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THESIS

UNDERSTANDING MOTIVATIONAL FACTORS OF PROBLEMATIC VIDEO GAMING IN THE USMC

by

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The goals of this thesis were to assess the prevalence of problematic video gaming within the United States Marine Corps (USMC), identify the motivational factors that lead Marines to engage in video gaming, assess the effects of video gaming on Marines' lives, and investigate whether Marines use video gaming as a maladaptive coping mechanism. Survey data (n = 1,098 Marines) were collected from three USMC commands. In total, 847 Marines (91%) reported playing video games. Recreation and coping with stress were the most frequently reported motivational factors for playing video games. Most gamers (91%) reported playing video games while at home/off duty. In contrast, 20% of gamers reported playing video games while on duty/in port and 36% reported playing video games while underway/deployed. In our sample, five Marines (2%) were classified as disordered gamers. Disordered gamers reported using dysfunctional coping styles more frequently than the rest of gamers. Disordered gamers reported more severe symptoms of depression and anxiety, higher levels of loneliness, elevated daytime sleepiness, and more symptoms suggestive of heavy drinking. These findings led to three recommendations: a) educate Marines on the risks of problematic video gaming and the factors associated with gaming addiction, b) educate Marines on sleep hygiene practices, and c) implement strategies to mitigate the effects of problematic video gaming.

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UNDERSTANDING MOTIVATIONAL FACTORS OF PROBLEMATIC VIDEO GAMING IN THE USMC

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ABSTRACT

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LIST OF ACRONYMS AND ABBREVIATIONS

ADSM	Active-duty service member
AIDS	Acquired immunodeficiency syndrome
AUDIT-C	Alcohol Use Disorders Identification Test
BC	Brief COPE
COPE	Coping Orientation to Problems Experienced
CEB	Combat Engineer Battalion
DSM-5	Diagnostic and Statistical Manual of Mental Disorders 5th Edition
ESS	Epworth Sleepiness Scale
FIFA	Federation Internationale de Football Association
FPS	First-person shooters
GAD-7	Generalized Anxiety Disorder Assessment
GD	Gaming disorder
HQMC	Headquarters Marine Corps
HRQOL	Health-related quality of life
ICD-11	International Classification of Diseases 11th Revision
IGD	Internet Gaming Disorder
IGDS9-SF	Internet Gaming Disorder Scale-Short Form 9
IQR	Interquartile Range
IRB	Institutional Review Board
LT	Lieutenant
MAW	Marine Air Wing
MEF	Marine Expeditionary Force
MLG	Marine Logistics Group
MMORPG	Massively multiplayer online role-playing games
MOGQ	Motives for Online Gaming Questionnaire
MOS	Military Occupational Specialty
NBA	National Basketball Association
NFL	National Football League
NPC	Non-player character
PC	Personal Computer

PENS	Player Experience of Need Satisfaction
PHQ-8	Patient Health Questionnaire
POV	Point of view
PSS-4	Perceived Stress Scale
RPG	Role-playing games
RTS	Real-time strategy
SDT	Self-determination theory
SWLS	Satisfaction with Life Scale
TBS	Turn-based strategy
UCLA	University of California, Los Angeles Loneliness Scale
USMC	United States Marine Corps
USN	United States Navy
VR	Virtual reality

EXECUTIVE SUMMARY

Over the years, video games have become increasingly popular among a wide variety of people. Video games provide an interactive and recreational entertainment for civilians and service members alike. These increases in video game engagement and technology use put people at risk of potential problematic video gaming. In 2013, Internet Gaming Disorder (IGD) was included in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as a recognized disorder (American Psychiatric Association, 2013). Similarly, the International Classification of Diseases 11th Revision (ICD-11) includes gaming disorder (GD) (World Health Organization, 2021). Both disorders are similar in definition, in which an individual shows symptoms of impairments incurred through their engagement in video gaming.

The goals of this thesis were to assess the prevalence of problematic video gaming within the United States Marine Corps (USMC), identify the motivational factors that lead Marines to engage in video gaming, identify the effects of video gaming on ADSMs' lives, investigate whether Marines use video gaming as a maladaptive coping mechanism, and provide suitable recommendations in terms of the use of video games in the military.

The study sample included in this assessment were Marines from three USMC commands, i.e., the 2nd Combat Engineer Battalion (CEB), the 2nd Marine Aircraft Wing (MAW), and the 3rd Marine Logistics Group (MLG). Data were collected with a web-based survey tool.

The survey assessed Marines' demographic information, occupational characteristics, behavioral habits, and video gaming habits. Ten standardized questionnaires were included in the survey. The Internet Gaming Disorder Scale-Short Form 9 (IGDS9-SF) was used to assess gaming addiction (Lemmens et al., 2015). The Motives for Online Gaming Questionnaire (MOGQ) assessed motivational factors for playing video games (Demetrovics et al., 2011). The Perceived Stress Scale (PSS-4) assessed psychological stress (Cohen et al,, 1983). The Satisfaction with Life Scale (SWLS) measured cognitive judgments of one's life satisfaction (Diener et al., 1985). The

Brief Coping Orientation to Problems Experienced (COPE) Inventory assessed coping strategies (Garcia et al., 2018). The Patient Health Questionnaire depression scale (PHQ-8) measured symptoms of depression (PHQ and GAD7 Instruction Manual, 2010) and the Generalized Anxiety Disorder Assessment (GAD-7) was used to assess anxiety (PHQ and GAD7 Instruction Manual, 2010). The University of California, Los Angeles Loneliness Scale (UCLA) measured a respondent's feelings of loneliness and isolation (Russell, Peplau, & Ferguson, 1978). The Epworth Sleepiness Scale (ESS) assessed the risk of falling asleep while engaged in various activities (Johns, 1991). The Alcohol Use Disorders Identification Test (AUDIT-C) was used to identify individuals with problems of alcohol use (Bush et al., 1998).

In total, 847 (91%) Marines reported playing video games. Recreation and coping with stress were the most frequently reported motivational factors for playing video games. Most gamers reported playing video games while at home/off duty (91%). In contrast, 20% of gamers reported playing video games while on duty/in port and 36% reported playing video games while underway/deployed. Gaming consoles, desktop/laptop computers, and smartphones were the most frequently reported devices for playing video games.

In our study sample, 5 (2%) Marines were classified as disordered gamers. Disordered gamers reported using dysfunctional coping styles more frequently than the rest of gamers. Also, disordered gamers reported more severe symptoms of depression and anxiety, higher levels of loneliness, elevated daytime sleepiness, and more symptoms suggestive of heavy drinking.

These findings led to three recommendations: a) educate Marines on the risks of problematic video gaming and the factors associated with gaming addiction, b) educate Marines on sleep hygiene practices, and c) implement strategies to mitigate the effects of problematic video gaming.

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I. INTRODUCTION

A. BACKGROUND

Over the years, video games have become increasingly popular among a wide variety of people, including U.S. military service members. In addition to being easily accessible, video games have evolved to take on many forms. Gamers all over the world can interact with each other with ease. Although there is evidence of healthy engagement, despite the large amount of time spent gaming, studies are finding more adverse effects on individuals that participate in excessive video gaming (Kiraly et al., 2017). A study conducted by Von der Heiden et al. (2019) found that the average time spent gaming has increased from 5.1 hours per week in 2011 to 6.5 hours per week in 2017. This increase is due in part to the increased popularization and accessibility of video games. A more recent study conducted by King (2020) noted that the COVID-19 pandemic greatly increased participation in gaming. Results from this study showed that viewership for common gaming-related streaming platforms increased by about 10%. As such, video gaming is becoming ever-present.

Individuals report several reasons for their attraction to video games. Some of these include a sense of autonomy, competence, enjoyment and the desire for an immersive experience (Ryan et al., 2006). Certain people also turn to video games as a form of coping with stress. However, in a study conducted by Schneider et al. (2017) maladaptive coping styles were associated with Internet Gaming Disorder (IGD) symptoms. Rather than using video games to relieve stress, some people may engage in video gaming to avoid responsibilities and interpersonal activities. Excessive video gaming can also have detrimental effects on the gamer's daily behavior and interactions with other persons. Excessive gaming holds similarities to substance-related dependencies and as such, can result in addiction (Kiraly et al., 2017). In their research, Von der Heiden et al. (2019) concluded that a negative association exists between problematic video gaming and psychological functioning.

In addition to these negative health effects, a 2015 study found that Marines who developed problematic video gaming lifestyles prioritized their gaming over sleep (Eickhoff et al., 2015). This maladaptive behavior may be directly related to numerous sleep-related issues, including chronic sleep deprivation, excessive daytime sleepiness, and elevated fatigue. Furthermore, poor sleep patterns could potentially lead to a desynchronization of one's circadian rhythm, which relates to clinical symptoms such as insomnia, poor appetite, mood disorders, and depression (Touitou et al., 2017).

The increasing prevalence of gamers has extended to include many active-duty service members. Kurtz (2020) states that the Navy must actively recognize and bring awareness to the impact that technology use has on its Sailors. There were four areas of readiness that Kurtz found to be directly affected due to an overuse of technology, i.e.: resiliency, suicidal ideation, retention, and sleep problems.

These findings highlight the importance of developing a better understanding of the attributes of video gaming within the Marine Corps and the need to formulate evidence-based guidance. Of note, there is no official policy in the USMC regarding video gaming and as such, no real guidance regarding video game use and mitigation (Doan et al., 2021).

The findings in the studies reviewed indicate that there needs to be a balance with the amount of gaming done and people who engage in excessive video gaming put themselves at risk of addiction and actions that are detrimental to one's health. To better grasp the presence of problematic video gaming in active-duty service members (ADSMs), a study is needed to gain insight on the extent to which video gaming is present and investigate the potential reasons for their use. In addition, it is necessary to explore the adverse health effects that come with video gaming and their importance.

B. STUDY SCOPE AND OBJECTIVES

The overarching aim of this thesis is to develop a greater understanding of the characteristics of problematic video gaming in the USMC. The objectives of this study are the following:

- To determine the prevalence of problematic video gaming in ADSMs

- To identify the motivational factors that lead Marines to engage in video gaming
- To identify the effects of video gaming on ADSMs' lives.
- To investigate whether Marines use video gaming as a maladaptive coping mechanism
- To provide suitable recommendations in terms of the use of video in the military.

This thesis is being conducted along with a concurrent thesis by another student, Jason Ma Xu, which focuses on USN Sailors on three USN warships, one in-port and two at-sea. That study on Sailors will extend the scope of the research and provide more data to expand upon the findings of our study.

C. THESIS OUTLINE

Chapter I of this thesis introduces the topic of problematic video gaming and describes the purpose of the study objectives. Chapter II provides an in-depth review of the literature. Chapter III describes the methods used in the study. Chapter IV provides the results of the analysis conducted. Chapter V ties all the information gathered in this research and synthesizes the results. Recommendations and potential future work are discussed in Chapter VI.

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II. LITERATURE REVIEW

Even though a widely accepted definition does not exist, the term "video games" is widely understood as any form of entertainment received through some form of technology. Esposito (2005) defined a video game as "a game that we play thanks to an audiovisual apparatus, and which can be based on a story." This definition distinguishes the concept of playing video games into smaller aspects that work coherently to define video gaming. The aspects of game (play and audiovisual apparatus) interact together to provide a formal definition of a video game. Esposito (2005) quotes Eric Zimmerman's definition of a game: "a voluntary interactive activity," specifically one in which various players are subject to certain rules that limit their behavior, thus creating an artificial dispute that results in a quantifiable outcome (Zimmerman, 2004). Play is defined as free movement within a firm structure (Esposito, 2005; Zimmerman, 2004). The combination of a game and play is the interaction between object and user in this space.

Another important aspect of video gaming is the audiovisual apparatus, i.e., any electronic system that has computing capabilities and both input and output devices (Esposito, 2005). This apparatus is also known as the "platform" on which the video game is played (Apperely, 2006). With advancements in technology, video games are now widely available through specialized gaming consoles, personal computers, phones, tablets, and other types of platforms (Palaus, 2017).

A. TYPES OF VIDEO GAMES

A study conducted by Qaffas (2020) assessed 100 of the top-ranked video games and allocated them into 16 representative game genres. These categories were adventure, role-playing, shooter, platform, puzzle, strategy, hack-and-slash, real-time strategy (RTS), turn-based strategy (TBS), point-and-click, indie, racing, sport, fighting, arcade, and strategy games (Qaffas, 2020). Conversely, an older classification of games divided video games into four genres, i.e., simulation, strategy, action, and role-playing, with each having its own sub-genres (Apperely, 2006). These differences show how diverse video games have evolved, requiring more specific classification.

Simulation games imitate “real” world activities that feel authentic and accurately reflect real activities. They allow virtual interaction with various phenomena from the real world (Qaffas, 2020). For example, the video game “Need for Speed” simulates the act of driving, thus can be classified as a simulation game (Apperly, 2006). However, Qaffas (2020) would classify “Need for Speed” as a racing game over a simulation game, as it focuses on the act of driving more than simulating. The level of authenticity relates to how closely the interaction between the video game and the gamer resembles real life; thus, games with stricter adherence to the laws of physics may provide a more immersive experience than video games that loosely follow these laws.

Adventure games are defined as games that tell a story. Adventure games typically follow a quest-focused structure (Qaffas, 2020). Many other genres of video games can include this type of feature, but the core of adventure games surrounds the narrative of a story. An example of adventure games are games like “The Witcher,” “The Last of Us,” and “Red Dead Redemption.” These games focus on a narrative, but also include aspects of other genres of games.

Strategy-based video games are typically separated into two subgenres of video games: real-time strategy (RTS) and turn-based strategy (TBS) (Apperely, 2006). The main difference between these two types of strategy video games is the environment and the constraint of having to take turns against adversaries. Qaffas (2020) classifies RTS, TBS, and strategy games separately, with strategy games simply being defined as games that focus on players making complex decisions to achieve their goal in the game. An example of a strategy game is “StarCraft.”

Turn-based strategy games are more reminiscent of classic board games but can include new features and nuances. Qaffas (2020) defines a TBS game as a game in which the player makes their move on a turn and then waits for the opponent to make theirs, continuing to alternate until one player wins. An example of this game would be chess, in both the board game form and any variation in a video game. Real-time strategy games are not bound to this medium and often contain aspects of simulation or action games (Apperely 2006). Qaffas (2020) defines an RTS game as one where there are multiple teams within an environment working in real-time, where one entity strives to beat the

others (Qaffas, 2020). An example of a real- time strategy game is “Warhammer” where the player controls and fights against armies.

Action games encompass the vast majority of video games but consist of two major subgenres: first-person shooters (FPS) and third-person games (Apperly, 2006). FPS video games are those that have the player play from the point of view of the character they control. One of the most popular FPS games is “Call of Duty.” In this game, the gamer takes a first-person perspective of a soldier and shoots adversaries. Qaffas (2020) separates FPS games into their own main category. Qaffas (2020) goes on to state that FPS games require quick motor responses as opposed to other types of games. Third-person games provide a “behind-the-shoulder” viewpoint, but still control the character or avatar through this viewpoint. Many third-person games can contain aspects of the other genres mentioned. One such game is “Splinter Cell.” In this game, the player takes control of a human figure, and infiltrates various buildings, all while maintaining stealth and fighting adversaries. The player’s perspective is the main difference between these two subgenres, as their environments can be the same. Action video games are typically more performative and require the player to apply precise inputs and decisions.

Role-playing video games (RPGs) are complex games that take place within an official fantasy world with strict parameters (Apperely, 2006). Qaffas (2020) defines an RPG as a game that is set in an imaginary world in which the player has the freedom to explore the game world. This genre of video games places an emphasis on the importance of the characters and their “transformation” or improvements throughout the progression of the game. Examples of role-playing games include titles such as “Kingdom Hearts,” “Skyrim,” and “Metal Gear Solid.” These games take place in fantasy worlds and are subject to the realms in which they are created.

Platform games are video games where the characters and environment are seen from a side view as opposed to a top-down, behind-the-shoulder (3rd person), or first-person point of view (POV). Common platform games are “side-scrollers,” where the goal is to move from one end of the game (the start) to the other (the goal/finish) (Qaffas, 2020). Some popular examples of platform games would be “Super Mario” and “Metroid.”

Puzzle games present a puzzle to solve (Qaffas, 2020). The puzzles presented can be the focus of the game or may be presented in other genres of video games as a secondary achievement. An example of a puzzle game would be “Portal” where the game focuses on solving increasingly difficult levels as the game advances.

Hack-and-slash games are games that are built around hand-to-hand combat between the player and numerous non-player characters (NPCs) (Qaffas, 2020). An example of this game would be “Marvel’s Spider-Man” where the player takes on the persona of Spider-Man and spends a large portion of the game fighting criminals.

Point-and-click games are video games in which the game is controlled and progress is made entirely through the use of the mouse cursor. The player would point to different things presented on the screen and click to interact with what is shown (Qaffas, 2020). An example of these games would be the “Nancy Drew” games.

Indie games are games that are developed by individuals or small teams of developers (Qaffas, 2020). Since indie games are broad in description, they can take many aspects of various genres of video games. One example of an indie game would be the title “Undertale.”

Sports games are video games that simulate a sport in which the player controls an avatar that represents an athlete or many athletes on a team or side (Qaffas, 2020). Examples of these games include “Madden NFL,” “NBA 2K,” and “FIFA.” These games simulate a sport that is played in real life.

Fighting games are video games that consist mostly of players fighting other players or NPCs through hand-to-hand combat and other means of violence (Qaffas, 2020). Popular fighting games include “Super Smash Bros.,” “Mortal Kombat,” and “Street Fighter.”

Arcade video games are games that utilize the “arcade” interface, and the player controls an avatar and plays with or against multiple other players or NPCs (Qaffas, 2020). Well-known arcade game titles are “Pac-man,” “Galaga,” and “Pong.”

Numerous other classification schemes of video game types have been proposed. However, these genres described previously, or a combination thereof, can be used to classify any video game. For example, in an article written by Clarke, Lee, and Clark (2017) the game "Minecraft" falls under the following genres: Sandbox Survival, Simulation, Action, Adventure, First-Person, Strategy, etc., showing that video games can share characteristics from multiple genres. This classification becomes an even more complex issue as virtual reality (VR) has gained popularity in recent years. VR allows an even greater sense of immersion and engagement within video games and allows the player to engage in various types of video game types (Foxman et al., 2021).

Understanding the different genres of video games is important as studies have shown that different genres are preferred for different reasons and may have a different effect on psychological functioning (Von der Heiden et al., 2019). Various emotions can be triggered with video games, both negative and positive depending on the genre of the game (Granic et al., 2014). For example, action video games are preferred because players find them to be rewarding. Conversely, action games were also found to be a source of frustration for players depending on the motivation of play (competition) (Von der Heiden et al., 2019). Also, gamers who frequently play FPS or action/adventure games are accustomed to quick reactions, but also have the potential to develop desensitization to violence due to repeated exposure (Gackenbach et al., 2011; Engelhardt et al., 2011).

In relation to the gaming disorder (GD), the International Classification of Diseases 11th Revision (ICD-11) classifies games in two subtypes, online and offline (Kiraly et al., 2017). Online gaming refers to video games that are played through the internet, and typically involve some form of social interaction, though not all the time (Kiraly et al., 2017). In addition to social interactions, competition between players provides incentives for gamers to continue playing. This interaction and player versus player competitiveness that come with online games seem to provide higher addictive potential compared to offline games (Kiraly et al., 2017). In a cross-sectional study conducted by Mihara et al. (2017), it was found that online games are preferred over offline games. This preference was shown to be partly due to the social proximity affiliated with online gaming as opposed to offline gaming (Trepte et al., 2012; Yee, 2006; Granic et al., 2014).

Offline gaming refers to video games that do not require the internet to be played (Kiraly et al., 2017). However, some video games that are considered "offline" can also be accessed through the internet. The distinguishing factor separating these two subtypes lies in the fact that offline gaming does not typically have the aspect of social interaction. A counterargument to this idea is the fact that some games allow for multiplayer engagement play through the same platform, especially some older platforms. Despite this distinction, offline games are typically viewed as games that are meant for a single player only, which does not provide the opportunity for social interaction.

B. THE PREVALENCE OF VIDEO GAMING

A study conducted by Primack and colleagues (2012) found the average age of video game players to be roughly 34 years old. In 2009, 67% of U.S. households were found to own some form of console or PC that is capable of running some form of video game (Primack et al., 2012). In 2011, a study conducted by Mentzoni and colleagues found that 56.3% of their Norwegian sample (N=816) used video games on a daily basis (Mentzoni et al., 2011). According to Kowert and colleagues, 97% of teens between the ages of 12 and 17 play video games (Kowert et al., 2014). Video gaming prevalence has since been increasing over the past number of years. Coinciding with the worldwide COVID-19 pandemic and the initial stay-at-home mandates in 2020, King (2020) identified a 75% increase in online gaming activity. It was also noted that the application "Steam," a gaming distributor, reported over 20 million concurrent active users throughout the world in the year 2020 (King, 2020).

C. MOTIVATION BEHIND VIDEO GAMES

People play video games for several reasons. First, video games can act as a distraction from their daily hassles and responsibilities. Similarly, people play video games as a coping mechanism, with denial being the most prevalent in problematic gamers (Schneider et al., 2017). Denial coping is an avoidant coping strategy, one in which the individual rejects the notion of an issue and does not recognize the issue as a problem (Schneider et al., 2017). Notably, general coping, need for social interaction, and desire for competition were the main reasons for video gaming found amongst males, but not for

females (Von der Heiden et al., 2019). Also, in the same study by Von der Heiden (2019), the most prevalent reasons identified for playing video games were relaxation, self-amusement, and investment in the storyline of the game. Distraction-motivated gamers, however, utilized coping strategies that involved self-blame, behavioral disengagement, self-distraction, denial, substance use, venting, and acceptance.

