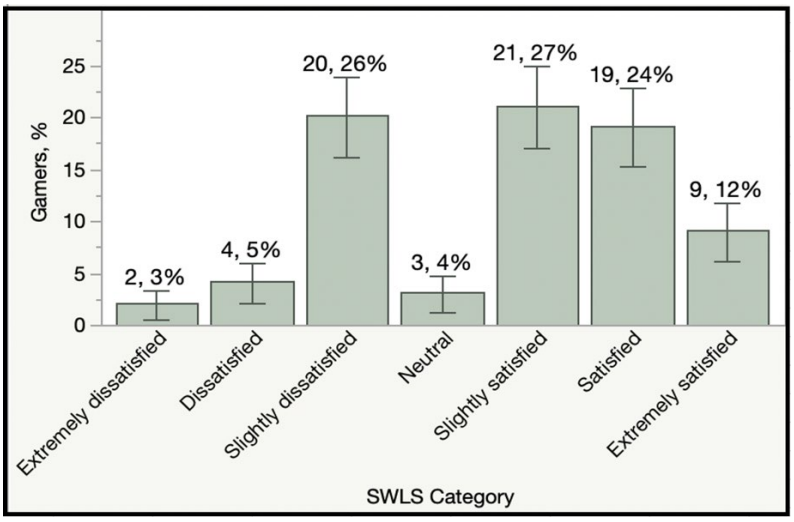


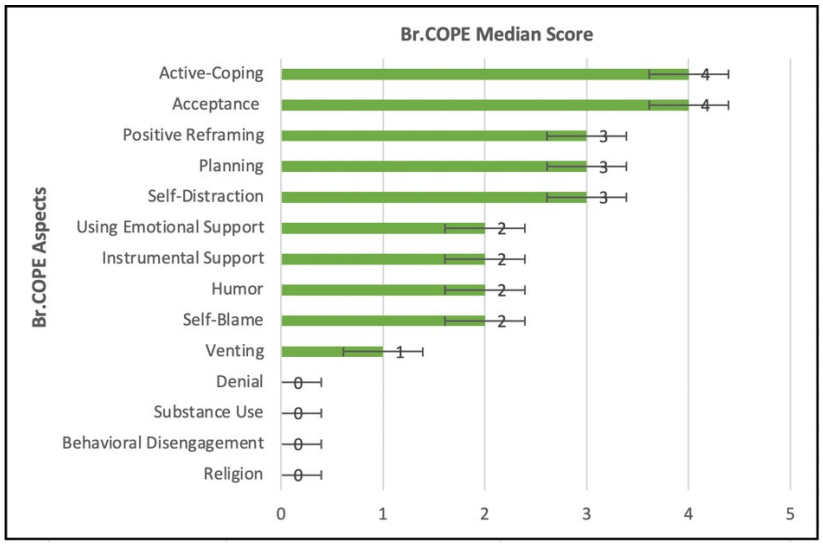
Figure 26. SWLS score distribution



Vertical lines denote the standard error of proportion.

Figure 27. SWLS Category distribution. Orientation to coping with problems

Next, using the Brief COPE scale, we assessed Sailor orientation to coping with problems using a scale from 0 to 6 (higher frequency). As shown in Figure 28, acceptance and active coping were the most frequently used styles with median scores of 4 (IQR = 3). The least frequently used styles were turning to religion (Mdn = 0, IQR = 2), substance use (Mdn = 0, IQR = 0), and denial (Mdn = 0, IQR = 1).



Horizontal lines denote the standard error of proportion.

Figure 28. Br.COPE median scores

G. DEPRESSION (PATIENT HEALTH QUESTIONNAIRE PHQ-8)

Gamers had PHQ-8 scores ranging from 0 to 24 with a median of 6 (IQR = 6.5). Figure 29 shows the distribution of the PHQ-8 scores. Gamers were classified into one of three groups depression groups ("Normal," "Major Depression," and "Severe Major Depression") based on their PHQ-8 score. As shown in Figure 30, a quarter of the gamers (19 [25%]) were classified as experiencing "major depression" or "severe major depression."

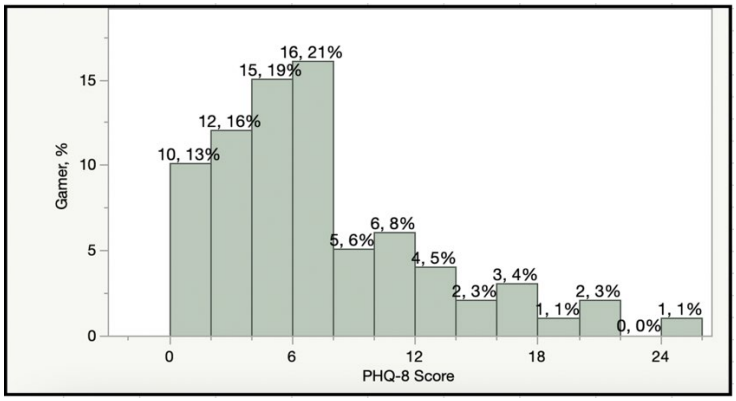
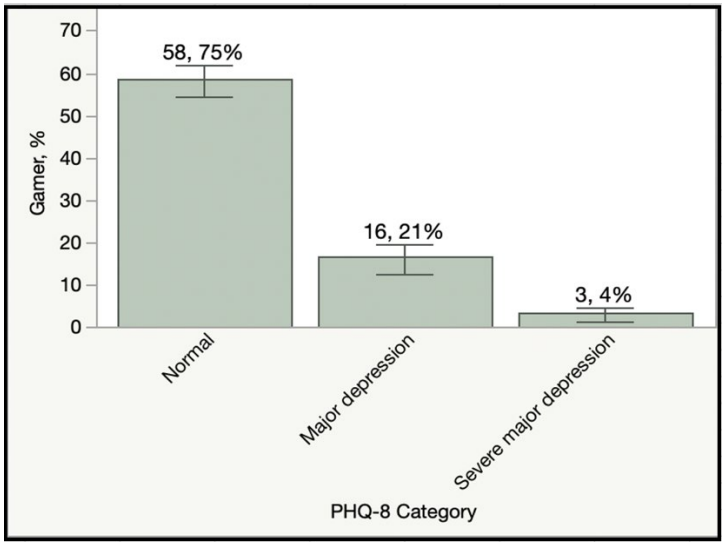


Figure 29. Distribution of PHQ-8 scores



Vertical lines denote the standard error of proportion.

Figure 30. Depression groups based on PHQ-8 scores

H. GENERALIZED ANXIETY SCALE

Gamers had a median GAD-7 score of 5 (IQR = 8) ranging from a minimum of zero to a maximum score of 21. The distribution of GAD-7 scores is shown in Figure 31, with 29 (35%) Sailors having a score less than a value of 3.