Conversely, gamers who played video games for their storyline, or to relax showed positive effects while engaged in video games (Von der Heiden et al., 2019). In 2006, Yee identified ten motivation subcomponents which he grouped into three main components: achievement, social, and immersion. The achievement component includes advancement, mechanics, and competition (Yee, 2006). These subcomponents identify with an individual's desire to improve their skills and the motivation to win against other players. According to Yee, the social component consists of socializing, relationships, and teamwork (Yee, 2006). These elements of the social component encapsulate an individual's desire for social engagement through video gaming and to develop skills that can transfer to real-life situations. The immersion component contains the discovery, role-playing, customization, and escapism subcomponents (Yee, 2006). These subcomponents encapsulate a player's curiosity and interactivity with the environment, as well as engagement for escapism.

One of the reasons that people play video games is as a means to escape or to engage in an immersive environment. Escapism, like coping with stress, can be both negative and positive (Kosa et al., 2020). The main effects of healthy escapism include emotion regulation, mood management, coping capability, and recovery (Kosa et al., 2020; Merhi, 2016; Granic et al., 2014). Video games provide a means to facilitate emotion regulation for players through their content and story. Games can be used as a distraction from negative feelings and require the reassessment of situations, both being techniques that successfully regulate emotion (Kosa et al., 2020). This practice is in line with the concept of mood management through video games. Kosa and colleagues state that video games can help manage moods by providing agency, optimal levels of task demand, and providing a sense of competency within the player, which was previously stated as a need to be satisfied by self-determination theory (SDT) (Kosa et al., 2020; Ryan et al., 2000). Another

effect of using video games as a healthy escapism tool is recovery, i.e., video games can provide stress relief and recuperation from both cognitive and emotional exhaustion (Kosa et al., 2020).

In many studies, video gaming is identified as a coping mechanism that can either be utilized positively or negatively (Kosa et al., 2020; Schneider et al., 2017; Mehroof et al., 2010; Von der Heiden et al., 2019; Kiraly et al., 2017). Kosa et al. (2020) state that video games can provide a healthy form of coping in certain players. Three types of coping were identified: problem-focused, emotion-focused, and avoidance-focused. Problem-focused coping aims to directly address the stress-inducing problem. Examples of this are getting organized and managing time properly. Emotion-focused coping is a means of decreasing stress through the regulation of feelings surrounding the problem by distracting oneself with pleasurable activities. Avoidance-focused coping is the act of rejecting any interaction with the problem at hand (Kosa et al., 2020). A study conducted by Kuo and colleagues concluded, "Actively engaging in a video game relieves stress by empowering players and projecting them into fantasy worlds, boosting the feelings of presence" (Kuo et al., 2016). These studies show that when used in moderation, gaming can provide a healthy coping strategy for players.

In addition to the previously mentioned motivations for video gaming, Ryan et al. (2006) identified some benefits that can be derived from engaging with gaming. These included a sense of efficacy, having power over one's environment, and increased learning improvement. These benefits provide additional reasons for play; however not all people play games solely for their benefit. Ryan and colleagues (2006) go on to describe Bartle's (1996) extrapolation of four types of players: killers, achievers, socializers, and explorers. These four types of players are defined by two dimensions of a player: those who act versus interact and those who focus on other players versus the virtual world itself. Players who are "killers" act on other players, socializers interact with players, achievers act on the virtual world and the game's achievements, and explorers interact with the virtual world itself (Ryan et al., 2006). Video games that fulfill the desires of their players pull those types of players into engagement.

Moreover, Ryan et al. (2006) identified "a new measurement of need satisfaction, Player Experience of Need Satisfaction (PENS), elaborated from self-determination theory (SDT)," which have been applied in many other recreational contexts such as sports (Ryan et al., 2006). Ryan et al. (2000) describes SDT as a means to understand "human motivation and personality… of people's growth tendencies and innate psychological needs" (Ryan et al., 2000). The idea of SDT includes both intrinsic and extrinsic motivations and focuses on the idea that motivation is stemmed from competence, relatedness, and autonomy (Ryan et al., 2000). Autonomy with respect to SDT relates to one's willingness while fulfilling a task (Ryan et al., 2000; Ryan et al., 2006). Competence is a need for challenge and feeling of effectiveness (Ryan et al., 2000; Ryan et al., 2006). Relatedness is the need to feel belonging and connection with others (Ryan et al., 2000).

Of note, two distinct types of motivation have been identified within the SDT: intrinsic and extrinsic motivation (Ryan et al., 2000). Ryan et al. (2006) state that "events and that enhance a person's sense of autonomy and competence support intrinsic motivation, whereas those factors that diminish perceived autonomy or competence undermine intrinsic motivation." Intrinsic motivation is the tendency to challenge and extend one's capacities (Ryan et al., 2000). An individual develops an internal interest or desire for mastery when intrinsically motivated. This is representative of being motivated by strong impulse to improve and enjoy what is being done. In a study conducted by Deci et al. (2000), some intrinsically motivated goals would be generativity, personal development, and affiliation. These traits have been shown to have an association with greater health, well-being, and performance (Deci et al., 2000). Intrinsic motivation requires constant supportive conditions, as it can easily be diminished (Ryan et al., 2000). Some examples of threats to intrinsic motivation are deadlines, directives, and pressured evaluations. The addition of these factors can be detrimental to intrinsic motivation as they force a focus on task performance. This focus undermines an individual's motivation to perform tasks for themselves, and instead pressures them. Additionally, it was found that positive feedback provided enhanced intrinsic motivation, whereas negative feedback diminished it (Ryan et al., 2000). Similar to sports, intrinsic motivation is the core type of motivation for playing video games (Ryan et al., 2006). This intrinsic motivation is a result

of video games providing an intrinsic form of satisfaction over extrinsic (playing for fun over external reward).

Ryan and Deci (2000) define extrinsic motivation as the "performance of an activity in order to attain some separable outcome" (Ryan et al., 2000; Deci et al., 2000). An extrinsically motivated task is done to satisfy an external demand or some form of reward contingency (Ryan et al., 2000). This idea is synonymous with completing a homework assignment solely to not get in trouble for incompletion. Extrinsically motivated tasks are typically externally prompted (Ryan et al., 2000). An important note on extrinsic motivation was that placing importance on it proved to be negatively related to a player's well-being. Similarly, attainment of extrinsic motivation was not positively associated with well-being (Ryan et al., 2000). In another study conducted by Deci et al. (2000), it was noted that extrinsically motivated goals would include achieving wealth, fame, or attractiveness. These goals are what an extrinsically motivated individual would desire, which are life goals that are not generally conducive to healthy lifestyles. In the same study, it was stated that extrinsic aspiration is a type of need substitute. Specifically, people are not meeting a certain need, and instead pursue an extrinsic goal such as fame as compensation for the need (Deci et al., 2000).

It is argued that the motivation behind video gaming is intrinsic in nature (Ryan et al., 2006). Autonomy is perceived as high when activities are done for interest or personal value. This is in sync with many of the reasons why people play video games. Most of the predominant reasons are for self-interest or benefit. The idea of competence stems from an opportunity to develop or acquire skills or abilities. These acts are a built-in feature in video games, especially RPG-based games. Gamers also desire a sense of presence in gaming. This idea is similar to the feeling of immersion. Both the feeling of presence and immersion encapsulate a feeling of being within the game world as opposed to being outside of the game. Lastly, people are motivated to play video games that have intuitive controls, as they are easier to engage with (Ryan et al., 2006).

D. BENEFITS OF VIDEO GAMING

Playing video games can have beneficial effects in four domains, i.e., cognitive, motivational, emotional, and social (Granic et al., 2014). Cognitive benefits include faster and more "accurate attention allocation," increased visual processing, and enhanced mental rotation abilities (Granic et al., 2014). These improvements to an individual's capabilities suggest that video games can be used to develop skills that would prove difficult without specific resources. A meta-analysis conducted by Uttal and colleagues (2013) concluded that the improvements in spatial skills that are gained through FPS video games are comparable to the effects of higher-level education aimed to train these skills (Uttal et al., 2013). Additionally, the study conducted by Granic et al. (2014) showed that "spatial skills can be trained in a relatively brief period, and that these benefits last over an extended period of time." Additionally, playing FPS video games can reduce reaction times, while maintaining accuracy (Dye et al., 2009). These skills are not specific to the video game, but are transferable to other tasks (Granic et al., 2014). Playing video games can result in improved focus, increased ability to multitask, and improved working memory (Von der Heiden, 2019). In agreement with Granic et al. (2014), Palaus and colleagues showed that the use of video games can lead to improvements in cognitive performance, specifically in the realms of attention, cognitive control, visuospatial skills, cognitive workload, and reward processing (Palaus et al., 2017).

Engagement with video gaming can also improve creativity (Jackson et al., 2012). In 2008, researchers from the University of Washington developed an online game, "Foldit" (Cooper et al., 2010). The "Foldit" game allowed players to model the genetic makeup of proteins. Gamers who played the game were eventually able to assist the researchers to identify a solution to a crystal structure for a monkey virus that was related to AIDS (Cooper et al., 2010) which had been an ongoing problem for the researchers for more than 10 years (Granic et al., 2014).

Another domain that can benefit from video gaming is motivation. Specifically, gaming environments can be conducive to cultivating persistent and optimal motivational styles, which in turn contribute to success and overall achievement (Granic et al., 2014).

Palaus and colleagues concluded that video games carry intrinsic features that increase a participant's motivation better than other tasks aimed to do so (Palaus et al., 2017).

In terms of emotional benefits, video games facilitate emotion regulation (Kosa et al., 2020), and can lead to better mood and increased positive emotions (Granic et al., 2014). For example, puzzle video games have been shown to improve players' mood, promote relaxation, and relieve anxiety (Russoniello et al., 2009).

Video gaming can also have social benefits. Granic and colleagues argued that the majority of gamers play with friends and that vital prosocial skills are developed when playing games that require cooperation and supportive behavior (Granic et al., 2014). Findings of a study on U.S. adolescents showed that individuals playing games that involved civic experiences or playing massively multiplayer online role-playing games (MMORPGs), are more likely to be engaged in social and civic movements in their everyday lives (Lenhart et al., 2008). Moreover, engagement in video gaming can be beneficial to those at risk of social isolation through fostered social interaction (Trepte et al., 2012).

E. NEGATIVE EFFECTS OF VIDEO GAMING

On the opposite end of the spectrum, there is evidence that excessive video gaming can be problematic. Plante et al. (2018) define problematic video gaming to be "repeated playing of games that significantly impairs the players day-to-day functioning." It is important to note that Plante and colleagues' definition applies to all the common nomenclature used: problematic video gaming, excessive video gaming, video game addiction, internet use addiction, internet gaming disorder (IGD), etc. These are all used interchangeably throughout the literature (Feng et al., 2017). Problematic video gaming is understood as the excessive use/engagement with video games despite the user's knowledge of negative consequences (Feng et al., 2017).

Numerous studies have found evidence of problematic video gaming to be prevalent amongst their respective population samples (Schneider et al., 2017; Engelhardt et al., 2011; Von der Heiden et al., 2019; Mihara et al., 2017; Mehroof et al., 2010; Eickhoff et al., 2015; King, 2020; Gilman et al., 2015; Di Blassi et al., 2019; Feng et al., 2017; Plante

et al., 2018; Mentzoni et al., 2011). However, their findings were population-dependent, as some populations included solely gamers while others utilized more representative samples. Additionally, the degree of problematic video gaming varied among the studies. Feng and colleagues found the prevalence of problematic video game use to range from 0.7% to 15.6% of the population (Feng et al., 2017). They concluded that although substantial portions of the populations are engaged in video games, only a small subset shows symptoms of problematic video gaming (Feng et al., 2017). Milani and colleagues' findings were in line with Feng and colleagues' conclusions, as their study identified 15.2% of their participants to be problematic video gamers and 2.1% of their sample to have IGD. Milani and colleagues' sample consisted of Italian adolescents, who reported an average video game time of 12.92 hours per week (Milani et al., 2018). In the Netherlands, another study found problematic video gaming within their participants to only make up 1.3%. Additionally, their average playing time per week was much less, at 5.97 hours per week (Haagsma et al., 2012). Witteck and colleagues' study found 1.4% of their sample to be addicted, 7.3% to be problematic gamers, 3.9% to be engaged gamers, and the rest of their sample to be normal (Witteck et al., 2016). Another study conducted on Norwegian adolescents found 4.2% of their sample to be addicted to gaming, 12.9% were problematic gamers, 4.9% were engaged gamers, and 78% were normal gamers. The mean time spent gaming per week was 10 hours, but their addicted sample averaged 24 hours per week (Brunborg et al., 2013).

As of 2013, Internet Gaming Disorder (IGD) is included in Section III of the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013). IGD is defined as gaming that must cause "significant impairment or distress" in several aspects of a person's life. The proposed symptoms of IGD include "preoccupation with gaming, withdrawal symptoms when gaming is taken away, tolerance, inability to reduce playing, giving up other activities, continuing play despite occurring problems, deception of family members, use of gaming to relieve negative moods, and risk to jobs and relationships" (American Psychiatric Association, 2018).

In the International Classification of Diseases 11th Revision (ICD-11), gaming disorder (GD) is defined by the World Health Organization (2021) as "a pattern of persistent or recurrent gaming behavior, which may be online, or offline, that is manifested by impaired control over gaming, increased priority given to gaming, and continuation or escalation of gaming despite the occurrence of negative consequences" (World Health Organization, 2021).

Both definitions carry similarities. According to the DSM-5, five of the nine criteria must be met in order to diagnose IGD, whereas according to the ICD-11, patients must exhibit only three symptoms for GD (Jo et al., 2019).

Symptoms of IGD closely resemble symptoms of gambling disorder and include preoccupation, withdrawal, tolerance, loss of control, loss of interest in other activities/ hobbies, continued play despite knowledge of consequence, deception of others regarding the amount of gaming, using games as an escape, and losses in relationships or career (Schneider et al., 2017). The same study conducted by Schneider et al. (2017) found problematic gaming to be associated with increased risk of psychopathology and symptoms of anxiety, panic disorder, depression, social phobia, and attention hyperactivity disorder. Also, excessive video gaming can lead to musculoskeletal problems. One example was a case study of a 29-year-old civilian male who experienced a tendon rupture in his left thumb due to excessive use of a common and popular smartphone game, "Candy Crush" (Gilman et al., 2015).

Most studies that have found strong correlations between gaming time and problematic use had a sample of general population samples. Studies that utilized population samples consisting of gamers had higher average gaming times with small variances. Kiraly and colleagues noted "the association between psychiatric symptoms and problematic online gaming was substantially stronger than the association between psychiatric symptoms and gaming time" (Kiraly et al., 2017). From this association they concluded that gaming is only associated with psychiatric symptoms when gaming is problematic and not necessarily due to high amounts of gaming. As a result, it is possible to have highly engaged gamers who are not necessarily problematic. Highly engaged

gamers who report good mental health play as an escape or for enjoyment, rather than to avoid responsibility (Kiraly et al., 2017).

Von der Heiden et al. (2019) found problematic video gaming to include issues such as craving for play and loss of control. Additionally, the degree of addictive video game use is related to certain personality traits such as low self-esteem and low self-efficacy. Thus, individuals who have such traits are at an even greater risk of developing an addiction to video gaming. Sensation-seeking is a trait that was found to be positively correlated with online gaming addiction (Mehroof et al., 2010). Additionally, a study conducted by Engelhardt and colleagues, concluded that individuals with low exposure to video game violence are subject to a desensitization to real-life violence and increased aggression, if the individual plays violent video games (Engelhardt et al., 2011).

Furthermore, individuals can utilize video games as a maladaptive coping mechanism, proving more harmful than beneficial to their well-being. Kiraly et al. (2017) stated that gaming could serve as a maladaptive coping strategy that decreases psychiatric distress through avoidance of real-life issues. Although stress relief is beneficial to health, turning to video games can have additional unforeseen adverse effects. Video games are recognized as being used as an avoidance-focused coping method (Kosa et al., 2020). In a study conducted by Plante et al. (2018) it was concluded that avoidance-focused coping is the least effective method of healthy coping. Schneider et al. (2017) identified that denial and behavioral disengagement are avoidant coping strategies.

As previously noted, there is also a negative side to escapism in video gaming. Escape motives were found moderately-to-strongly associated with problematic video game use of video games (Kiraly et al., 2017). Several other studies have concluded that the use of the internet as a means for escape may increase the risk of pathological use (Allison et al., 2006; Beranuy et al., 2013; Tejeiro et al., 2012; Wan and Chiou, 2006). Additionally, escapism was found to be associated with higher levels of emotion dysregulation (Di Blassi et al., 2019; Loton et al., 2015).

Moreover, of the previously mentioned coping styles, video gaming seems to be related to emotion-focused or avoidance-focused coping strategies, as people play video

games for self-enjoyment, distraction, or in avoidance of other responsibilities (Kosa et al., 2020).

On the extreme end of problematic video gaming is the development of addiction. Problematic video gaming and addiction can be seen as existing on the same continuum with addiction being on the upper end of the scale (Von der Heiden et al., 2019). Addiction is more so whether a player plays the game as a means of coping with stress or setbacks (Plante et al., 2018). As such, not all excessive gamers are necessarily addicted, but the frequency of use could be problematic. Wan and Chiou (2006) concluded that addicted gamers are more likely to play games to avoid discomfort rather than play solely for pleasure. A problematic gamer may play also for pleasure, but his/her excessive gaming results in adverse health effects. In 2011, Mentzoni and colleagues conducted a review on problematic video game use and found that 56.3% of their respondents to use video games on a regular basis, 4.1% showed signs of problematic video game use, and only 0.6% of respondents showed addiction to video gaming (Mentzoni et a., 2011).

1. Video Gaming and Sleep

Several studies have shown problematic video gamers prioritize gaming over sleep. A study conducted by Eickhoff et al. (2015) showed that excessive video gaming was associated with sleep deprivation, and that participants reported routinely sleeping only 3 to 4 hours per night. Saunders et al. (2017) also found that excessive gaming disturbed gamers' sleep patterns.

Sleep deprivation, however, has detrimental effects on one's health (Touitou et al., 2017). The recommended amount of sleep for a healthy adult is 7 or more hours per night on a regular basis (Watson et al., 2015). Compared to young adults who sleep less than 7 hours, individuals who sleep less than 7 hours a night are more likely to report poor general health, low overall physical and mental health-related quality of life (HRQOL) (Watson et al., 2015). Impaired immune function, increased pain, impaired performance, and increased errors are some of the potential results of a lack of sufficient sleep (Watson et al., 2015). Sleep deprivation increases drowsiness, decreased alertness, and decreases our ability to

focus (Touitou et al., 2017). Lastly, chronic short sleep is associated with increased mortality (Shen, Wu, & Zhang, 2016).

Also, playing video games late in the evening and at night can have detrimental effects on human circadian rhythms, the body's internal clock that regulates all the major physiological systems in mammals (Touitou et al., 2017). With a period of approximately 24.5 hours, sleep propensity increases, and alertness decreases during our biological night. Environmental light is the main factor that synchronizes circadian rhythms to external environmental conditions (Touitou et al., 2017). Desynchronization of one's circadian rhythm can lead to deteriorated health, e.g., increase the risk of cancer, diabetes, obesity, mood disorders, and age-related macular degeneration (Touitou et al., 2017).

F. VIDEO GAMING WITHIN THE UNITED STATES MILITARY

A study reported in 2010 by Orvis and colleagues found that over 40% of soldiers across all ranks in the U.S. Army reported not playing video games, or doing so rarely, and around 50% reported playing no more than once a month (Orvis et al., 2010). In another study conducted on U.S. military veterans it was found that only a small percentage of veterans (8.8%) showed symptoms that were indicative of problematic video gaming. However, the average age of the participants was much larger than other studies (37.5 years old) which could influence the results as most studies previously conducted had adolescent participants (Myrseth et al., 2017). Myrseth and colleagues concluded that proneness to boredom and enhancement motivation were significant predictors of problematic gaming (Myrseth et al., 2017).

A case-series study conducted on three U.S. Marines found problematic video gaming to be similar to substance abuse and result in severe emotional, social, and mental dysfunction (Eickhoff et al., 2015).

The first patient reported depressed mods, poor concentration, inability to focus, irritability, and insomnia. Upon observation, the patient showed slumped posture and poor eye contact. The patient stated that they were not able to complete tasks they would normally have been able to before video gaming. When the discussion shifted to video gaming, the patient's demeanor became more engaged and attentive. The patient

acknowledged playing video games for more than 30 hours a week while sleeping only 3 to 4 hours a night. Upon being provided education with sleep hygiene, the patient refused to comply (Eickhoff et al., 2015). The second patient reported symptoms similar to the first patient, stating that they had lasted for three months. This patient in particular reported daydreaming about homicidal ideation. Similar to the previous patient, when conversation of video games arose, the patient's mood became enthusiastic, and the patient even smiled. This patient acknowledged playing between 50 to 60 hours weekly. They admitted sleeping and eating very little, and experienced withdrawals from gaming. An intervention was pursued, going two weeks without video games. After the intervention, the same patient reported sleeping 7 to 8 hours nightly, improved moods, and resolved homicidal ideations. Although the patient did not quit gaming entirely, their hours going forward were greatly reduced (Eickhoff et al., 2015). The third patient was referred for mental health evaluation after reported suicidal ideation. The patient reported issues with sleep and insomnia and experienced problems with anxiety, anger, poor concentration, and inability to focus. During the interview, the patient was notably disengaged until the topic of video games was mentioned. The patient then became excited and active in the conversation. The patient admitted to playing FPS games 4 to 7 hours on weekdays and between 12 to 14 hours on weekends. Additionally, the patient reported drinking 4 to 5 beers daily. The patient agreed to cut down on screen time, but then experienced cravings and irritability without video games (Eickhoff et al., 2015).

In this study, only one out of the three patients was able to overcome issues related to problematic video gaming.

USMC and USN leaders have recognized the growth in the number of service members engaging with video games. As such, leadership from both services monitor their personnel to ensure that they are maintaining a healthy lifestyle. The Marine Corps Force Preservation Council (FPC) performs these checks monthly (Eickhoff et al., 2015). Through FPC programs, military members can receive the necessary counseling and resources to treat any issues that may affect their well-being.

Throughout many of these studies, video gaming has been shown to cause adverse health effects that may outweigh the benefit that can occur from frequent play. Excessive

or problematic gaming is an issue that is disguised as a means to satisfy a person's needs. However, the actual effects of video gaming are both positive and negative. Recognizing the prevalence of problematic video gaming within the USMC is the first step in learning how to approach the issues that the gaming will cause.

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III. METHODS

A. RESEARCH DESIGN

Data were collected from three USMC units through surveys and focus groups. The focus groups further investigated trends that were uncovered from the surveys. The descriptive results of the survey responses and statistical analysis were then conducted in the following chapter. Correlations and associations of disordered gaming were assessed. Invalid responses and major outliers to items within the survey were removed to prevent skewing the data.

B. PARTICIPANTS

Active-duty Marines (n=1,098) volunteered to participate in the online survey while (n=43) Marines were interviewed in the focus groups. Three commands were selected by the HQMC to participate in the study, i.e., the 2nd Combat Engineer Battalion (CEB), the 2nd Marine Aircraft Wing (MAW), and the 3rd Marine Logistics Group (MLG). The 2nd CEB is located in Camp Lejeune, NC and falls under the command of the 2nd Marine Division. The 2nd CEB provides combat engineer support to the 2nd Marine Division to enhance their mobility, counter-mobility, and survivability. The 2nd MAW is located in Cherry Point, NC at the Marine Corps Air Station. The 2nd MAW conducts air operations to support Marine forces in the form of air support, anti-air warfare, assault support, aerial reconnaissance, electronic warfare, and control of aircraft and missiles. The 3rd MLG is located at Camp Kinser, Marine Corps Base Smedley D. Butler, in Okinawa, Japan. The 3rd MLG provides responsive combat logistics support to the III Marine Expeditionary Force (MEF) and other Marine forces within their area of operations. The USMC units involved in the study can be seen in Table 1.

The study protocol was approved by the Naval Postgraduate School Institutional Review Board (IRB) (NPS.2021.0040), the USMC IRB, the USMC Survey Office (SCN USMC-HQ-21016), and the USN Survey Office (RCS# NSP5223.07). Informed consent was obtained from all volunteers.

From the initial 1,098 responses to the survey, 171 were omitted from analysis. Specifically, 93 responses were omitted because respondents failed to indicate their gamer information. Another 57 respondents were omitted for invalid entries. A further 21 responses were omitted because a large portion of their survey was missing information. Consequently, data from 928 Marines were used for further analysis.

C. SURVEY

The survey included items assessing demographic information about the respondent, followed by items about their military background. Next, sleep patterns under various scenarios, nicotine and caffeine consumption, and exercise routines were assessed. From here, the survey separated gamers and non-gamers, with gamers moving on to gaming-specific questions. The survey concluded by assessing the well-being of all respondents through various standardized questionnaires. Using the items in the survey responses, statistical analysis was conducted.

The survey was made available to the three USMC units following the survey design logic delineated in Figure 1.

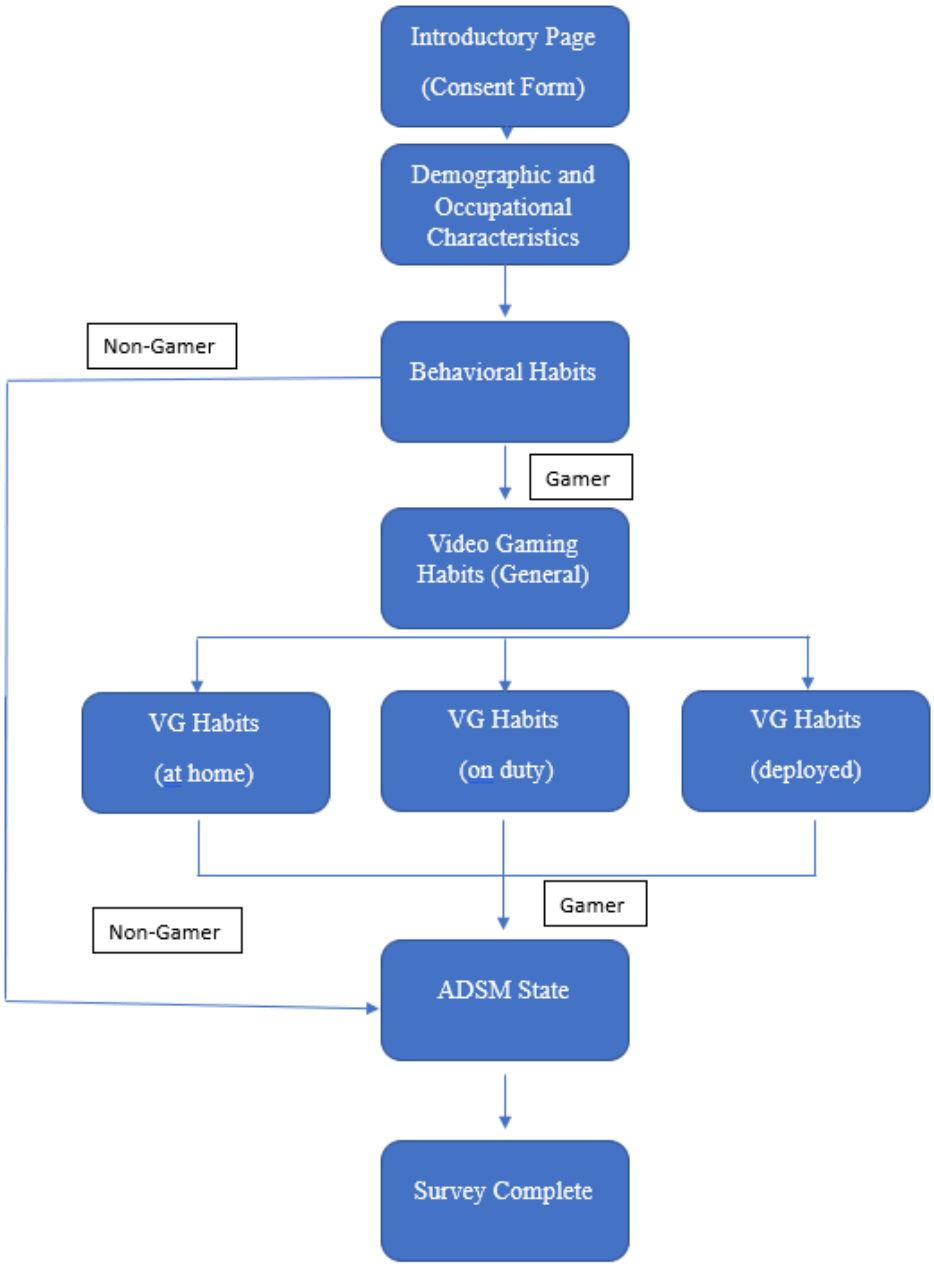

Figure 1. Survey Design Logic

Each section of the survey contained items pertaining to the topics relevant to the section's title. The demographic information and occupational characteristics section asked

questions about age, sex, rank, number of years of active-duty service, deployment history and combat experience in months.

The behavioral habits section asked questions about daily sleep durations, consumption of nicotine products, consumption of caffeinated beverages, exercise routines, and whether the individual plays video games. From these answers, the individual was classified as a gamer or a non-gamer. Non-gamers skipped to the ADSM state section while gamers continued to the video gaming habits section.

The video gaming habits sections asked questions about the number of years spent playing video games, types of video games preferred, video gaming habits (at home, while on duty/inport, and while deployed/underway), and included items about frequency, duration, and the types of devices used. The survey included 10 standardized tools. Two of these tools were completed only by gamers.

1. IGDS9-SF

The Internet Gaming Disorder Scale-Short Form 9 (IGDS9-SF) is a screening tool that is used to assess gaming addiction based on the latest diagnostic DSM-5 criteria for IGD (Lemmens et al., 2015; Pontes et al., 2015). This scale is based on the nine criteria in the DSM-5 for IGD, i.e., preoccupation with internet games, withdrawal symptoms when internet gaming is taken away, tolerance, unsuccessful attempts to control participation in internet games, loss of interest in previous hobbies, continued excessive use of internet games despite knowledge of psychosocial problems, deception of family members, and jeopardizing or losing a significant relationship or job (Lemmens et al., 2015; Pontes et al., 2015). The IGDS9-SF assesses and assigns a score to an individual ranging from 9 to 45, with higher scores being indicative of a higher degree of IGD (Pontes & Griffiths, 2015). In their study of gaming disorders. Using Chinese gamers, Qin and colleagues determined a score of 32 to be the appropriate cutoff value to identify a disordered gamer (Qin et al., 2020). The IGDS9-SF was completed only by gamers.

2. MOGQ

The Motives for Online Gaming Questionnaire (MOGQ) is a self-report tool containing 27 items assessing seven motivational factors for playing video games (Demetrovics et al., 2011). These factors are social, escape, competition, coping, skill development, fantasy, and recreation. These seven factors cover the full range of possible motives for gaming. MOGQ was completed only by gamers.

3. PSS-4

The Perceived Stress Scale (PSS-4) is a tool used to assess psychological stress (Cohen, Kamarck, and Mermelstein, 1983). The PSS-4 asks the participants questions regarding their feelings and thoughts over the last month. The PSS-4 contains four items, of which the participant provides an answer ranging from "never" to "very often" (Cohen, Kamarck, and Mermelstein, 1983).

4. SWLS

The Satisfaction with Life Scale (SWLS) is a 5-item scale that measures cognitive judgments of one's life satisfaction (Diener et al., 1985). The possible range of scores for the SWLS is 5 to 35, with 20 being representative of a neutral score (Diener et al., 2985). General score benchmarks are as follows:

- 31-35: Extremely satisfied
- 26-30: Satisfied
- 21-25: Slightly satisfied
- 20: Neutral
- 15-19: Slightly dissatisfied
- 10-14: Dissatisfied
- 5-9: Extremely dissatisfied

5. Brief COPE

The Brief-COPE is an abbreviated version of the Coping Orientation to Problems Experienced (COPE) Inventory (Carver et al., 1989). It is a self-report questionnaire designed to assess a variety of coping responses within an individual (Garcia et al., 2018). Brief-COPE asks the individual questions regarding how often they have had to do certain actions. The score is then used to determine the coping strategy utilized by the respondent.

6. PHQ-8

The Patient Health Questionnaire depression scale (PHQ-8) is a multiple-choice, self-report inventory that is used to as a diagnostic measure for depressive disorders. The resulting PHQ-8 score ranges from 0 to 24, with 24 being the worst. A score of 10 or greater is indicative of major depression, while 20 or more is severe major depression. The PHQ-8 is a descendant of PHQ, which was developed to be the self-administered version of the PRIME-MD developed by Pfizer Inc. (PHQ and GAD7 Instruction Manual, 2010). The PHQ itself was developed by Spitzer and colleagues (PHQ and GAD7 Instruction Manual, 2010).

7. GAD-7

The Generalized Anxiety Disorder Assessment (GAD-7) is a seven-item self-report instrument used to assess the severity of generalized anxiety disorder. The GAD-7 asks the respondents to rate the severity of their symptoms over the previous two weeks, with responses ranging from “not at all” to “nearly every day.” The resulting score is tallied with a total ranging between 0 and 21, with 21 being the worst. The scores 5, 10, and 15 are the cutoff points corresponding to “mild,” “moderate,” and “severe” anxiety, respectively. The GAD-7 was developed by Spitzer and colleagues similar to the PHQ (PHQ and GAD7 Instruction Manual, 2010; Spitzer et al., 2006).

8. UCLA

The University of California, Los Angeles Loneliness Scale (UCLA) is a 20-item scale that is designed to measure a respondent’s subjective feelings of loneliness and feeling of isolation. The UCLA Loneliness Scale was originally developed in 1978 by

researchers at UCLA but has since been simplified and utilizes a reverse scoring system for certain questions in the assessment (Russell, Peplau, & Ferguson, 1978; Russell, Peplau, & Cutrona, 1980). The UCLA Loneliness Scale provides the respondent with a score ranging between 20 and 80, with 80 being the worst. The higher the score, the more indicative of the individual having feelings of loneliness and isolation (Russell, Peplau, & Cutrona, 1980).

9. ESS

The Epworth Sleepiness Scale (ESS) is an 8-item, self-administered questionnaire in which respondents are prompted to rate their chances of dozing off/falling asleep while engaged in different activities (scaling from 0 to 3) (Johns, 2015). The resulting score can range from 0–24, with a higher score being representative of a higher "daytime sleepiness" (Johns, 2015). The ESS was developed by Dr. Murray Johns for adults and was later adapted in a version appropriate for children and adolescents, the ESS-CHAD (Johns, 2015).

10. AUDIT-C

The Alcohol Use Disorders Identification Test (AUDIT-C) is a short alcohol-based screening tool that is used to identify people that are hazardous drinkers or have active alcohol use disorders. The AUDIT-C is a modified version of the AUDIT instrument that was developed by the World Health Organization (Bush et al., 1998). AUDIT-C includes three questions. Each question has five possible answer choices. Males with a score of 4 or more are "positive," meaning they are suggestive of having alcohol problems. Females with a score of 3 or more are considered "positive." The higher the score, the increased likelihood of an alcohol disorder. (Bradley et al., 2003; Bush et al., 1998).

11. QUALTRICS

Qualtrics is an online survey tool that enables users to build and distribute surveys within one location. The survey was distributed to all three of the USMC units through Qualtrics.

D. PROCEDURES

Recruitment for respondents was initiated through an ombudsperson who informed potential participants of the survey's purpose and contents. The recruitment script contained a link that brought participants to the online survey via Qualtrics. The ombudsperson recruitment technique was used for both the initial survey and focus group participants.

The surveys were made available to participants online via Qualtrics. The survey assessed demographic characteristics of the respondents, their use of video games, their preferred genres and platforms used, the prevalence of problematic video gaming, and video gaming-related behaviors.

Some period of time after the survey's completion, the focus groups were conducted. The focus groups built on the findings of the survey. Issues and trends identified through the results of the survey were investigated further. The focus groups helped capture further information that might not have been captured through the surveys alone. A total of 43 Marines participated in the focus groups. Thirteen Marines from the 2nd CEB and 30 from the 3rd MLG. The rank of the participants ranged from E1 – E4.

The questions asked during the focus groups were:

- What video games do you like to play?
- How often/how long do you play them?
- What platforms do you use?
- Where do you play them?
- Why do you play them?
- What benefits do video games offer?
- Are there any drawbacks of playing video games frequently? If so, what are they?

- Have (Did) your video gaming habits change during COVID?
- How prevalent is video gaming in your unit?
- Have you noticed any performance decrements in yourself or your fellow Marines due to video gaming? If so, how did those decrements manifest themselves?

Although focus groups were conducted, this thesis focuses solely on the results of the survey responses.

E. ANALYTICAL TOOLS

The analytical tools used to analyze the survey data are delineated in this section.

1. Excel

Microsoft Excel is program used for documentation and data analysis. It is a spreadsheet program that allows ease of data parsing and manipulation. In this thesis, Excel is mainly used for entering the data in spreadsheets (Microsoft.com, 2021).

2. JMP

JMP is a statistical data analysis tool that allows the exploration of data and visual representations. Common JMP applications include designing experiments and analysis of statistical data (JMP.com, 2021).

F. ANALYTICAL METHODS

Initially, the survey response data were parsed and cleaned for analysis. Prior to conducting statistical analysis, normality tests were performed to determine if the data were normally distributed. The distributions of all continuous variables were analyzed with normal quantile plots. These distributions indicated a lack of normality. To confirm this hypothesis, the Shapiro-Wilk Normality Test was conducted. The resulting p-values indicated whether the data were normally distributed.

1. Shapiro-Wilk Test

The Shapiro-Wilk test is a test statistic developed by Shapiro and Wilk in 1965 (Shapiro & Wilk, 1965). The Shapiro-Wilk test divides the square of an appropriate linear combination of the sample order statistics by the symmetric estimated variance. The Shapiro-Wilk test is used to check for normality within a distribution (Shapiro & Wilk, 1965). The Shapiro-Wilk test utilizes the following equation to assess the "W" statistic (shown in Figure 2), which is then used to calculate the p-value.

$$W = \frac{\left(\sum_{i=1}^{n} a_i x_{(i)}\right)^2}{\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

Figure 2. Shapiro-Wilk Test Equation

This p-value is then used to either reject the null hypotheses (normality) or accept it. This test was used due to its statistical power in checking normality within distributions.

2. Kruskal Wallis Test

The Kruskal-Wallis test is a nonparametric method of analysis developed by Kruskal and Wallis in 1952. The Kruskal-Wallis test is used to determine if samples originate from the same distribution. The Kruskal-Wallis test is considered to be the equivalent of a one-way ANOVA test but does not require the assumption of normality (Kruskal & Wallis, 1952). The Kruskal-Wallis test was used to analyze the correlations between groups within ordinal variables.

3. Wilcoxon Rank-Sum Test

The Wilcoxon rank-sum test was originally proposed by Frank Wilcoxon in 1945 (Wilcoxon, 1945). The Wilcoxon rank-sum test is a nonparametric statistical test that compares two independent samples. In 1947, Mann and Whitney conducted a thorough analysis of Wilcoxon's statistics which sparked the Wilcoxon Rank-Sum test to also be

known as the Wilcoxon-Mann-Whitney test. It is also the reasoning behind why the Mann-Whitney U test is equivalent to the Wilcoxon rank-sum test (Mann & Whitney, 1947). The Wilcoxon Rank-Sum test was used to analyze the variables in the survey data and assess differences between them.

4. Spearman Rank Correlation

The Spearman rank correlation coefficient was developed by Spearman in 1904. The Spearman rank correlation coefficient is a nonparametric statistical method that measures the monotonic association between variables (Spearman, 1904). This statistical method was used to assess relationships between quantitative variables within the data set.

5. Exact Fisher Test

Fisher's Exact test was initially conceptualized by Fisher in 1934. The Fisher Exact test is a statistical test that is used to assess associations between qualitative (categorical) variables (Fisher, 1945). Fisher's Exact test was used to determine the relationship between the various categorical variables within the survey response dataset.

6. Regression

Two regression techniques were utilized to assess relationships between disordered gamers and the various items recorded in the survey. Linear regression was used to assess relationships between the IGDS9-SF scores and various continuous variables in the survey. Logistic regression was used to assess relationships between IGDS9-SF classification groups and various continuous variables in the survey.

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IV. RESULTS

This chapter shows the analysis of data collected from three Marine units. The study sample consisted of 928 Marines who responded to the survey including 62 (7%) Marines from the 2nd CEB, 315 (34%) from the 3rd MLG, and 551 (59%) from the 2nd MAW.

A. ENTIRE SAMPLE OF MARINES

1. Demographic Information and Occupational Characteristics of Respondents

Marines responding to the survey had a median age of 24 years (IQR = 9 years) ranging from 18 to 51 years. The distribution of ages across the entire sample was not normally distributed (Shapiro Wilk test, $W = 0.851$, $p < 0.001$). Ninety-two percent of the respondents were male. The distribution of Marines' ages is shown in Figure 3.

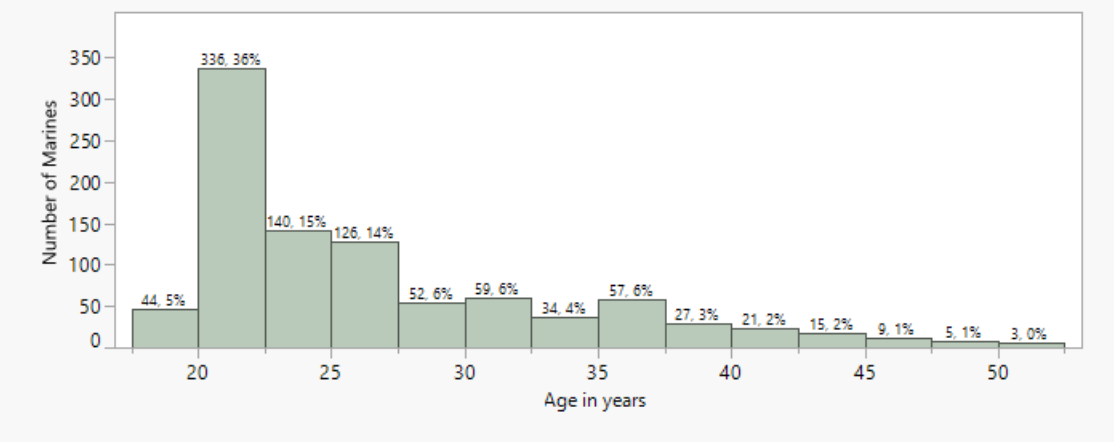

Figure 3. Age Distribution

In terms of their Military Occupational Specialty (MOS), 201 (22%) Marines were Marine Ground contracts, 213 (23%) were Marine Logistic contracts, and 498 (55%) were Marine Air contracts.

The study sample included 773 (84%) enlisted Marines (E-1 to E-9), 14 (1%) warrant officers (CWO1 to CWO4), and 141 (15%) officers (O-1 to O-6). Detailed rank information is shown in Figure 4.