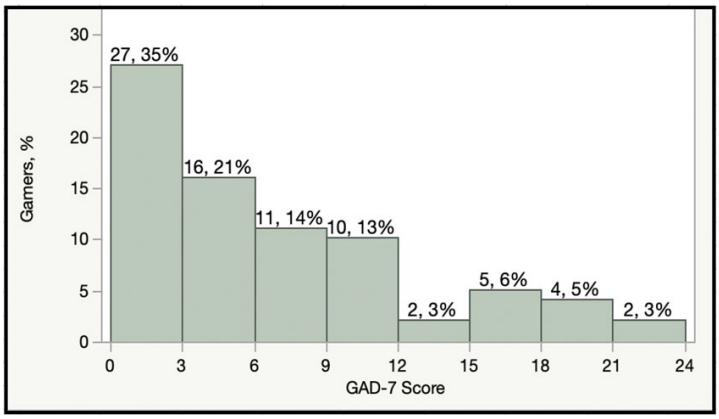
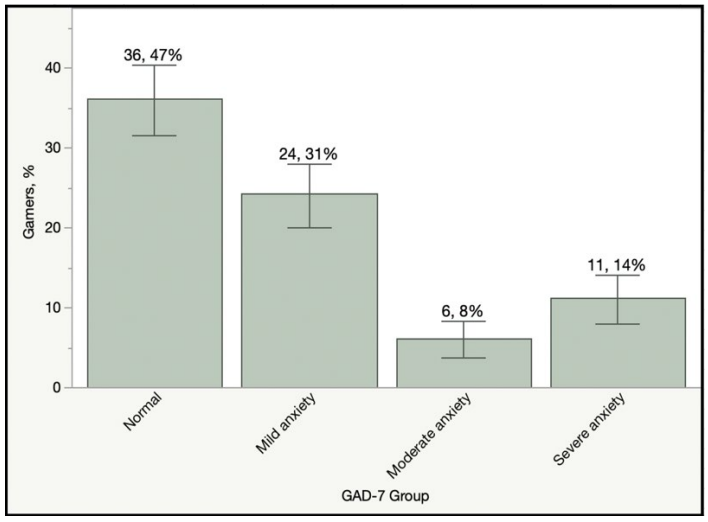


Figure 31. Distribution of GAD-7 scores

Based on their GAD-7 score, gamers were categorized into four generalized anxiety groups. As shown in Figure 32, 17 (22%) of gamers were classified as “moderate anxiety” or “severe anxiety.”



Vertical lines denote the standard error of proportion.

Figure 32. Generalized anxiety groups

I. UCLA LONELINESS SCALE

The mean UCLA Loneliness Scale was 43.7 ± 11.5, ranging from 25 to 76. Figure 33 shows the distribution of the UCLA Loneliness scores.

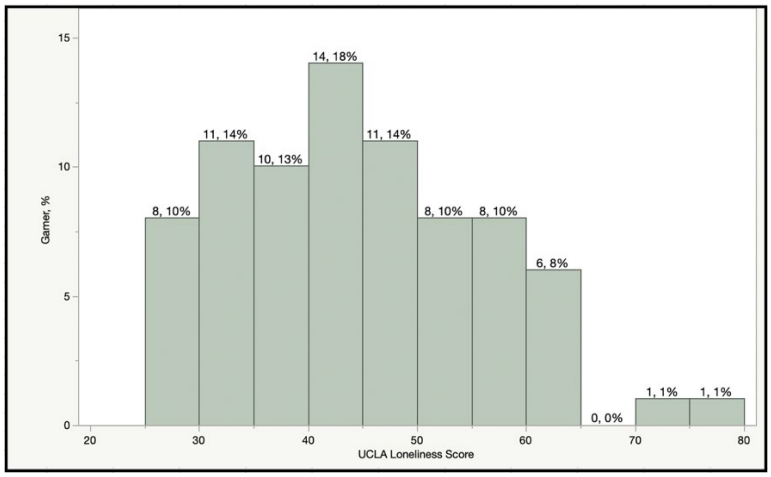


Figure 33. Distribution of UCLA Loneliness Scale scores

J. AVERAGE DAYTIME SLEEPINESS—EPWORTH SLEEPINESS SCALE

Gamers had a mean score of 8.92 ± 4.93, ranging from 0 to 20. Figure 34 shows the distribution of the ESS scores. Gamers with ESS scores greater than 10 may indicate a higher tendency to fall asleep during the day. Based on their ESS scores, over a third of gamers (28 [36%]) of participants reported symptoms of elevated daytime sleepiness.

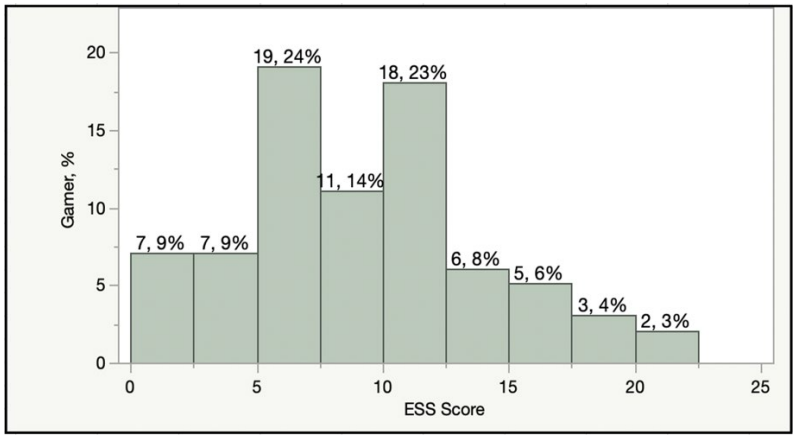


Figure 34. Distribution of ESS scores

K. ALCOHOL USE (ALCOHOL USE DISORDERS IDENTIFICATION TEST FOR CONSUMPTION AUDIT-C).

The median AUDIT-C score was 3, ranging from 0 to 10. Based on their AUDIT-C scores, 30 (37%) gamers were classified as having symptoms suggestive of an alcohol problem. Figure 35 shows the distribution of the AUDIT-C scores.

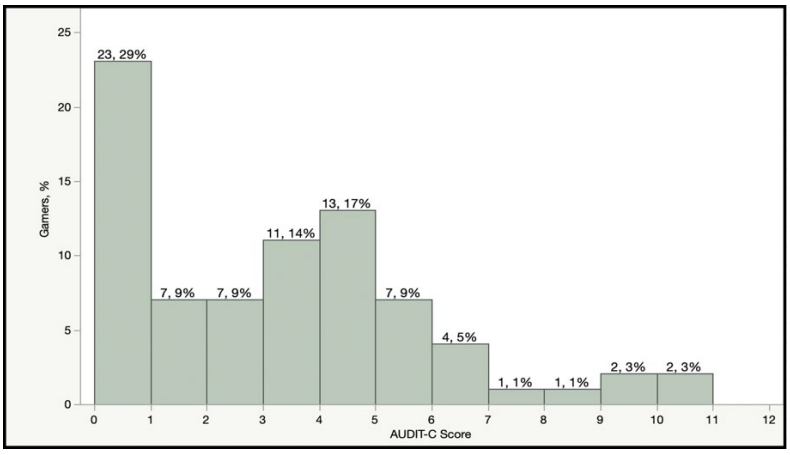


Figure 35. Distribution of AUDIT-C scores

L. PREVALENCE DISORDERED VIDEO GAMING

Based on the ICD-11 "5 out of 9" and the IGDS9-SF score "greater than or equal to 36" criteria, none of the Sailors in the study sample were classified as "disordered" video gamers.