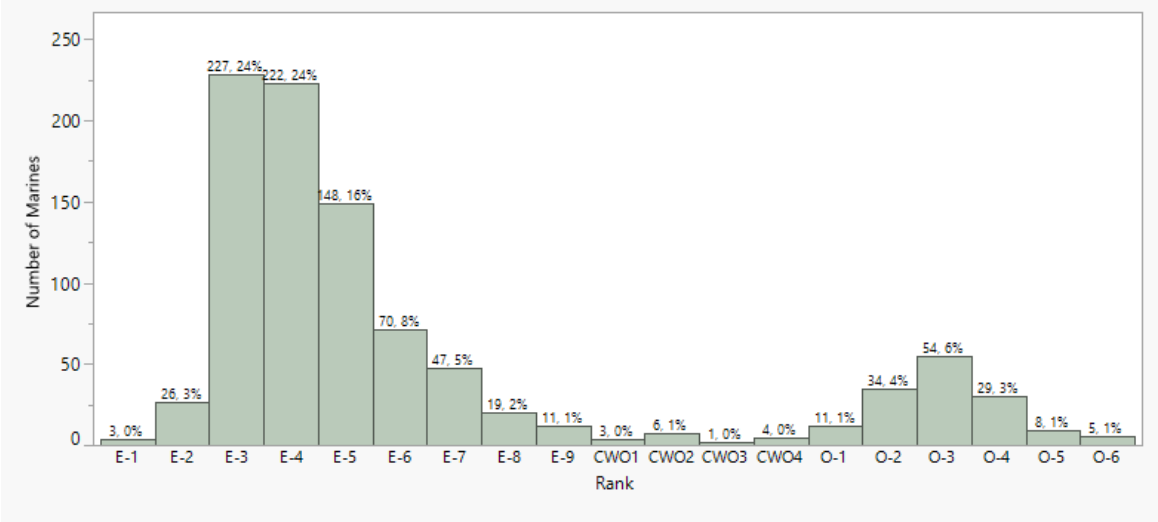

Figure 4. Ranks of Marines in the Study Sample.

The median number of years spent on active duty was 4 (IQR = 5 years) ranging from 0 to 31 years (Figure 5). The distribution of years on active duty was not normally distributed (Shapiro-Wilk test, $W= 0.791$, $p < 0.001$). The distribution of Marine years of service is shown in Figure 5.

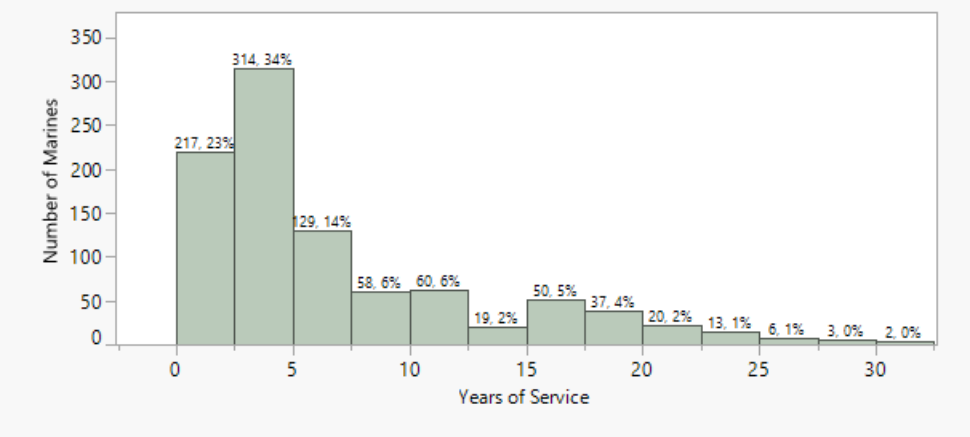

Figure 5. Years on Active Duty

Of all the Marine respondents, 425 (46%) have deployed while serving in the military. For those Marines who have deployed, the median number of months deployed was 10 (IQR = 14 months) ranging from 0 to 100 months (Figure 6). The distribution of months spent deployed was not normally distributed (Shapiro-Wilk test, W= 0.751, $p < 0.001$). Of those Marines who had deployed, 144 (34%) reported having experienced combat during their deployment. The distribution of Marines' months spent deployed is shown in Figure 6.

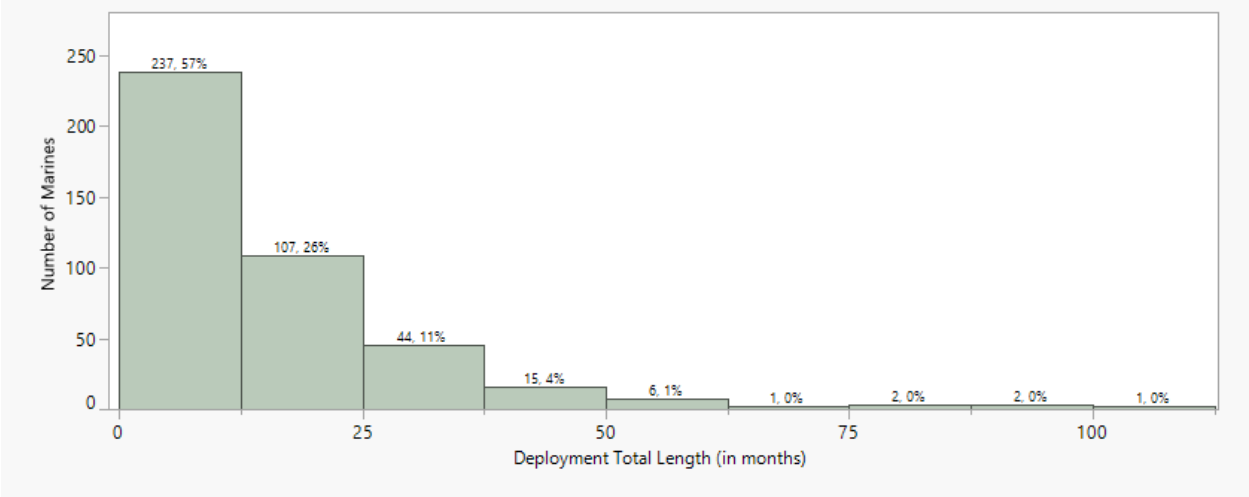

Figure 6. Months Spent Deployed

2. Behavioral Habits

Marines were asked to report their daily sleep duration in three settings, i.e., when they were at home/off duty, on duty, and when underway/deployed.

When at home/off duty, the median number of hours spent sleeping was 7 hours/ day (IQR = 2 hours; one outlier omitted) ranging from 0 to 14 hours (Figure 7). Reported daily sleep duration data while at home/off duty was not normally distributed (Shapiro-Wilk test, W= 0.921, p < 0.001). The distribution of daily sleep duration (at home/off duty) is shown in Figure 7.

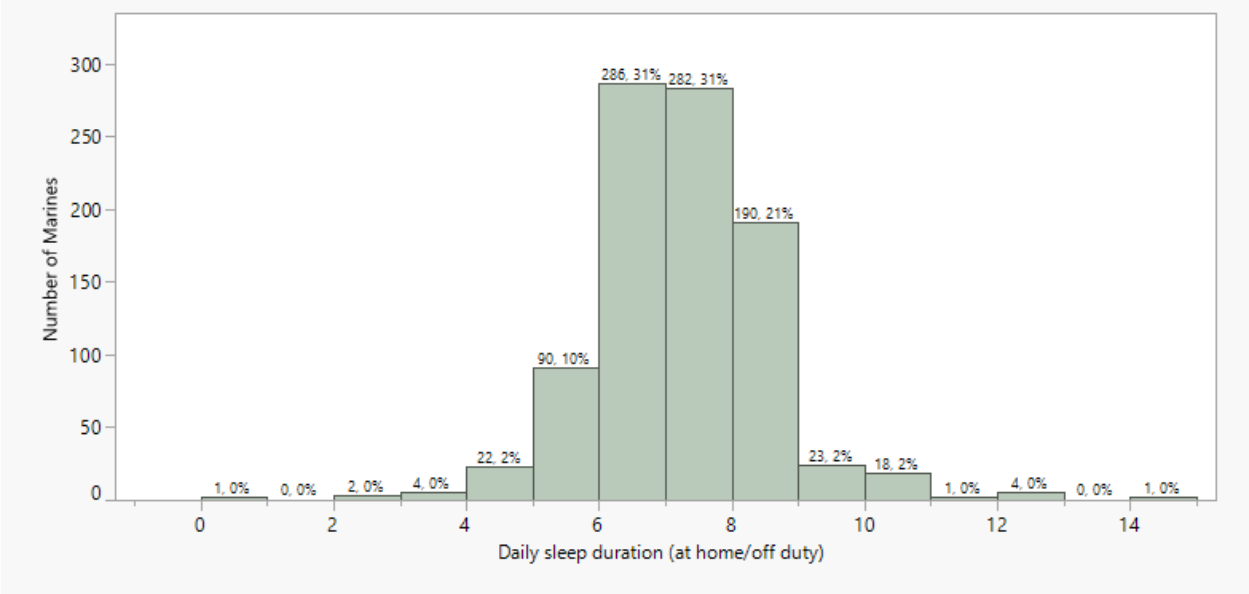

Figure 7. Daily Sleep Duration (at home/off duty)

When on duty, the median number of hours spent sleeping each day was 1 hour (IQR = 5 hours; one outlier omitted) ranging from 0 to 11 hours (Figure 8). This sleep data (on duty/in port) was not normally distributed (Shapiro-Wilk test, W= 0.798, p < 0.001).

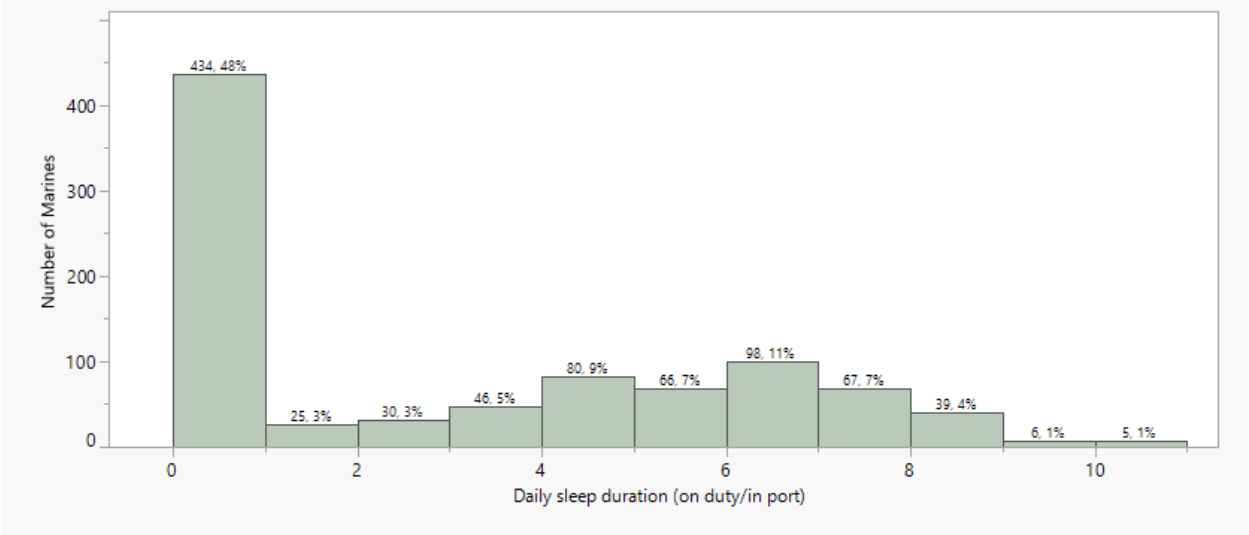

Figure 8. Daily Sleep Duration (on duty/in port)

While deployed, the median number of hours spent sleeping each day was 5 hours (IQR = 7 hours; one outlier omitted) ranging from 0 to 18 hours (Figure 9). This sleep data (while underway/deployed) was not normally distributed (Shapiro-Wilk test, W= 0.842, p < 0.001).

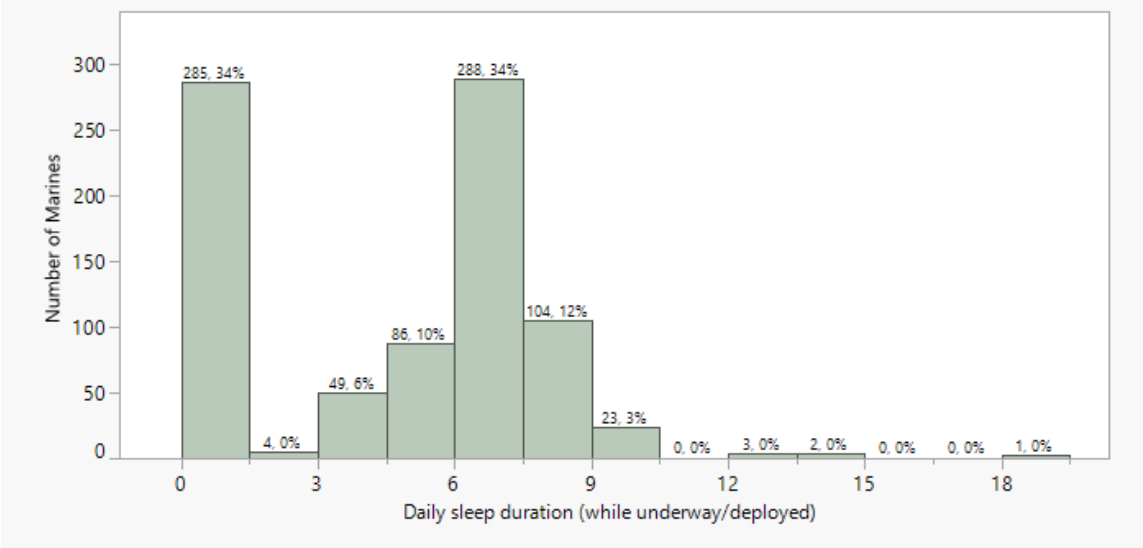

Figure 9. Daily Sleep Duration (while deployed/underway)

Of the 927 Marines, 387 (42%) reported using nicotine products. The most widely used nicotine product was electronic smoke (vaping) (178 [19%] Marines). The second most widely used nicotine product was chewing tobacco/snuff (55 [6%] Marines). Detailed information regarding nicotine use is shown in Table 1.

Table 1. Use of Nicotine Products

Nicotine product	Number of Marines n (%)	Number of products smoked/used per day MD (IQR)
Electronic smoke	267 (69%)	12 (35)
Chew tobacco/snuff	119 (31%)	3 (4)
Cigarettes	88 (23%)	4 (5)
Nicotine gum/patches	22 (6%)	2 (3.25)

Within the entire sample, 860 (93%) Marines reported consuming caffeinated products. Approximately 66% of all Marine respondents reported drinking coffee, followed by 62% drinking energy drinks. Detailed information regarding caffeine consumption is shown in Table 2.

Table 2. Consumption of Caffeinated Beverages

Caffeinated beverage	Number of Marines n (%)	Number consumed per day MD (IQR)
Coffee	569 (66%)	1 (1)
Energy drinks	535 (62%)	1 (0)
Soda/pop/soft drinks	380 (44%)	1 (1)
Tea	351 (41%)	1 (1)

In total, 803 (87%) of all Marine respondents reported having an exercise routine. Marines exercised 5 times per week (median value; IQR = 1.875 times per week) ranging from 1 to 14 sessions per week. This data was not normally distributed (Shapiro-Wilk test, W= 0.867, p < 0.001). The number of exercise sessions per week are shown in Figure 10.

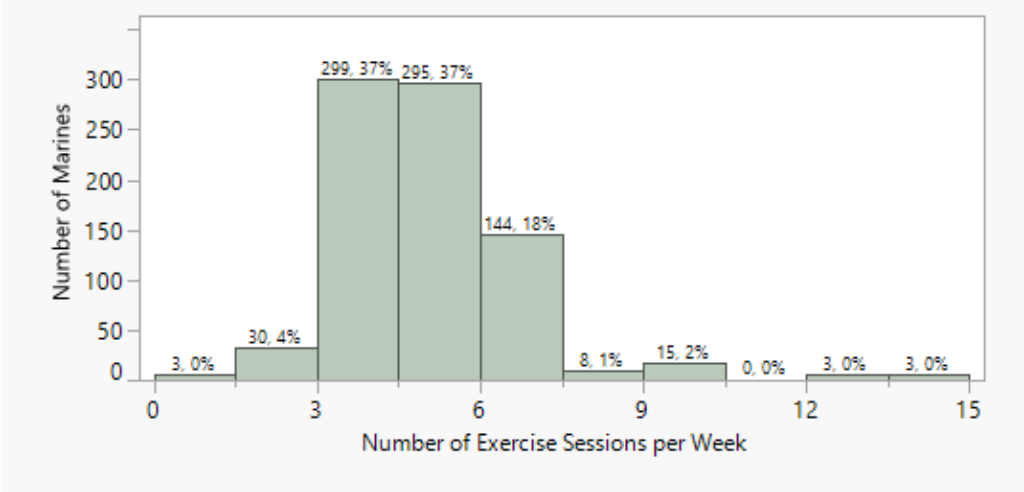

Figure 10. Number of Exercise Sessions per Week

In terms of types of exercise, Marines reported lifting weights, cardio/endurance training, swimming, CrossFit, high-intensity interval training (HIIT), powerlifting, martial arts, yoga, running, basketball, calisthenics, climbing, and combinations of these. The median duration of exercising was 60 minutes (IQR = 30 minutes) ranging from 15 to 240 minutes. This data was not normally distributed (Shapiro-Wilk test, W= 0.863, p < 0.001). The distribution of exercise duration is shown in Figure 11.

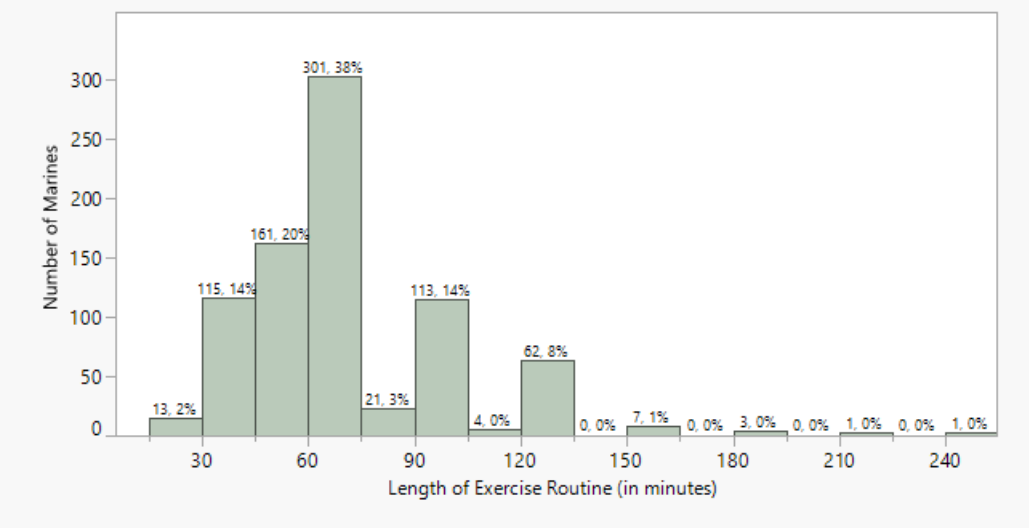

Figure 11. Length of Exercise Routine.

3. ADSM's Status

a. Perceived Stress

The median PSS-4 was 8 (IQR = 2) ranging from 0 to 14. PSS-4 scores were not normally distributed (Shapiro-Wilk test, W= 0.905, p < 0.001). The distribution of PSS-4 scores is shown in Figure 12.

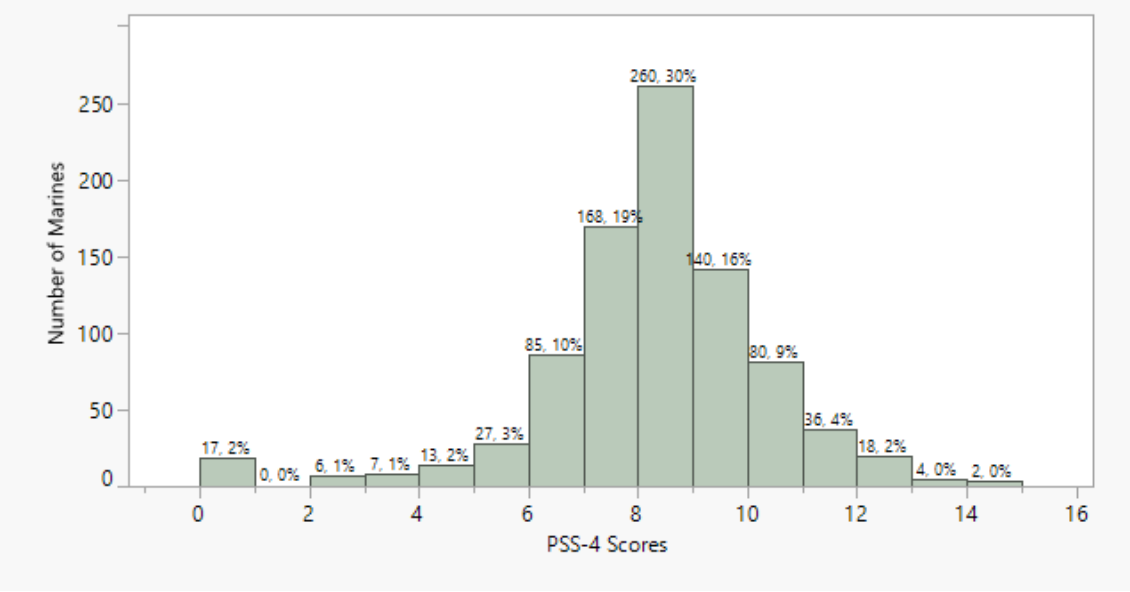

Figure 12. PSS-4 Scores.

b. Satisfaction with Life

The median SWLS score was 23 (IQR = 10). The scores ranged from 5 to 35 and were not normally distributed (Shapiro-Wilk test W= 0.973, $p < 0.001$). The distribution of SWLS scores is shown in Figure 13. Based on their SWLS scores, Marines were classified into seven groups representing their satisfaction with life. There were 46 (5%) Marines that were extremely dissatisfied with life, 91 (10%) Marines that were dissatisfied, 129 (15%) that were only slightly dissatisfied with life, 60 (7%) that were neutral, 214 (24%) that were slightly satisfied with life, 225 (26%) that were satisfied with life, and 110 (13%) that were extremely satisfied with life. These results are shown in Figures 13 and 14.