M. SEVERITY OF VIDEO GAMING AND SAILOR WELL-BEING

Next, we assessed the effect of video gaming severity on Sailor well–being by comparing gamers with an IGDS9-SF score in the first quartile (lower–severity gaming) with gamers with an IGDS9-SF score in the fourth quartile (higher–severity of gaming). The two groups of gamers did not differ in terms of age ($p = 0.219$), reported daily sleep duration, and gaming duration both on duty and during deployment (all $p > 0.30$).

However, compared to gamers in the 1st quartile (n = 22), however, gamers in the 4th quartile (n = 19) had statistically significantly higher scores on the PSS-4 scale ($p = 0.008$), PHQ-8 ($p = 0.004$), GAD-7 ($p < 0.001$), and in the UCLA loneliness scale ($p < 0.01$). Also, gamers in the 4th quartile were more likely to be identified with symptoms of major/severe depression (9.26 times more likely) and generalized anxiety (8.1 times more likely).

Compared to gamers in the 1st quartile, gamers in the 4th quartile consistently score higher on all six motivational factors, i.e., socialize with others ($p = 0.033$), escape from reality ($p < 0.001$), cope with stress ($p = 0.004$), find competition ($p = 0.005$), find recreation amongst others ($p = 0.023$), and to increase skill development ($p = 0.019$). Differences in all motivational factors to play video games had at a minimum medium effect size, with escape from reality, coping with stress, and recreation amongst others having the largest effect sizes. Compared to lower severity gamers (1st quartile), greater severity of gamers (4th quartile) more frequently used two dysfunctional styles to cope with stress, i.e., self-distraction ($p = 0.004$) and self-blame ($p < 0.001$). Table 5 summarizes the results of the comparisons between the two groups.

Table 5. Differences between gamers in the 1st and 4th quartile groups of IGDS9-SF scores

Variables	1st Quartile Gamers (n = 22)	4th Quartile Gamers (n = 19)	p-value	Effect Size
Age in years, MD (IQR)	26.5 (11.25)	22 (8)	0.693[A]	0.061[Ci]
Sex (males), # (%)	22 (100%)	17 (89%)	0.219[B]	-
Daily Sleep Duration on duty (hours), MD (IQR)	6 (3)	5.5 (2.5)	0.583[A]	0.085[Ci]
Daily Sleep Duration deployed (hours), MD (IQR)	6 (2.75)	5 (2.375)	0.332[A]	0.151[Ci]
Hours Spent Gaming on duty (hours), MD (IQR)	2 (2)	2.25 (2.25)	0.977[A]	0.152 [Ci]
Hours Spent Gaming while deployed (hours), MD (IQR)	2 (2)	3 (3)	0.461[A]	0.115 [Ci]
PSS-4 (perceived stress)	6 (3.25)	8 (2)	**0.008[A]**	0.417 [Cii]
SWLS (satisfaction with life) score, MD (IQR)	23 (7)	21 (9)	0.254[A]	0.178 [Ci]
PHQ-8 (depression), MD (IQR)	3 (4)	8 (7)	**0.004[A]**	0.554 [Ciii]
Sailors with depression, # (%)	1 (5%)	8 (42%)	**0.005[B]**	9.26 (1.27, 67.5)[D]
GAD-7 scores (anxiety), MD (IQR)	1.5 (4.25)	9 (10)	< **0.001[A]**	0.639 [Ciii]
Sailors with GAD, # (%)	1 (5%)	7 (37%)	**0.012[B]**	8.10 (1.09, 60.1)[D]
UCLA loneliness scale, MD (IQR)	37.5 (15)	50 (16)	**0.01[A]**	0.402 [Cii]
ESS (daytime sleepiness), MD (IQR)	6 (7.5)	9 (8)	0.149[A]	0.225 [Cii]
Elevated daytime sleepiness, # (%)	6 (27%)	7 (37%)	0.374[B]	1.35 (0.54, 3.32)[D]
AUDIT-C score, MD (IQR)	1 (4)	3 (5)	0.247	0.178
Suggestive of alcohol problem), # (%)	7 (32%)	9 (47%)	0.243[B]	1.49 (0.68, 3.22)[D]

Variables	1st Quartile Gamers (n = 22)	4th Quartile Gamers (n = 19)	p-value	Effect Size
MOGQ, MD (IQR)				
Social	1.63 (1.13)	2.5 (1.75)	**0.033**[A]	0.332 [Cii]
Escape	1.75 (0.75)	3.5 (1.50)	< **0.001**[A]	0.682 [Ciii]
Competition	1.875 (1.56)	3.25 (2.25)	**0.005**[A]	0.437 [Cii]
Coping	2.5 (1.50)	3.5 (1)	**0.004**[A]	0.557 [Ciii]
Skill Development	2.5 (2.25)	3.25 (1.50)	**0.019**[A]	0.365 [Cii]
Recreation	3.83 (1.41)	3.67 (1.33)	**0.023**[A]	0.577 [Ciii]
Brief COPE, MD (IQR)				
Self-Distraction	1.5 (2)	3 (2)	**0.004**[A]	0.456 [Cii]
Positive Reframing	2 (2.25)	3 (2)	0.491[A]	0.107 [Ci]
Emotional Support	1.5 (3.25)	2 (3)	< **0.001**[A]	0.192 [Ci]
Behavioral Disengagement	0 (1.25)	0 (2)	0.438[A]	0.068 [Ci]
Using Instrumental Support	2 (4)	2 (4)	0.611[A]	0.079 [Ci]
Venting	1 (2)	2 (3)	0.243[A]	0.182 [Ci]
Acceptance	3 (3.25)	4 (2)	0.57[A]	0.087 [Ci]
Self-Blame	0.5 (3.25)	3 (2)	0.024[A]	0.351[Cii]

Statistically significant p-values ($p < 0.05$) are in bold.

A Pairwise comparisons with non-parametric Mann Whitney U test (Wilcoxon Rank Sum Test)

B Pairwise comparisons with Fisher's Exact Test

C Non-parametric effect size r

D Relative risk (95% confidence interval)

Effect size degree: "i": Small effect ($r \leq 0.20$); "ii": Medium effect ($0.20 < r \leq 0.50$); "iii": Large effect ($r \geq 0.80$)

Scales ranging from 0 (lower frequency of use) to 6 (higher frequency) for MOGQ and Br.COPE

N. CORRELATIONS AMONG GAMING SEVERITY AND OTHER VARIABLES OF INTEREST

Analysis showed that IGDS9-SF scores were correlated at a statistically significant level with PSS-4 scores, PHQ-8, GAD-7, UCLA loneliness scale scores, ESS, MOGQ social component scores, MOGQ escape component scores, MOGQ coping component scores, MOGQ skill development, MOGQ fantasy, MOGQ recreation, Brief COPE denial, Brief COPE behavioral disengagement, Brief COPE self-blame, number of hours spent gaming at home, and number of days spent gaming at home. As gaming severity increased, Sailors experienced greater levels of stress, depression, anxiety, loneliness, and average daytime sleepiness. Also, Sailors with increased gaming severity tended to score higher also in escapism and coping with stress. Detailed results of the correlation analysis are shown in Table 6.

Table 6. Correlation matrix based on Spearman's ρ.

Survey component	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
(1) IGDS9-SF																										
(2) PSS-4	**0.37**																									
(3) SWLS	-0.19	-0.11																								
(4) PHQ-8	**0.48**	**0.29**	**-0.29**																							
(5) GAD-7	**0.55**	**0.24**	**-0.23**	**0.82**																						
(6) UCLA	**0.38**	**0.25**	**-0.35**	**0.50**	**0.49**																					
(7) ESS	**0.22**	**0.43**	-0.16	**0.29**	**0.28**	0.06																				
(8) AUDIT-C	0.12	0.15	0.08	-0.03	-0.04	-0.06	0.19																			
(9) MOGQ Social	**0.33**	0	-0.04	0.10	**0.20**	0.15	0.13	-0.21																		
(10) MOGQ Escape	**0.57**	**0.21**	-0.11	**0.26**	**0.40**	**0.27**	0.14	0.03	**0.52**																	
(11) MOGQ Competition	**0.38**	0.10	**-0.28**	0.15	0.08	0.07	**0.27**	-0.09	**0.52**	**0.40**																
(12) MOGQ Coping	**0.47**	0.15	-0.10	**0.20**	**0.30**	**0.17**	**0.22**	-0.08	**0.59**	**0.69**	**0.61**															
(13) MOGQ Skill Development	**0.31**	0	-0.06	0.08	0.17	0.13	**0.20**	**-0.22**	**0.65**	**0.53**	**0.47**	**0.73**														
(14) MOGQ Fantasy	**0.27**	0.11	-0.19	**0.25**	**0.23**	**0.40**	0.07	-0.11	**0.52**	**0.57**	**0.42**	**0.50**	**0.46**													
(15) MOGQ Recreation	**0.27**	0.16	0.17	0.17	0.14	0.09	-0.01	-0.14	**0.34**	**0.25**	**0.21**	**0.41**	**0.23**	**0.24**												
(16) BC Denial	**0.22**	**0.22**	**-0.34**	**0.41**	**0.42**	**0.28**	**0.28**	0.02	0.09	0.15	**0.23**	**0.41**	0.09	0.17	**-0.25**											
(17) BC Substance use	0.07	0.16	-0.15	**0.25**	**0.17**	-0.02	**-0.31**	**0.44**	-0.14	0.07	0.02	-0.08	-0.10	0.02	0.02	0.07										
(18) BC Emotional support	0.12	**0.24**	0.11	0.06	0.15	-0.14	0.19	0.15	0.09	**0.26**	0	0.18	0.03	0.06	0.13	0.11	**0.24**									
(19) BC Behavioral disengagement	**0.21**	0.18	**-0.29**	**0.43**	**0.40**	**0.41**	0.16	-0.07	**0.21**	**0.28**	0.13	0.09	0.12	**0.32**	0.05	**0.41**	**0.34**	0.05								
(20) BC Instrumental support	0.05	0.08	0.10	0.10	**0.23**	-0.14	0.14	0.06	0.20	**0.22**	0.08	0.19	0.09	0.14	0.11	**0.24**	0.18	**0.79**	0.03							
(21) BC Venting	0.18	**0.35**	-0.06	**0.28**	**0.34**	-0.02	**0.24**	**0.24**	0.01	**0.26**	0.04	**0.20**	0.03	0.07	**0.24**	0.18	0.16	**0.43**	0.10	**0.46**						
(22) BC Positive reframing	0.11	**0.22**	0.04	0.02	0.17	-0.09	0.16	0.18	0.01	0.14	-0.06	0.02	-0.06	0.05	-0.10	0.16	-0.02	**0.64**	-0.08	**0.63**	**0.34**					
(23) BC Acceptance	0.03	**0.26**	0.15	0.06	0.15	-0.06	**0.21**	0.14	0.04	0.10	-0.16	0	-0.02	0	0.13	0.01	0.14	**0.58**	-0.04	**0.57**	**0.42**	**0.56**				
(24) BC Self-blame	**0.31**	0	-0.05	**0.51**	**0.52**	**0.32**	**0.22**	0.19	0.06	**0.25**	0.07	0.11	0.05	**0.30**	0.03	**0.28**	0.18	**0.28**	**0.25**	**0.37**	**0.34**	**0.40**	**0.37**			
(25) Daily Sleep Duration (on duty)	0.07	-0.16	0.01	0.12	-0.20	**-0.22**	0.06	-0.10	-0.08	-0.08	0.08	0.02	-0.08	0.02	0.12	0.07	-0.01	**-0.06**	**-0.12**	**0.37**	0.03	-0.07	-0.05	-0.18		
(26) Number of Hours Spent Gaming (at home)	**0.27**	0.02	0.07	0.05	0.06	**0.21**	0.01	0.09	**0.59**	**0.27**	**0.43**	**0.38**	**0.45**	**0.46**	**0.30**	0.07	0.12	-0.01	0.09	-0.03	0.04	-0.03	0.05	-0.14	0.15	
(27) Number of Days Spent Gaming (at home)	**0.41**	0.16	-0.11	0.06	0.13	0.06	0.18	-0.09	**0.29**	**0.27**	**0.31**	**0.31**	**0.22**	**0.32**	**0.27**	0.09	0.08	0.02	0.01	0.04	0.01	0.01	0.08	0.05	0.02	**0.41**

Post hoc statistical significance assessed by the using BH FDR procedure.

Bolded values denote significant p-values ($p < 0.05$).

O. COMPARISON AMONG SAILOR GAMERS FROM ON SHIPS, SAILOR GAMERS IN USMC COMMANDS, AND MARINE GAMERS.

Next, we compared Sailor on ships (n = 78), Sailors in USMC commands (n = 53), and Marine gamers (n = 954). All three groups were predominantly male, with both the "Sailors on ships" group (Fisher's Exact test, $p = 0.022$) and Marines (Fisher's Exact test, $p = 0.035$) having significantly more males than the "Sailors in USMC commands" group. Additionally, Sailors in USMC commands were older than Sailors on ships (Dunn Method for Joint Ranking, $p < 0.001$) and Marines (Dunn Method for Joint Ranking, $p < 0.001$). In terms of daily sleep duration while on duty, Sailors on ships reported 2 more hours of sleep her day compared to Sailors in USMC commands (Dunn Method for Joint Ranking, $p < 0.001$).

In terms of well–being, Sailors in USMC commands had higher greater levels of anxiety (Dunn Method for Joint Ranking, $p = 0.045$) and depression (Dunn Method for Joint Ranking, $p = 0.037$) compared to Sailors on ships, with nearly double the median scores of Sailors at sea. Also, Sailors on ships had two and a half times higher anxiety levels than Marines (Dunn Method for Joint Ranking, $p = 0.019$). Table 7 shows the results of the comparisons among the three groups.