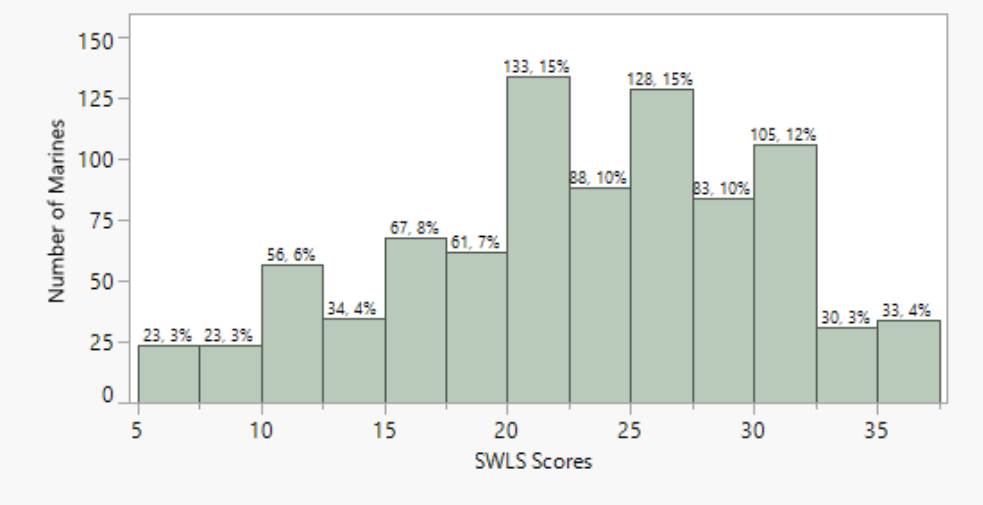

Figure 13. SWLS Scores

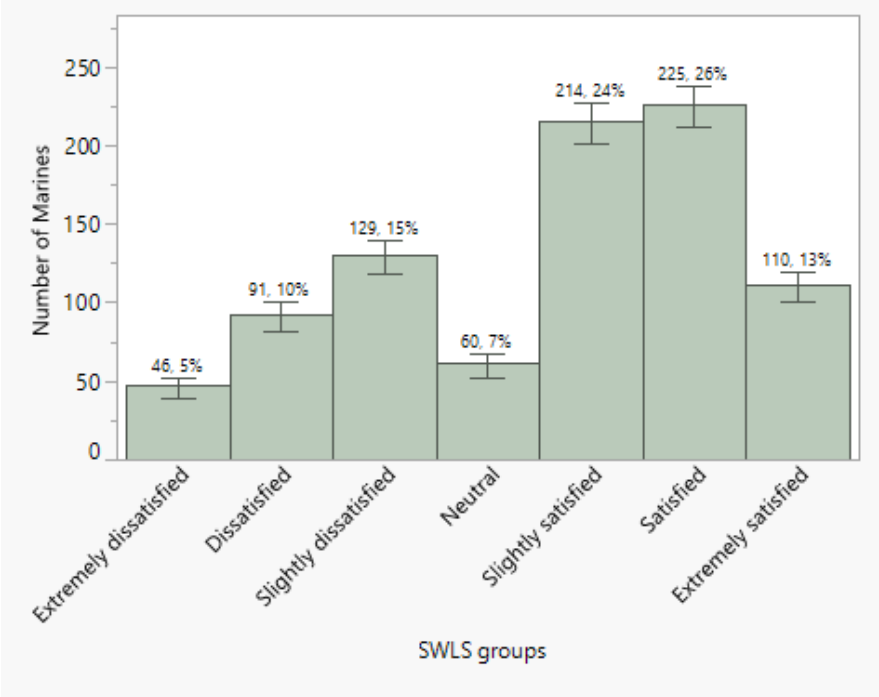

Figure 14. SWLS Groups. Vertical Lines Denote the Standard Error of Proportion.

c. Style of Coping with Problems

The Brief COPE had three coping styles with the highest median scores: active coping, planning, and acceptance, each with a median score of 3 (IQR = 3, 3, 2 respectively). All Brief COPE styles had scores ranging from 0 to 6. All scores had a not normal distribution with significant p-values ($p < 0.001$). Table 3 shows the median scores for each Brief COPE category.

Table 3. Scores of Brief COPE Styles.

Brief COPE Style	Median Score MD (IQR)
Active coping	3 (3)
Planning	3 (3)
Acceptance	3 (2)

Brief COPE Style	Median Score MD (IQR)
Self-distraction	2 (3)
Emotional support	2 (4)
Instrumental Support	2 (3)
Positive reframing	2 (3)
Humor	2 (4)
Self-blame	2 (3)
Venting	1 (2)
Denial	0 (0)
Substance use	0 (0)
Behavioral disengagement	0 (1)
Religion	0 (2)

d. Depression Symptoms

The median PHQ-8 score was 4 (IQR = 8). The PHQ-8 scores varied from 0 to 24 and were not normally distributed (Shapiro-Wilk test, $W= 0.85$, $p < 0.001$). Based on their PHQ-8 scores, 35 (4%) Marines were classified as having symptoms of severe major depression and 132 (17%) Marines were classified as having symptoms of major depression. The distributions of PHQ-8 scores and depression groups are shown in Figures 15 and 16.

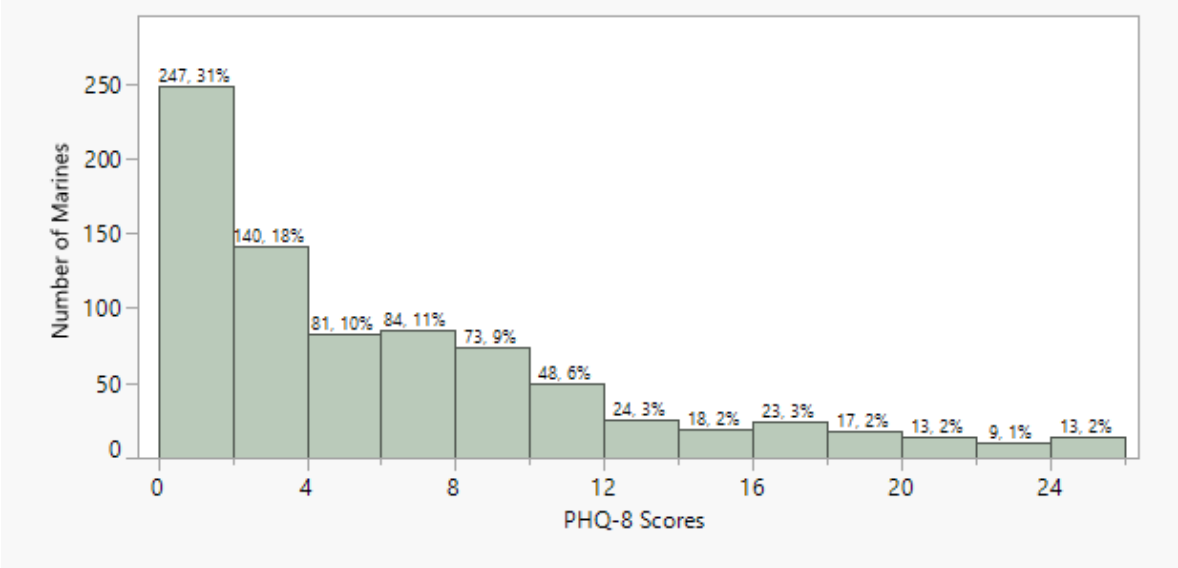

Figure 15. PHQ-8 Scores

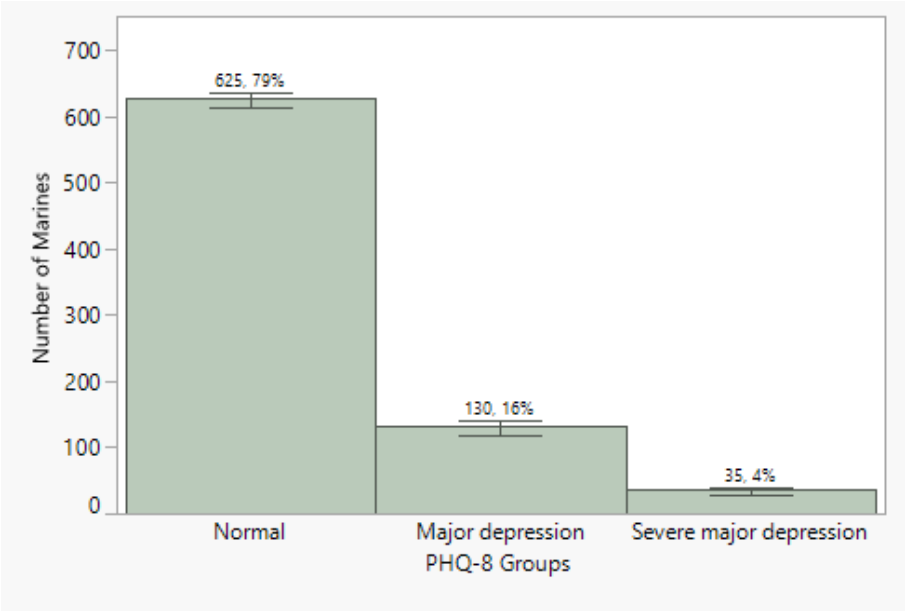

Figure 16. PHQ-8 Groups. Vertical Lines Denote the Standard Error of Proportion.

e. Generalized Anxiety

The median GAD-7 score was 2 (IQR = 7) ranging from 0 to 21. The GAD-7 scores were not normally distributed (Shapiro-Wilk test, W= 0.803, $p < 0.001$). Based on their

GAD-7 scores, 62 (8%) Marines were classified as having symptoms of severe anxiety, 76 (10%) Marines were classified as having symptoms of moderate anxiety, 166 (21%) Marines were classified as having symptoms of mild anxiety. The distribution of GAD-7 scores and the corresponding GAD groups are shown in Figures 17 and 18.

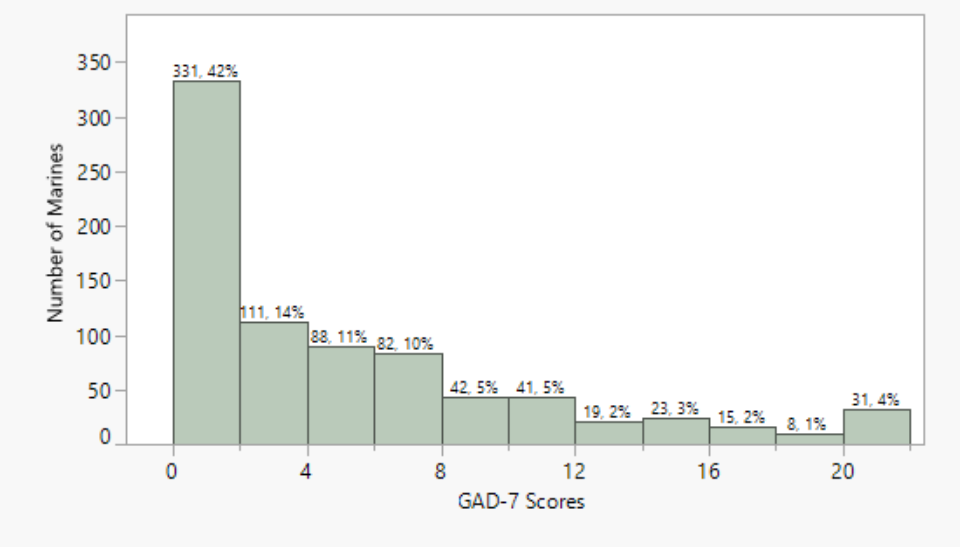

Figure 17. GAD-7 Scores

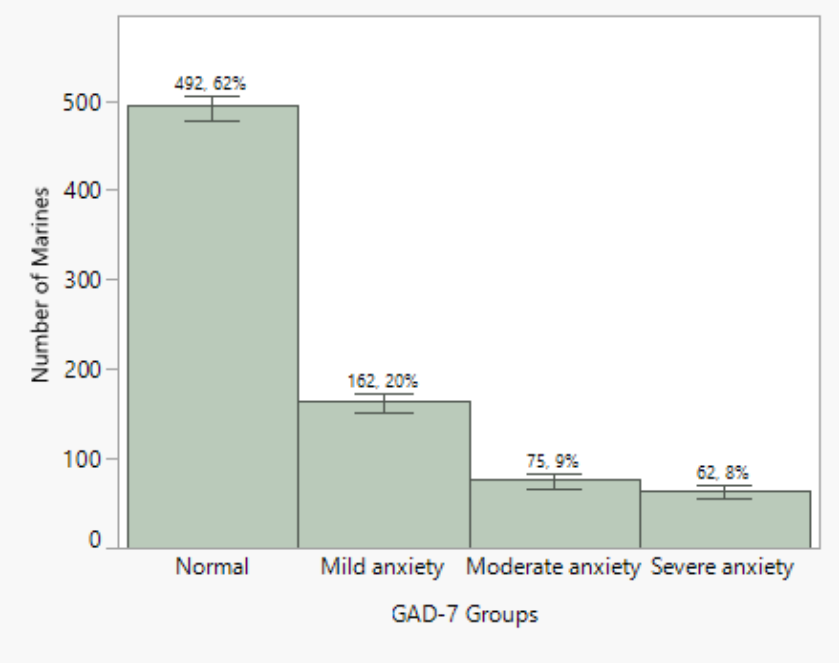

Figure 18. GAD-7 Groups. Vertical Lines Denote the Standard Error of Proportion.

f. Loneliness

The median UCLA Loneliness score was 43 (IQR = 20) ranging from 20 to 80. The UCLA loneliness scores were not normally distributed (Shapiro-Wilk test, W= 0.98, $p < 0.001$). The distribution of UCLA Loneliness scores is shown in Figure 19.

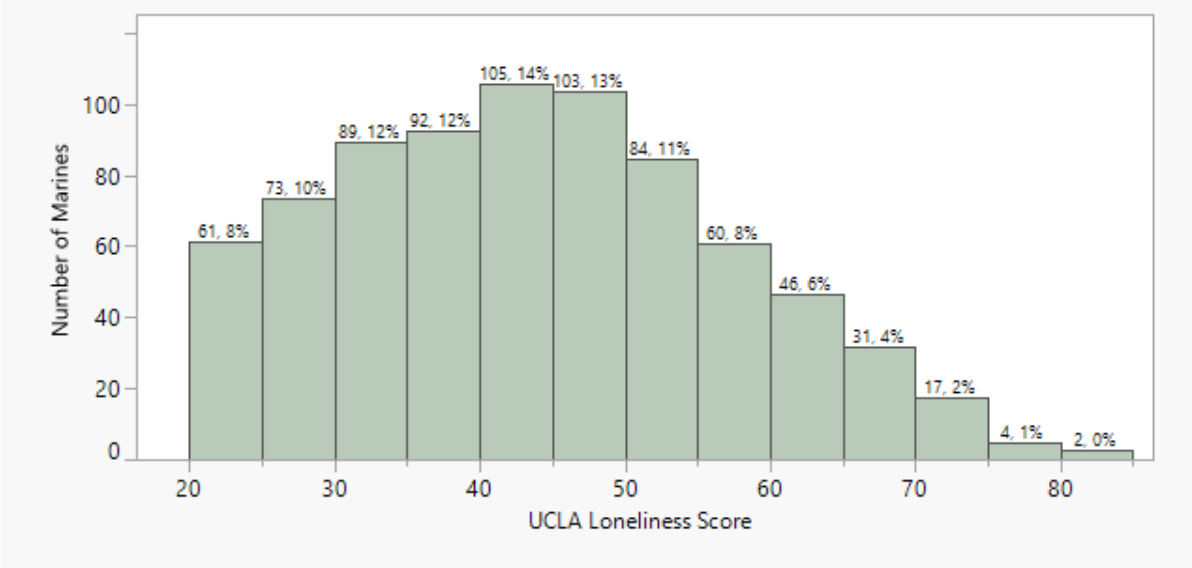

Figure 19. UCLA Loneliness Scores.

g. Average Daytime Sleepiness

Marines had a median ESS score of 8 (IQR = 6). The ESS scores ranged from 0 to 24 and were not normally distributed (Shapiro-Wilk test, W= 0.976, $p < 0.001$). Based on their ESS scores, 233 (30%) Marines had symptoms of elevated daytime sleepiness. ESS scores and daytime sleepiness groups are shown in Figures 20 and 21.

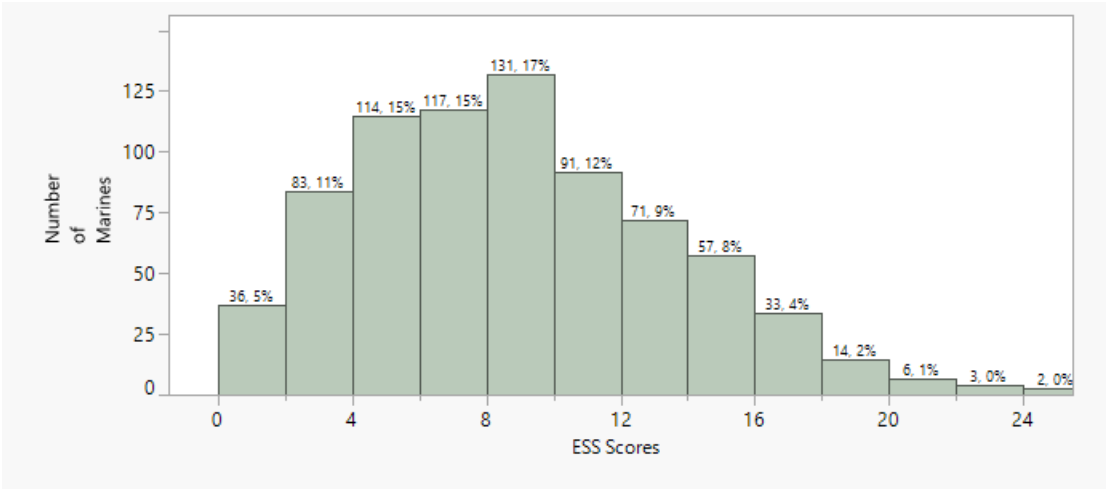

Figure 20. ESS Scores

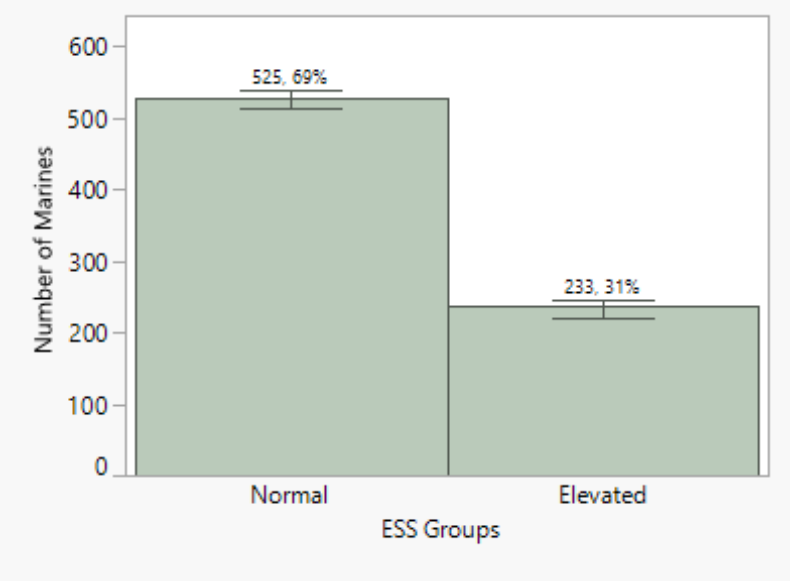

Figure 21. ESS groups. Vertical Lines Denote the Standard Error of Proportion.

h. Alcohol Use

Marines had a median AUDIT-C score of 3 (IQR = 3) ranging from 0 to 11. The AUDIT-C scores were not normally distributed (Shapiro-Wilk test, $W= 0.913$, $p < 0.001$). Based on their AUDIT-C scores, 299 (39%) Marines had a score that was suggestive of heavy drinking and/or active alcohol abuse or dependence. Figures 22 and 23 show the distributions of AUDIT-C scores and respective groups.

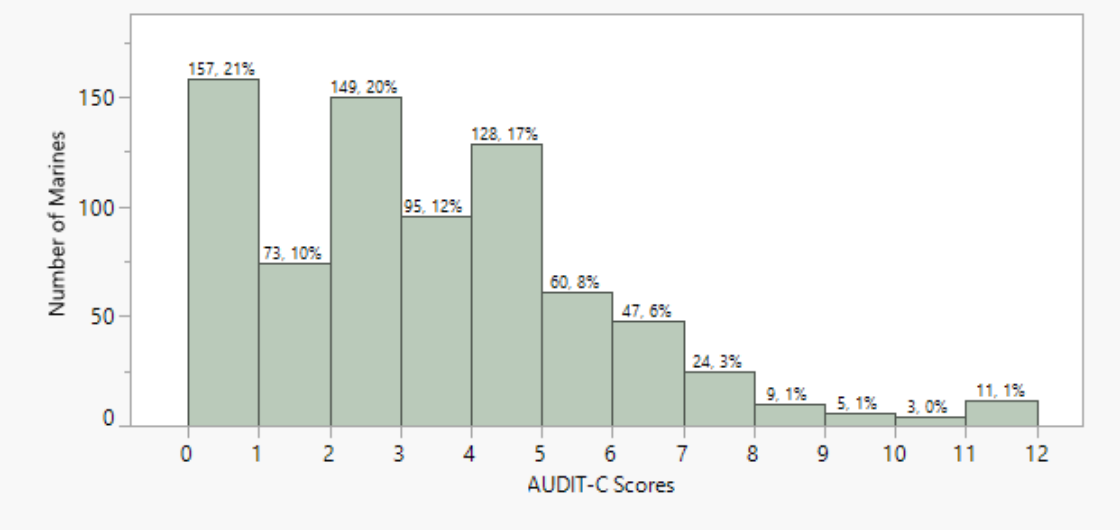

Figure 22. AUDIT-C Scores

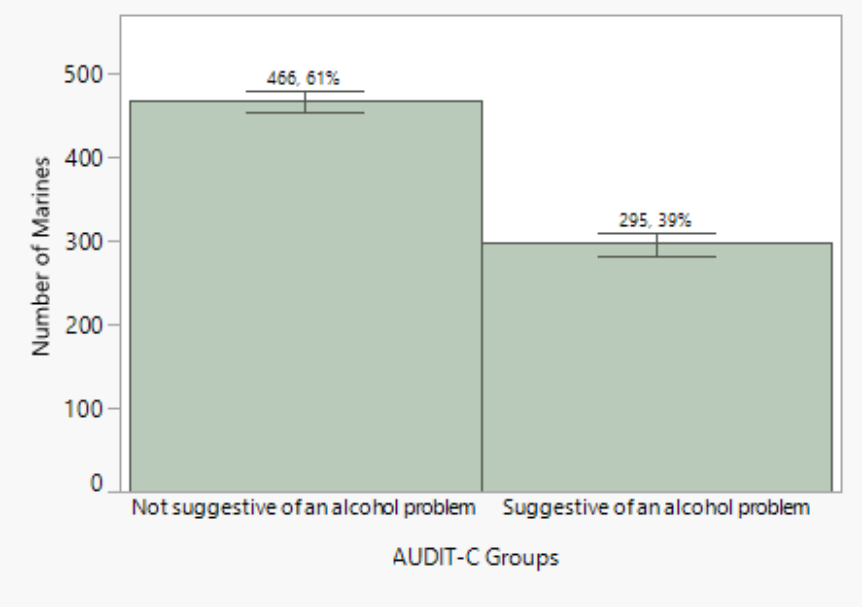

Figure 23. AUDIT-C groups. Vertical Lines Denote the Standard Error of Proportion.