Table 7. Comparison between occupational groups

Variables of Interest	Sailors on ships (n = 78)	Sailors in USMC commands (n = 52)	Marines (n = 954)
Age in years, MD (IQR)[D]	24.5 (11)	31 (9.75) [A***, C***]	23 (7) [B]
Sex (males), # (%)[E]	75 (97.4)[A*]	45 (86.54)	869 (94.25)[C*]
Daily Sleep Duration on duty (hours), MD (IQR)[D]	6 (2) [B***]	4 (6.25) [A***]	1 (5)
Hours Spent Gaming on duty (hours), MD (IQR)[D]	2 (2)	2.5 (2.5)	3 (2)
IGDS9-SF (gaming severity)[D]	14 (7.5)	13 (9)	15 (7)
PSS-4 (perceived stress)[D\]	8 (3)	8 (2.5)	8 (2)
SWLS (satisfaction with life), MD (IQR)[D]	23 (8)	23 (12)	23 (10)
PHQ-8 (depression), MD (IQR)[D]	6 (6.5)	3 (7)[A*]	4 (8)
GAD-7 (anxiety), MD (IQR)[D]	5 (8) [B*]	2 (6) [A*]	2 (7)
UCLA (loneliness), MD (IQR)[D]	42.5 (16.3)	43 (20)	43 (20)
ESS (daytime sleepiness), MD (IQR)[D]	9 (6)	8 (6)	8 (6)
AUDIT-C (suggestive of alcohol problem), # (%)[E]	30 (38%)	14 (32%)	276 (39%)
MOGQ, MD (IQR)[D]			
Social	2 (2)	1.75 (1.25)	2 (1.75)
Escape	2.25 (1.875)	2.25 (2.125)	2.5 (2.5)
Competition	2.5 (1.25)	2.5 (1.5)	2.75 (1.75)
Coping	3.25 (1.375)	3 (2.125)	3.25 (1.5)
Skill Development	2.75 (2.125)	2 (2.75)	2.75 (2.25)
Recreation	4.33 (1.33)	4.67 (1.33)	4.67 (1)
Brief COPE, MD (IQR)[D]			
Self-Distraction	3 (3)	2 (3.75)	2 (3)
Positive Reframing	3 (3)	3 (4.75)	2 (3)
Emotional Support	2 (3)	2 (4)	2 (4)
Behavioral Disengagement	0 (1.5)	0 (1)	0 (1)
Using Instrumental Support	2 (3)	2 (3.75)	2 (3)
Venting	1 (2)	0.5 (3)	1 (2)
Acceptance	4 (3)	3 (5)	3 (3)
Self-Blame	2 (4)	1 (2)	2 (3)

Statistical significance for differences: "*": $p<0.05$; "**": $p<0.01$; "***": $p<0.001$

[A] Difference between "Sailors on ships" and "Sailors in USMC commands"; [B] Difference between "Sailors on ships" and "Marines" groups; [C] Difference between "Sailors in USMC commands" and "Marines"

[D] Multiple comparisons with non-parametric Dunn method for joint ranking

[E] Pairwise comparisons with Fisher's Exact Test

Lastly, we used the ICD-11 "5 out of 9" and the IGDS9-SF score greater than or equal to 36 criteria to identify "disordered" gamers. Analysis showed that none of the Sailors on ships were classified as "disordered" video gamers, whereas 2 (0.2%) Marines had IGDS9-SF scores greater than or equal to 36, and 5 (0.5%) Marines (including the three Marines from the "5 of 9" criteria) met the ICD-11 criteria of "disordered" video gamers. One Sailor from a USMC command fit both disordered criteria. A summary of the prevalence of "disordered" video gamers according to the ICD-11 and IGDS9-SF criteria is shown in Table 8.

Table 8. "Disordered" gamers based on ICD-11 and IGDS9-SF criteria

Criterion	**Sailors on Ships**	**Sailors in USMC Commands**	**Marines in USMC commands**
ICD-11 "5 out of 9"	0	1 (2%)	5 (0.5%)
IGDS9-SF Score $\geq$ 36	0	1 (2%)	2 (0.2%)

V. CONCLUSIONS, RECOMMENDATIONS, AND FUTURE WORK

Initially, this study had three goals. The first goal was to assess the prevalence and severity of problematic video gaming in the USN. The second goal was to identify the factors associated with problematic video gaming in the USN. The third goal was compare and contrast the results of problematic video gaming in the USN with the results of problematic video gaming from the USMC. We will discuss our results in terms of these three goals and will also discuss the effect of the COVID-19 environment on the video gaming habits of Sailors.

A. ASSESSMENT OF THE PREVALENCE AND SEVERITY OF PROBLEMATIC VIDEOGAMING IN THE USN AND USMC

As assessed by IGDS9-SF scores, the overall average severity of Sailor video gaming habits was low; none of the Sailors in our sample could be classified as having a gaming disorder. That said, however, because a Sailor does not meet the ICD-11 criteria for having a gaming disorder does not necessarily indicate that problematic videogaming is not present.

Moreover, the ICD-11 criteria were originally based on research conducted in civilian populations and they are not specifically tailored to military personnel. To better differentiate between individuals who qualify as "Disordered" and "Non–disordered gamers," the military needs to develop military–specific criteria for the functional effects of video gaming on ADSMs.

Future research should increase the sample size of USN participants to both increase variability within the data and validate our findings. Regardless of the number of participating ships, however, a major concern is the response rate of Sailors which, in the current study, was fraught with some bias due to the way participants were recruited into the study. Follow–on studies on video gaming should advertise the study in more generic terms rather than a videogaming study per se. This approach will help reduce the possibility of response bias (i.e., the majority of the respondents in our study were, by their own

admission, gamers). Such an approach will provide the opportunity to have a larger and more representative control group of Sailors who do not play video games. Additionally, further research is needed to hone and elaborate the criteria for "problematic" and "disordered" video gaming to be more suited for an operational military environment. Future studies could include a sleep study using objective methods to reliably assess sleep/wake patterns and sleep attributes (e.g., sleep duration, quality, timing, heart rate variability) of gamers.

B. FACTORS ASSOCIATED WITH PROBLEMATIC VIDEO GAMING IN THE USN AND USMC

Our findings show that greater severity gamers, in comparison to lower severity gamers, reported higher levels of stress, depression, anxiety, and loneliness. Despite these differences, however, the two groups did not differ in terms of reported satisfaction with life, reported daily sleep duration, and reported time spent playing video games, regardless of the setting (on duty or deployed). These findings suggest that reported sleep duration and hours spent playing video games cannot be used to differentiate gamers in terms of video gaming severity.

In terms of the motivational factors for playing video games, greater severity gamers identified their motives as socializing with others, escaping from reality, coping with stress, competition, recreation with others, and developing skills. Further research is needed to determine if these motivational factors for gaming are the result of work–related or other issues.

Our data suggests that greater severity gamers were in general at higher risk of experiencing daytime sleepiness and having an alcohol problem. However, more data are required in order to assess reliably the validity of our findings.

Future studies should consider assessing facets of video gaming that could not be explored in our study. For example, one issue of interest is the extent to which videogaming habits affected gamers' psychological state. Another question of interest is how video gaming habits may change after joining the military.

C. COMPARISON OF PROBLEMATIC VIDEO GAMING RESULTS BETWEEN USN AND USMC

As assessed by IGDS9-SF scores, the severity of video gaming habits was, on average, low and did not differ for any of the three groups: Sailors on ships, Sailors assigned to Marine Corps commands, and Marines in Marine Corps commands. Sailors assigned to USMC commands reported higher levels of depression and anxiety than their counterparts on ships. Sailors on ships also experienced greater levels of anxiety than Marines. Again, it is unclear whether the well–being of Marines and Sailors is affected by video gaming; further research is needed to discern whether other confounding variables may be contributing to the differences we found.

Like more well–studied addictions such as nicotine and drug addiction, problematic video gaming can have adverse effects on the well–being of the human mind and body (Griffiths et al., 2014). All addictions, in essence, activate a similar reward circuitry in the brain (Wise, 1996), and can negatively affect the mental and physical health of the individual (Lewis, 2018). Therefore, it is important that follow–on studies consider the effects of similar addictions that create similar short–term dopamine spikes in users (e.g., social media, alcohol, gambling, food addiction) for the future performance and long-term health conditions of the service members of the U.S. military.

D. EFFECTS OF THE COVID-19 ENVIRONMENT

The Coronavirus of 2019 (COVID-19) was a global pandemic that severely limited travel, forced businesses to temporarily close, and quarantined many people, forcing them to remain in their homes/living quarters. With the many restrictions on activities put into place by local governments, participants were asked to compare their videogaming activities before the COVID-19 environment (i.e., before March 2020) to the present. Although most of the Sailors in our study reported that their gaming habits remained consistent, 26% of the Sailors reported increased video gaming usage following the COVID-19 pandemic. Specifically, 10 (56%) of the greater severity gamers reported increased video gaming usage since the start of the COVID-19 pandemic compared to only three (14%) of the lower severity gamers. The effects of the COVID-19 pandemic were

ongoing during this study; therefore, the behaviors and patterns of the participants of this study should be considered within the context of the on–going pandemic.

E. STUDY LIMITATIONS

This study has several limitations. First, our data were collected using a survey tool. Therefore, our findings, however useful, cannot be directly attributed to video gaming habits. Other occupational stressors may have affected Sailor responses. Also, our findings cannot shed light on the direction of the effects. For example, we identified that higher–severity gamers reported greater levels of stress, depression, anxiety, loneliness, and daytime sleepiness. Given that our data were collected with a survey, we cannot assess whether these Sailor well–being indices are the outcome of video gaming habits, or whether military life led to deteriorations in well–being that in turn led to more severe gaming habits. We cannot assess reliably the prevalence of video gaming (the first goal of this thesis) due to the small sample size. Follow–on studies should focus on collecting data from multiple ships to increase the sample size.

Similar to the focus groups that were conducted for the USMC, focus groups should be conducted on USN ships to further investigate specific issues and trends of concern.

APPENDIX A. USN PROBLEMATIC GAMING QUESTIONNAIRE

***General instructions**: Please answer ALL questions as accurately as possible. ALL information is confidential and will be used only for research purposes. Video games include any computer- or console-based games played alone or with other players, either online or locally.*

Demographic Information and Occupational Characteristics

1) What is your age? _____ years
2) What is your sex? (Check one ☑) ☐ Male ☐ Female
3) What is your rank? (for example, E4, O2) _____
4) Years on active duty: _____
5) Have you ever deployed while serving in the military? (Check one ☑) ☐ Yes ☐ No
   a) If yes, how many total months were you deployed: _____
   b) Did your deployment experience involve combat? (Check one ☑) ☐ Yes ☐ No

Behavioral habits

6) On average, how many hours do you sleep (all sleep including naps) during a typical day?

   a) At home/off duty/after the duty day: _____ hours/day
   b) On duty/in port/during the duty day: _____ hours/day
   c) When deployed/underway _____ hours/day

7) Which of the following nicotine products do you use? (Check ALL that apply ☑ and indicate how often, for example: three times a day, once a week)

   ☐ Cigarettes If YES, how many per day? _____
   ☐ Chewing tobacco/snuff If YES, how many times per day? _____
   ☐ Nicotine gum or patches If YES, how many per day? _____
   ☐ Electronic smoke If YES, how many per day? _____

☐ Other (specify): _____ If YES, how many per day? _____

8) Which of the following caffeinated beverages do you drink? (Check ALL that apply ☑ and indicate daily amount)

☐	Tea	If YES, how many servings/cups per day: _____
☐	Coffee	If YES, how many servings/cups per day: _____
☐	Soda/pop/soft drinks	If YES, how many per day: _____
☐	Energy drinks (Monster, RedBull, Bang, etc.)	If YES, how many per day: _____
☐	Other (specify): _____	If YES, how many per day: _____

9) Do you have an exercise routine? If YES, indicate weekly frequency.

a)	At home/off duty/after the duty day:	☐ Yes	If YES, ___ times per week	☐ No
b)	On duty/in port/during the duty day:	☐ Yes	If YES, ___ times per week	☐ No
c)	When deployed/underway:	☐ Yes	If YES, ___ times per week	☐ No

10) Do you play video games when … (Check ALL that apply ☑)

a)	At home/off duty/after the duty day?	☐ Yes	☐ No
b)	On duty/in port/during the duty day?	☐ Yes	☐ No
c)	Deployed/underway?	☐ Yes	☐ No

IF YOU ANSWERED **NO** TO ALL PARTS OF QUESTION 10 ABOVE, SKIP TO PAGE 6

Video Gaming Habits

11) If you play video games, how many years have you been playing them? _____ years

12) Which of the following genres of video games do you play? (Check ALL that apply ☑). Video games include games played on all platforms (for example, computers, tablets, smartphones, consoles).

a)	Action/adventure (for example, Tomb Raider, Assassin's Creed)	☐ Yes	☐ No
b)	Sports (for example, Madden NFL, FIFA)	☐ Yes	☐ No
c)	Role-playing (for example, The Witcher, Mass Effect)	☐ Yes	☐ No
d)	Strategy (for example, Civilization, The Age of Empires)	☐ Yes	☐ No
e)	Multiplayer online battle arenas (e.g., Smite, League of Legends)	☐ Yes	☐ No
f)	Simulation (for example, SimCity)	☐ Yes	☐ No
g)	Puzzle (for example, Puzzle Quest, Match 3)	☐ Yes	☐ No
h)	Shooter (for example, Call of Duty)	☐ Yes	☐ No
i)	Racing (for example, Gran Turismo, Forza)	☐ Yes	☐ No
j)	Fighting (for example, Mortal Kombat, Street Fighter)	☐ Yes	☐ No
k)	Battle Royale (for example, Fortnite)	☐ Yes	☐ No
l)	Platformer (for example, Super Mario Bros.)	☐ Yes	☐ No
m)	Music & dance (for example, Just Dance, Guitar Hero)	☐ Yes	☐ No
n)	Card-based games (for example, Hearthstone, Legends of Runeterra)	☐ Yes	☐ No
o)	Other (please define) _____	☐ Yes	☐ No

13) The following questions refer to video gaming habits when **at home/off duty/after the duty day**

a) In a typical ***week*** at home/off duty/after the duty day, how many days are you involved with video games (either you are playing or watching others play video games)? ____ days

b) On average on these days, how many hours are you involved with video games? ____ hrs/day

c) What electronic devices do you use to play video games at home/off duty/after the duty day? (Check ALL that apply ☑)

Desktop/laptop computer	☐ Yes	☐ No
Smartphone	☐ Yes	☐ No
Tablet	☐ Yes	☐ No
Game console	☐ Yes	☐ No
Virtual Reality (VR) device	☐ Yes	☐ No
Other (specify): _____	☐ Yes	☐ No