B. GAMERS

Of the total entire study sample, 847 (91%) Marines reported playing video games. This section is focused on the characteristics of gamers.

1. Demographic and Occupational Characteristics

Gamers differed from non-gamers in age, sex, rank group, years of service, and deployment experience. Specifically, gamers were 6 years younger than the non-gamers (Kruskal-Wallis test, $p < 0.001$). Additionally, the median years of service for the gamers was 4 years, whereas the non-gamer group had a median total year of service of 7 years. Gamers had a median deployment of 9 months (14), whereas non-gamers had a median deployment of 12 months (18). Detailed characteristics of gamers and non-gamers are shown in Table 4.

Table 4. Demographic and Occupational Characteristics of Gamers and Non-gamers.

Characteristic	Gamers	Non-gamers	p-value
Age in years, MD (IQR)	23 (7)	29 (13.5)	**p=0.001** [A]
Males, n (%)	796 (94%)	61 (75%)	**p=0.001** [B]
Rank group, n (%)			**p=0.001** [B]
Enlisted personnel	723 (85%)	50 (62%)	
Officers	124 (15%)	31 (38%)	
MOS, n (%)	458 (55%)	40 (50%)	p = 0.615 [B]
Air			
Ground	183 (22%)	18 (23%)	
Logistics			
	191 (23%)	22 (28%)	
Years of service, MD (IQR)	4 (5.5)	7 (12.5)	**p=0.001** [A]
Having been deployed, n (%)	379 (45%)	46 (57%)	**p=0.038** [B]
Months deployed, MD (IQR)	9 (14)	12 (18)	p=0.328 [A]
Combat experience while deployed, n (%)	123 (32%)	21 (46%)	p=0.079 [B]

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

[A] Wilcoxon Rank-sum test

[B] Fisher's Exact test

2. Behavioral Characteristics

Gamers differed from non-gamers in daily sleep duration while deployed/ underway, nicotine use, daily cigarette use, daily tea consumption, whether sodas were consumed, daily soda consumption, whether energy drinks were consumed, daily energy drink consumption, whether the Marine had an exercise routine, and the number of exercise sessions per week. These behavioral characteristics are detailed in Table 5.

Table 5. Behavioral Characteristics of Gamers and Non-gamers.

Characteristic	Gamers	Non-gamers	p-value
Daily sleep duration, MD (IQR)			
At home/off duty)	7 (2)	7 (2)	p=0.114 [A]
On duty	1 (5)	0 (5)	p=0.404 [A]
While deployed/underway	5 (7)	6 (3)	**p=0.022** [A]
Nicotine use, n (%)	367 (43%)	20 (25%)	**p=0.001** [B]
Cigarette use, n (%)	83 (23%)	5 (25%)	p=0.806 [B]
Number of cigarettes smoked per day, MD (IQR)	4 (4)	1 (0.8)	**p=0.001** [A]
Chew tobacco/snuff use, n (%)	113 (31%)	6 (30%)	p=0.940 [B]
Number of tobacco/snuff used daily, MD (IQR)	3 (4)	2.5 (4.125)	p=0.518 [A]
Nicotine gum/patch use, n (%)	22 (6%)	0 (0%)	p=0.120 [B]
Number of gum/patches used daily, MD (IQR)	2 (3.25)	0 (0)	n/a
Electronic smoke use, n (%)	255 (69%)	12 (60%)	p=0.382 [B]
Caffeine consumption, n (%)	786 (93%)	74 (91%)	p=0.642 [B]
Tea consumption, n (%)	322 (41%)	29 (39%)	p=0.765 [B]
Cups of tea consumed per day, MD (IQR)	1 (1)	1 (0)	**p=0.011** [A]
Coffee consumption, n (%)	513 (65%)	56 (76%)	p=0.063 [B]
Cups of coffee consumed per day, MD (IQR)	1 (1)	1 (1)	**p=0.746** [A]
Soda consumption, n (%)	361 (46%)	19 (26%)	**p=0.001** [B]
Number of sodas consumed per day, MD (IQR)	1 (1)	1 (0)	**p=0.044** [A]
Energy drinks consumption, n (%)	468 (63%)	37 (50%)	**p=0.025** [B]
Number of energy drinks consumed daily, MD (IQR)	1 (1)	1 (0)	**p=0.013** [A]
Exercise routine, n (%)	739 (87%)	64 (79%)	**p=0.047** [B]
Number of exercise sessions/week, MD (IQR)	5 (2)	5 (2)	**p=0.048** [A]
Length of exercise routine, MD (IQR)	60 (30)	60 (38.75)	p=0.832 [A]

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

[A] Wilcoxon Rank-sum test

[B] Fisher's Exact test

3. Marines' Status

Gamers differed from non-gamers in PSS-4 scores, SWLS scores, and Brief COPE religion scores. Although statistically significant differences were found in these factors, their median scores were similar. For example, both gamer and non-gamer PSS-4 scores had a median of 8 (2). The detailed statistics for these factors are shown in Table 6.

Table 6. Marines' Status.

Factor	Gamers	Non-gamers	p-value
PSS-4 score, MD (IQR)	8 (2)	8 (2)	**p=0.018** [A]
SWLS score, MD (IQR)	23 (10)	26 (10.25)	**p=0.004** [A]
SWLS groups, n (%)			p=0.119 [B]
Dissatisfied	247 (33%)	19 (25%)	
Neutral	57 (7%)	3 (4%)	
Satisfied	493 (62%)	56 (71%)	
BC Self-distraction score, MD (IQR)	2 (3)	2 (2.75)	p=0.723 [A]
BC Active coping, MD (IQR)	3 (3)	3 (2)	p=0.886 [A]
BC Denial, MD (IQR)	0 (0)	0 (0)	p=0.854 [A]
BC Substance use, MD (IQR)	0 (0)	0 (0.75)	p=0.948 [A]
BC Emotional support, MD (IQR)	2 (4)	2 (3)	p=0.224 [A]
BC Behavioral disengagement, MD (IQR)	0 (1)	0 (1)	p=0.233 [A]
BC Instrumental support, MD (IQR)	2 (3)	2 (2)	p=0.363 [A]
BC Venting, MD (IQR)	1 (2)	1 (2)	p=0.851 [A]
BC Positive reframing, MD (IQR)	2 (3)	3 (2)	p=0.093 [A]
BC Planning, MD (IQR)	3 (3)	3 (2)	p=0.975 [A]
BC Humor, MD (IQR)	2 (4)	2 (3)	p=0.136 [A]
BC Acceptance, MD (IQR)	3 (3)	2.5 (2)	p=0.095 [A]
BC Self-blame, MD (IQR)	2 (3)	2 (3)	p=0.974 [A]
BC Religion, MD (IQR)	0 (2)	2 (3)	**p=0.005** [A]
PHQ-8 Score, MD (IQR)	4 (8)	3 (7)	p=0.216 [A]
PHQ-8 groups (depressive), n (%)	157 (22%)	10 (14%)	p=0.302 [B]
GAD-7 Score, MD (IQR)	2 (7)	2 (7.75)	p=0.780 [A]
GAD-7 groups (GAD), n (%)	124 (17%)	14 (19%)	p=0.610 [B]
UCLA Loneliness score, MD (IQR)	43 (20)	41 (18.5)	p=0.546 [A]
ESS Score, MD (IQR)	8 (6)	9 (6)	p=0.928 [A]
Elevated daytime sleepiness, n (%)	213 (31%)	20 (29%)	p=0.785 [B]
AUDIT-C score, MD (IQR)	3 (3)	2 (4)	p=0.129 [A]
AUDIT-C groups (suggestive), n (%)	276 (39%)	23 (34%)	p=0.366 [B]

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

[A] Wilcoxon Rank-sum test

[B] Fisher's Exact test

4. Why Marines Play Video Games

The MOGQ category with the highest median score was recreation, with a median score of 4.67 (IQR=1). The categories with the lowest median scores were fantasy and social, with a median score of 2 (IQR = 2, 1.75 respectively) for both. MOGQ scores ranged between 1 and 5 for each category. All MOGQ category scores were not normally distributed, with significant p-values ($p < 0.001$). The median scores of each MOGQ category are shown in Table 7.

Table 7. MOGQ Descriptive Statistics

MOGQ Category	MD (IQR)
Recreation	4.67 (1)
Coping	3.25 (1.5)
Competition	2.75 (1.75)
Skill Development	2.75 (2.25)
Escape	2.5 (2.5)
Social	2 (1.75)
Fantasy	2 (2)

5. Gaming Behaviors

There were 831 (91%) Marines who reported playing video games while at home/ off duty, 190 (20%) playing video games while on duty/in port, and 338 (36%) Marines who reported playing video games while underway/deployed. The median number of years playing video games was 16 years (IQR = 7 years). This data was not normally distributed (Shapiro-Wilk test, W= 0.972, $p < 0.001$). Figure 24 shows the distribution of years Marines reported playing video games.

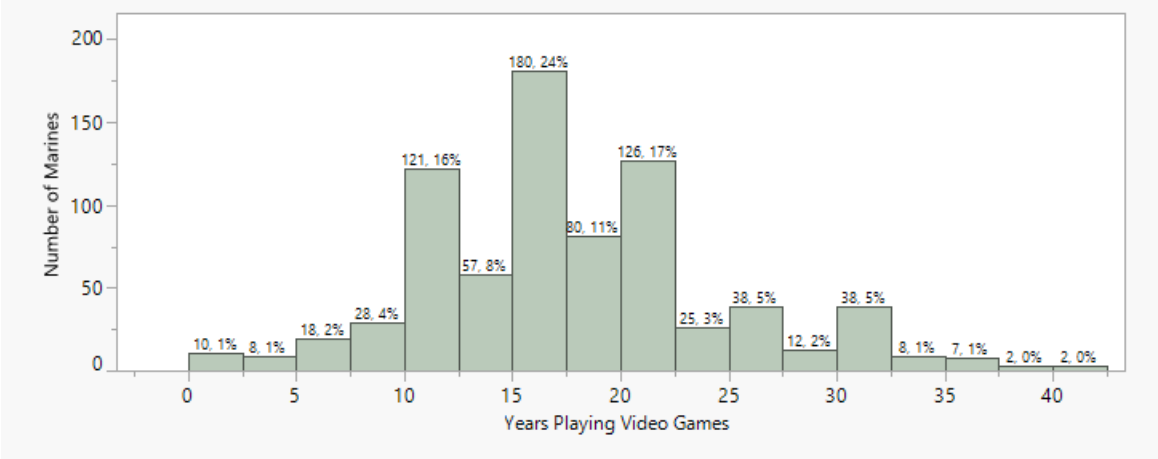

Figure 24. Years Spent Playing Video Games

In light of the recent COVID-19 pandemic, an assessment of the Marines' video game engagement since the pandemic was conducted. A total of 85 (38%) Marines reported that gaming increased since the pandemic while 13 (5%) Marines reported that video game engagement decreased since the pandemic. Finally, 126 (56%) Marines reported their video gaming to have stayed about the same. The distribution of responses is shown in Figure 25.

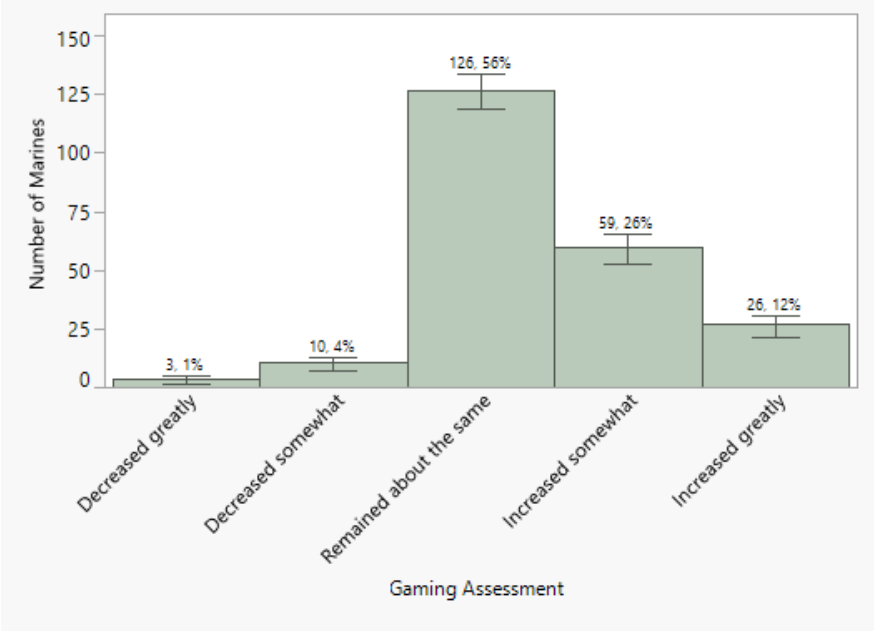

Figure 25. Changes in Engaging in Video Gaming since COVID-19. Vertical Lines Denote the Standard Error of Proportion.

a. Video Gaming at home/off duty

Marines reported playing video games a median of 5 days (IQR = 4 days) in a typical week when at home/off duty ranging from 0 days to the full 7 days per week. This data was not normally distributed (Shapiro-Wilk test, $W = 0.812$, $p < 0.001$). The distribution of days is shown in Figure 26.

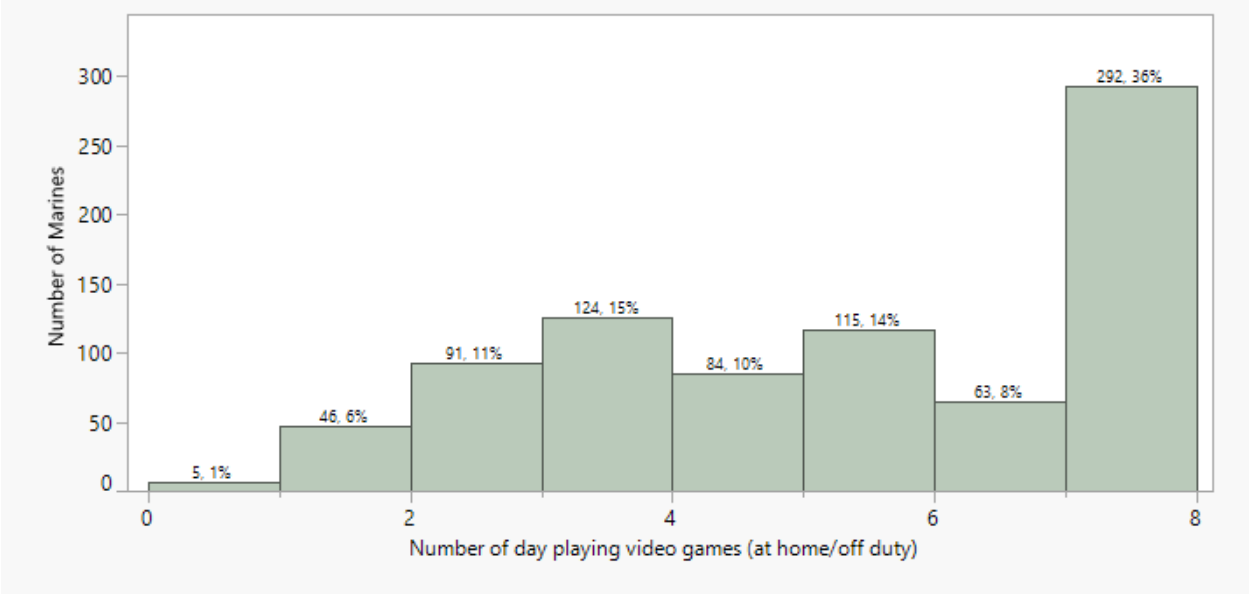

Figure 26. Number of Days Playing Video Games at home/off duty

Marines reported playing video games at home/off duty a median of 3 hours per day (IQR = 3 hours; one outlier removed) ranging between 0 hours up to 18 hours per day. This data was not normally distributed (Shapiro-Wilk test, W= 0.202, p < 0.001). The distribution of hours is shown in Figure 27.

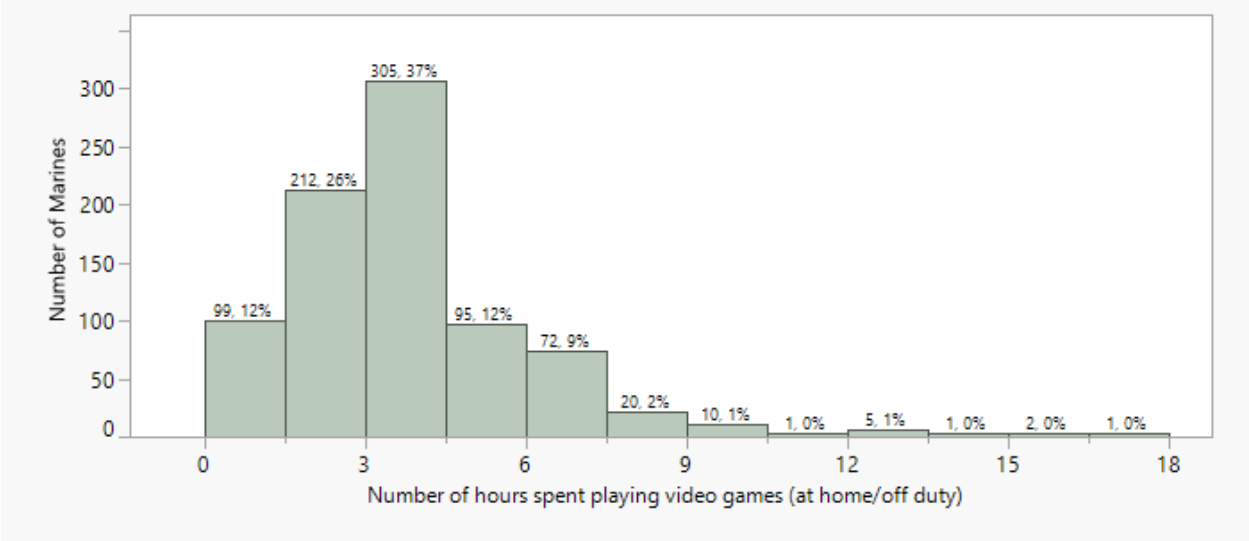

Figure 27. Number of Hours/Day Spent Playing Video Games at home/off duty

In terms of devices used to play video games, 523 (63%) Marines reported using desktops/laptops to game, 484 (58%) reported using smartphones to game, 71 (9%) used tablets, 656 (79%) used gaming consoles, and 121 (15%) Marines used virtual reality (VR) devices. Handheld video game devices were also reported. The timing of playing video games was also assessed during these times. A total of 257 (31%) Marines reported playing video games in the morning, 399 (48%) Marines reported playing video games in the afternoon, 776 (93%) Marines reported playing video games in the evening, and 607 (73%) Marines reported playing video games before bedtime. Also, 375 (62%) Marines reported sleeping later (sometimes, frequently, or always) as a result of engaging in video gaming. These results are shown in Figure 28.

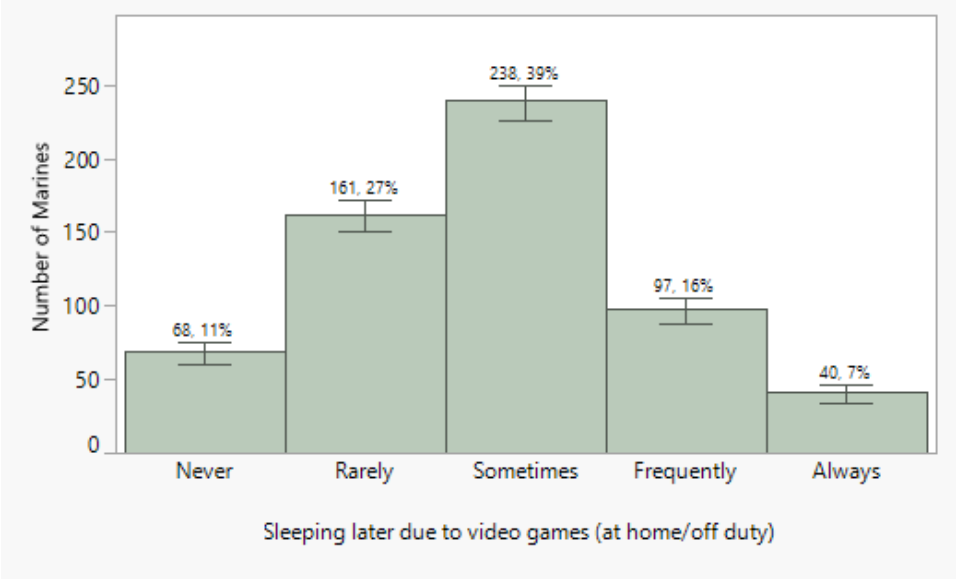

Figure 28. Sleeping Later Due to Playing Video Games (at home/off duty). Vertical Lines Denote the Standard Error of Proportion.

b. Video Gaming on duty/in port

In a typical week on duty/in port, Marines reported playing games a median of 5 days (IQR = 5 days) ranging from 0 days to the full 7 days per week. This data was not normally distributed (Shapiro-Wilk test, W= 0.894, $p < 0.001$) The distribution of days is shown in Figure 29.