14) The following questions refer to video gaming habits when **on duty/in port/during the duty day**

a) In a typical ***day*** when you are on duty/in port, how many hours in total are you are playing or watching others play video games? ____hrs/day

b) What devices do you use to play video games while on duty/in port/during the duty day? (Check ALL that apply ☑)

Desktop/laptop computer	☐ Yes	☐ No
Smartphone	☐ Yes	☐ No
Tablet	☐ Yes	☐ No
Game console	☐ Yes	☐ No
Virtual Reality (VR) device	☐ Yes	☐ No
Other (specify): _____	☐ Yes	☐ No

15) The following questions refer to video gaming habits when you are **deployed or underway**

a) In a typical ***week*** when you are deployed/underway, how many days are you are playing or watching others playing video games? ____ days/week

b) On average on these days, how many hours are you involved with video games? ____ hrs/day

c) What devices do you use to play video games when deployed/underway? (Check ALL that apply ☑)

Desktop/laptop computer	☐ Yes	☐ No
Smartphone	☐ Yes	☐ No

	Tablet	☐ Yes	☐ No
	Game console	☐ Yes	☐ No
	Virtual Reality (VR) device	☐ Yes	☐ No
	Other (specify): _____	☐ Yes	☐ No
d)	When do you play video games or watch others play video games when deployed/underway? (Check ALL that apply ☑)		
	Before I go to work	☐ Yes	☐ No
	During spare time at work	☐ Yes	☐ No
	After work	☐ Yes	☐ No
	Before bedtime	☐ Yes	☐ No
	Other (specify: _____)	☐ Yes	☐ No
e)	Where do you play video games or watch others play video games when deployed/underway? (Check ALL that apply ☑)		
	In the mess decks	☐ Yes	☐ No
	In my rack	☐ Yes	☐ No
	Other (specify: _____)	☐ Yes	☐ No

f) If you play video games before bedtime, have you ever slept later because you played video games?

☐ Never ☐ Rarely ☐ Sometimes ☐ Frequently ☐ Always

g) Think of your shipmates. How many of them play video games when underway/deployed?

☐ 0 – 20% ☐ 20% – 40% ☐ 40% – 60% ☐ 60% – 80% ☐ 80% – 100%

IGDS9-SF. These questions ask you about your gaming activity during the past year (i.e., last 12 months). By gaming activity, we mean any gaming-related activity that has been played either from a computer/laptop or from a gaming console or any other kind of device (e.g., mobile phone, tablet, etc.) both online and/or offline. Please answer all questions.

Question	Never	Rarely	Sometimes	Often	Very Often
1. Do you feel preoccupied with your gaming behavior? (Some examples: Do you think about previous gaming activity or anticipate the next gaming session? Do you think gaming has become the dominant activity in your daily life?)	○	○	○	○	○
2. Do you feel more irritability, anxiety or even sadness when you try to either reduce or stop your gaming activity?	○	○	○	○	○
3. Do you feel the need to spend increasing amount of time engaged gaming in order to achieve satisfaction or pleasure?	○	○	○	○	○
4. Do you systematically fail when trying to control or cease your gaming activity?	○	○	○	○	○
5. Have you lost interests in previous hobbies and other entertainment activities as a result of your engagement with the game?	○	○	○	○	○
6. Have you continued your gaming activity despite knowing it was causing problems between you and other people?	○	○	○	○	○
7. Have you deceived any of your family members, therapists or others because the amount of your gaming activity?	○	○	○	○	○
8. Do you play in order to temporarily escape or relieve a negative mood (e.g., helplessness, guilt, anxiety)?	○	○	○	○	○
9. Have you jeopardized or lost an important relationship, job or an educational or career opportunity because of your gaming activity?	○	○	○	○	○

Compared to your videogaming activities before COVID-19, your videogaming activities in the COVID-19 environment (March 2020 to present) have…

☐ Decreased greatly ☐ Decreased somewhat ☐ Remained about the same ☐ Increased somewhat ☐ Increased greatly

MOGQ. People play video games for different reasons. Some reasons are listed below. Please indicate how often you play online or offline video games for the reasons listed below by circling the appropriate response. There is no right or wrong answer! We are only interested in your motives for gaming.

I play video games…	Almost never/ never	Some of the time	Half of the time	Most of the time	Almost always/ always
1. … because I can get to know new people	1	2	3	4	5
2. … because gaming helps me to forget about daily hassles	1	2	3	4	5
3. … because I enjoy competing with others	1	2	3	4	5
4. … because gaming helps me get into a better mood	1	2	3	4	5
5. … because gaming sharpens my senses	1	2	3	4	5
6. … because I can do things that I am unable to do or I am not allowed to do in real life	1	2	3	4	5
7. … for recreation	1	2	3	4	5
8. … because I can meet many different people	1	2	3	4	5
9. … because it makes me forget real life	1	2	3	4	5
10. … because I like to win	1	2	3	4	5
11. … because it helps me get rid of stress	1	2	3	4	5
12. … because it improves my skills	1	2	3	4	5
13. … to feel as if I was somebody else	1	2	3	4	5
14. … because it is entertaining	1	2	3	4	5
15. … because it is a good social experience	1	2	3	4	5
16. … because gaming helps me escape reality	1	2	3	4	5
17. … because it is good to feel that I am better than others	1	2	3	4	5
18. … because it helps me channel my aggression	1	2	3	4	5
19. … because it improves my concentration	1	2	3	4	5

Why Duty							Active Service
	20. … to be somebody else for a while	1	2	3	4	5	
	21. … because I enjoy gaming	1	2	3	4	5	
	22. … because gaming gives me company	1	2	3	4	5	
	23. … to forget about unpleasant things or offences	1	2	3	4	5	
	24. … for the pleasure of defeating others	1	2	3	4	5	
	25. … because it reduces tension	1	2	3	4	5	
	26. … because it improves my coordination skills	1	2	3	4	5	
	27. … because I can be in another world	1	2	3	4	5	

Members Play Video Games

PLEASE COMPLETE ALL QUESTIONS

Everyday Life

*(PSS-4) The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate how often you felt or thought a certain way.*	Never	Almost never	Some times	Fairly often	Very often
In the past month, how often have you felt that you were unable to control the important things in your life?	○	○	○	○	○
In the past month, how often have you felt confident about your ability to handle your personal problems?	○	○	○	○	○
In the past month, how often have you felt that things were going your way?	○	○	○	○	○
In the past month, how often have you felt difficulties were piling up so high that you could not overcome them?	○	○	○	○	○

SWLS. Below are five statements with which you may agree or disagree. Indicate your agreement with each item by choosing one of the responses. Please be open and honest in your responding.	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree
In most ways my life is close to ideal	○	○	○	○	○	○	○
The conditions of my life are excellent	○	○	○	○	○	○	○
I am satisfied with life.	○	○	○	○	○	○	○
So far, I have gotten the important things I want in life	○	○	○	○	○	○	○
If I could live my life over, I would change almost nothing	○	○	○	○	○	○	○