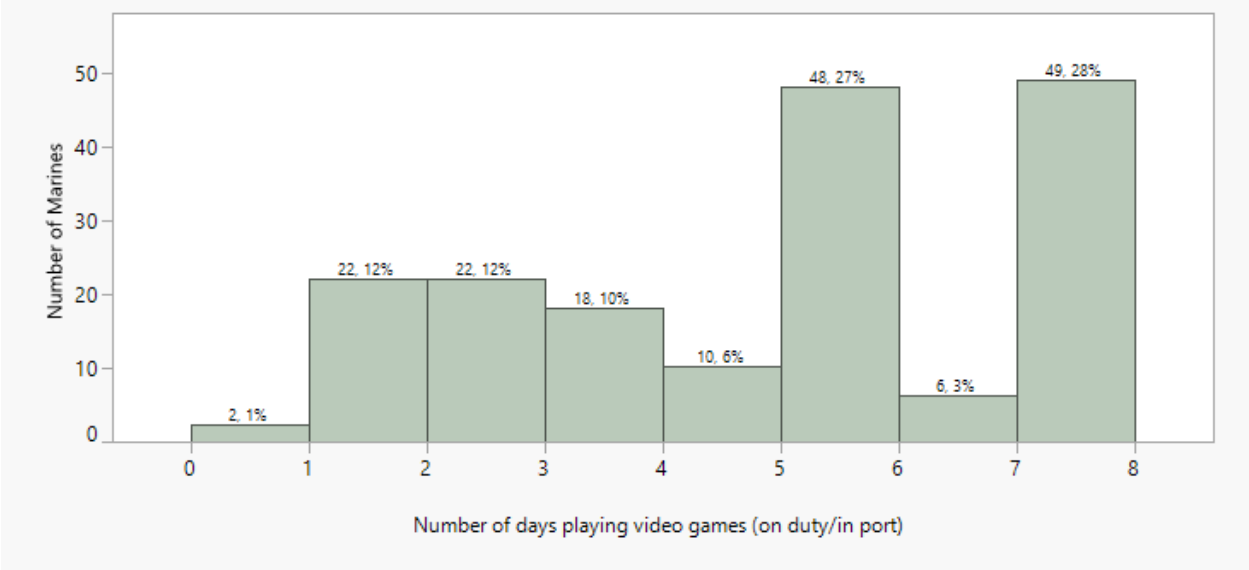

Figure 29. Number of Days Playing Video Games on duty/in port.

The number of hours spent playing video games on these days had a median of 2.5 hours (IQR = 2 hours; one outlier removed) ranging between 0 hours to 13 hours per day. This data was not normally distributed (Shapiro-Wilk test, W= 0.650, $p < 0.001$). The distribution of hours is shown in Figure 30.

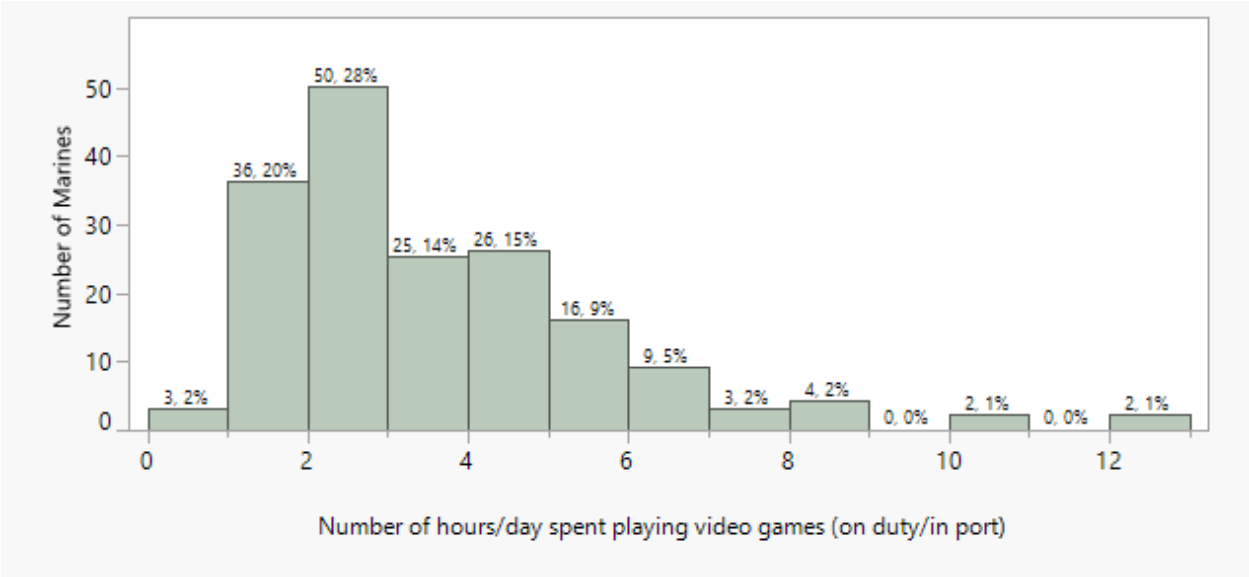

Figure 30. Number of Hours/Day Spent Playing Video Games on duty/in port

In terms of gaming devices, 91 (50%) Marines reported using desktops/laptops to game, 135 (74%) reported using smartphones, 20 (11%) used tablets, 204 (57%) used gaming consoles, and 15 (8%) Marines used VR devices. Additionally, 38 (21%) Marines reported playing video games before going to work, 94 (51%) reported playing video games during their spare time while at work, 153 (84%) Marines reported playing after work, and 125 (68%) reported playing video games before bedtime. Of those Marines who reported playing video games before bedtime, 76 (61%) reported sleeping later (sometimes, frequently, or always) as a result of playing video games. Detailed information is shown in Figure 31.

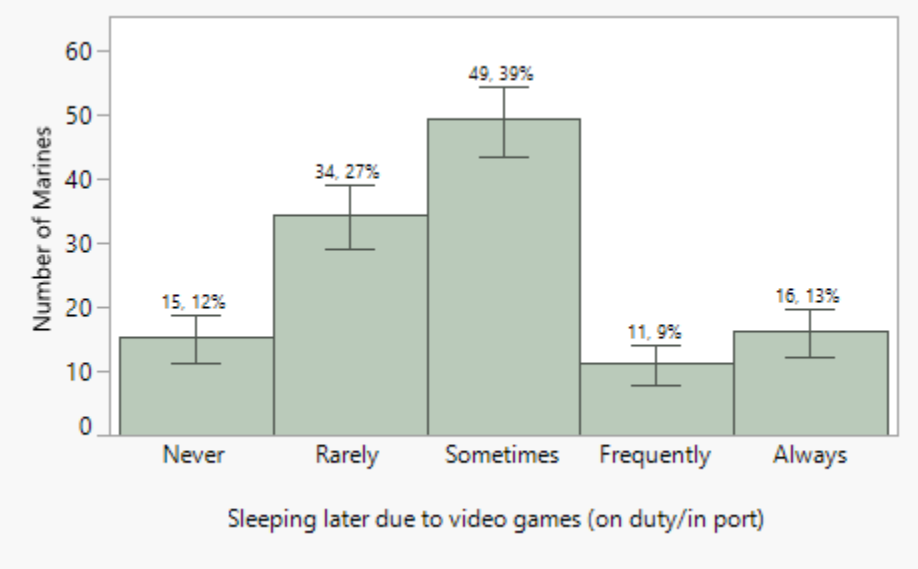

Figure 31. Sleeping Later Due to Playing Video Games (on duty/in port). Vertical Lines Denote the Standard Error of Proportion.

c. Video Gaming while underway/deployed

Marines reported playing games a median of 6 days (IQR = 4 days) in a typical week while underway or deployed, ranging from 0 days to the full 7 days a week. This data was not normally distributed (Shapiro-Wilk test, $W = 0.842$, $p < 0.001$). The distribution of days is shown in Figure 32.

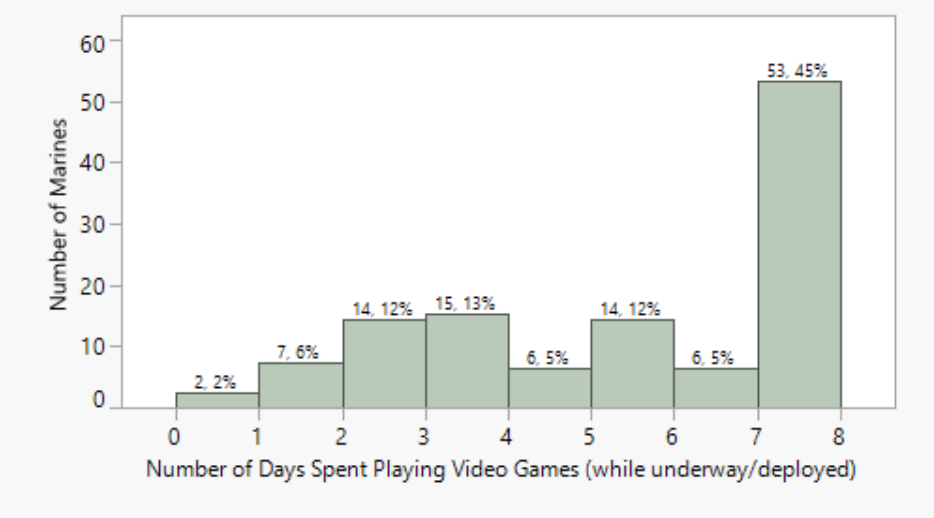

Figure 32. Number of Days Playing Video Games in a Typical Week underway/deployed

The median number of hours spent playing video games on these days was 3 hours/ day (IQR = 2 hours; one outlier removed) ranging from 0 hours to 14 hours per day. This data was not normally distributed (Shapiro-Wilk test, W= 0.703, $p < 0.001$). The distribution of hours is shown in Figure 33.

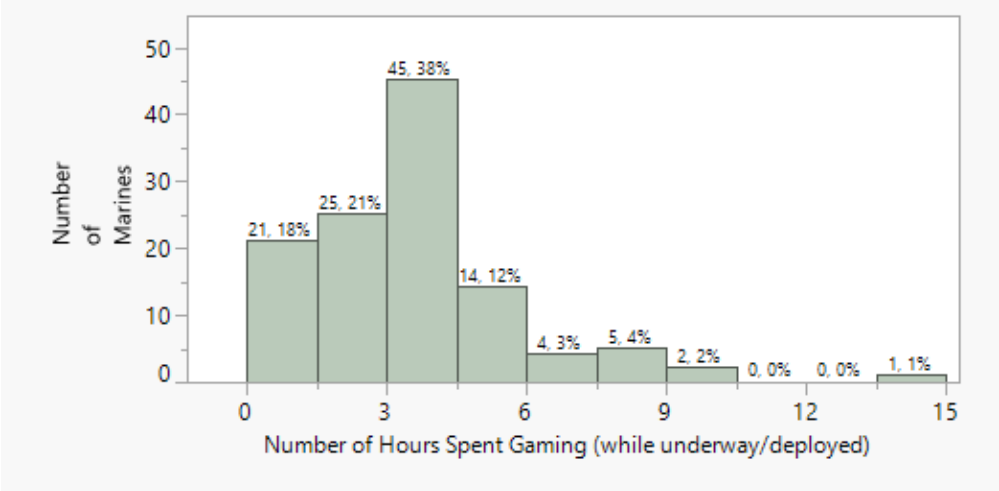

Figure 33. Number of Hours/Day Spent Playing Video Games while underway/deployed.

In terms of devices used to play video games when underway/deployed, of the Marine respondents that reported playing when underway/deployed, 74 (61%) Marines reported using desktops/laptops, 85 (70%) used smartphones, 20 (17%) used tablets, 76 (63%) used gaming consoles, and 7 (6%) used VR devices. Additionally, the timing of gaming while underway/deployed was assessed. As such, 28 (23%) Marines reported gaming before going to work, 60 (50%) reported gaming during their spare time at work, 106 (88%) reported gaming after work, and 80 (67%) Marines reported playing video games before bedtime. Most Marines (110, 92%) reported playing video games in their rack and 35 (29%) Marines reported playing video games in the mess decks. Some other responses recorded locations such as common areas, working spaces, and shops that have free space.

While underway/deployed 48 (60%) Marines reported sleeping later (sometimes, frequently, or always) due to playing video games at least sometimes. Detailed information is shown in Figure 34.

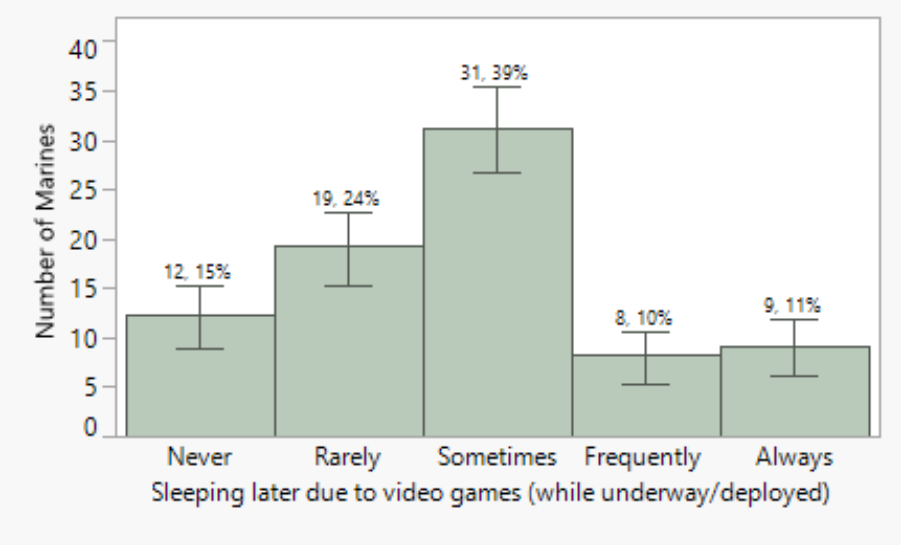

Figure 34. Sleeping Later Due to Playing Video Games while underway/ deployed. Vertical Lines Denote the Standard Error of Proportion.

Lastly, Marines were asked to estimate the percentage of their peers that play video games. Results showed that 86 (50%) Marines thought at least 60% of their peers played video games. The distribution of these responses is shown in Figure 35.

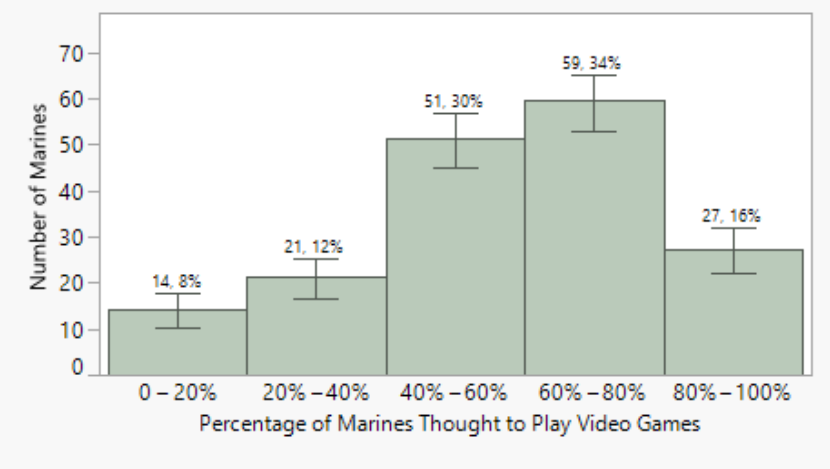

Figure 35. Percentage of Peers Thought to Play Video Games. Vertical Lines Denote Standard Error of Proportion.

d. Genres of Games Played

Marines were asked to report the genre of video games they play. The top three game genres played were shooters (91% of Marines), action/adventure games (89%), and RPGs (76%). In contrast, only 28% of Marines reported playing music and dance games, whereas 27% reported playing puzzle games and 27% reported playing card-based games. Table 8 shows detailed information on the genres of games played by Marines.

Table 8. Types of Video Games Played

Game Genre	Marines n (%)
Shooters	773 (91%)
Action/Adventure	758 (89%)
RPGs	640 (76%)

Game Genre	Marines n (%)
Platformers	514 (61%)
Battle Royale	473 (56%)
Strategy	467 (55%)
MOBAs	456 (54%)
Fighting	456 (54%)
Racing	427 (50%)
Sports	304 (36%)
Simulation	286 (34%)
Music & Dance	233 (28%)
Puzzle	230 (27%)
Card-Based	227 (27%)

C. SEVERITY OF GAMING

The median IGDS9-SF score was 15 (IQR = 7; IGDS9-SF scale completed by 226 Marines). The IGDS9-SF scores ranged from 9 to 45, which are the questionnaire's respective minimum and maximum. IGDS9-SF scores were not normally distributed (Shapiro-Wilk test, $W= 0.889$, $p < 0.001$). Based on their responses in the IGDS9-SF scale, the Marines were classified into two groups, disordered and non-disordered gamers. Marines were classified as disordered gamers if they responded "very often" to five or more (out of nine) items of the IGDS9-SF scale. As a result, 5 (2%) Marines were identified as disordered gamers. Figure 36 shows the distribution of IGDS9-SF scores.

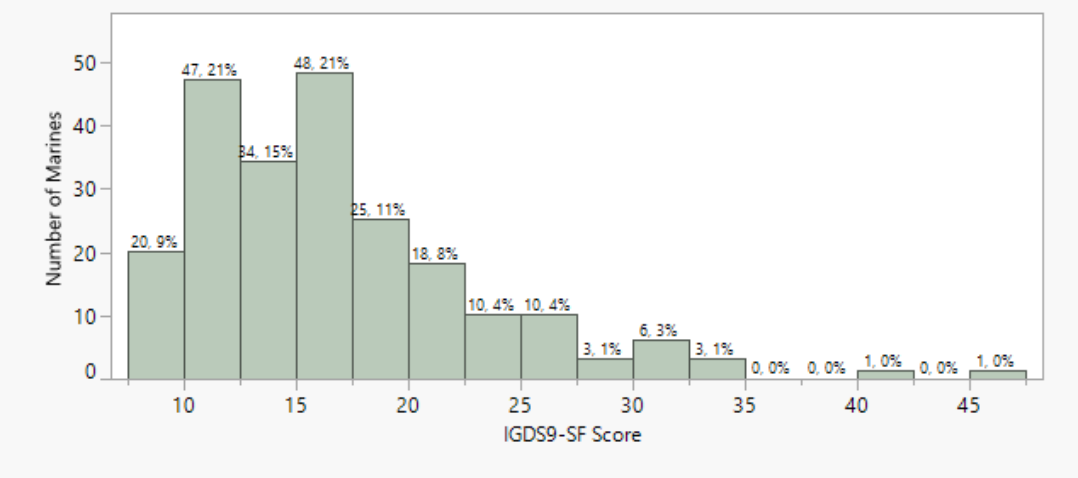

Figure 36. IGDS9-SF Scores

1. Differences between Disordered and Non-disordered Gamers

We assessed differences between disordered and non-disordered gamers in terms of demographic and occupational characteristics, behaviors, and service member status. All the results in this section should be interpreted with caution due to the small number of disordered gamers. Results showed that the two groups did not differ in terms of demographic and occupational characteristics. Detailed results are shown in Table 9.

Table 9. Comparison of Demographical and Occupational Characteristics between Disordered and Non-disordered Gamers.

Factor	Disordered gamers	Non-disordered gamers	p-value
Age in years, MD (IQR)	25 (13.5)	23 (7)	p=0.345 [A]
Males, n (%)	5 (100%)	214 (97%)	p=0.572 [B]
Rank groups, n (%)			p=0.432 [B]
Enlisted personnel	4 (80%)	198 (90%)	
Officers	1 (20%)	23 (10%)	
MOS, n (%)	2 (40%)	94 (43%)	p=0.934 [B]
Air	1 (20%)	54 (25%)	
Ground	2 (40%)	71 (32%)	
Logistics			
Years in service, MD (IQR)	5 (11.5)	4 (5)	p=0.413 [A]
Deployment experience, n (%)	3 (60%)	108 (49%)	p=0.621 [B]
Months deployed, MD (IQR)	14 (34)	9 (11.25)	p=0.435 [A]
Combat experience while deployed, n (%)	1 (20%)	29 (27%)	p=0.8071 [B]

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

[A] Wilcoxon Rank-sum test

[B] Fisher's Exact test

Compared to non-disordered gamers, more disordered gamers smoked cigarettes, and chew tobacco/snuff. Detailed information on the differences in behavioral characteristics is shown in Table 10.

Table 10. Comparison of Behavioral Characteristics between Disordered and Non-disordered Gamers.