Br.COPE. These items deal with ways you've been coping with the stress and hardships in your life. Read the statements and indicate how much you have been using each coping style.				
	I haven't been doing this at all	A little bit	A medium amount	I've been doing this a lot
1. I've been turning to work or other activities to take my mind off things	1	2	3	4
2. I've been concentrating my efforts on doing something about the situation I'm in	1	2	3	4
3. I've been saying to myself "this isn't real"	1	2	3	4
4. I've been using alcohol or other drugs to make myself feel better	1	2	3	4
5. I've been getting emotional support from others	1	2	3	4
6. I've been giving up trying to deal with it	1	2	3	4
7. I've been taking action to try to make the situation better	1	2	3	4
8. I've been refusing to believe that it has happened	1	2	3	4
9. I've been saying things to let my unpleasant feelings escape	1	2	3	4
10. I've been getting help and advice from other people	1	2	3	4
11. I've been using alcohol or other drugs to help me get through it	1	2	3	4
12. I've been trying to see it in a different light, to make it seem more positive	1	2	3	4
13. I've been criticizing myself	1	2	3	4
14. I've been trying to come up with a strategy about what to do	1	2	3	4
15. I've been getting comfort and understanding from someone	1	2	3	4
16. I've been giving up the attempt to cope	1	2	3	4
17. I've been looking for something good in what is happening	1	2	3	4
18. I've been making jokes about it	1	2	3	4
19. I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping	1	2	3	4
20. I've been accepting the reality of the fact that it has happened	1	2	3	4
21. I've been expressing my negative feelings	1	2	3	4
22. I've been trying to find comfort in my religion or spiritual beliefs	1	2	3	4

Br.COPE. These items deal with ways you've been coping with the stress and hardships in your life. Read the statements and indicate how much you have been using each coping style.				
	I haven't been doing this at all	A little bit	A medium amount	I've been doing this a lot
23. I've been trying to get advice or help from other people about what to do	1	2	3	4
24. I've been learning to live with it	1	2	3	4
25. I've been thinking hard about what steps to take	1	2	3	4
26. I've been blaming myself for things that happened	1	2	3	4
27. I've been praying or meditating	1	2	3	4
28. I've been making fun of the situation	1	2	3	4

PHQ-8. Over the **last 2 weeks**, how often have you been bothered by any of the following problems? (circle **one** number on each line)				
	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

GAD-7. Over the **last 2 weeks**, how often have you been bothered by the following problems? (circle **one** number on each line)

	Not at all	Several days	Over half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it's hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

UCLA. The following statements describe how people sometimes feel. For each statement, please indicate how often you feel the way described by choosing one of the responses below.

	Never	Rarely	Sometimes	Always
1. How often do you feel that you are "in tune" with the people around you?	○	○	○	○
2. How often do you feel that you lack companionship?	○	○	○	○
3. How often do you feel that there is no one you can turn to?	○	○	○	○
4. How often do you feel alone?	○	○	○	○
5. How often do you feel part of a group of friends?	○	○	○	○
6. How often do you feel that you have a lot in common with the people around you?	○	○	○	○
7. How often do you feel that you are no longer close to anyone?	○	○	○	○
8. How often do you feel that your interests and ideas are not shared by those around you?	○	○	○	○
9. How often do you feel outgoing and friendly?	○	○	○	○
10. How often do you feel close to people?	○	○	○	○
11. How often do you feel left out?	○	○	○	○
12. How often do you feel that your relationships with others are not meaningful?	○	○	○	○
13. How often do you feel that no one really knows you well?	○	○	○	○
14. How often do you feel isolated from others?	○	○	○	○
15. How often do you feel that you can find companionship when you want it?	○	○	○	○
16. How often do you feel that there are people who really understand you?	○	○	○	○
17. How often do you feel shy?	○	○	○	○

18. How often do you feel that people are around you but not with you?	○	○	○	○
19. How often do you feel that there are people you can talk to?	○	○	○	○
20. How often do you feel that there are people you can turn to?	○	○	○	○

ESS: *How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in the last week. Even if you have not done some of these things recently try to work out how they would have affected you.*

Check ☑ the most appropriate number for each situation.	**CHANCE OF DOZING**			
	None (0)	**Slight (1)**	**Moderate (2)**	**High (3)**
Sitting and reading	○	○	○	○
Watching TV	○	○	○	○
Sitting inactive in a public place (e.g., a theater or a meeting)	○	○	○	○
As a passenger in a car for an hour without a break	○	○	○	○
Lying down to rest in the afternoon when circumstances permit	○	○	○	○
Sitting and talking to someone	○	○	○	○
Sitting quietly after a lunch without alcohol	○	○	○	○
In a car, while stopped for a few minutes in traffic	○	○	○	○

AUDIT-C. These questions help in the assessment of alcohol consumption at home/off duty/after the duty day. Indicate how uncharacteristic or characteristic each of the following statements is in describing you.

How often do you have a drink containing alcohol?	○ Never	○ Monthly or less	○ 2-4 times a month	○ 2-3 times a week	○ 4 or more times a week
How many drinks do you have on a typical day when you were drinking?	○ 1 or 2	○ 3 or 4	○ 5 or 6	○ 7 to 9	○ 10 or more
How often do you have 6 or more drinks on one occasion?	○ Never	○ Less than monthly	○ Monthly	○ Weekly	○ Daily or almost daily

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APPENDIX B. ACTIVITY LOG

NAVAL
POSTGRADUATE
SCHOOL

1 UNIVERSITY CIRCLE
MONTEREY, CALIFORNIA 93943
WWW.NPS.EDU

Activity Log

Naval Postgraduate School

Participant ID: _____

Beginning Date: _____

If this booklet is found, please return to the NPS Sleep Research Team

Study Activities

1. Read, sign and return consent form to the NPS Research Team.
2. You will be given a study ID number by the NPS Research Team.
3. Complete the Study Survey and return to the NPS Research Team.
4. Take your Activity Log with you.
5. Each day, record your activities in the next section of this Activity Log (see example in next page).

Reminder

The completed questionnaires and sleep log will be used for research purposes only. All results will be kept confidential.

Thank you for participating in this study!

Date: _____

Midnight 0000	0015	0030	0045	0100	0115	0130	0145	0200	0215	0230	0245	0300	0315	0330	0345
0400	0415	0430	0445	0500	0515	0530	0545	0600	0615	0630	0645	0700	0715	0730	0745
0800	0815	0830	0845	0900	0915	0930	0945	1000	1015	1030	1045	1100	1115	1130	1145
Noon 1200	1215	1230	1245	1300	1315	1330	1345	1400	1415	1430	1445	1500	1515	1530	1545
1600	1615	1630	1645	1700	1715	1730	1745	1800	1815	1830	1845	1900	1915	1930	1945
2000	2015	2030	2045	2100	2115	2130	2145	2200	2215	2230	2245	2300	2315	2330	2345

Activity

M Meal
S Sleep or nap
O Work [O]ut
W Work/watch/on duty
V Play or watch video games
P Personal time (not video games)

Daylight Exposure: _____ hours When? _____

# of Caffeinated Beverages: _____ When? _____

# of Energy Drinks: _____ When? _____

Did you work out? ☐ Yes ☐ No

If YES, when? _____

If YES, type of workout (running, weight lifting, etc.) _____

Additional Notes: _____

_____

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