Factor	Disordered gamers	Non-disordered gamers	p-value
Daily sleep duration (at home/off duty), MD (IQR)	7 (0.75)	7 (2)	p=0.984 [A]
Daily sleep duration (on duty), MD (IQR)	1 (5.75)	4 (6)	p=0.383 [A]
Daily sleep duration (while deployed/underway), MD (IQR)	7 (9)	6 (7)	p=0.196 [A]
Use of nicotine products, n (%)	2 (40%)	115 (52%)	p=0.586 [B]
Cigarette use, n (%)	2 (40%)	29 (25%)	**p=0.020** [B]
Number of cigarettes smoked per day, MD (IQR)	27.5 (45)	5 (4)	p=0.056 [A]
Chew tobacco/snuff use, n (%)	2 (40%)	26 (23%)	**p=0.015** [B]
Number of tobacco/snuffs used per day, MD (IQR)	12 (0)	3 (3.5)	**p=0.001** [A]
Nicotine gum/patch use, n (%)	1 (20%)	6 (5%)	p=0.078 [B]
Number of gum/patches used per day, MD (IQR)	24 (0)	2 (1.75)	**p=0.016** [A]
Electronic smoke use, n (%)	2 (40%)	87 (76%)	p=0.293 [B]
Consumption of caffeinated beverages, n (%)	5 (100%)	205 (93%)	p=0.388 [B]
Tea consumption, n (%)	3 (60%)	81 (40%)	p=0.361 [B]
Cups of tea consumed per day, MD (IQR)	2 (5)	1 (1)	p=0.115 [A]
Coffee consumption, n (%)	3 (60%)	134 (65%)	p=0.805 [B]
Cups of coffee consumed per day, MD (IQR)	3 (4)	2 (1)	p=0.105 [A]
Soda consumption, n (%)	4 (80%)	103 (50%)	p=0.173 [B]
Number of sodas consumed per day, MD (IQR)	3.5 (4.5)	1 (1)	**p=0.026** [A]
Energy drink consumption per day, n (%)	4 (80%)	139 (68%)	p=0.547 [B]
Number of energy drinks consumed per day, MD (IQR)	1.5 (4)	1 (1)	**p=0.033** [A]
Have an exercise routine, n (%)	4 (80%)	191 (86%)	p=0.695 [B]
Number of exercise sessions per week, MD (IQR)	4 (3.5)	5 (1)	p=0.778 [A]
Length of exercise routine, MD (IQR)	55 (25)	60 (15)	p=0.587 [B]

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

[A] Wilcoxon Rank-sum test

[B] Fisher's Exact test

In terms of Marines' status, the following factors were found to be significantly different between disordered and non-disordered gamers: SWLS score, Brief COPE Denial, Brief COPE Substance use, Brief COPE Behavioral disengagement, PHQ-8 score, PHQ-8 groups (depression levels), GAD-7 score, GAD-7 groups, UCLA Loneliness score, ESS score, elevated daytime sleepiness group, AUDIT-C score, and groups suggestive of alcohol abuse. Detailed information regarding ADSM's welfare is shown in Table 11.

Table 11. Comparison of Marines' Status between Disordered and Non-disordered Gamers.

Factor	Disordered gamers	Non-disordered gamers	p-value
PSS-4 score, MD (IQR)	9 (2)	8 (1)	p=0.079 [A]
SWLS score, MD (IQR)	11 (15)	23 (9)	**p=0.023** [A]
SWLS groups, n (%)			p=0.246 [B]
Dissatisfied	4 (80%)	66 (31%)	
Neutral	0 (0%)	18 (8%)	
Satisfied	1 (20%)	130 (61%)	
BC Self-distraction score, MD (IQR)	3 (5)	2 (3)	p=0.483 [A]
BC Active coping, MD (IQR)	3 (5.5)	3 (2)	p=0.656 [A]
BC Denial, MD (IQR)	2 (4)	0 (0)	**p=0.006** [A]
BC Substance use, MD (IQR)	2 (5.5)	0 (0)	**p=0.002** [A]
BC Emotional support, MD (IQR)	2 (3)	2 (4)	p=0.477 [A]
BC Behavioral disengagement, MD (IQR)	3 (4.5)	0 (1)	**p=0.004** [A]
BC Instrumental support, MD (IQR)	1 (2.5)	2 (4)	p=0.229 [A]
BC Venting, MD (IQR)	1 (3)	1 (2)	p=0.228 [A]
BC Positive reframing, MD (IQR)	3 (3)	2 (3)	p=0.756 [A]
BC Planning, MD (IQR)	3 (4)	3 (3)	p=0.263 [A]
BC Humor, MD (IQR)	2 (3.5)	2 (3)	p=0.974 [A]
BC Acceptance, MD (IQR)	6 (5)	3 (3)	p=0.332 [A]
BC Self-blame, MD (IQR)	3 (6)	2 (3)	p=0.302 [A]
BC Religion, MD (IQR)	2 (3)	0 (2)	p=0.697 [A]
PHQ-8 Score, MD (IQR)	21 (15)	3 (7)	**p=0.002** [A]
PHQ-8 depressive groups, n (%)	4 (80%)	36 (19%)	**p=0.006** [B]
GAD-7 Score, MD (IQR)	19 (11.5)	2 (7)	**p=0.001** [A]
GAD-7 groups, n (%)	5 (100%)	65 (35%)	**p=0.001** [B]
UCLA Loneliness score, MD (IQR)	55 (36.5)	42 (16)	**p=0.036** [A]
ESS Score, MD (IQR)	16 (12.5)	8 (7)	**p=0.005** [A]
Elevated daytime sleepiness, n (%)	4 (80%)	52 (29%)	**p=0.019** [B]
AUDIT-C score, MD (IQR)	7 (8)	3 (3)	**p=0.002** [A]
Groups suggestive of alcohol abuse, n (%)	4 (80%)	67 (36%)	**p=0.049** [B]

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

[A] Wilcoxon Rank-sum test

[B] Fisher's Exact test

The gaming habits of disordered and non-disordered gamers are shown in Table 12. The factors that were identified as significantly different were the number of days per week games are played (at home/off duty, on duty), daily gaming length (while underway/ deployed), MOGQ Social, and MOGQ Fantasy.

Table 12. Comparison of Gaming Characteristics between Disordered and Non-disordered Gamers.

Factor	Disordered gamers	Non-disordered gamers	p-value
Years playing games, MD (IQR)	20 (9.5)	17 (5.25)	p=0.901 [A]
Weekly gaming frequency (at home/off duty), MD (IQR)	7 (0)	6 (3)	**p=0.015** [A]
Weekly gaming frequency (on duty), MD (IQR)	7 (0)	5 (4)	**p=0.009** [A]
Weekly gaming frequency (while underway/ deployed), MD (IQR)	7 (0)	6 (4)	p=0.076 [A]
Daily gaming length (at home/off duty), MD (IQR)	5 (5)	3 (3)	p=0.619 [A]
Daily gaming length (on duty), MD (IQR)	3.5 (3)	2 (2)	p=0.765 [A]
Daily gaming length (while underway/deployed), MD (IQR)	8 (12)	3 (2)	**p=0.025** [A]
Slept later due to video gaming (at home/off duty), n (%)	4 (80%)	110 (63%)	p=0.160 [B]
Slept later due to video gaming (on duty), n (%)	4 (80%)	65 (59%)	p=0.125 [B]
Slept later due to video gaming (while underway/ deployed), n (%)	3 (60%)	45 (59%)	p=0.129 [B]
MOGQ Social, MD (IQR)	4.5 (3.25)	2.25 (1.75)	**p=0.033** [A]
MOGQ Escape, MD (IQR)	4.5 (3.125)	2.75 (2)	p=0.137 [A]
MOGQ Competition, MD (IQR)	4.5 (2.625)	3 (1.75)	**p=0.070** [A]
MOGQ Coping, MD (IQR)	4.75 (2.75)	3.25 (1.5)	p=0.176 [A]
MOGQ Skill development, MD (IQR)	4.75 (3.375)	3 (2.25)	p=0.355 [A]
MOGQ Fantasy, MD (IQR)	3.5 (3.125)	2 (2)	**p=0.049** [A]
MOGQ Recreation, MD (IQR)	4 (1.833)	4.67 (1)	p=0.424 [A]

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

[A] Wilcoxon Rank-sum test

[B] Fisher's Exact test

In brief, all disordered gamers identified in the survey were male, with four belonging to the lower enlisted ranks and one officer. Notably, the number of days per week spent gaming, hours spent gaming, and the timing of gaming in the three different scenarios showed major differences between the two groups. Disordered gamers were more inclined to play games in the morning, whether or not they had work or obligations for that day. They also reported playing whenever they had time available, such as during spare time at work. Every disordered gamer also endorsed playing games before bedtime. Additionally, all disordered gamers favored shooters and fighting-based games. Disordered gamers displayed higher overall median scores in most MOGQ categories, except for recreation. The Brief COPE showed disordered gamers having higher overall median scores in the majority of categories.

(1) Correlational Analysis

Correlational analysis showed that IGDS9-SF scores were associated with daily sleep duration (on duty), exercise routine length, number of days spent gaming (at home), number of hours spent gaming (at home), MOGQ Social, MOGQ Escape, MOGQ Competition, MOGQ Coping, MOGQ Skill development, MOGQ Fantasy, MOGQ Recreation, PSS-4, SWLS, Brief Cope Self-distraction, Denial, Substance use, Emotional support, Behavioral disengagement, Instrumental support, Venting, Positive reframing, Acceptance, Self-blame, PHQ-8, GAD-7, and ESS. Detailed results of the correlation analysis are shown in Table 13.

Table 13. 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) Daily sleep duration (on duty)	**0.15**																									
(3) Exercise routine length	**-0.14**	0.02																								
(4) Number of days spent gaming (at home)	**0.19**	0.03	-0.03																							
(5) Number of hours spent gaming (at home)	**0.17**	0.03	-0.06	**0.36**																						
(6) MOGQ Social	**0.33**	0.04	0.01	**0.37**	**0.37**																					
(7) MOGQ Escape	**0.53**	-0.04	-0.03	**0.30**	**0.33**	**0.46**																				
(8) MOGQ Competition	**0.40**	0.06	0.03	**0.31**	**0.29**	**0.49**	**0.38**																			
(9) MOGQ Coping	**0.49**	-0.02	0.04	**0.36**	**0.30**	**0.52**	**0.71**	**0.51**																		
(10) MOGQ Skill Development	**0.31**	-0.01	0.04	**0.32**	**0.29**	**0.55**	**0.40**	**0.52**	**0.61**																	
(11) MOGQ Fantasy	**0.34**	0.02	-0.02	**0.17**	**0.23**	**0.44**	**0.69**	**0.30**	**0.55**	**0.41**																
(12) MOGQ Recreation	**0.15**	-0.06	0.02	**0.22**	**0.07**	**0.23**	**0.18**	**0.19**	**0.35**	**0.29**	**0.22**															
(13) PSS-4	**0.13**	0.01	0.02	-0.01	0.01	0.04	**0.21**	**0.10**	**0.18**	**0.07**	**0.18**	**0.11**														
(14) SWLS	**-0.15**	-0.01	-0.01	**-0.12**	**-0.20**	**-0.16**	**-0.42**	**-0.10**	**-0.21**	-0.01	**-0.30**	**0.07**	-0.06													
(15) BC Self-distraction	**0.26**	-0.06	0.03	**0.08**	**0.14**	**0.23**	**0.50**	**0.17**	**0.39**	**0.21**	**0.40**	0.05	**0.22**	**-0.36**												
(16) BC Denial	**0.26**	-0.03	-0.03	0.02	**0.08**	**0.17**	**0.32**	**0.15**	**0.18**	**0.10**	**0.25**	**-0.09**	**0.08**	**-0.29**	**0.26**											
(17) BC Substance use	**0.18**	0.02	-0.01	-0.02	-0.01	0.03	**0.24**	**0.08**	**0.16**	-0.01	**0.16**	-0.01	**0.17**	**-0.23**	**0.21**	**0.08**										
(18) BC Emotional support	**0.18**	-0.01	-0.01	-0.02	-0.01	**0.13**	**0.12**	0.06	**0.14**	**0.10**	**0.15**	0.06	**0.14**	0.02	**0.32**	**0.37**	**0.11**									
(19) BC Behavioral disengagement	**0.30**	0.01	-0.04	0.05	**0.16**	**0.15**	**0.4**	**0.13**	**0.21**	0.03	**0.33**	-0.06	**0.15**	**-0.48**	**0.34**	-0.01	**0.48**	**0.38**								
(20) BC Instrumental support	**0.14**	-0.01	0.01	-0.03	-0.01	**0.14**	**0.14**	0.05	**0.13**	**0.13**	**0.15**	0.02	**0.14**	-0.02	**0.35**	**0.40**	**0.12**	**0.07**	**0.7**							
(21) BC Venting	**0.23**	-0.01	-0.01	-0.02	0.05	**0.17**	**0.34**	**0.13**	**0.27**	**0.17**	**0.33**	-0.01	**0.20**	**-0.27**	**0.45**	**0.29**	**0.32**	**0.21**	**0.42**	**0.37**						
(22) BC Positive reframing	**0.14**	-0.01	0.03	-0.09	-0.01	**0.10**	**0.17**	**0.09**	**0.13**	**0.11**	**0.21**	-0.01	**0.12**	-0.01	**0.40**	**0.46**	**0.18**	**0.12**	**0.51**	**0.11**	**0.50**					
(23) BC Acceptance	**0.21**	-0.06	0.03	-0.01	0.05	0.16	0.24	0.06	**0.20**	**0.13**	**0.25**	0.06	**0.22**	**-0.13**	**0.49**	**0.10**	**0.08**	**0.38**	**0.18**	**0.39**	**0.47**	**0.53**				
(24) BC Self-blame	**0.23**	-0.02	0.04	0.06	**0.10**	0.18	**0.41**	**0.16**	**0.27**	**0.11**	**0.38**	0.05	**0.27**	**-0.45**	**0.51**	**0.33**	**0.31**	**0.26**	**0.50**	**0.28**	**0.45**	**0.33**	**0.43**			
(25) PHQ-8	**0.35**	-0.02	-0.03	0.04	**0.09**	**0.11**	**0.42**	**0.08**	**0.22**	0.02	**0.31**	-0.02	**0.24**	**-0.54**	**0.44**	**0.31**	**0.32**	**0.08**	**0.53**	**0.10**	**0.37**	**0.16**	**0.24**	**0.59**		
(26) GAD-7	**0.33**	-0.01	-0.01	-0.01	0.05	**0.10**	**0.38**	**0.10**	**0.24**	0.04	**0.27**	-0.01	**0.27**	**-0.44**	**0.44**	**0.32**	**0.31**	**0.12**	**0.47**	**0.14**	**0.42**	**0.19**	**0.25**	**0.57**	**0.80**	
(27) ESS	**0.23**	-0.01	-0.01	**0.09**	0.03	**0.15**	**0.26**	**0.12**	**0.20**	**0.11**	**0.20**	**0.11**	**0.2**	**0.09**	**0.11**	**-0.15**	**0.14**	**0.17**	**0.07**	**0.13**	**0.21**	**0.12**	**0.16**	**0.07**	**0.25**	**0.23**

Correlations in bold have a significant p-value ($p < 0.05$)

V. DISCUSSION

The objectives of this thesis were to assess the prevalence of problematic video gaming within the USMC, identify the motivational factors for playing video games, and assess the effect of video gaming on Marines' behavior patterns and well-being.

A total of five Marines were identified as disordered gamers (IGD) representing 2% of the respondents that completed the IGDS9-SF items (n=226). In comparison, the prevalence of IGD in 37 cross-sectional and 13 longitudinal studies ranged from 0.7% to 27.5% (Mihara et a., 2017). Therefore, the prevalence of disordered gaming in our population was on the lower end. However, our findings agree with various studies that assessed the prevalence of IGD on diverse population samples. For example, Milani and colleagues found that 2.1% of their sample had symptoms indicative of IGD (Milani et al., 2018). Schneider and colleagues found that 3.2% of their sample of adolescents showed signs of being at high risk for IGD (Schneider et al., 2017). In a sample of 246 military veterans, 8.8% of veterans showed symptoms that were indicative of problematic gaming (Myrseth et al., 2017). In relation to IGD, other studies assessed video game addiction, which was classified in a similar fashion to IGD. Mentzoni et al. found 0.6% of their sample to be addicted to video games (Mentzoni et al., 2011). Another study found that 1.4% of their 3,389 participants were addicted to video games (Witteck et al., 2016). A study conducted on 1,320 eighth graders found a prevalence of 4.2% to be indicative of gaming addiction within their sample (Brunborg et al., 2013). Based on their review of 27 studies, Feng and colleagues found that the prevalence of IGD ranged from 0.7% to 15.6% in their respective naturalistic populations (Feng et al., 2017).

The strongest motivational factors for playing video games were recreational purposes and using games to cope with stress. Although video gamers are typically motivated by social interactions (Granic et al., 2014), this was not reflected in the Marine gamers, as their overall MOGQ social scores were low in comparison to recreation and coping with stress. Of note, disordered gamers had higher scores (more frequently reported) in the social, escape, competition, coping, and skill development motivational dimensions compared to the rest of the Marines who reported playing video games.

In terms of coping with problems, disordered gamers scored higher in denial, substance use, and behavioral disengagement. These three coping styles are considered dysfunctional and have been found to be associated with IGD symptoms (Schneider et al., 2017; Von der Heiden et al., 2019). Denial and behavioral disengagement, typically classified as avoidant-based coping methods, have been found to be positively associated with internet addiction in male adolescents (Senormanci et al., 2014).

Compared to non-gamers, the group of Marine gamers were younger, included more enlisted personnel, were mostly male. Various studies have found the male sex to be associated with increased prevalence of IGD, with males outnumbering females (Mihara et al., Von der Heiden et a., 2019). Gamers typically slept less than non-gamers while underway/deployed. In terms of Marine's satisfaction with life, gamers were generally more dissatisfied with life than non-gamers. In line with this finding, personal satisfaction with life has been found to be associated with potential problematic video game use (Mentzoni et al., 2011). Pathological gaming has been more likely when basic need satisfaction is low in the real world, but high when playing video games (Von der Heiden et al., 2019; Mentzoni et al., 2011; Allen et al., 2018). Additionally, Marine gamers used more nicotine products and consumed more caffeine than non-gamers.

Disordered Marine gamers, differed from the rest of gamers in terms of satisfaction with life, depressive symptoms, anxiety symptoms, loneliness, daytime sleepiness, alcohol use, weekly gaming frequency (at home/off duty), weekly gaming frequency (on duty), and daily gaming duration (while underway/deployed). As previously mentioned, lower levels of satisfaction with life are associated with problematic video gaming (Von der Heiden et al., 2019; Mentzoni et al., 2011; Allen et al., 2018). Depression and anxiety have also been found to be associated with problematic gaming (Schneider et al., 2017; Von der Heiden et al., 2019; Brunborg et al., 2013; Mentzoni et al., 2011). Even though loneliness may be reduced in some cases by playing video games, high levels of loneliness are positively associated with problematic video gaming (Von der Heiden et al., 2019). Disordered gamers in our study sample reported playing video games 7 days per week. In a study conducted by Haagsma and colleagues, only about 16% of their sample (N=902) reported playing video games every day, and 47.6% of respondents reported playing at least 4 days

per week (Haagsma et al., 2012). Additionally, the mean video gaming duration was 5.97 hours per day (Haagsma et al., 2012), whereas the Marine respondent's median gaming duration was 5 hours per day when at home/off duty, 3.5 hours when on duty, and 3 hours while underway/deployed. Brunborg and colleagues found that addicted gamers played video games on average 24 hours per week as compared to 10 hours per week for all players in their study sample (Brunborg et al., 2013). The disordered gamers in our sample of Marines reported playing video games as long as, or longer compared to the findings of the aforementioned studies. However, gaming time alone is not a reliable indicator of problematic video gaming in many studies as findings vary depending on the sample assessed (Kiraly et al., 2017; Mihara et al., 2017).

In conclusion, the prevalence of disordered gaming in our sample of Marines does not differ from the other gaming studies in the scientific literature we reviewed. Marines reported playing video games mainly for recreation and to cope with stress. Disordered gamers reported using dysfunctional coping styles more frequently than the rest of gamers. Also, disordered gamers reported more severe symptoms of depression and anxiety, higher levels of loneliness, elevated daytime sleepiness, and more symptoms suggestive of heavy drinking.

A parallel thesis effort is being conducted by LT Jason Xu. LT Xu's thesis focuses on Sailors from three USN surface ships. LT Xu's work will assess the prevalence of problematic video gaming in his sample and compare the results from his USN sample with the USMC sample assessed in this thesis. Further analysis will be conducted to see if and where the two services differ regarding potentially problematic video gaming in ADSMs.

(1) Study Limitations

This study has several limitations. Data were acquired using questionnaires that are known to be subject to response bias. Given that most of our variables were not normally distributed, the statistical tests used were non-parametric, which typically has less statistical power to classify differences between groups as statistically significant.

Even though one of the goals of this thesis was to assess the prevalence of problematic video gaming, our data cannot be used for a reliable prevalence assessment due to the low response rate (approximately 7.5%). Therefore, the high prevalence of gamers in the study sample should be interpreted with caution.

VI. RECOMMENDATIONS

This chapter provides recommendations to ameliorate the negative effects of problematic video gaming on Marines and provides ideas for future research.

A. EDUCATE MARINES ON THE RISKS OF PROBLEMATIC VIDEO GAMING

The first recommendation is to educate Marines on the potential risks of problematic video gaming and the factors associated with gaming addiction. Developing a better understanding of the risk factors and the negative consequences of problematic video gaming will allow Marines to conduct self-assessments and make conscious efforts to mitigate potential problematic video gaming-related behaviors within themselves.

B. EDUCATE MARINES ON SLEEP HYGIENE PRACTICES

Our results showed that several Marines reported sleeping later due to playing video games. This finding was paired with sleep deprivation, which is endemic in the military, and suggests that Marines should be better educated on the importance of sleep and appropriate sleep hygiene practices to improve sleep and reduce fatigue.

C. IMPLEMENT STRATEGIES TO MITIGATE THE EFFECTS OF PROBLEMATIC VIDEO GAMING

Leadership should take action to mitigate the effects of problematic video gaming in Marines. Such strategies may include reducing screen time, taking time away from video games, and meeting needs for satisfaction in alternative ways rather than playing video games. These strategies are similar to the interventions implemented on Marines in a study conducted by Eickhoff et al. (2015).

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